International Journal of Science, Technology, Engineering and Mathematics
Volume 2 Issue 4 December 2022
DOI: https://doi.org/10.53378/352928

Learning Readiness and Level of Science Learning Outcomes in Modular Distance Modality

[1]Raechelle Joyce Siudad & [2]John Vincent Aliazas

Abstract

The study investigates the students' learning readiness and their level of learning outcomes in the science subject during the modular distance modality. The descriptive-correlational design gathered relevant data to determine the relationship between learning readiness and the level of learning outcomes. Through a survey questionnaire, data were gathered from 273 Grade 11 students enrolled in a public High School during the School Year 2021-2022. Based on the results, the students are moderately ready in terms of self-knowledge, analyzing context, and activating knowledge. Similarly, they are also moderately ready in terms of designing learning pathways, clarifying knowledge, and apply understanding. Likewise, the respondents are at the level of moderately engaged in their learning outcomes in Science in modular distance modality as to knowledge in terms of content, process, and nature of science knowledge, and behavior and stewardship; as to skills in terms of science inquiry and self-efficacy; as to attitude in terms of interest and motivation. Finally, a significant relationship was found between learning readiness and the level of learning outcomes in Science in modular distance modality. These results suggest that knowing how learning readiness affects the level of learning outcomes in Science in modular distance modality can help to determine, develop and enhance self-learning materials that the learners may use in the distance modality.

Keywords: *Learning Readiness, Learning Outcomes, Modular Distance Modality, Science Inquiry Skills, Self-Learning Materials*

Article History:
***Received**: August 4, 2022* ***Revised**: September 12, 2022*
***Accepted**: September 19, 2022* ***Published online**: October 26, 2022*

Suggested Citation:
Siudad, R. & Aliazas, J. (2022). Learning Readiness and Level of Science Learning Outcomes in a Modular Distance Modality. *International Journal of Science, Technology, Engineering and Mathematics*, Volume 2 Issue 4, pp. 39 - 53. DOI: https://doi.org/10.53378/352929

About the authors:
[1]Corresponding Author. Teacher 2, Malvar Senior High School, DepEd-Batangas, Philippines
[2]Assistant Professor 3, College of Teacher Education, Laguna State Polytechnic University, Philippines

1. Introduction

Mastery of information with entrenched knowledge and understanding and the use of technology in a sophisticated manner are two goals of education in the 21st century. With these skills, learners are able to master the learning process, engage with their curriculum, and own and direct their learning in their individual and flexible ways. However, due to the COVID-19 pandemic, the normal operation of schools and universities has been hampered by the results of strict implementation of policies, which disrupted the attainment of the education goals. As a classic adaptive and transformative challenge, the pandemic has no pre-determined playbook that can be used to guide suitable answers. In that scenario, educators must act quickly to develop answers that are tailored to individual settings as the epidemic progresses through the educational system (Reimers et al., 2020). In the Philippines, the immediate solution was modular distance learning.

There are several studies confirming the effectiveness of the modular distance modality in education. There are contentions that it increases the student-centered approach to learning, where the learners learn in their own progress and they learn everything in the module using their own effort at their own pace even at a distant (Ambayon & Millenes, 2020). Dangle and Sumaoang (2020) assert that usage of modules encourages learners to pursue their own interests. As such, this will help them to develop superior self-study or learning skills as a result of the experience. In the same way, learners actively participate in the learning of the concepts taught in the course module as they gain a sense of responsibility as a result of completing the duties assigned to them in the module. As a result, they make significant progress on their own, as they learn and become more independent (Nardo, 2017).

As the school adopts the new normal in education with modular distance learning modality, many challenges have been encountered by the teachers and the learners. It caused them unprepared and encounter difficulties in dealing with the new normal in learning especially in the Philippines (Aucensillo, 2021). One of these challenges is the learner's readiness for learning, which questions if learners are well-equipped to learn. As this process evolves on creating favorable circumstances for the whole effective teaching-learning process, learners are expected to be ready physically, mentally, and emotionally. Being ready in all dimensions can help learners effectively learn with greater fulfillment (Dangol & Shrestha, 2019).

Without learning readiness, indications are to decrease the educational achievement of students as well as a decrease in the efficiency and effectiveness of classroom teaching. The absence of learning readiness among learners is the reason why quality education in school becomes meaningless. Nevertheless, if the learner is ready to learn, he can learn fast while the student who is not geared up to learn, cannot learn well (Prakash, 2012). In gauging their readiness, learners are ready for learning if they are able to discern their own knowledge of a task, analyze the task's circumstances, stimulate prior knowledge relevant to the task, devise strategies for learning from the tasks, determine the need for creativity, innovation, and information on the task, and apply understanding for a better result. In the modular learning, they are ready to evaluate their own learning needs, communicate their own goals, select and use accurate ways, and examine their own learning outcomes (Heick, 2013).

In the local setting, the Malvar Senior High School, a public high school in the Philippines, conducted an online poll to get feedback on the school's chosen learning delivery method, which is Modular Distance Learning. Students were also asked on the preferred retrieval of their Self-Learning Modules (SLM) as offered by the Division office. In this setup, those who chose printed modules are provided with hard copies of SLMs to be received by their parents at designated pick-up points while students who chose non-printed modules can download copies of SLMs through Google Drive which can be accessed through Google Classroom. The provided SLMs contain self-paced learning instruction with objectives, activities, and assessments that ensure the attainment of the most essential learning competencies set by the Department of Education (DepEd). It also provided an answer key for the learners and teachers for self-check on the attainment of the needed learning competency (Repe & Student, 2021). However, the teaching of science requires more than just self-check.

As part of learning objective in science, students should demonstrate behavior and environmental stewardship as well as understanding of the nature of scientific knowledge and inquiry abilities as well as their own drive and self-efficacy. As opposed to focusing on the coverage of the subject, learning outcomes articulate how students will be able to apply the material, both within the framework of the class and in their lives in general (Phillips et al., 2018). Moreover, the advancement of science and technology has resulted to an increased amount of information available, necessitating the need for individuals to keep their knowledge up to date on a regular basis. As such, individuals not only enhance their knowledge and skills,

but they continue their learning processes outside of the classroom. It is then expected that individuals with SDM will get the necessary knowledge and abilities by being aware of their learning needs (Karatas & Zeybek, 2020).

Given the local scenario, challenges and subject expectations, this study assumes that the students are considered ready in taking the science subject offered during the distance learning. This study further assumes that the students' learning readiness contributes to their achievement of learning outcomes in science. Thus, this study aims to evaluate the learning readiness and the level of learning outcomes of students in science in the modular distance modality. It answers the following hypothesis:

HO: There is no relationship between learning readiness and level of learning outcomes in science.

2. Literature review

2.1. Learning Readiness

According to Ibrahim et al. (2015) and Ridwan et al. (2019), learning readiness refers to the student's capacity to demonstrate prior knowledge and abilities in order to be successful in his/her courses and meet the demands. This prior knowledge and skills have been found to have a substantial impact on the quality of learning and student accomplishment. It can also be described as the degree of concentration and eagerness to learn among students.

The teaching and learning process without learning readiness is less effective and further becomes a serious threat to promoting educational achievement among students. Thus, the absence of learning readiness becomes a great obstacle to providing quality education (Dangol & Shrestha, 2019). Prakash (2012) describes student prepared can learn rapidly while student not geared up to learn cannot learn successfully. Every effort to provide quality education in school becomes meaningless due to the absence of student's readiness in learning. Learning readiness can increase the educational achievement of students, efficiency and effectiveness of classroom teaching.

2.2. Self-learning and Learning Readiness

Students with self-learning are able to identify their own learning needs, set their own learning goals, find the needed resources to support learning, and able to evaluate their own

knowledge of the lesson. Moreover, students with high self-learning have initiative and high motivation in learning and have great curiosity, as well as a strong desire to learn. Thus, the students with high self-learning will be more active in the learning process, and have more frequent discussions or ask if they are having difficulty, not easily give up when difficulties because the students who have self-learning high takes initiative to learn and are able to find the cause of learning difficulties, have the initiative to overcome the difficulties, and have steadiness or believe in their own abilities. It is a positive effect that increased insight and knowledge, then their study results increase (Yamin, 2011; Tekkol & Demirel, 2018; Tan & Koh, 2014, Heick, 2013; Phillips et al., 2018). This will help them to achieve the desired learning outcomes that the school and teachers want them to achieve even at a distance.

Research conducted by Purwanto (2012) showed that the higher the self-learning, the students have better the learning outcomes. Students with a high degree of self-learning are more diligent and more active during the learning process. Different from the student's medium of self-learning, they are underprivileged to monitor, evaluate, and organize their learning effectively in studying the material, but they still have awareness of learning. Thus, students who have low self-learning are lacking can get maximum results.

2.3. Module Distance Learning and Learning Readiness

Dargo and Dimas (2021) describe MDL as individualized instruction wherein teachers provide learners with the self-learning modules that will help them in giving assessment tools to check for understanding and provide immediate and appropriate feedback. In this modality, the teacher takes responsibility for monitoring the progress of the learners and learners may ask for assistance from the teacher via text messages, cell phone, or even email. In this learning delivery modality, learning takes place between the teacher and the learners who are geographically distant from each other during instruction through the use of modules (Dangle & Sumaoang, 2020).

In the Philippines, MDL modality is currently used by all public schools because it is the most preferred distance learning method of parents with children where modules can be printed and digital (Bernardo, 2020). As per the Department of Education (DepEd), it is one of the best learning modalities during a pandemic since it can help the school and the teachers provide education and the students to continue learning even when they are at home.

2.4. Students' Attitude and Learning Readiness

Attitude towards Science. Attitudes toward science are the positive or negative opinions that individuals have supported by their perceptions as a school subject, as an aspect of society, and as an individual endeavor (Osborne et al., 2003 as cited by Fulmer & Liang, 2019). Attitude could be a relatively more dispositional construct that changes slowly and influences the broad range of perceptions, views, and values regarding science, likewise as their interest in pursuing potential careers in science.

Vedder-Weiss and Fortus (2012) found that Israeli democratic schools, which emphasize autonomy and self-direction, do not have attitude declines. Attitudes, interest, and motivation have also been found to own important peer and social support effects (Rice et al., 2013; Vedder-Weiss & Fortus, 2012), making it clear that understanding the school's academic context is important. This is in contrast with Basl (2011) based on the PISA 2006 data that showed lack of preparation on students' developing awareness of science careers. The findings of Maltese and Tai (2010) suggest that school-based activities were particularly important for students to develop an interest in science.

Self-efficacy. Self-efficacy is one of the important psychological structures that plays and important role in multiple areas of psychology. In fact, enhanced self-efficacy was found affecting the achievement of learners. It is the competence and ability to deal with life's challenges. It also refers to the extent or strength of one's belief in one's own ability to finish tasks and reach goals (Saeid & Eslaminejad, 2016). It is a motivational construct developed by Bandura in social cognitive theory referring to an individual's belief about their performance of a specific task (Tobing, 2013). Conway (2017) points out that self-efficacy addresses what people think they will do no matter what their actual skills are.

In the study of Shaker et al. (2011), study habits and academic self-efficacy were correlated with academic achievement of the students of guidance school. It was indicated that the student's academic achievement is connected to talent and effort items of academic self-efficacy variable. Thus, applying study strategies not only outcomes to improved academic self-efficacy but is also effective of the learners' academic performance that way.

Motivation. Learning motivation is the process whereby goal-directed activity is instigated and sustained. It is reflected in personal investment, cognitive, emotional, and behavioral engagement in learning activities (Geng & Niu, 2019). The motivation of

accomplishment plays important role in directing the behavior of the learners. There is direct relationship between learning strategies and motivation for achievement (Farhoush & Ahmadi, 2013). Because students are not always internally motivated, they generally need situated motivation found in environmental conditions that teacher creates.

2.5. Learning Skills

Kazeni et al. (2018) defines science inquiry skills as science process skills that can acquire sets of broadly transferable abilities appropriate to many science disciplines and reflective of the behavior of scientists. According to Binti Ibrahim (2018), it is a collective of science process skills that are implemented during inquiry for the academic background in science classrooms. This skill is usually acquired by the learners in the classroom on the learning context. These skills are categorized into basic and integrated skills that eventually can develop higher-order thinking skills. Learners can acquire science inquiry skills through participation in practical investigations, which allow them to hold out activities that test hypotheses for observed phenomena. According to Brunsell (2010), helping students use evidence to create explanations for natural phenomena is central to science inquiry.

The five features of science inquiry include: learner engages in scientifically oriented questions; learner gives priority to evidence in responding to questions; learner formulates explanations from evidence; learner connects explanations to scientific knowledge, and learner communicates and justifies explanations.

3. Methodology

The descriptive-correlational design sought to gather relevant data and information to determine the relationship between the learning readiness and the level of learning outcomes of students in Science.

A survey questionnaire was utilized to obtain the data from the 273 Grade 11 students taking up Earth and Life Science subjects enrolled in a public high school in one province in the Philippines during the Academi Year 2021 - 2022. Due to their prior experiences, they can provide the necessary information required for the study. This study used the random sampling technique, a type of probability sampling in which the researcher randomly selects a subset of participants from a population. Each member of the population has an equal chance of being selected.

The instrument used in this study is a researcher-made questionnaire consists of statements that describe the learning readiness as to content (self-knowledge, analyzing context, and activating existing knowledge), process (designing learning pathways, clarifying knowledge, and applying to understand) and level of learning outcomes in science (behavior and stewardship, interest, self-efficacy, motivation, content, process, nature of scientific knowledge, and skills of scientific inquiry). The respondents responded in reference to the Likert-type scales on the constructs covered in the study. The online survey instrument was content–validated by experts in the fields of educational management, statistics, and research. The criteria used were suitability and appropriateness of items. The final instrument was programmed in Google Form and the extracted data were analyzed using appropriate tools.

This study used mean and standard deviation to measure the learning readiness and the level of learning outcomes. On the other hand, Pearson's product-moment of correlation was used to determine the significant relationship between the variables.

4. Findings and Discussions

Table 1

Perceived Learning Readiness in Science

Indicators	Mean	SD	Verbal Interpretation
	Content		
Self-Knowledge	4.01	0.53	Moderately Ready
Analyzing Context	4.08	0.54	Moderately Ready
Activating Existing Knowledge	4.08	0.54	Moderately Ready
	Process		
Designing Learning Pathway	4.03	0.56	Moderately Ready
Clarifying Knowledge	4.03	0.58	Moderately Ready
Apply Understanding	3.96	0.55	Moderately Ready
Overall	**4.03**	**0.55**	**Moderately Ready**

Legend:4.21 – 5.00 - Very Much Ready; 3.41 – 4.20 -Moderately Ready; 2.61 – 3.40 –Ready; 1.81 – 2.60 -Slightly Ready; 1.00 – 1.80 -Not Ready.

Based on the data gathered as shown in table 1, the perceived learning readiness as to content and process of the respondents has an overall mean of 4.03 signifying that the learners are moderately ready in modular science learning. It was further revealed that the respondents assessed analyzing content and activating knowledge tied with the highest mean of 4.08

interpreted as moderately ready. Therefore, it implies that the respondents agreed to look at the context from a different perspective enhances their mastery of the content which promotes the spiral progression wherein their previous knowledge serves as a prerequisite to the present concepts supported by the framework of the K-12 curriculum. However, the respondents assessed self-knowledge with a mean of 4.01, interpreted as moderately ready. The numbers imply that the respondents are aware that the foundational knowledge about the subject made them ready for the different concepts that may be supported by the practices of the learners as they are exposed to self-paced learning using the modules in science.

It was also found that designing learning pathways and clarifying knowledge both with a mean of 4.03, which suggests that the respondents appreciate the process in relation to their learning readiness as they see it as an opportunity to learn different concepts in Science even in the distance learning modality. They are aware of the importance of confirming the facts presented to them first before considering them true. On the other hand, apply understanding received the lowest mean of 3.96 as compared to the other two components of learning readiness to process interpreted as moderately ready. It shows that the learners can value how to process their acquired knowledge in alternative contexts most especially in real-life scenarios.

Table 2

Level of Learning Outcomes in Science in Modular Distance Modality

Indicators	Mean	SD	Verbal Interpretation
Knowledge			
Content, Process, and Nature of Science Knowledge	4.09	0.55	Moderately Engaged
Behavior and Stewardship	4.07	0.54	Moderately Engaged
Skills			
Science Inquiry	3.99	0.58	Moderately Engaged
Self-Efficacy	3.95	0.56	Moderately Engaged
Attitude			
Interest	4.06	0.58	Moderately Engaged
Motivation in Learning Science	4.15	0.58	Moderately Engaged
Overall	**4.05**	**0.57**	**Moderately Engaged**

Legend: 4.21 – 5.00 -Highly Engaged; 3.41 – 4.20 -Moderately Engaged; 2.61 – 3.40 – Engaged; 1.81 – 2.60-Slightly Engaged; 1.00 – 1.80 - Not at all

Table 2 displays the level of learning outcomes in terms of knowledge, skills, and attitude of the students with an overall mean of 4.05; learners are at the level of moderately engaged in their science lessons. The result further shows content, process, and nature of science knowledge with a mean of 4.09, interpreted as moderately engaged, which shows the core of evaluating the

knowledge of the learners after they have performed tasks and activities in the subject. This signifies that students are involved in the learning and their knowledge is given importance; one cannot perform or participate without knowledge of the subject. In addition, the behavior and stewardship was assessed with a mean of 4.07, moderately engaged. It signifies that students still recognize behavior and stewardship as part of the level of knowledge as the mean score is not drifted away from the other variable.

The level of learning outcomes in terms of skills, science inquiry with a mean of 3.99 is interpreted as moderately engaged suggesting the value of science inquiry as it may open up new knowledge and taps their potential as learners of science-related subjects. Meanwhile, self-efficacy received a mean of 3.95 as compared to the other components of level of skills interpreted as moderately engaged. This may imply that the learners reflect confidence in the ability to exert control over one's behavior, in this case, possessing participative learning skills.

The level of learning outcomes in terms of attitude, motivation in learning science attained the highest mean of 4.15, construed as moderately engaged, suggesting respondents deemed motivated to participate in science-related subjects. It benefits not only their academic performance but also their efficiency in daily tasks. The level of attitude as to interest received a mean of 4.06, interpreted as moderately engaged, connotes that the respondents still give importance to interest as it pushes them to pursue learning science-related subjects.

Having the highest mean, the respondents signifies that they are able to see the value of the attitude in learning science-related subjects. Their attitude as a learner contributes a great factor to whether they will excel or not in a particular learning area. It is a critical part that must be considered not only by the learners but the teachers of the subjects as well.

Based on the findings in table 3, learning readiness as to content in terms of self-knowledge shows a significant relationship to the level of learning outcomes in science in terms of content, process and nature of science knowledge ($r = .726$), behavior and stewardship skills ($r = .691$), skills of science inquiry ($r = .697$), self-efficacy ($r = .652$), interest ($r = .666$) and motivation ($r = .650$) when tested at $p < .01$ level of significance. Likewise, the level of learning outcomes in terms of content, process and nature of science knowledge ($r = .726$), behavior and stewardship skills ($r = .719$), skills of science inquiry ($r = .682$), self-efficacy ($r = .706$), interest ($r = .643$) and motivation ($r = .640$) aspects were significantly related to the respondent's learning readiness in analyzing the context. All variables in the level of learning outcomes in science were found to be related significantly to the respondent's learning readiness in activating

knowledge. Furthermore, the respondent's learning readiness as to process in terms of designing, clarifying, and apply were significantly related to their level of learning outcomes such as content, process and nature of science knowledge (r = .746, .643, .758), behavior and stewardship skills (r = .762, .690, .761), skills of science inquiry (r = .746, .651, .714), self-efficacy (r = .664, .623, .724), interest (r = .643, .555, .659) and motivation (r = .698, .569, .654).

Table 3

Test of Correlation between Learning Readiness and Level of Learning Outcomes

Learning Readiness	Level of Learning Outcomes					
	Knowledge		Skills		Attitude	
	Content, Process and Nature of Science Knowledge	Behavior and Stewardship Skills	Skills of Science Inquiry	Self-Efficacy	Interest	Motivation
			Content			
Self-Knowledge	.726**	.691**	.697**	.652**	.666**	.650**
Analyzing Context	.726**	.719**	.682**	.706**	.643**	.640**
Activating Knowledge	.787**	.724**	.706**	.669**	.724**	.700**
			Process			
Designing Pathways	.746**	.762**	.746**	.664**	.643**	.698**
Clarifying Knowledge	.643**	.690**	.651**	.623**	.555**	.569**
Apply Understanding	.758**	.761**	.714**	.724**	.659**	.654**

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*
Verbal Interpretation of r-values:

+1.0 Perfect positive +/- association
+0.8 to +1.0 Very strong +/- association
+0.6 to +0.8 Strong +/- association
+0.4 to +0.6 Moderate +/- association
+0.2 to +0.4 Weak +/- association
0.0 to +0.2 Very weak +/- or no association

The results of the correlation between learning readiness and level of learning outcomes show a significant relationship. The learning readiness in terms of self-knowledge, analyzing context and activating existing knowledge as well as designing learning pathways, clarifying knowledge, and apply understanding were all found to be positively correlated with their level

of learning outcomes in content, process, and nature of science knowledge, behavior and stewardship skills, skills of science inquiry, self-efficacy, interest, and motivation in science. It signifies that the learners in modular distance modality who are much ready for learning will achieve a high level of learning outcomes in science.

These findings were found to be related to the findings of Purwanto (2012) that higher self-learning in students have better learning outcomes because a high degree of self-learning activates diligence and reactiveness during the learning process. On the contrary, students with lower levels of self-learning tend to be passive because they lack the awareness to do well. With these results, the students with high self-learning are better than students with low self-learning (Kurniasih, 2010; Wijayanti & Roemintoyo, 2017).

5. Conclusion

The study sought to evaluate the learning readiness and the level of learning outcomes of science students in a modular distance modality. The descriptive-correlational design sought to gather relevant through a survey questionnaire and science inquiry skills test administered to 273 Grade 11 students. The findings have significant implications for successfully implementing the modular distance modality.

The results showed that students were moderately ready for the content in science in terms of self-knowledge, analyzing context, and activating knowledge. Similarly, they were also moderately ready to process in terms of designing learning pathways, clarifying knowledge, and apply understanding. The respondents were moderately engaged when they evaluated the level of learning outcomes in science as to knowledge in terms of content, process and nature of science knowledge, and behavior and stewardship; as to skills in terms of science inquiry and self-efficacy; as to attitude in terms of interest and motivation. The results of the correlation between learning readiness and level of learning outcomes show that there is a significant relationship. Learning readiness as to content in terms of knowledge, analyzing context, and activating existing knowledge as well as the process in terms of designing learning pathways, clarifying knowledge, and apply understanding were all found to be positively correlated with content, process, and nature of Science knowledge, behavior and stewardship skills, skills of science inquiry, self-efficacy, interest, and motivation.

Through the findings of the study, the teachers may continue to develop and enhance self-directed learning materials based on the readiness of the students as well to improve their science inquiry skills of the students.

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