



Motivation Mediation in Science Anxiety and Self-Directedness in Distance Learning

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ABSTRACT

The global outbreak of COVID-19 posed significant challenges to educational systems. The shift to distance learning underscored the crucial importance of self-directed learning. The study was to determine the mediating effect of motivation factors in the relationship between science anxiety and self-directedness on modular learning in the science of Grade 10 students of public secondary junior high schools in Mabini District, Davao de Oro Division. This research used descriptive and correlational designs, to determine the relationships between variables. Then stratified random sampling was employed, and 300 respondents were chosen from the three public secondary junior high schools to be interviewed. Two adopted questionnaires, The Anxiety Scale (SAS) and Students Motivation toward Science Learning Survey (SMTSL), and one adopted questionnaire, the Self-Directed Learning Readiness Scale (SLRS), were used as tools in gathering substantial data. The mean with standard deviation, person r , and Sobel tests were used as statistical tools. This study revealed students' science anxiety to be at a moderate level, while both students' motivation factors and self-directedness were high. Furthermore, science anxiety was not significantly related to motivation factors and self-directedness. On the other hand, the relationship between motivation factors and self-directedness was significant. It was found that motivational factors have no significant mediating effect on the relationship between science anxiety and the self-directedness of the students under modular distance learning in science. The results of the study would benefit the students, teachers, school administrators, DepEd officials, and other researchers in effectively teaching science subject to junior high school students.

Keywords: Mediating effect, modular distance learning, motivational factors, Philippines, science anxiety, secondary students, self-directedness

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INTRODUCTION

The global Coronavirus disease (COVID-19) outbreak posed unprecedented challenges to educational systems worldwide. One significant shift was adopting distance education as a new norm (Unger and Merian, 2020). This paradigm shift underscored the importance of self-directed learning (SDL), a crucial skill for lifelong, disciplined, and independent learning (Mahlaba, 2020). Self-directedness of an individual means having the initiative, with or without assistance from others, to do personal educational activities such as diagnosing one's own needs in learning, establishing learning objectives, managing learning resources, applying appropriate learning strategies, and assessing learning results (Brandt, 2020).

Research across different countries highlights similar challenges in developing SDL, especially in science education. For instance, a study in Hong Kong indicated that students tend to be passive in goal-setting due to the pressure of completing science content for examinations (Hew et al., 2016). In Iran, researchers identified obstacles such as information overload, household distractions, and difficulty adjusting to new learning methods as barriers to self-directedness in distance learning (Kohan et al., 2017). Similarly, Abuhassna and Yahaya (2018), found that students in Malaysia who participated in distance learning in modular-based instruction showed limited independence in their studies and expressed dissatisfaction with their learning experience. This underscores the challenges associated with this learning mode, particularly in fostering independent and engaged learners.

Furthermore, the Philippine educational landscape mirrors these findings, as SEAMEO INNOTECH (2015) reported that Filipino students often perceive science as complex in distance learning. The report also detailed the difficulties encountered when learning science through module-based formats. These include struggles linked to independent study habits, such as ineffective scheduling, an inability to work through tasks alone, and limited capacity for managing one's learning. Dangle and Sumaoang (2020) further noted that a lack of enthusiasm, unfavorable attitudes, and minimal external assistance can impede comprehension when learners are left to study independently. Echoing

these issues, another study in the Northern Philippines revealed that students in alternative learning systems exhibit low acquisition of 21st-century skills, including self-directed learning abilities (Tindowen et al., 2017).

Similar challenges have emerged in science education with the shift to modular distance learning in public schools across the Mabini District, Davao de Oro. Students frequently view science as an intimidating subject, a perception that becomes more pronounced in the context of independent study. Under the new normal education policy, direct engagement with teachers has been significantly reduced, leaving students dependent on their families for guidance and support. This situation has made it even more difficult for them to develop the independence required for self-managed learning. Their struggles are reflected in their inability to grasp the content and complete the assigned modules fully. As such, there is a pressing need to address the means to strengthen students' self-directed learning capabilities in this learning modality. Additionally, several studies have explored the relationships between anxiety and self-directedness (Kahyaoglu et al., 2019; Uzun, 2016), anxiety and motivation (Ajay, 2016; Tsai and I-Cheng, 2013), as well as motivation and self-directedness (Zhu et al., 2020; Song and Bonk, 2016). However, most of these studies focus on online learning, adult education, and not science education. No research has been conducted yet in the context of modular distance learning in science. While some studies have considered motivation as a mediating variable, these mainly examine relationships between stress and self-regulation (Serratore, 2015) or motivation and anxiety as mediators between self-concept and effort (Daher et al., 2017). The researcher has not found any study investigating motivation as a mediator between science anxiety and self-directedness.

Given these gaps, this study aims to investigate the mediating effect of motivation on the relationship between science anxiety and self-directedness among students engaged in modular distance education. The findings are expected to provide valuable insights for educators, administrators, and parents in addressing learning challenges and enhancing the

effectiveness of modular instruction. Additionally, the results can support existing educational programs, such as the Alternative Learning System (ALS) and Open High School System, and serve as a foundation for future research in similar educational contexts. This study aimed to determine the mediating effect of motivation on the relationship between science anxiety and self-directedness on modular distance learning in the science of Grade 10 public secondary junior high schools in Mabini District, Davao de Oro.

MATERIALS AND METHODS

This study employed a quantitative research design to quantify and analyze associations among variables. Specifically, it utilized the descriptive and correlational design. Descriptive design studies outline characteristics, situations, or conditions based on specific factors or aspects (Loeb et al., 2017). This design is suitable for this study since it aims to examine the levels of science anxiety, motivation factors, and self-directedness among students engaged in modular instruction in the public secondary schools of Mabini District, Davao de Oro. Additionally, correlational design was used to explore the existence and strength of relationships between measurable variables, including the mediating factors (Apuke, 2017). This also intended to examine the extent of relationships among the variables and to assess the mediating role of motivational factors.

In addition, this study was conducted in three (3) public secondary junior high schools in Mabini, Davao de Oro. The respondents of this study were Grade 10 students who were officially enrolled in the school year 2020-2021 and undertaking modular distance learning delivery mode. A stratified random sampling method was employed. The strata were formed based on each school. The Raosoft sample size calculator, with a confidence level of 95% and a margin of error of 5%, was also used to determine the sample size of respondents from the given total population of 710 grade 10 students. It added 20% of the sample size to prevent data outliers. There were 300 sample respondents needed to conduct the study based on the computation. Using ratio and proportion to determine the number of respondents from each school, 135 participants were selected from School A, 136 from School B, and 29 from School C.

This study used three sets of questionnaires specifically designed to gather data on the levels of science anxiety, motivational factors, and self-directed learning among students engaged in modular education in science. Two adopted questionnaires: Anxiety scale (SAS) from Guzeller and Dogru (2012) with Cronbach's alpha of 0.96 and students motivation toward science learning survey (SMTSL) from Lathrop (2011) with Cronbach value of 0.82 and one adapted questionnaire: Self-Directed Learning Readiness Scale (SLRS) from Malison (2019) with computed Cronbach alpha coefficient of 0.972, were used as tools in gathering substantial data.

The study utilized various statistical methods to analyze the data. Mean and standard deviation were applied to assess students' science anxiety levels, motivational factors, and self-directedness. Pearson's *r* was used to examine the significance of the relationships between the variables: science anxiety and self-directedness, motivation factors and self-directedness, and science anxiety and motivation factors. Additionally, the Sobel test was employed to evaluate the significance of the mediating effect of motivational factors on the relationship between science anxiety and self-directedness.

To facilitate the conduct of the study, the researchers secured informed consent from the parents or guardians and informed assent from the respondents. These were submitted electronically, as scanned copies, or through photographs, ensuring clear proof of their voluntary participation. Following this, virtual orientations were conducted to provide the parents and respondents with detailed information about the study. For those unable to attend the virtual sessions, phone calls were arranged as an alternative means to communicate and explain the study's purpose and procedures.

The administration of the three survey questionnaires was done online using Google Forms. The researchers personally did the correspondence and administration of the online survey through virtual or phone call communication with the respondents. The researchers gave the Google form link to the respondents, and they had one hour to answer the online survey at home. The respondents were required to answer the survey questionnaires in a

place where they could only see the online survey. The respondents' responses were retrieved through the consolidated data taken from the Google form.

The researchers gathered, checked, and collated the data responses and ratings taken from the Google form in the Excel application. The raw data scores were tabulated for the treatment and analysis. Thereafter, the researchers interpreted it for the results and discussion. This study observed key ethical principles based on the Belmont Report (1979)—respect for persons, beneficence, and justice. In respect of persons, the researcher will ensure the voluntary participation, protection, and confidentiality of information of the minor respondents in the context of the online conduct of the study. To follow the beneficence, the researcher will take measures to minimize the risk and identify the benefits of this study to the respondents. To abide by the justice principle, the researcher should ensure a fair selection of respondents, conduciveness of location, adequacy of facilities, ensured qualification of the researcher and adviser, and just compensations.

Furthermore, to adhere to RA 10173, also known as the Data Privacy Act of 2012, this study abides by its mandates to keep with utmost priority the confidentiality and security of sensitive personal information such as the respondents' name, race, ethnic origin, age,

gender, color, etc., so that the person under study will be fully protected and not discriminated. Upon answering the online survey questionnaires, all the personal information, especially the entry of their names, was made optional and voluntary to the concerned respondents. The researcher must keep the names of the respondents, the school, and its sections by assigning them to specific code names. All research data or information was protected by storing the electronic data in a password-protected folder and the material copies in a locked cabinet.

RESULTS

Summary of the level of students' science anxiety

Table 1 exhibits the summary of the level of students' science anxiety. The environmental dimension has a higher mean of 2.78 followed by the personal dimension with a mean of 2.70. Both indicators are found to be descriptively moderate among the students. The overall mean of students' science anxiety is 2.71 and $SD \pm$ of 1.11, which has a descriptive equivalent of moderate level. This means that the students' science anxiety is moderately felt or evident. This further signifies that the students' science anxiety in personal and environmental dimensions is occasionally observed as they underwent modular distance learning in science.

Table 1. Summary of the level of student's science anxiety.

Indicators	Mean	SD	Description
Personal Dimension	2.70	1.11	Moderate
Environmental Dimension	2.78	1.15	Moderate
Overall Mean	2.71	1.11	Moderate

Summary of the level of students' motivation factors

Table 2 summarizes the level of the student's motivation factors. The results reveal that the science learning value has the highest

mean, which is 3.81, followed by achievement goal with a mean of 3.72. Active learning strategies with a mean of 3.64, next is learning environment stimulation with a mean of 3.46, then self-efficacy with a mean of 3.38 and the lowest is the performance goal with 3.27.

Table 2. Summary of the level of student's motivation factors.

Indicators	Mean	SD	Description
Self-Efficacy	3.38	1.04	Moderate
Performance Goal	3.27	1.20	Moderate
Active Learning Strategies	3.64	0.96	High
Science Learning Value	3.81	0.95	High
Achievement Goal	3.72	0.98	High
Learning Environment Stimulation	3.46	1.00	High
Overall Mean	3.55	1.03	High

The overall mean of motivation factors is 3.55 or higher. This implies that the student's motivation factors, such as self-efficacy, performance goals, active learning strategies, science learning value, achievement goal, and learning environment stimulation, are generally much felt or observed and manifested most of the time as they have their modular distance learning in science.

In detail, only the factor of performance goal is found to be descriptively moderate, while the rest of the indicators of motivation factors are descriptively high. This further means that achievement goals, active learning strategies, and learning environment stimulation are much felt or observed among the students. However, only

performance goals and self-efficacy are found to be moderately felt or observed to them.

Summary of the level of students'

Self-directedness

Table 3 summarizes the level of students' self-directedness as they are under modular distance learning in science. Based on the data, the students' self-directedness level has an overall mean of 3.56 and SD $\pm$ of 0.98. This result means that self-directedness has the descriptive equivalent of high. In general, the students' self-directedness is very satisfactory. This signifies that they are capable of self-directedness as they have their modular distance learning in science.

Table 3. Summary of the level of student's self-directedness.

Indicators	Mean	SD	Description
Learning with Intention	3.34	1.06	Moderate
Open-Mindedness	3.85	0.87	High
Characteristics of Self-Discipline	3.40	0.99	High
Characteristics of Self-Management	3.55	0.97	High
Desire to Learn	3.89	0.91	High
Overall Mean	3.56	0.98	High

The desire to learn got the highest mean of 3.89 or higher; then open-mindedness got the second highest mean of 3.85 or higher, the characteristics of self-management got the mean of 3.55 or higher, followed by the characteristics of self-discipline got the mean of 3.40 or high and the lowest mean of 3.34 or moderate is on learning with intention. These results imply that the students very satisfactorily manifest self-directedness indicators such as the desire to learn, open-mindedness, self-management characteristics, and self-discipline. Only the indicator of learning with intention is manifested satisfactorily.

Relationship between variables

To test whether there is any significant

relationship between the variables in this study, namely science anxiety, motivation factors, and self-directedness, the Pearson r correlation was employed for determination. The results of the computation were summarized in Table 4.

The table presents the results of a test of the significance of the relationship between variables (Table 4). The relationship of science anxiety to self-directedness ($r = 0.07$; $p = 0.22$) and science anxiety to motivation factors ($r = -0.02$; $p = 0.68$) are not significant because p -values are all greater than 0.05 level of significance. However, only the relationship of motivation factors to self-directedness ($r = 0.62$; $p = 0.000$) is significant since the p -value is less than the 0.05 significance level.

Table 4. Significance of relationships between the variables.

Variables correlated	R	p -value
Science Anxiety and Self-directedness	0.07	0.22
Science Anxiety and Motivation Factors	-0.02	0.68
Motivation Factors and Self-directedness	0.62	0.000

The findings revealed that science anxiety to self-directedness and science anxiety to motivation factors have no significant relationships. However, motivational factors and self-directedness are found to have a substantial relationship.

The results of the mediation analysis are presented in Table 5. The analysis was done to determine if the motivation factors mediate the relationship between the two variables: science anxiety and self-directedness.

The data reveal that science anxiety does not significantly predict self-directedness and motivation factors. These are verified by the p -value of 0.22 in science anxiety and self-directedness and the p -value of 0.68 in science anxiety and motivation, which are greater than 0.05 significance level.

However, only the motivation factors were highly significant predicted the students' self-directedness ($p=0.000$). The result implied that students' level of motivation factors can determine their capability for self-directedness.

Table 5. Mediation analysis (bold p -value is significant).

Independent variable	: Science anxiety			
Dependent variable	: Self-directedness			
Mediating variable	: Motivation factors			
Paths	Unstandardized Beta (β)	Standard error (e)	p -value	Standardized Beta (β)
Path C (IV & DV)	0.09	0.08	0.22	0.07
Path B (MV & DV)	0.79	0.06	0.000	0.62
Path A (IV & MV)	-0.02	0.06	0.68	-0.02
Combined Influence of IV, MV on DV	0.11	0.06	0.06	0.08
Science Anxiety Motivation Factors	0.80	0.06	0.000	0.62

Ultimately, the aforementioned results on mediation analysis signified that the statistical outcomes did not meet the preconditions and criteria for the mediation of motivation factors between science anxiety and self-directedness to occur. That is due to the lack of a significant relationship between science anxiety and self-directedness. Also, only the motivation factors and self-directedness manifest substantial relationships. These confirmed that motivation factors did not significantly mediate the relationship between science anxiety and self-directedness among the students.

DISCUSSIONS

Level of students' science anxiety

The students' science anxiety is moderately felt in both personal and environmental aspects during modular distance learning. The findings from the descriptive evaluation of students' anxiety

align with Ajay's (2016) research, which suggested that the level of science anxiety among students varies depending on how they perceive the subject. This perception can influence their self-awareness, prompting them to focus more and put in extra effort within their learning environment. Additionally, Agra et al. (2017) noted that the structure and content of science subjects can heighten students' anxiety, often reflected through fear of tests, limited understanding of scientific concepts, difficulties in problem-solving, and apprehension toward laboratory activities.

Furthermore, the result also aligns with Gonzalez et al. (2017), which stated that students can manage moderate science anxiety through metacognitive skills, self-efficacy, and learning strategies. These factors collectively enable students to navigate their science coursework with a manageable perceived difficulty, providing the necessary support to overcome challenges.

Level of students' motivation factors

Motivation factors are generally high during modular distance learning, with only performance goals being moderately observed. The result conforms with the findings of Toit-Brits and Zyl (2017), who emphasized that motivational factors play a crucial role in encouraging students to engage in learning, particularly when independent study is required. These factors help students become more self-aware and responsible in recognizing their strengths and areas for improvement, thereby fostering intrinsic motivation for academic growth. Similarly, the study supports the view of Chan and Norlizah (2017), who highlighted the importance of student motivation in achieving academic success in science. When students are highly motivated, they tend to show greater determination and effort in completing learning tasks, with both teachers and the learning environment playing vital roles in this process.

On the other hand, the findings disagree with Hoang (2019), who noted that students' motivation often declines in distance learning. This decline is attributed to difficult subject matter, limited teacher interaction, feelings of isolation, and a disconnect between student needs and the curriculum. These factors can contribute to reduced engagement and motivation in modular learning environments.

Level of students' self-directedness

Students demonstrate high self-directedness, particularly in their desire to learn and open-mindedness, though they show moderate self-direction in setting learning goals. The results align with the assertions of Dina et al. (2016), who noted that higher levels of self-directed learning among students could result from a departure from rigid, traditional instruction, reduced teacher dominance, and greater access to formal and informal learning opportunities through distance education. They also highlighted that a flexible and purpose-driven learning environment fosters self-direction. Similarly, Hoang (2019) emphasized the importance of communication and interaction in supporting students' self-directedness, suggesting that distance learning can help build a supportive

learning community with peers and teachers, reducing isolation and enhancing academic engagement.

Furthermore, Hew et al. (2016) emphasized that factors such as the nature of science, teacher support, and students' prior knowledge are crucial in fostering self-directed learning in science. In support of this, Kan'an and Osman (2015) found that students with higher levels of self-directedness tend to be more reliable and effective in science learning. This self-reliance is often reflected in their stronger academic performance, as these students are more adept at managing their learning and overcoming challenges in the subject.

Relationship between variables

The study found that science anxiety does not affect students' self-directedness in modular distance learning. This implies that a high level of science anxiety does not necessarily lead to an increase in self-directedness. Conversely, a low level of anxiety does not guarantee a decrease in self-directedness. These findings contradict those of Jones et al. (2017), who argued that science anxiety significantly influences students' self-directed learning and academic performance. According to their study, anxiety can motivate students to put forth more effort and actively apply strategies to overcome learning challenges. Similarly, Heo and Han (2017) suggested that a moderate level of stress or anxiety might enhance students' ability to engage in self-directed learning by pushing them to take initiative in managing their learning.

However, the absence of a significant relationship between science anxiety and self-directedness is supported by England et al. (2019), who found that science anxiety does not affect students' performance, persistence, or the use of self-directed learning strategies. Similarly, other research has indicated that academic anxiety had little to no impact on students' academic success or self-directed learning abilities. These studies suggest that while anxiety may influence emotional responses or attitudes toward a subject, it does not necessarily affect students' ability to manage their learning independently (Ajay, 2016; Dami et al., 2019).

The study found no significant relationship between students' science anxiety and motivation factors, indicating that changes in science anxiety do not necessarily impact the level of students' motivation in a modular distance learning setting. These results align with Ajay's (2016) assertion that no clear connection exists between anxiety and motivation, particularly among learners in rural schools. Similar studies suggest that while science anxiety may not directly affect motivation, it can lead to adverse outcomes such as fear, poor perceptions of science, decreased confidence, and avoidance of science-related subjects (Ali and Hassan, 2019). Therefore, while anxiety may not influence motivation, it can still affect students' attitudes and engagement with science, highlighting the need for strategies to manage anxiety in educational settings.

On the other hand, the correlation between motivation factors and self-directedness revealed a strong positive relationship. This suggests that when students' motivation in science is high, they are more likely to achieve a higher level of self-directedness in modular distance learning. The findings align with previous research highlighting the link between motivation and self-directed learning. Triastuti (2016) found that motivation directly contributes to developing students' self-directedness, acting as a key factor in encouraging independent learning. This is supported by Bodkyn and Stevens (2015), who emphasized the role of intrinsic motivation in fostering self-directed behavior. Furthermore, Adib et al. (2019) observed a strong connection between motivation and self-directedness, particularly in self-evaluation and interpersonal competence. These studies collectively underline the importance of motivation in enhancing students' ability to manage their learning, which is especially significant in a modular learning context.

Mediation analysis

Finally, motivational factors do not significantly mediate the relationship between science anxiety and students' self-directedness under modular distance learning in science. This is attributed to the absence of a substantial relationship between science anxiety and self-directedness. Only motivation factors and self-directedness showed a meaningful correlation.

These results indicate that motivational factors did not significantly mediate the link between science anxiety and self-directedness. Therefore, motivation cannot be considered a connecting or explanatory factor, as science anxiety does not appear to influence students' self-directed learning in the context of modular distance education in science.

The findings of this study did not align with the assumptions of Uzun (2016), who proposed a positive relationship between anxiety and self-directedness, with motivation playing a key mediating role. Additionally, the results contradict Deci and Ryan's (1985) Self-Determination Theory, which suggests that motivation mediates the connection between science anxiety and self-directed learning—where anxiety drives motivation, enhancing self-directed learning skills. Similarly, Elmelid et al. (2015) argued that motivation is closely tied to anxiety and academic performance, helping students face challenges, stay persistent, and employ strategic learning methods. Mattoo and Nabi (2012) also proposed that anxiety can either positively or negatively influence motivation, ultimately assisting learners in planning and managing their learning.

However, this study is more consistent with Ajay (2016), who found no significant interaction between motivation, science anxiety, and learning performance. Ajay's findings suggest that motivation levels do not always correlate with anxiety or academic outcomes. Instead, motivation may vary depending on individual learner characteristics, learning environments, and the degree of focus and effort exerted. This study, therefore, underscores the complexity of the relationship between science anxiety, motivation, and self-directedness, highlighting the need for further exploration of contextual and individual factors that may influence learning outcomes.

CONCLUSION

Based on the findings of the study, students experienced science anxiety at a moderate level. Their motivational factors were strongly evident, and their self-directedness was rated very satisfactory, showing a fair degree of independence in managing learning tasks. Furthermore, no significant relationship was found between science anxiety and self-directedness, nor between science

anxiety and motivational factors. However, a significant positive relationship was observed between motivational factors and self-directedness. This suggests that while science anxiety does not directly influence self-directedness, motivation is key in supporting students' ability to manage their learning effectively.

Finally, motivational factors did not significantly mediate the relationship between science anxiety and self-directedness. This is primarily because no significant relationship was found between science anxiety and self-directedness. Motivation cannot be a bridge since mediation requires a meaningful connection between the independent and dependent variables. This implies that science anxiety may influence students through other mechanisms that do not directly impact their ability to manage learning independently.

Given these findings, it is suggested that educational stakeholders such as teachers, school administrators, and curriculum developers focus on strengthening students' motivation through positive feedback, goal-setting, and a supportive learning environment, which can enhance self-directed learning. There is also a need to address science anxiety as it remains essential for improving overall learning experiences. Furthermore, future research should explore other possible mediating factors to understand better the complex dynamics influencing student success in modular distance education.

RECOMMENDATION

Based on the conclusions of this study, it is recommended that the Department of Education (DepEd) develop and implement innovative programs designed explicitly for modular distance learning, focusing on addressing science anxiety. These programs aim to make science more engaging, and learner-centered. Furthermore, strengthening students' motivation and self-directedness is essential. This can be achieved by integrating flexible, interactive, and supportive instructional materials that cater to the diverse needs of students in distance learning.

School administrators play a crucial role in monitoring the implementation of these programs and ensuring their effectiveness.

They should also initiate seminars and training sessions for teachers, focusing on science anxiety, motivation, and self-directed learning in modular education. These professional development opportunities will equip teachers with the necessary tools to better support students in overcoming the challenges of distance learning.

Teachers, particularly science teachers, are encouraged to adopt appropriate teaching strategies that promote motivation and self-directed learning. Inquiry-based tasks and independent study guides can foster greater engagement and persistence. Collaboration with parents is also key, as they can help reinforce motivation and support students in becoming more independent learners.

Future researchers are encouraged to investigate additional variables that might influence science anxiety, motivation, and self-directedness, such as learning strategies and metacognitive skills. Expanding the study to include senior high school students would help validate the findings across different educational levels. Lastly, using regression analysis in future studies can offer deeper insights that inform educational policies and practices in modular distance education.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

AUTHOR CONTRIBUTIONS

Study conceptualization: R. D. R.; methodology design: R. D. R.; data collection and organization: R. D. R.; data analysis: P.L.D.P.; result interpretation: P. L. D. P.; conclusion formulation: P.L.D.P.; writing—original draft preparation: R. D. R.; writing—review and editing: R. D. R. and P. L. D. P.; final manuscript approval: R. D. R. and P. L. D. P.

REFERENCES

- Abuhassna, H., and Yahaya, N. (2018). Students' utilization of distance learning through an interventional online module based on Moore transactional distance theory. *EUR-ASIA Journal of Mathematics, Science and Technology Education*, 14(7). <https://doi.org/10.29333/ejmste/91606>
- Adib, M., Ghiyasvandian, S., Varaei, S., and Roushan, Z. A. (2019). Relationship between academic motivation and self-directed learning in nursing students. *Journal of Pharmaceutical Research International*, 1-9. <https://doi.org/10.9734/jpri/2019/v30i530281>
- Agra, E., Fischer, S. M., and Beilock, S. L. (2018). The role of students' gender and anxiety in physics performance. 2017 Physics Education Research Conference Proceedings. <https://doi.org/10.1119/perc.2017.pr.001>
- Ajay, C. (2016). An achievement motivation and academic anxiety of school going students. *Psychology and Behavioral Science International Journal*, 1(4). <https://doi.org/10.19080/pbsij.2016.01.555567>
- Ali, N. A., and Hassan, N. C. (2019). Mathematics anxiety and mathematics motivation among students in the faculty of science of a public University in Malaysia. *International Journal of Academic Research in Progressive Education and Development*, 8(4). <https://doi.org/10.6007/ijarped/v8-i4/6786>
- Apuke, O. D. (2017). Quantitative research methods: A synopsis approach. *Kuwait Chapter of Arabian Journal of Business and Management Review*, 6(11), 40-47. <https://doi.org/10.12816/0040336>
- Bodkyn, C. and Stevens, F. (2015). Self-directed learning, intrinsic motivation and student performance. *Caribbean Teaching Scholar*, 5 (2), 79-93.
- Brandt, W. C. (2020). Measuring Student Success Skills: A Review of the Literature on Self-Directed Learning. 21st Century Success Skills. National Center for the Improvement of Educational Assessment
- Chan, Y. L. and Norlizah, C.H. (2017). Students' motivation towards science learning and students' science achievement. *International Journal of Academic Research in Progressive Education and Development*. <https://doi.org/10.6007/ijarped/v6-i4/3716>
- Daher, W., Al-Khalili, F., and Abu-Kayyas, Y. (2017). Psychosocial variables that affect students' effort in mathematics. *Research Highlights in Education and Science* 2017, 53.
- Dami, B. E., James, C. A., and Gogwim, P. C. (2019). Test anxiety as predictor of academic performance in biological science examination among secondary school students. *Clinical Research in Psychology*, 2(1). <https://doi.org/10.33309/2639-9113.020103>
- Dangle, Y. R. P., and Sumaoang, J. D. (2020, November). The implementation of modular distance learning in the Philippine secondary public schools. In 3rd International Conference on Advanced Research in Teaching and Education (Vol. 100, No. 1, p. 108).
- Deci, E. L., and Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. <https://doi.org/10.1007/978-1-4899-2271-7>
- Dina, N., Haron, S., and Rashid, R. M. (2016). Can self-directed learning environment improve quality of life? *Procedia - Social and Behavioral Sciences*, 222, 219-227. <https://doi.org/10.1016/j.sbspro.2016.05.150>
- Elmelid, A., Stickley, A., Lindblad, F., Schwab-Stone, M., Henrich, C. C., and Ruchkin, V. (2015). Depressive symptoms, anxiety and academic motivation in youth: Do schools and families make a difference? *Journal of Adolescence*, 45, 174-182. <https://doi.org/10.1016/j.adolescence.2015.08.003>
- England, B. J., Brigati, J. R., Schussler, E. E., and Chen, M. M. (2019). Student anxiety and perception of difficulty impact performance and persistence in introductory biology courses. *CBE—Life Sciences Education*, 18(2), ar21. <https://doi.org/10.1187/cbe.17-12-0284>
- Gonzalez, A., Fernández, M. C., and Paoloni, P. (2016). Hope and anxiety in physics class: Exploring their motivational antecedents and influence on metacognition and

- performance. *Journal of Research in Science Teaching*, 54(5), 558-585. <https://doi.org/10.1002/tea.21377>
- Guzeller, C. O., and Doğru, M. (2011). Development of science anxiety scale for primary school students. *Social Indicators Research*, 109(2), 189-202. <https://doi.org/10.1007/s11205-011-9894-6>
- Heo, J., and Han, S. (2017). Effects of motivation, academic stress and age in predicting self-directed learning readiness (SDLR): Focused on online college students. *Education and Information Technologies*, 23(1), 61-71. <https://doi.org/10.1007/s10639-017-9585-2>
- Hew, K. F., Law, N., Wan, J., Lee, Y., and Kwok, A. (2016). Self-directed learning in science education: Explicating the enabling factors. Singapore: *International Society of the Learning Science*.
- Hoang, H. T. (2019). Best practices of motivation in a self-directed distance education at a community college. Theses and Dissertations. 1110. <https://digitalcommons.pepperdine.edu/etd/1110>
- Jones, M., Meijen, C., McCarthy, P. J., and Sheffield, D. (2009). A theory of challenge and threat states in athletes. *International Review of Sport and Exercise Psychology*, 2(2), 161-180.
- Kahyaoglu, M., Birel, F., and Yetişir, M. (2019). The role of anxiety as a predictor of secondary school students' self-learning skills towards science course. *Electronic Journal of Social Sciences*.
- Kan'an, A., and Osman, K. (2015). The relationship between self-directed learning skills and science achievement among qatari students. *Creative Education*, 06(08), 790-797. <https://doi.org/10.4236/ce.2015.68082>
- Kohan, N., Arabshahi, K. S., Mojtahedzadeh, R., Abbaszadeh, A., Rakhshani, T., and Emami, A. (2017). Self-directed learning barriers in a virtual environment: a qualitative study. *Journal of Advances in Medical Education & Professionalism*, 5(3), 116.
- Lathrop, A. (2011). Impact of student motivation in online learning activities. Theses, Dissertations, and Student Research in Agronomy and Horticulture. 24. <https://digitalcommons.unl.edu/agronhortdiss/24>
- Loeb, S., Dynarski, S., McFarland, D., Morris, P., Reardon, S., and Reber, S. (2017). Descriptive analysis in education: A guide for researchers. NCEE 2017-4023. National Center for Education Evaluation and Regional Assistance.
- Mahlaba, S. (2020). Reasons why self-directed learning is important in South African during the COVID-19 pandemic. *South African Journal of Higher Education*, 34(6). <https://doi.org/10.20853/34-6-4192>
- Malison, K., (2018). An exploratory study of self-directed learning: The differences between IT and non-IT employees in Thailand. *Journal of Entrepreneurship Education*, 21(3), 1-16.
- Mattoo, N. H., and Nabi, R. (2012). A study on academic anxiety among adolescents (14-16 years). *International Journal of Social Science Tomorrow*, 1(3), 1-3.
- SEAMEO INNOTECH (2015) Evaluation of the open high school program in the Philippine. Commonwealth Ave., Diliman, Quezon City. https://www.seameo-innotech.org/wp-content/uploads/2017/07/OHSP_2015_Dec_compressed.pdf
- Serratore, N. (2015). Teaching towards self-regulation: The impact of stress, self-efficacy, and motivation. Undergraduate Honors Theses. Paper 19. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.914.5317&rep=rep1&type=pdf>
- Song, D., and Bonk, C. J. (2016). Motivational factors in self-directed informal learning from online learning resources. *Cogent Education*, 3(1), 1205838. <https://doi.org/10.1080/2331186x.2016.1205838>
- Tindowen, D. J., Bassig, J. M., and Cagurangan, J. (2017). Twenty-first-century skills of alternative learning system learners. *SAGE Open*, 7(3), 215824401772611. <https://doi.org/10.1177/2158244017726116>
- Toit-Brits, C. and Zyl, C. M. (2017). Embedding motivation in the self-directedness of first-year teacher students. *South African Journal of Higher Education*, 31(1). <https://doi.org/10.20853/31-1-824>
- Triastuti, J. (2016). The relationship of self-directed learning readiness and learning motivation toward learning achievement of first year medical students. The 2nd International Conference on Science, Technology, and Humanity.
- Tsai, C. C., and Chang, I. C. (2013). The study on motivation and anxiety of English learning of students at a Taiwan Technical University. *International Journal of English Language Teaching*, 1(1), 24-41.

- Unger, S., and Meiran, W. (2020). Student attitudes towards online education during the COVID-19 viral outbreak of 2020: Distance learning in a time of social distance. *International Journal of Technology in Education and Science*, 4(4), 256-266. <https://doi.org/10.46328/ijtes.v4i4.107>
- Uzun, K. (2016). The relationship between foreign language anxiety and self-directed learning readiness. *ELT Research Journal*, 5(1).
- Zhu, M., Bonk, C. J., and Doo, M. Y. (2020). Self-directed learning in MOOCs: Exploring the relationships among motivation, self-monitoring, and self-management. *Educational Technology Research and Development*, 68(5), 2073-2093. <https://doi.org/10.1007/s11423-020-09747-8>