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# Effects of Learning Style on Students Achievement: Experimental Research

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***Abstract*---**This study aims at investigating the relationship between learning styles and academic achievement in Physics of high school students in Thai Nguyen city, Vietnam. In this study, we selected a simple random sample consisting of students attending high schools located in Thai Nguyen city (Luong Ngoc Quyen High School, Iron Steel High School, Thai Nguyen High School; Duong Tu Minh High School; Ngo Quyen High School; Luong the Vinh High School; Dao Duy Tu High School) from 2019-2020; 2020-2021. This study used the formula for sample size calculation developed by Watson (2001), our population size is 307 students. This study used an online questionnaire survey method using Google form and Zalo form. Survey was conducted from April 2019 to May 2021. The result implied that different learning styles accompanied with learning setting can contribute greatly to students' academic achievement.

***Keywords*---**academic achievement, experimental research, learning style, students, teaching method.

## Introduction

Students' academic achievement reflects the result 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. These factors can be divided into 3 groups: (1) Subjective factors like learning motivation, learning style, self-study ability, beliefs on the personal competencies, student persistence in learning, students' academic competitiveness; (2) Objective factors such as teachers' competencies, school facilities, friends; (3) Control factors like gender, region, input, financial conditions. Among these factors, learning style is a fairly stable psychological state of learners that affects their learning performance by answering the question: do learners acquire knowledge in their preferred way? Studies on the relationship between learning styles and academic achievement

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often combine some other factors such as personality or motivation to find a linear relationship between these factors. The research results reveal a strong correlation between learning performance and learning styles. Most of these studies surveyed learners between the ages of 16 and 18. Here are some typical researches (Oka, 2021; Putra et al., 2020).

According to Snyder (1999), on the relationship between learning styles, multiple intelligences and academic achievement, a positive correlation was found between learning styles and academic achievement. Research also shows a positive correlation between self-study activities and learning performance. Demirbas & Demirkan (2007); Cano-Garcia & Hughes (2000), studied the relationship between learning styles, thinking styles and academic achievement of students. Their research results indicate that learning styles and thinking styles are closely related and these are two important factors for predicting student performance. Farsides & Woodfield (2003), examined the relationship between motivation, learning style and academic achievement. These researchers also stated a positive relationship between learning styles and student performance. Homayoni & Abdolahi (2003), investigated the relationship between learning styles and learning performance of high school students. Homayoni & Abdolahi (2003), looked into the relationship between learning styles and academic achievement of high school students. Their study revealed a very close correlation between learning style and learning performance. Siddiquei & Khalid (2018); Komarraju et al. (2011), studied the correlation between personality, learning style and academic achievement. This study was conducted on a sample of 308 students. It indicated that personality and learning style can together influence and result in 17% of the change in learning performance Jahanbakhsh (2012), studied the correlation between learning styles and academic result of girls' schools in Iran. A strong correlation was found between learning styles and academic result of these students. In this study, I investigated the correlation between learning styles and academic achievement in Physics of a group of high school students in Thai Nguyen City (Husin et al., 2021; Dudar et al., 2021).

**Theoretical framework**

**Learning styles**

Learning styles can be considered as a series of distinct behaviors gathered in a single conceptual definition presented by Alonso (2000), based on studies (Keefe, 1985). Learning styles are qualified as cognitive, affective, and psychological behavior which show how learners perceive, interact with, and respond to the learning environment. Sharing this view and based on Pieget's experiential learning theory, Kolb (1984), argued that experience plays a crucial role in learning. Individuals differ in how they approach different tasks and how they use experience. Some like to learn by experiment, others like to learn by observation. Accordingly, Kolb (1984), defined a learning style as a learner's consistent reaction to respond to and utilize environmental stimuli in a particular learning context, individual ways of dealing with information processing, emotions, and behavior in learning situations. For Messick (1984), learning styles can be thought of as the different ways a student can learn. According to Alonso (2000), people use different learning styles, although one learning style is often preferred.

This leads to confirm that all humans develop learning styles, some dominant over others, but it is essential to identify them and use them in learning (Widana et al., 2020).

This study shares Ried's (1984, 1987, 1995) views on learning styles. At the same time, the author uses the learning style instrument of Reid (1984) to investigate the learning style of students in Physics. 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 (1984, 1987, 1995) and the author has made the following adjustments:

- Visual learning style through modern information technology system (VS): Learners receive information through visual stimuli. If the material is visual and vivid, clear images will be formed in the learner's brain (N.T.T. Ha 2021). 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, oral explanation.
- Auditory learning style supported by modern information technology system (AS): 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.
- Tactile learning style (TS): Learners like to approach problems through "hands –on" experiences in classroom learning, such as hands-on activities with laboratory materials, building and processing models.
- Group preferring learning style with the support of modern information technology system (GS): Learners like to study with others, attach great importance to group interaction.
- Kinesthetic learning style with the support of modern equipment systems (KS): Learners like to approach problems through their own body movement experiences in class, such as games, role play in class. Learners of this type often feel uncomfortable when sitting for a long time (N.T.T. Ha 2021).
- Individual preferring learning style with the support of modern information technology systems when needed (IS): Learners prefer to study alone. They believe that studying alone is more effective than studying with others.
- (Abbreviation: V-visual; A-auditory; T-tactile; G-group; K-kinesthetic; I-individual; S- styles)

**Academic achievement**

According to modern teaching theory, learning is essentially the acquisition and processing of information mainly by intellectual manipulations based on the biological characteristics and acquired knowledge of individuals, thereby acquiring new understanding of human culture, scientific concepts, and reproduce 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, explore and create new knowledge (Eaton, 2003; Nguyen, 2021; Reid, 1995).

Learning in the teaching process is a cognitive activity conducted by learners under the control of teachers (Tuminaro & Redish 2007). Learning enriches learners' understanding. The value of learning is to make the experiences of learners change sustainably, helping them develop their inherent nature to adapt and integrate with the community, nation and humanity. Learning is the student's own action, done by learners, no one can replace them. Learning aims at absorbing human cultures and transforming them into physical and mental capacities of each individual, and changing the intellectual, emotional and physical behavior of each individual.

Academic result achieved by learners are the most important basis for assessing the quality of education. It can be understood that 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. Thereby, appropriate recommendations will be given. Measurement of learning result must provide reliable conclusions about student performance to help teachers make appropriate decisions in the teaching process, and promote learning motivation and their responsibility. To accomplish this goal, the measurement must perform its functions and be based on evidence gathered from a wide range of activities. The methods used in the measurement of learning performance should be diverse and must be selected in accordance with the learning objectives and follow certain principles. They need to be an integral part of the teaching process.

As described by Plant et al. (2005), learning performance can be measured through the grade point average. For their part, Clark (2001), argued that academic achievement can also be self-assessed by students through their learning process and job search results. In particular, Young et al. (2003), based on Bandura (1999), view: learning is the acquisition of knowledge through the processing of perceived information from society and from individual thinking. In the view of McCloy, McCloy et al. (1994), learning performance is a multidimensional construct related to targeted behaviors or actions. Their model consists of 3 determinants of the relevant variance: declarative knowledge, procedural knowledge and skill, and volitional choice (motivation) (Young et al., 2003). On that basis, Young et al. (2003), defined learning performance as students' self-evaluation of acquired knowledge, understanding and skills developed and efforts made in a specific learning context compared to other learning contexts. Accordingly, learning performance is reflected in 6 aspects: the knowledge you gain, the skills you develop, the effort you put in, the ability to apply your knowledge, the desire to learn more and your understanding of the learning content.

According to Bergan (2003), academic achievement is 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 statement of the competencies that the learner aspires to acquire after the learning process. According to the Council for Higher Education Accreditation of the United States (CHEA), learning performance is the measurement of the amount of academic content a student can learn. It can be understood as expectations or result of a learning experience. Thus, student achievement is properly measured according

to the knowledge, experience, and abilities that learners gain after completing an academic course. In a separate study, Fleming & Eames (2005), indicated that academic result often includes many factors such as knowledge, experience, abilities and understanding that learners will gain when participating in a particular educational program (Amrai et al., 2011; Núñez-Peña et al., 2016).

Therefore, learning leads to new achievements, new results for learners, 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 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 Young et al. (2003), which is students' overall assessments of acquired knowledge, understanding and skills developed and efforts they made after studying at school.

**Research Methodology**

**Objectives of the study**

This study aims at investigating the relationship between learning styles and academic achievement in Physics of high school students in Thai Nguyen city, Vietnam.

**Research sample**

In this study, we selected a simple random sample consisting of students attending high schools located in Thai Nguyen city (Luong Ngoc Quyen High School, Iron Steel High School, Thai Nguyen High School; Duong Tu Minh High School; Ngo Quyen High School; Luong The Vinh High School; Dao Duy Tu High School) from 2019-2020; 2020-2021. This study used the formula for sample size calculation developed by Watson, with 95% confidence level and 50% variable value for the total from 900 to 1000 people. The appropriate sample size ranges from 277 to 286 people. Our population size is 307 students, this sample size can represent the total sample according to Watson. This study used an online questionnaire survey method using Google form and Zalo form. Survey was conducted from April 2019 to May 2021 (Janis, 1967; Libby et al., 2002).

**Research tools and research methods**

In this study, we used data collection, questionnaire survey, data analysis using SPSS 20.0 in which, questionnaire survey is the main research method. The questionnaire consists of two parts: the first part is related to personal

information of respondents, the second part includes 2 scales: Perceptual Learning Style Preference Questionnaire by Reid (1984), consisting of 30 items divided into 6 factors correspond to 6 learning styles, each learning style is measured by 5 items and the measurement of student learning performance taken from Young et al. (2003), consisting of 6 items. Both scales are the 5-point Likert scale: level 1 is strongly disagree and level 5 is strongly agree (Busato et al., 2000; Lynch et al., 1998).

The mean on the learning style inventory reflects the frequency with which a learning style is preferred. The higher the mean is, the more frequent students use that learning style. On the contrary, the smaller the mean is, the less frequent students use that learning style. Reid (1987), divides Scores on the Learning Styles Inventory into three categories: major learning style with mean from 13.5 to 25, minor learning style with mean from 11.5 to 13.49 and negligible learning style with mean from 0 to 11.49. The mean on the learning style inventory represents the frequency of students' assessment of the knowledge, skills developed and effort they have gained after studying Physics in school. The higher the mean is, the better the learning performance is; The lower the mean is, the lower the academic success is (Beiter et al., 2015; Garg et al., 2001).

**Results**

Quantitative data collected from the questionnaire survey were analyzed by using SPSS 20.0. The reliability tested by Cronbach's Alpha coefficient and Exploratory Factor Analysis (EFA) showed that the scale is valid and highly reliable to measure students' learning style in the below table (Table 1).

Table 1
Results of the reliability test and Exploratory Factor Analysis on the learning style scale and the student academic achievement scale

| Scale | Number of Items | Cronbach's Alpha | | Exploratory Factor Analysis (EFA) | | |
|---|---|---|---|---|---|---|
| | | Cronbach's Alpha | Corrected Item - Total Correlation | KMO | Percentage of variance | Factor Loading |
| learning style scale (29 items)* | | | | 0.801 (Sig. = 0.000) | 67.66 | 6 factors , factor loading from 0.519 to 0.882 |
| AS | 5 | 0.774 | 0.453-0.624 | | | |
| VS | 5 | 0.761 | 0.447-0.647 | | | |
| GS | 5 | 0.903 | 0.698-0.844 | | | |
| TS | 4 | 0.783 | 0.521-0.681 | | | |
| KS | 5 | 0.829 | 0.547-0.747 | | | |
| IS | 5 | 0.919 | 0.781-0.805 | | | |
| Academic achievement scale | 5** | 0.909 | 0.702-0.875 | 0.877 (Sig. = 0.000) | 74.42 | 1factor, factor loading from 0.806 to 0.928 |

Note: * In TS, 1 item tested fell due to Corrected Item – Total Correlation < 0.3, so that the remaining 29 items are valid.

** In Academic achievement scale,1 item tested fell due to Corrected Item - Total Correlation <0.3, so that the remaining 5 items are valid.

Table 2
Results of mean and standard deviation of students' learning styles in Physics

| Learning styles | Mean (M) | Standard Deviation (SD) |
|---|---|---|
| AS | 20.34 | 3.42 |
| VS | 18.42 | 3.43 |
| GS | 17.32 | 5.03 |
| TS | 14.83 | 3.14 |
| KS | 19.70 | 3.53 |
| IS | 17.42 | 5.23 |

Data analysis shown in Table 2 indicated that all learning styles of respondents have M > 13.5 with a relatively low standard deviation. With this level, all 6 learning styles are the main ones. The level ranging from the highest to the lowest is respectively AS > KS > VS > IS > GS > TS. Thus, respondents in this study are most likely to use a wide range of learning styles in their studies, in which the three learning styles are preferred the most: AS, KS, and VS while TS is chosen by the fewest students. This result shows similarities and differences with other prior researches such as on Thai students' learning style, study on learning style of Indonesian students. My research surveys on high school students in Physics. As a result, AS is preferred by the most of the respondents, which is similar to the results of the two studies above - mentioned. However, the less preferred learning styles is not the same. This result confirms that students' learning styles are diverse.

Table 3
Results of mean and standard deviation of student self-assessment on academic achievement

| Item | Mean (M) | Standard Deviation (SD) |
|---|---|---|
| I can apply my knowledge of Physics in practice | 3.63 | 1.07 |
| I gained a lot of knowledge from studying Physics | 3.87 | 0.89 |
| I understand more things after studying Physics in high school | 4.04 | 0.94 |
| I want to broaden my knowledge in other domains, not only in Physics | 3.97 | 0.82 |
| I developed many skills while studying Physics | 3.93 | 0.85 |
| Academic achivement | 3.89 | 0.78 |

The table 3 shows that the mean and standard deviation of performance outcomes assessed by students are estimated at a fairly high level (3.89; 0.78). In which, the mean values of variables vary from 3.63 to 4.04. The item: “I have gained a lot of knowledge after studying Physics in high school” was chosen the most by students (M = 4.04, SD = 0.94), and item: “I can apply my knowledge of

Physics in practice" was selected by the fewest of them (M = 3.63, SD = 1.07). Consequently, the majority of respondents assessed their academic result at a fairly good level (Popil, 2011; Charlton, 2006).

Table 4
Correlation between learning style and academic achievement

| Learning style | Academic achievement |
|---|---|
| AS | 0.387** |
| VS | 0.316** |
| GS | 0.325** |
| TS | 0.314** |
| KS | 0.530** |
| IS | 0.386** |

Note: **if p < 0,01

Data results in Table 4 revealed that KS had the strongest correlation with students' performance outcomes in Physics ($r = 0.530$, $p<0.01$). This means that if students are directly involved in classroom activities, practice role-play, case study and are supported by modern education technology, they can improve their learning performance. The weakest correlations with school success were TS ($r = 0.314$, $p<0.01$) and VS ($r = 0.316$, $p<0.01$). In general, the implications of this study pointed out that a significant positive correlation was found between academic achievement and student learning styles. If students can use the learning style appropriate to themselves, they will achieve higher academic performance. This conclusion is also coincident with previous studies mentioned in the problem statement.

**Findings**

- A positive correlation between learning styles and students' academic performance in Physics was found. All learning styles are positively and quite closely correlated with students' academic performance. This means the more students adopt these learning styles, the higher their Physics achievement will be
- If students can learn Physics in the best way adapted to them, they will enhance their academic performance.
- The implication of this study suggested that teachers, especially teachers of Physics in high schools need to know the types of learning styles and adopt appropriate teaching style with students' learning styles to attract student interest in exploring the subject taught.

**Conclusion**

Our findings confirm that learning styles preferences have a significant positive relationship with student academic achievement. This conclusion is coincident with previous studies (Snyder, 1999; Cano-Garcia & Hughes, 2000). This suggests that if physics teachers involving at high schools located in Thai Nguyen city, Vietnam know well the preferred learning style of each student, they will be

able to adopt appropriate teaching style with students' learning styles. I strongly believe the quality of teaching physics will be enhanced.

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