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The Impact of Learning Environment on Students' Procrastination Behavior and Learning Efficiency

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Abstract. In the fast-paced modern learning environment, procrastination significantly impacts students' learning efficiency and can lead to psychological issues such as depression and anxiety. This study is aimed at the effect of learning environment on students' procrastination behavior and learning efficiency. Researcher adopted questionnaire survey to collect the data among junior and senior high school students. The General Procrastination Scale (GPS) was used to measure procrastination levels. The learning environments were categorized into three levels: quiet, slightly noisy, and noisy. The results showed that 60% of participants preferred a quiet learning environment, and 71.4% of them believed that they could start studying more quickly in their preferred environment. However, variance analysis indicated no significant difference in overall procrastination scores based on the match between real and preferred learning environments ($p > 0.05$). Nevertheless, five specific behaviors showed significant differences, suggesting that a preferred learning environment can reduce procrastination in some tasks. The study concludes that creating a suitable learning environment can enhance students' self-efficacy and reduce procrastination, providing a new perspective for understanding external factors influencing procrastination and offering practical suggestions for improving learning efficiency among high school students.

Keywords: Procrastination; learning environment; learning efficiency.

1. Introduction

In today's fast-paced learning environment, procrastination has become a major factor that affects learning efficiency. Some severe procrastination behavior can even lead to psychological disorders, like depression and anxiety. The learning environment is an external factor of studying. It can influence the individual's learning state. This research aims to investigate whether a suitable learning environment can improve students' learning efficiency and try to reduce students' procrastination during study period.

2. Literature Review

Procrastination is a behavior that although foreseeing the negative consequences, individuals will voluntarily delay the tasks that have to be completed. Procrastination often occurs in tasks that are important but not urgent. The phenomenon of procrastination has existed for over three thousand years and has had a significant impact on productivity. In the future, the impact of procrastination is unlikely to disappear and may even become more severe. In 2006, Steel and König proposed the Temporal Motivation Theory (TMT), which explains the cognitive mechanisms of procrastination from the perspectives of temporal discounting and value representation. These researchers fixed microeconomics, expectancy theory, prospect theory, and need theory to provide a more comprehensive understanding of the motivation of human behavior. Steel pointed out that in previous research, the understanding of human behavior was impeded by the barrier between different subjects, and research in different fields were not directly connected. With more and more research has been done, these theories across various fields are gradually being integrated. The researchers emphasized in their paper that integrating these theories may help break down the barriers between different subjects and promote a deeper understanding of human behavior. According to the TMT, motivation

can be understood as being weakened by temporal delays in expectations and values, and the impacts of gains and losses are different. The formula for this theory is as follows:

Utility=E*V/1+Γ*(T-t)

In this formula, E represents expectancy, V represents value, T - t represents the delay in time, and Γ represents the individual's sensitivity to time delay. The researchers pointed out that any change in any of these factors can influence an individual's procrastination behavior. In this study, the researchers used procrastination as an example and set the experimental scenario as a college student's thesis assignment, explaining that three individuals showed different levels of self-efficacy under the influence of temporal discounting effects, and also exhibited differences in the time it took to complete the thesis. All three students showed the intention to complete the thesis, but because of the influence of temporal discounting, they tended to procrastinate and delay writing until the final deadline. The TMT theory suggests that it is reasonable to complete assignments given at the beginning of the semester in the last few weeks or days. In addition, the researchers also discussed the prospects and applications of TMT. In addition to a deeper understanding of procrastination, the TMT theory can also be further applied in job design and stock markets. The researchers also indicated that the TMT theory is not only crucial for individuals but also for groups [1].

Nowadays, procrastination is affecting the individuals' lives in all aspects. Some researchers have summarized the negative impacts of sleep procrastination on individuals [2]. Other researchers pointed out that self-efficacy was also related to procrastination [3]. Based on this theory, some researchers made further research which is about the relationship between procrastination and self-efficacy among junior high school students. The conclusion showed a significant negative correlation between academic procrastination and self-efficacy [4].

The learning environment is an essential external factor in learning and has vital impact on learning efficiency. Most studies believe that learning method is the main factors that affect learning efficiency, but there are still studies showing that the learning environment can also affect learning efficiency. Some studies have shown that different levels of noise, temperature, and light intensity in the teaching building can affect students' learning efficiency [5]: a light intensity of 160–197 lx, a temperature above 21.5°C, or a CO_2 concentration above 2481 ppm can reduce concentration; a light intensity of 184–260 lx or a noise intensity of 40–47 dB is beneficial for perception; a light intensity above 310 lx can reduce comprehension and memory abilities; a temperature of 21.5°C or a noise intensity above 42.5 dB is conducive to logical reasoning abilities. In the past years, technology has been gradually integrated into education. Online learning has become a part of the learning environment. For some students who are used to in-home learning, they find that it is more convenient than learning at school. However, current research still cannot confirm whether using mobile phones and other electric devices during study will improve procrastination or whether different learning environments will affect learning efficiency.

In summary, in the research about procrastination, juveniles and the university students are the main components of the participants. Researchers use procrastination scales to measure the procrastination level of participants, such as the General Procrastination Scale, Pure Procrastination Scale, and Adult Procrastination Questionnaire. For specific groups, researchers also made some special scales such as the Academic Procrastination Scale. After collecting data, researchers conduct variance analysis, reliability and validity tests, and correlation analysis with collected data. Some researchers have started from the perspective of multi-modal and multi-omics, organized and analysis the cognitive mechanisms, neural basis, genetic basis, and possible metabolic and microbiome basis of procrastination, and have constructed a new theoretical framework based on this to try to explain the mechanism of procrastination [6]. Some researchers have also studied the self-efficacy of learning and related concepts, exploring the correlation between motivation and procrastination [7]. Some research tried to establish a connection between procrastination behavior and different personalities [8]. At the same time, some researchers have also tried to speculate the external factors that may affect procrastination, such as the mobile phones and other electronic products. A previous studies

showed that mobile phone addiction has a significant positive predictive effect on procrastination [9]. Now, although there are many studies and experiments about academic procrastination, there are only a few studies about the impact of the surrounding learning environment on procrastination. In addition, studies on procrastination among high school students also occupied only a small proportion.

This study used the method of questionnaire survey. Firstly, the researcher divided the learning environment into three categories based on the surrounding noise level. Secondly, the researcher distributed the General Procrastination Scale to the participants while investigating their learning environment and learning efficiency. The researchers initially plan to conduct variance analysis after collecting data to explore the differences in learning efficiency under different learning environments. This study aims to summarize the preferred learning environment of high school students and explore the impact of the learning environment on procrastination, and attempt to improve the procrastination behavior of high school students during study period.

3. Research Questions and Hypothesis

The research question is the effect of learning environment on procrastinating. The research is designed to figure out are people less likely to procrastinate in their preference environment. Researcher assumed that people will have less procrastination behavior in their preferred environment.

4. Methods

The participants were junior and senior high school students in China. A questionnaire survey method was used. The General Procrastination Scale (GPS) developed by Lay and other researchers was selected to measure the participants' procrastination levels. Studies have shown that the Chinese version of the GPS demonstrates good reliability and validity among middle school students: The Cronbach's α coefficient of the scale is 0.806, and the split-half coefficient is 0.808 [10], indicating that the scale has good reliability and can be used to measure and study procrastination behavior among middle school students in China. In addition, this study initially categorized the learning environment into three types: quiet, slightly noisy, and noisy. The participants were asked about how the learning environment is and whether it is matched with their ideal learning environment. Moreover, a question used to check the attention of participants was used to filter the valid questionnaires. Finally, 46 valid questionnaires are collected. Researcher used the SPSSAU to analysis the differences in procrastination levels among participants in different learning environments.

5. Results

In general, 60% of the participants preferred a quiet learning environment. 71.4% of the participants believed that they would start studying faster in their preferred learning environment than usual.

Question 4, "How well do you think your current learning environment matches your preferred learning environment?" and the total score of the scale were analyzed using variance analysis. Sum1 represents the total score of each participant's scale. The result showed that $p > 0.05$, indicating that Question 4 did not have a significant difference in the total scale score (see Table 1).

Table 1. The variance analysis of the entire scale for Question 4

	How well do you think your current learning environment matches your preferred learning environment?			F	p
options	completely matched	partly matched	barely matched		
sum1 Variance	67.27±13.12	2.779	74.00±22.91	2.779	0.073

In addition, there are five specific behaviors in the scale showed significant differences, which indicates that in different learning environments, students' levels of procrastination are different when finishing the following five tasks (see Table 2).

Table 2. The variance analysis of the five specific behaviors on the scale and the total score of the scale

	Completely matched	Partly matched	Barely matched	p
A letter may sit for days after I write it before mailing it.	3.36±1.12	2.65±1.17	4.50±1.00	0.008
Even with jobs that require little else except sitting down and doing them, I find they seldom get done for days.	4.09±0.83	2.90±1.11	4.00±1.41	0.005
I usually make decisions as soon as possible.	3.73±1.01	2.87±1.20	1.75±0.96	0.013
When preparing to go out, I am seldom caught having to do something at the last minute.	3.36±1.03	2.97±1.11	1.50±0.58	0.016
I am continually saying“I’ll do it tomorrow”.	4.27±0.65	3.16±1.24	4.00±1.41	0.021

6. Discussion

Beyond the conclusions, the researcher reasonably speculated on other factors that may influence procrastination. In addition to the variables examined in this study, procrastination levels may be related to personal factors and other external factors, such as personal habits and the distractions from others. The difficulty of tasks may also be a cause of procrastination. Overly challenging learning tasks can lead to the fear of difficulty of students, exacerbating procrastination. Learning environment is closely related to individual preferences; some individuals may study more efficiently with some music is played, while others feel it distracting. Moreover, factors beyond noise, such as the items on the desk, the overall atmosphere of the environment, and the individual's physical condition, may also influence the presence of procrastination behavior. According to Steel's study, external temptations like video games can increase the tendency to procrastinate [1]. This research also suggested that the more external temptations are, the more likely individuals will behave procrastination. The study speculates that procrastination levels are closely related to an individual's focus and motivation. Learning efficiency may also decrease in overly comfortable environments. The individual's interest in the task at hand may also affect procrastination. Good study habits and methods can effectively help individuals reduce procrastination. When individuals think the procrastination situation is too severe, the study recommends involving others to provide supervision or reminders, or seeking medical advice to check for potential physiological issues are available.

7. Limitations

The sample size of the questionnaire was relatively small, which may affect the accuracy of the variance analysis results. The participants were mainly junior and senior high school students, so the result may not be generalized into other groups. The GPS scale used in this study was developed by Clarry H. Lay in 1986, and some items may no longer be relevant to today's society (e.g., "A letter may sit for days after I write it before mailing it."). A few questions on the scale were not directly related to learning, which could lead to biased results. In addition, the study used self-assessment to measure learning efficiency, which may lead to bias. In future research, objective indicators or established scales should be considered as measurement standards.

8. Future Directions and Outlook

Nowadays, research which focuses on procrastination among adolescents is not yet comprehensive. Future studies should focus more on the psychological states of adolescents and explore the use of artificial intelligence to improve procrastination. Innovations in educational methods could also provide motivation and direction for adolescent learning.

9. Concluison

This study focused on developing the impact of learning environments on procrastination among high school students, aiming to enhance the learning efficiency and reduce procrastination through setting appropriate learning environment. The researcher used questionnaire survey as the method, targeting junior and senior high school students in China as participants. The General Procrastination Scale (GPS) developed by Lay and other researchers was used to measure the participants' procrastination levels. The learning environment was categorized into three types: quiet, slightly noisy, and noisy. The research developed the compatibility between participants' real and preferred learning environments and used an attention-check question to filter valid questionnaires. SPSSAU was used to conduct variance analysis on the 46 valid questionnaires to evaluate differences in procrastination levels across different learning environments.

The results indicated that 60% of the participants preferred a quiet learning environment, and 71.4% of them believed they could start studying more quickly in their preferred environment. Variance analysis showed no significant difference in the whole procrastination scores based on the congruence between real and preferred learning environments ($p > 0.05$). However, five specific behaviors on the scale showed significant differences, suggesting that students were more likely to procrastinate when their learning environment did not match their preferred environment. For example, behaviors such as "A letter may sit for days after I write it before mailing it." and "I am continually saying“I’ll do it tomorrow”." were more obvious in unmatched environments. This indicates in some specific behaviors, a preferred learning environment can reduce procrastination. The study recommends that individuals choose learning environments that suited with their preferences and encourages students to create suitable environments to enhance self-efficacy. This research provides a new perspective on understanding the external factors influencing procrastination and attempts to propose solutions for reducing procrastination among high school students, aiding individuals in selecting appropriate learning environments.

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