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Virtual Laboratory Learning Environment and The Students' Performance

Jessielou M. Tambiga[1], Jeza M. Revelo[2], Dayrill Fearl G. Tulba[3], Jame S. Bazar[4], and Genelyn R. Baluyos[5]

[1]Research Instructor, Misamis University/College of Education
[2,3]Student, Misamis University/College of Education
[4]Adviser, Misamis University/College of Education

Abstract**—** The virtual laboratory learning environment is one of the indicators that would indicate students' success in their performance in the virtual laboratory class. This study determined the predictors of students' academic performance at Misamis University, particularly those with virtual laboratory classes. The total populations of the students with virtual laboratory classes were 185, and the target respondents were 125. The researchers used the descriptive-correlational research design and the Student Perceptions of Learning Environment Questionnaire (SPLEQ) as instruments. Mean, standard deviation and Multiple Regression Analysis were the statistical tools used. Findings revealed that the student's virtual laboratory learning environment was good. The student's performance in laboratory subjects was satisfactory. There was a significant relationship between the students' virtual laboratory learning environment and their performance in task orientation and investigation; these two predicted students' performances in the virtual laboratory. The study recommends that students participate attentively and perform in virtual laboratory classes. Teachers must also be attentive regarding their student's work and performance in the virtual simulations and ensure clarity of instruction and proper guidance. Teachers should also review and explain to the students after completing virtual simulations (LABSTER). And future researchers must investigate other factors that might contribute to the student's performances in virtual laboratory classes.

Keywords**—** virtual laboratory, virtual laboratory learning environment, performance in the virtual laboratory

I. INTRODUCTION

A virtual laboratory is one of the most important educational innovations in the twenty-first century (Eljack & Alfayez, 2020). It is an effective educational tool allowing students to conduct experiments in their homes' privacy. It is a great way to involve students with technology while avoiding unplanned disruptions (Vasiliadou, 2020). A laboratory is believed to cause less-than-optimal learning, necessitating supporting media like virtual laboratories (VL) (Jannah et al., 2021).

Recent studies have looked at VL tools as alternatives to conventional hands-on. (Mirçik & Saka 2018). By monitoring student strategies and providing 16 opportunities to test new features easily, virtual laboratories can play a role in designing all laboratory activities (Vitale & Linn, 2018). However, using virtual laboratories has raised questions regarding its usefulness to students as an alternative tool in distance learning.

There is an increasing demand for online formats, and it shows that virtual methods 46 are a viable alternative to face-to-face methods for acquiring laboratory material information (Miller et al., 2018). These virtual laboratories were created to assimilate laboratory experiments practically to provide students with new and interesting learning opportunities (Zalewski et al., 2019).

Using simulation software in academic teaching is a great way to connect theory with traditional hands-on practice. (Domínguez, 2018). Students can perform laboratory experiments in these virtual laboratories at any time and from any place. Students may use 3-D virtual apparatus to perform experiments as if in a real laboratory, interpret the results, and apply the findings to real-life scenarios (Muradova, 2020).

Virtual laboratories can increase students' pre-laboratory preparation, and students feel considerably more confident and comfortable operating virtual laboratory equipment (Dyrberg et al., 2017). It is well-suited for use as a supplement or a primary tool, but it also has value when a laboratory is unavailable (de las Heras et al. 2021). Using a virtual laboratory improves students' conceptual understanding (Gunawan et al., 2018). It positively impacted students' understanding, skills, behaviors, achievement, and ability to innovate.

Virtual labs are suggested to be used to their full potential (Alneyadi, 2019).

The effect of using hands-on and virtual laboratories suggests that using hands-on and VL sequentially instead of in isolation improves students' development of information and inquiry skills (Kacipi & Akcay, 2019). It did not affect students' academic performance or attitudes toward Science; however, students had a generally positive attitude toward virtual lab learning (Ambusaidi et al., 2018).

The students' behaviors improved because of their virtual laboratory experiences. Besides, semi-structured interviews revealed that they had positive feelings about their virtual physics lab experiences (Islek & Aşksoy, 2017). Virtual lab simulation appears to aid laboratory students in connecting theory to practice and visualizing molecular processes and practical laboratory practices and instrument methods; however, it also presents technical difficulties. Furthermore, the study found that virtual lab simulation cases would help students study more actively and be more motivated (de Vries & May 2019).

It is not easy to design online environments for practical in technical fields where students must perform hands-on exercises and laboratory work critical to their learning (Barchino et al., 2019). In Nigeria, it is said that virtual laboratories should ensure that the packages are highly flexible to increase students' access to them through mobile devices and the Internet. The government should financially help schools by providing needed funds to develop contextually relevant learning packages, as the benefits to students' understanding of physics concepts are tremendous (Falode & Gambari, 2017).

There is an ongoing debate about the impact of vi25 rtual experiments/labs on students' physics learning and whether they can replace and improve students' performance in the real lab. Besides, successful learning environments more conducive to students' digital age characteristics and can help them acquire scientific inquiry and practical skills are required (Hamed & Aljanazrah, 2020).

Objectives:

This study determined the level of use of virtual laboratories on the student's performance. It will answer the specific objectives of the study were:

1. Describe students' virtual laboratory learning environment in the areas of usability, learning enhancement, material environment, teacher support, task orientation, investigation, and differentiation.
2. Determine the students' performance in the laboratory subjects:
3. Explore the significant relationship between the virtual laboratory learning environment and the students' performances and;
4. Identify which among the constructs of the virtual lab learning environment predicts the students' performance.

II. METHODOLOGY

Research Design

This study used a descriptive-correlational design. The method explained phenomena, attitudes, opinions, behaviors, or other defined variables by collecting numerical data analyzed using statistical methods (Kapici & Akçay, 2016). The descriptive-correlational design is appropriate for this study in determining students' academic performance predictors using virtual laboratories.

Research Setting

The study was conducted at Misamis University, Ozamiz City. Misamis University is a non-sectarian institution at H.T Feliciano St. Ozamiz City, Misamis Occidental. Misamis University has 12 colleges offering 29 programs, including graduate programs, and has complete Basic Education programs. The university has undergone the most extensive academic transformation in its academic pursuit of excellence and a rigid Institutional Sustainability Assessment or ISA by Commission on Higher Education (CHED), awarded as Centers of Development for Teacher Education, Criminology, and Information Technology programs. The university also received awards from the Philippine Association of Colleges and Universities [PACUCOA] with the most substantial part of accredited programs for two years, recertified by DNV as having conformed to ISO 9001:2008 with a rating of excellent.

Respondents of the Study

The study's respondents were students enrolled in the virtual laboratory in the 63 second semester of Misamis University who were chosen through stratified sampling. There are 185 students from the first year to the third year. Using 55 the sample size calculator from Rao Soft, the target respondents were 125 students. The following criteria were used 5 to choose the respondents: 1.) students who are enrolled in Misamis University for the academic year 2020-2021: 2.)

students who are using a virtual laboratory for cycle of the second semester: 3.) students who are willing to participate in the study. Before conducting the interviews, the researchers were guaranteed that the following criteria were fully met.

Research Instrument

The study used two questionnaire and students' grades to gather data the following instruments.

A. Student Perceptions of Learning Environment (Appendix A). This questionnaire was adapted from Fraser, Giddings & McRobbie (1992). It is a four-point Likert scale to determine the students' perception of the learning environment.

The instrument has indicators with six constructs: usability, material environment, teacher support, task orientation, investigation, and differentiation.

Experts and pilots validated this test for the teachers who will be excluded from the study and 2 yielded a Cronbach's Alpha coefficient of 0.70. Hence, the instrument will be valid and reliable for the study. In determining the students' perception of the learning environment, the following scale was used.

Responses	Continuum	Interpretation
5- Strongly Agree (SA)	4.20-5.00	Excellent
4- Agree (A)	3.40-4.19	Very Good
3- Neutral (N)	2.60-3.39	Fair
2- Disagree (D)	1.80-2.59	Poor
1-Strongly Disagree (SD)	1.00-1.79	Very Poor

B. Intrinsic Motivation Inventory. It is an adopted research instrument from Carbonell (2017). It consists of twenty-four statements used to determine the students' intrinsic motivation. It has four constructs, including interests or enjoyment with seven items, effort with four items, pressure and tension with three items, choice with five items, and value/ usefulness with five items. It has been validated by five experts in the Mathematics department of Misamis University. In determining the level of the students' intrinsic motivation, the following scale was used:

Responses	Continuum	Interpretation
5- Strongly Agree (SA)	3.25-4.0	Very Excellent
4- Agree (A)	3.40-4.19	Good
3- Neutral (N)	2.60-3.39	Fair
2- Disagree (D)	1.80-2.59	Poor

Data Collection

In gathering the data, the researcher asked permission from the College of Education at Misamis University to conduct the study. Moreover, after the approval, the researcher asked permission from the office Vice President of Academic Affairs (VPAA) to survey the selected respondents. After obtaining the permits, the researcher prepared a consent letter for the respondents.

The researcher explained the importance of the study to the respondents. The data gathering was conducted on the school premises only.

The researcher conducted and administered the survey questionnaires among the study respondents to ensure complete cooperation with them and easier access to retrieving data. The data gathered was tallied, analyzed, and interpreted.

Ethical Consideration

To uphold the ethical aspect of this study, the researcher solicited the respondents' voluntary participation. The respondents assured that they were not subjected to harm in any way. Respect for the respondents' dignity was prioritized. Protection of the respondents' privacy, adequate confidentiality of the research data, and the anonymity of individuals participating were ensured. Moreover, deception and exaggeration about the research aims and objectives were avoided; affiliations in any form, funding sources, and any possible conflicts of interest were declared. Finally, communication about the research was done honestly and transparently, and any misleading information and misinterpretations of primary data findings were avoided. The researcher asked the respondents to sign the informed consent as proof of their willingness to participate.

Data Analysis

The study used the following tools in analyzing the data gathered with the use of Minitab Software:

- Mean and standard deviation. These were used in describing students' virtual laboratory learning environment in the areas of usability, learning enhancement, material environment, teacher support, task orientation, investigation, and differentiation as perceived by students and the student's performance in the laboratory subjects.
- Pearson r Product Moment Correlation Coefficient. This was used in exploring the significant relationship between the virtual laboratory learning environment and the students' performances and;
- Multiple Regression Analysis. It was utilized to identify the predictors in the independent variables of students' performance in the virtual laboratory.

III. RESULTS AND DISCUSSION

Students' Virtual laboratory learning environment

The students level of the virtual laboratory learning environment laboratory was good (M = 3.53; SD = 0.88). Students experience good virtual learning environment in terms of task orientation with the highest (M= 4.05; SD= 0.81).

Four areas which are usability (M= 3.63; SD= 0.87), material environment (M= 3.69; SD= 0.87), teacher support (M= 4.43; SD= 0.91) and investigation (M= 3.55; SD= 0.73) also got good remarks. However, differentiation (M= 2.83; SD=0.94) was rated lowest by the students.

The data implies that the learning environment of students in the virtual laboratory in regards to task orientation has the highest rating which means that the students are good in carrying out and completing their tasks through the virtual laboratory.

It describes that student are good in setting out what to do regarding the activities in virtual classes and knows how much work is to be done.

And it also implies that students are good in working in the class on time and gives good attention during the virtual laboratory classes.

Material environment which has the second highest remarks also implies that students have good experience in the material environment of the virtual laboratory. The clear visual animations and even graphics, were effective for the students that they were able to complete virtual experiments and manifest expected outcomes.

However, the area of differentiation was rated lowest by the students but still the remarks was fair regarding to the students learning environment. Hence, the teachers must look into how to improve all these areas to obtain highest remarks.

The interactions that take place within a classroom, between students, and between teachers and students are the focus of classroom learning environment study (Fraser, 2012).

The environment suggests using 3D social representations for dynamic and interactive access to learning resources, which is thought to be closer to the physical world experienced by teachers and students in a learning context (Roderval, Bentoda, Gustavo, Lirio, 2010) It's critical to establish whether virtual labs like these are still useful for students' learning (Wolf, 2009) but students can be otherwise developed practical skills at their own pace, rather than being constrained by the educational organization's hours or geographic location (Rashidovna 2020).

The virtual laboratory excels at enhancing critical voice and personal relevance (Widodo, Maria, Fitriani, 2017).

The use of simulations in conjunction with laboratory work saves time since the laboratory element can be cut short, and students who use simulations have a little better understanding of the practical aspects of laboratory work (TÜYSÜZ1, 2010).

A good learning environment of students in the virtual laboratories is needed to obtain positive outcome same as of the traditional laboratories.

To obtain this, the teacher need to be flexible and skillful to properly guide the students before and after the simulation to make sure students are comfortable and is ready in their learning process during virtual experiments.

The teachers must provide clear instructions to ensure the students' understanding of the concepts of the virtual laboratory since learning environments are nurturing spaces that support the development of all young children and it encompasses learning resources and technology, means of teaching, modes of learning, and connections to societal and global contexts.

Table 1: *Learners' Health Status (n= 152)*

Students' Virtual laboratory learning environment	Mean	SD	Remarks
Usability	3.63	0.87	Good
Material Environment	3.69	0.87	Good
Teacher Support	3.43	0.91	Good
Task Orientation	4.05	0.81	Good
Investigation	3.55	0.73	Good
Differentiation	2.83	0.94	Fair
Overall Virtual laboratory learning environment	3.53	0.86	Good

Learning Environment Scale: 4.20 – 5.0 (Very Good); 3.4 - 4.19 (Good); 2.6 – 3.39 (Fair); 1.8 – 2.59 (Poor); 1.0 – 1.79 (Very Poor)

Students' Performance in Laboratory

Data in Table 2 revealed that the student's performance in the virtual laboratory, in general, was satisfactory (M=83.58). However, out of 125, only three respondents had outstanding grades; got satisfactory grades, 38 got fair grades, and 42 got poor grades. Students' academic performance in the laboratory was measured through written and performance tasks. Written tasks are equivalent to 30%, which includes oral and written exams. Performance tasks are equivalent to 70%, which includes class standing, quizzes, assignments, project involvement/participation, and laboratory activities.

The student's performance in the virtual laboratory was satisfactory, which means that they are doing good in the virtual laboratory. Both their written and performance scores were good. However, there were students with poor performance in the virtual laboratory. This means these students needed help carrying out their virtual laboratory classes and completing their virtual laboratories.

This experimental study of the students can affect their grades by over reused the technology based on their learning outcomes of the study. Although "learning by doing" (Bruner,1990) is not new, allowing students to learn by doing in the classroom is a break from traditional techniques.

Students better know the methodologies and basic concepts employed in laboratory work using virtual laboratories. The program's use helps pupils with the most severe learning disabilities progress (Bellido et al., 2003).

For students to achieve outstanding grades, they need to be more attentive in the virtual laboratory class, participate in online activities, employ lessons in Science, and complete assignments, quizzes, exams, and, most especially, virtual simulations (LABSTER). They must provide good internet connections to complete their virtual experiments effectively. Teachers/instructors must also be attentive to the students' work and concerns regarding their engagement/use of the virtual simulations in the virtual laboratory classes. They need to ensure clear instructions and proper guidance through students' virtual laboratory so that students can meet the expected learning as in the traditional laboratory classes. This experimental study of the students can affect their grades by over-reusing technology based on their learning outcomes. Although "learning by doing" (Bruner,1990) is not new, allowing students to learn by doing in the classroom is a break from traditional techniques. Students better know the methodologies and basic concepts employed in laboratory work when they use virtual laboratories. The program's use helps pupils with the most severe learning disabilities progress (Bellido et al., 2003).

For students to achieve outstanding grades, they need to be more attentive in the virtual laboratory class, participate in online activities, employ lessons in Science, and complete assignments, quizzes, exams, and, most significantly, virtual simulations (LABSTER).

They must provide good internet connections to complete their virtual experiments effectively. Teachers/instructors must also be attentive to the students' work and concerns regarding their engagement/use of the virtual simulations in the virtual laboratory classes.

They need to ensure clarity of instructions and proper guidance through students' virtual laboratory and ensure that students can meet the expected learning same as in the traditional laboratory classes.

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Students' Performance in Laboratory	Frequency	Percent
Very Satisfactory (VS)	3	2.4
Satisfactory (S)	42	33.6
Fair (F)	38	30.4
Poor (P)	42	33.6
Overall Performance	M= 83.58	Satisfactory

Performance Scale: 85-89 (Very Satisfactory); 80-84 (Satisfactory); 75-79 (Fairly Satisfactory); 74 and below (Poor)

Relationship between Students' Virtual laboratory learning environment and their performance

The substantial association between the students' performance and numerous 66 criteria was ascertained in the online laboratory learning environment using the Pearson Product Moment association Coefficient (Table 3). The data revealed that the area of task 5 orientation (r=0.11; p=0.03) and investigation (r=0.13; p=0.05) were related to student's academic performance in the virtual laboratory.

The data implies that task orientation and investigation affect students' performance in the virtual laboratory class, meaning these factors impact how they perform in their virtual laboratory. Their attentiveness to their tasks to be done and carrying out their investigations are relative to their performance. It means that how they know what activities they shall engage with the virtual laboratory, how they perform investigations, and how they complete their virtual laboratories contribute to their work, learning, and the 56 progress of their performance. On the other hand, the rest of the areas of students' virtual learning environment are insignificant, which means it does not affect students' performance.

Virtual reality laboratories allow users to perform the same scientific investigation as they would in a physical lab but with the added benefit of the virtual setting (Sypsas et al., 2020). Although there were no significant differences in student opinions before and after the virtual laboratory experience, there was a general reduction in student assessments of chemistry's interest and utility. Themes in the interviews revealed that the students enjoyed their time in the lab. Students also believed they had mastered a chemistry topic but did not exhibit a shift in their attitude toward chemistry (Koehler, 2021).

To improve students' performance in the virtual laboratory learning environment, teachers need to uplift clear instructions and proper guidance to students. They need to provide the students with the necessary lectures accordingly and take measures to ensure that students are prepared, skilled, and knowledgeable enough to engage in the virtual laboratory so that all areas of the virtual laboratory learning environment shall be achieved positively by students.

Table 3: *Relationship between Students' Virtual laboratory learning environment and their performance*

Variables	rvalue	p-value	Remarks
Usability & Performance	0.00	0.97	Not Significant
Material Environment & Performance	0.03	0.74	Not Significant
Teacher Support & Performance	0.06	0.52	Not Significant
Task Orientation & Performance	0.11	0.03	Significant
Investigation & Performance	0.13	0.05	Significant
Differentiation & Performance	0.09	0.30	Not Significant

IV. Regression Analysis on the Students' Performance in Virtual Lab that Predicts their Academic Performance

Regression analysis, which produced p-values less than 0.05 alpha level, was utilized to investigate the predictor of students' performance in the virtual laboratory. Data revealed that among the six factors in the student's performance in the virtual lab, two factors- task orientation (β= 0.44, t= 0.52, p= 0.04) and investigation (β= 2.08, t= 2.19, p= 0.03) affect students' performance in a virtual laboratory. Other factors like usability, material environment, teacher support, and differentiation between teachers and students do not affect the students' performance in virtual laboratories. These factors are not predictors of students' performance in virtual laboratories.

The regression equation (Performance = 79.16 + 0.44 Task Orientation + 2.08 Investigation) indicates that

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0.44 percent from the area of task orientation and 2.08 from the area of investigation affects students' performance in the virtual laboratory. The data indicates that 0.44 percent from the area of task orientation and 2.08 from the area of investigation affects students' performance in a virtual laboratory. The data shows that

71.14 percent of students' performance in the virtual laboratory is attributed to students' learning environment in task orientation and investigation. The remaining 28.86 percent is 8 attributed to other factors not included in the study. Thus, future researchers must look into these factors that predict the student's performance in a virtual laboratory. Virtual laboratories overcome many of these issues; students can be encouraged to 'make mistakes' to examine the consequences (Cann, 2016). Students conduct online research that culminates in cross-disciplinary collaboration and knowledge integration. Furthermore, how neural networks simulate physical processes in a virtual laboratory is presented (Aleksandra, 2020). Students can use the virtual laboratory to tackle simple antenna distribution problems and proceed to a higher level by adding limits and incorporating new concepts into the network design (Rivera & Suescon, 2020). Students can engage and interact in inquiry32 -based classes using virtual labs, where they can conduct and analyze their experiments and learn using virtual objects and apparatus. Students can acquire critical thinking, inventive, and teamwork skills through virtual labs, which are highly desired in today's employment market (Lynch, 2017).

Students must be capable of planning what they will do during virtual classes. They must know the importance of arriving on time and paying close attention during virtual classes. Students must utilize concepts, cognitive processes, and skills to61 solve problems. To ensure that students understand the concepts of the virtual laboratory, teachers should be digitally literate in their use of technology. Teachers should take a more active role in their students' education. They must be flexible and skilled in guiding students before and after the simulation. They must pay more attention to the students' work and concerns about their engagement in virtual simulations in virtual laboratory classes.

Predictors	Coef (β)	SE Coef	T-Value	P-Value
Constant	79.16	2.69	29.47	0.00
Task Orientation	0.44	0.84	0.52	0.04
Investigation	2.08	0.95	2.19	0.03
$R^2 = 71.14\ \%$				

Dependent Variable: Student Performance

Performance = 79.16 + 0.44 Task Orientation + 2.08 Investigation

IV. SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The virtual laboratory learning environment is one of the indicators 9 that would indicate students' success in their performance in the virtual laboratory class. This study determined the predictors of students' academic performance at Misamis University, particularly those with virtual laboratory classes. The total populations of the students with virtual laboratory classes were 185, and the target respondents were 125. The researchers used the descriptive-correlational research design and the Student Perceptions of SPLEQ, or the Learning Environment Questionnaire, as tools. The statistical tools employed 65 were mean, standard deviation, and multiple regression analysis. Specifically, the following were the objectives of the study: 1) Describe the virtual laboratory learning environment of students in the areas of usability, material environment, teacher support, task orientation, investigation, and differentiation. 2) Determine the student's performance in the laboratory subjects. Explore the significant relationship between the virtual laboratory learning environment and student performance. Identify which among the constructs of the virtual laboratory environment predicts the students' performance.

Findings

1) The student's virtual laboratory learning environment was good regarding usability, learning enhancement, material environment, teacher support, task orientation, investigation, and differentiation.
2) The students' performance in laboratory subjects was satisfactory.
3) There was a significant relationship between the students' virtual laboratory learning environment and their performance in task orientation and performance, investigation, and performance.

4) Task orientation and investigation predict students' performance in the virtual laboratory regarding usability and performance, material environment and performance, teacher support and performance, and differentiation and performance.

Conclusions

The study recommends that school heads plan seminars and workshops about the technological approaches of the newly used virtual laboratory. Hence, the teachers are knowledgeable and literate with the tool as a medium of laboratory instruction. Teachers must also be technologically literate with the tool to ensure clear instructions and effective guidance to students. They must be attentive to their students' engagement in the virtual laboratory to reinforce their performance progress. Students must be prepared, manage, study, and secure a good internet connection to complete virtual laboratories and improve 33 their performance. Future researchers must look into other factors that might contribute to students' performance in the virtual laboratory.

Recommendation

The study recommends that school heads plan seminars and workshops about the newly used virtual laboratory's technological approaches so the teachers can be knowledgeable and literate about the tool as a medium of laboratory instruction. Teachers must also be technologically literate with the tool to ensure clear instructions and practical guidance to students. They must also be attentive to their students' engagement in the virtual laboratory to reinforce the progress of their students' performance to ensure that their laboratory facilities are adequate and students may bring knowledge to every task. Students must be prepared, manage, study, and secure a good internet connection to complete virtual laboratories and improve their performance. Future researchers must look into other factors that might contribute to students' performance in the virtual laboratory.

APPENDIX A

Appendix A

Student Perceptions of the Learning Environment (Modified and Adapted from Fraser, Giddings & McRobbie 1992)

Direction: Below are the statements regarding to the Student Attitudes towards Science and Student Perceptions of the Learning Environment. Please rate the following statements and indicate your response by clicking the number of columns based on the following case.

5-Strongly Agree, 4-Agree, 3-Neutral, 2 Disagree, 1-Strongly Disagree

13. I have interest or pleasure in doing things.					
Constructs/Indicators	5	4	3	2	1
Usability					
The virtual laboratory was easy to install/download.					
The laboratory instructions were easy to understand.					
Time required to complete online lab assignments was comparable to time spent in traditional laboratory					
The laboratory software was easy to use.					
Material Environment					
1. The materials that I need for laboratory activities and technology are readily available.					
2. The laboratory is an appealing place for me to work in.					
3. I find the audio and visual effects used in the technology in this class to be appealing.					
4. The laboratory and/or technology space has enough room for individual or group work.					
5. The materials that I need for laboratory activities and technology are in good working order.					
6. I find the instructions to use the materials in laboratory activities and technology to be clear and precise.					
7. I do not have to wait to use both laboratory and technology materials.					
Teacher Support					
1. Help is available for laboratory materials when I need it.					
2. The teacher takes a personal interest in me.					
3. The teacher goes out of his/her way to help me.					
4. The teacher helps me when I have trouble with my work.					

5. The teacher is interested in my problems related to schoolwork.					
6. The teacher moves about the class to talk with me.					
7. The teacher’s questions help me to understand the topic.					
8. The teacher guides me through activities when I am stuck.					
9. The teacher helps me with problems related to schoolwork.					
Task Orientation					
1. Getting a certain amount of work done is important to me.					
2. I do as much as I set out to do regarding the activities in this class.					
3. I know the purpose of completing the activities in this class.					
4. I am ready to start my work in this class on time.					
5. I know what I am trying to achieve in this class.					
6. I pay attention during this class.					
7. I try to understand the work in this class.					
8. I know how much work I must do in this class.					
Investigation					
1. I carry out investigations to test my ideas in this class.					
2. I am asked to think about the evidence for statements in this class.					
3. I carry out investigations to answer questions during the activities in this class.					
4. I explain the meaning of statements, diagrams, and graphs during activities in this class.					
5. I carry out investigations to answer questions that puzzle me in this class.					
6. I carry out investigations to answer the teacher’s questions in this class.					
7. I find out answers to questions by doing investigations in this class.					
8. I solve problems by using information obtained from my own investigations in this class.					
9. I work at my own speed regarding the activities I do in this class.					
10. Students who work faster than me in these activities move onto the next task.					
Differentiation					
1. I am given a choice of tasks regarding the activities I do in this class.					
2. I am given tasks that are different from other students’ tasks.					
3. I am given work that suits my ability.					
4. I use different materials from those used by other students.					
5. I am assessed in a different manner from other students in this class.					
6. I do work that is different from other students’ work in this class.					
14. I encouraged myself to do things that make me happy.					
15. I learned new practices to cope with floods.					
Development					
16. I am grateful about the size or shape of my body or my physical appearance.					
17. On the whole, I do like myself.					
18. I developed citizens’ awareness of self-responsibility.					
19. I have place where I can seek shelter after floods.					
20. I felt proud that I have accomplished things in life.					

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