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Research Article

Junior High School Students' Science Process Skills Evaluation Through Alternative Laboratory Experiment

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ABSTRACT

This study aimed to develop alternative laboratory experiments (ALEs) in Chemistry 8 and evaluate the perceived improvement of the students' basic science process skills after utilizing the material. This employed a mixed method of research. Initially, a self-assessment survey questionnaire was used to determine the basic science process skills of the 20 Grade 8 student-respondents. From the results, alternative laboratory experiments were developed and validated. Validated ALEs were given to the same group of respondents. At the same time, acceptability questionnaire was administered to the 21 teacher-respondents comprising the total population of science 8 teachers in the Division of Lucena City. The teachers highly accepted that the ALEs promote holistic development in all the three (3) learning domains, cognitive, psychomotor, and affective. To evaluate the improvement of the students' basic SPS, an individual in-depth interview was conducted. Qualitative analysis of the students' basic SPS revealed that the learners who utilized the ALE improved their skills. As perceived by students, they became mindful of the process of observation, execute alternative way of quantifying data and materials, identify the cause and effect, and use related observations, look closely at the properties and characteristics, made the good prediction based on recorded data, and improve in presenting data and explaining results. Therefore, the developed material in selected contents for Chemistry 8 that can improve the target learners' basic science process skills is ready for utilization in the home school scheme.

INTRODUCTION

Science is one of the disciplines where all three learning domains have dimensions. Science content is for the cognitive aspect. Science process skills involve psychomotor activities. Meanwhile, scientific attitude and values correspond to the affective domain. Aiming to deal with all the three aspects ensures holistic development and more meaningful learning in science education. Development of the science process skills of Filipino learners during this 21st century is one of the goals of the new Philippine science education framework. Nurturing confident life-long learners, with skills, attitudes, and capacities to thrive in complex societies is a high priority (Science Education Institute-Department of Science and Technology, 2011).

Science Education Institute-Department of Science and Technology (2011) further emphasized that one of the Philippine Science education frameworks' most pervasive goals is developing 21st century science process skills. As a response, the State, by all means, shall create a functional basic education system that will develop the productive and responsible

Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

citizens equipped with the essential competencies, skills and values for employment and life-long learning.

Hofstein (2017) posited that laboratories play a significant role in effective chemistry education. According to Kennepohl (2021), laboratory classes are supplementary to chemistry education and make up a crucial part of its courses. He also stated that laboratories are very important for comprehending abstract chemistry concepts.

Hands on activities included in laboratory experiments and exercise further develop scientific skills as it provides students with opportunities for authentic and firsthand learning experiences. However, challenges arise due to inadequate resources for laboratory activities and experiments (Duban et al., 2019). Because of this, teachers end up looking for a substitute for reagents and apparatus or doing just experiment demonstration and viewing them as alternatives, cutting out the important hands-on part of learning Chemistry.

The sudden shift from the traditional learning modality makes laboratory experiments become even more difficult to administer. Though faced with this transition and its coupled limitations, teachers should innovate and explore ways to integrate laboratory experiments in their classes. Here, the use of alternative laboratory or home-based experiments poses great potential. Since most of the learning modality being used in DepEd is in the modular mode, the teacher may develop alternative, self-guided, home-based laboratory experiments. Through these, it can also address the problem of insufficient resources in school laboratories.

This led the researcher to determine the enhancement of students' Science process skills after conducting alternative laboratory experiments, crafted from the contents in Chemistry 8, following the DepEd's Most Essential Learning Competencies (MELCs).

Specifically, it aims to attain the following objectives:

1. Determine the junior high school students' self-assessment of the six (6) basic Science process skills: observing, measuring, inferring, classifying, predicting, and communicating.

2. Develop alternative laboratory experiments in the selected content standards for junior high school students.

3. Reveal the teachers' level of acceptance of the use of alternative laboratory experiments in terms of its:

    a. Cognitive,
    b. Psychomotor, and
    c. Affective dimensions.

4. Evaluate the perceived improvement in the students' basic science process skills.

Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

The result of the study is expected to be of great help to both the learners and teachers as it offers alternatives to explore the concepts in in the comfort of their home and even at traditional schools when face-to-face classroom instructions become possible again.

MATERIALS AND METHODS

The study was conducted in Mayao Parada Agricultural Integrated High School, a public agricultural high school in Southern Luzon situated at Brgy. Mayao Parada, Lucena City where the researcher currently teaches.

Mixed-method approach in research was employed in gathering the pertinent data. It entails creation of alternative laboratory experiments that incorporate the most important learning competencies in Chemistry 8, Quarter 3: Matter, to improve junior high school basic science process skills while also determining the level of acceptability of the material by teachers.

A survey questionnaire was conducted before using the material to disclose the respondents' self-assessed basic science process capabilities. Meanwhile, an in-depth interview was conducted to assess if the students' basic science process abilities had improved due to alternative laboratory activities. On the other hand, teachers' level of acceptance of the said material using a survey questionnaire was also exposed.

A total of 20 grade 8 students served as respondents in the study. The respondents, who were students of the researcher, were enrolled at Mayao Parada Agricultural Integrated High School. She discovered the students' lack of mastery of the basic science process skills. The researcher utilized purposive sampling in selecting the participants based on the set criteria relevant to the study. The distribution comprises 25% of students with above average academic performance, 50% average, and the other 25% with below average performance.

On the other hand, the 21 teacher-respondents were selected since they have knowledge of lesson contents in Chemistry 8 and have direct experience in laboratory instruction. All the Science 8 teachers in the 14 secondary schools under the Division of Lucena City participated in the study.

The table shows the frequency distribution of the teacher-respondents among the secondary schools in the Division of Lucena City.

Table I. Frequency Distribution and Selection of the Teacher-Respondents in the Schools Division of Lucena City

School/Unit	Teachers
Cotta National High School	2
Gulang-Gulang National High School	3
Gulang-Gulang National High School - Domoit Ext.	1
Gulang-Gulang National High School-Bocohan Ext.	1
IbabangTalim Integrated High School	1
Lucena City National High School	4
Lucena City National High School - IlayangDupay Ext.	1
Lucena City National High School - Mayao Castillo Annex	1
Lucena City National High School - Mayao Crossing Ext.	1
Lucena City National High School - Silangang Mayao Annex	1
Lucena Dalahican National High School	3
Lucena Dalahican National High School-Barra Annex	1
Mayao Parada Agricultural Integrated High School	0
Ransohan Integrated School	1
TOTAL	**21**

Before the intervention, the students' basic science process skills were assessed using a survey questionnaire with Likert scale integration. Observing, measuring, inferring, classifying, predicting, and communicating were the six (6) components of the basic science process skills. The survey questionnaire results served as the foundation for developing alternative laboratory experiments.

To establish the validity of the intervention material, the researcher sought the assistance of five (5) experts for face and content validation comprising two (2) Master teachers, two (2) head teachers in Science and the Education Program Supervisor in Science in the Schools Division of Lucena City. Their comments and suggestions were considered for the modifying, rephrasing, and improving of the research instrument.

The researcher also developed a questionnaire with Likert Scale integration for the teachers' level of acceptance. It comprises three parts, perception in terms of cognitive, psychomotor, and affective dimensions. Also, the researcher drafted a semi-structured interview with probing questions to evaluate students' basic science process skills improvement – a set of questions perused from the researcher's readings that underwent similar validations to the first instrument.

Before the data gathering, the researcher first secured permission and approval from the DepEd Division of Lucena City for the conduct of the study. The researcher also asked for the consent of the parents/guardians of the learners and the teacher-respondents on their participation in the study and explained how their physical, emotional, and mental health safety will be ensured along the process.

The researcher then administered the self-assessment survey questionnaire to determine the student-respondents' basic science process skills. Because the legitimacy of results obtained without face-to-face contact is uncertain and may jeopardize validity, the researcher interviewed through a phone call to confirm the results of the student-respondents' self-assessment of their basic science process skills before the intervention.

Alternative laboratory experiments developed were based on the Most Essential Learning Competencies (MELCs) in Chemistry 8, the survey questionnaire on basic science process skills results, and the Science grades during the school year 2019 to 2020.s

The ALE is composed of eight (8) experiments. The topics covered include (1) properties and characteristics of solids, liquids, and gasses, (2) phase changes, and (3) properties of elements. It is divided into two parts; part I is the experiment worksheets, and part II is the corresponding answer sheets for each experiment.

After administering the validated alternative laboratory experiments, an individual in-depth interview was administered to the students who received the intervention. Data gathered were transcribed through handwritten notes, analyzed, and interpreted to evaluate the perceived improvement in the students' basic science process skills.

A survey questionnaire was also administered to the teacher-respondents to reveal teachers' level of acceptance of alternative laboratory experiments regarding their cognitive, psychomotor, and affective dimensions.

Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

To ensure the rights of the respondents, the following ethical considerations were employed in this study (Strauss & Corbin, 2008 in Magpantay, 2017): anonymity and privacy, informed consent, confidentiality, and rapport. For anonymity and privacy, the researcher respected the rights of participants to privacy by seeking permission thru a written letter before conducting interviews and decoding conversations. Participants were invited at the most convenient time and place where no one could hear the conversation during the in-depth interview with the researcher. No identifying information of the respondents was revealed in any communication and written output of this paper. In the institution's identity, the researcher sought permission before conducting the study in the research locale. Informed consent is carried out by sending a letter of permission to the respondents to record the conversation during the in-depth interviews. Participants were free to withdraw from this study if they did not want to participate. In ensuring confidentiality, as stated in the letter of permission given to the participants, all information was utilized only for this study. Their identity was not revealed once their transcripts were quoted for discussion. No information was also used other than this study.

The collected data were tallied, tabulated, analyzed, and interpreted. The weighted mean was used to assess the students' basic science process skills and the teachers' level of acceptance of the use of alternative laboratory experiments utilizing the scale points below.

Scale Points	Range	Qualitative Description	
		Student's Self-Assessment	***Teacher's Acceptance***
4	3.50-4.00	Highly Skilled (S)	Highly Acceptable (SA)
3	2.50-3.49	Skilled (S)	Acceptable (A)
2	1.50-2.49	Less Skilled (LS)	Fairly Acceptable (FA)
1	1.00-1.49	Not Skilled (NS)	Unacceptable (U)

Meanwhile, open coding and thematic analysis were used to analyze the qualitative data obtained from the in-depth interview.

RESULTS AND DISCUSSION

The research findings include junior high school students' self-assessment of their basic science process skills, teachers' acceptance of alternative laboratory experiments, and perceived improvement in students' basic science process skills after using the materials.

Basic Science Process Skills Self-Assessment

Table II reveals the summary of the results of the self-assessment of students' in the six (6) basic science process skills. The grand weighted mean of the students' basic science process skills of 2.03 signifies that they are less skilled.

Table 2. Basic Science Process Skills of Students Before the Use of Intervention

Basic Science Process Skills	AWM	QD
1. Observing	2.09	LS
2. Measuring	1.96	LS
3. Inferring	1.90	LS
4. Classifying	2.36	LS
5. Predicting	1.86	LS
6. Communication	2.01	LS
Grand Weighted Mean	**2.03**	**LS**

All the six component skills obtained a similar qualitative description of Less Skilled (LS). Predicting obtained the least value with an average weighted mean (AWM) of 1.86. Even though classifying recorded the highest AWM of 2.36, it is still signified students being less skilled.

Mirana (2019) reiterated that if these skills are not acquired, students will find learning difficult; they could not get meaningful learning experiences. The latter's absence contributes immensely to the decline in interest and the negative attitude toward science. As a result, scientific education should support the development of science process abilities in schools by providing the required learning environment, such as active engagement, life integration, and meaningful learning.

Harlen (1999) claimed that students' ability to acquire SPSs at a required level is critical and that pupils who cannot do so will be unable to perceive the world and make vital connections. As a result, it is reasonable to infer that science process skills and subject understanding are complementary (Bulent, 2015).

According to Hackling (2009), science education must include realistic and practical research to acquire science process skills, which constitute science literacy.

The study of Mirana (2019) revealed how science process skills becomes essential that every student should develop science process skills while they are studying, as they will use these skills throughout their lives. These skills are the foundations of the critical and higher order thinking skills needed to thrive and be competitive in the technological based society of today and the near future. This reminds the teachers to reconsider the end targets of their science lessons – instead of passing the convenient knowledge, students should be taught how to attain it.

Level of Acceptance of the Alternative Laboratory Experiments

Table III summarizes the acceptance level of alternative laboratory experiments evaluated by the teacher-respondents in the cognitive domain. The intervention developed received favorable acceptance as revealed in the average weighed mean of 3.72 with a qualitative description of highly acceptable.

It is highly acceptable (HA) for the teacher-respondents that the developed alternative laboratory experiments can help the students explain the meaning of the information they learned (3.86) and recall information better (3.81). Though rated lowest with a 3.57 weight mean, it is still highly acceptable that the material can facilitate students in showing how the information they learn can be used in another field/situation.

Table 3. Teacher's Acceptance Level in Using Alternative Laboratory Experiments in terms of Cognitive Domain

Statements	WM	QD
Cognitive Domain With the help of the intervention, students will be able to… 1. recall information better.	3.81	HA
2. explain the meaning of the information they learned	3.86	HA
3. show how the information they learn be used in another field/situation.	3.57	HA
4. examine the individual use and importance of resources used and knowledge learned.	3.71	HA
5. create an output for the required learning task independently or with little help.	3.76	HA
6. evaluate which among the key concepts embedded is the most important/least important.	3.62	HA
Average Weighted Mean	**3.72**	**HA**

The cognitive domain contains learning skills predominantly related to mental (thinking) processes. Learning processes in the cognitive domain include a hierarchy of skills involving processing information, constructing understanding, applying knowledge, solving problems, and conducting research. These processes enable performance at five different levels of learner knowledge, originally suggested by Bloom (1956).

Cronin-James (2000) stated that for young students, hands-on science has a stronger effect on knowledge than on attitude. Students can conduct their investigations and satisfy their curiosity, increasing their engagement and supporting their interest in science (Metz, 2008). By incorporating the transferable learning skills into instructional design and delivery, process educators have experimented with ways to make subject matter mastery more authentic (Hanson & Wolfskill, 2000). The cognitive domain offers a tool for highlighting and measuring the well-defined subsets of learning skills traditionally associated with course content.

Table 4. Teacher's Acceptance Level in Using Alternative Laboratory Experiments in terms of Psychomotor Domain

Statements	WM	QD
Psychomotor Domain With the help of the intervention, students will be able to… 1. use multiple senses.	3.71	HA
2. prepare materials or resources properly.	3.71	HA
3. do the laboratory set-up.	3.62	HA
4. illustrate the activity design.	3.76	HA
5. measure chemicals and materials needed accurately.	3.57	HA
6. adapt to the conditions necessary in performing the task.	3.76	HA
Average Weighted Mean	**3.69**	**HA**

Table IV summarizes the level of acceptance of alternative laboratory experiments as evaluated by the teachers in the psychomotor domain. With an average weighted mean of 3.69, the respondents approved that the alternative laboratory experiments are highly acceptable for developing their psychomotor skills. The developed intervention has high acceptability that it can help students illustrate the activity design and adapt to the conditions needed in performing a task rating, as revealed with 3.76 as the highest evaluation rating.

According to McFarlane (2013), to enhance students' interest in learning science subjects, there is a need for a more dynamic and activity-based practical approach that provides students with opportunities to engage with science, as science subject has long been taught and learned as a mono-methodological branch of knowledge. This attitude needs to change through the practice of embracing more student-centered approaches in science learning. Therefore, practical work is one of the most distinctive features of science that may ignite students' interest in learning this subject (Allen, 2012; Sorgo & Spernjak, 2012).

Conducting hands-on practical work in a science laboratory is an important scientific process skill and a common intention of the science standards (Schwichow, Zimmerman, Croker & Härtig, 2016). Abrahams and Millar (2008) and Abrahams, Reiss, and Sharpe (2013) define the term 'practical work' as any teaching and learning that involve manipulating and observing real objects. However, practical work in the context of this study can be defined as any hands-on and minds-on scientific activity in which the students work actively, either individually or in small groups, to observe any physical phenomena (Fadzil &

Saat, 2013).

Research in practical work has developed tremendously over the years and has been given increasingly important emphasis around the world (Allen, 2012; Hofstein & Mamlok, 2007). Through practical work, students get an opportunity to investigate the phenomena, draw conclusions, and practice the scientific skills in handling apparatus that lead to meaningful science learning and development of critical thinking skills. However, when it comes to the issue of implementation, recent studies (e.g., Abrahams, Reiss & Sharpe, 2013; Fuccia, Witteck, Markic & Eilks, 2012; Fadzil & Saat, 2013) reported that practical work is still limited in many school science laboratories. Hands-on practical laboratory work is essential to teaching and learning chemistry, must take a proactive and sensitive approach to make this an inclusive and valuable experience for all.

Table V reveals that the teacher-respondents have high acceptability that the developed alternative laboratory experiments are appropriate for developing students' affective skills, with an average weighted mean of 3.70. They gave high acceptability that with intervention material, students can accept and follow do's, don'ts, and caution, use time effectively to meet the needs of the activity and show self-reliance when working independently.

Table 5. Teacher's Acceptance Level in Using Alternative Laboratory Experiments in terms of Affective Domain

Statements	WM	QD
Affective Domain With the help of the intervention, students will be able to… **1.** act freely and accept the given learning task.	3.71	HA
2. accept and follow do's, don'ts, and caution.	3.76	HA
3. examine the importance of different resources.	3.62	HA
4. acknowledge the knowledge gained and how it is used.	3.57	HA
5. use time effectively to meet the needs of the activity.	3.76	HA
6. show self-reliance when working independently.	3.76	HA
Average Weighted Mean	**3.70**	**HA**

They also agreed that the material is highly acceptable in enabling the students to acknowledge the knowledge gained and its use (3.57). Science educators typically place great importance on laboratory work, arguing that the scientific knowledge cannot be learned effectively from books. They believe that when students involve themselves in practical work, they acquire knowledge and develop technical skills. Laboratory work promotes the cognitive development of psychomotor skills of students, and it also enhances their scientific attitude and enjoyment of science laboratory (Hofstein & Lunetta, 2003). NABT (2004) describes a laboratory learning environment as a place where the students work individually or in groups. Students use scientific processes and materials to develop their explanation of scientific principles or phenomena. They use science process skills like observation, investigation, experimentation, collection manipulation, and integration of data.

Perceived Improvement on Students' Basic Science Process Skills

To reveal the students' perceived improvement of their basic science process skills after utilizing the alternative laboratory experiment, handwritten notes were used to transcribe the students' responses to the interview. Six (6) themes were identified from the interview and those were the six basic science process skills for individual improvement. Structured-framework analysis and descriptive coding were employed in analyzing in-depth interview data. The respondents shared that performing alternative laboratory experiments improved their basic science process skills.

Theme 1: Perceived Improvement in Observation

The table summarizes the subthemes, codes, and responses under the perceived observation improvement based on the interview transcripts' analysis. The perceived improvement of the students' basic science process skills in observation stimulated four subthemes: mindfulness of the process, accuracy, confidence, and ease.

Table 6. Students' Perceived Improvement in Observing Skills

Subthemes	Codes	Responses
mindful of the process	Looking for details	*Sharp mind to observe-SR1* *specific details-SR5* *sensitive to changes-SR6* *focus on small details-SR7, SR13* *careful observation and note-taking-SR12* *multiple perspectives-SR15*
	Know where to focus	*Focus on the observable change-SR4* *Careful observation-SR6* *Concentrated -SR8* *Avoid confusion-SR13*
	Sensitive to changes	*Checking for changes-SR2* *Understand when changes occur-SR3* *Focus on changes-SR4* *Looking for changes-SR8* *Noting changes-SR19*
	Identifying the properties/ characteristics	*Difficulty in identifying properties before-SR1* *Easier way to identify characteristics-SR5, SR13*
accuracy		*Repeated observation-SR2, SR6-9, SR13-14 . SR19-20*
confidence		*Making correct observation-SR2* *More confident observation records-SR3* *Improved observation-SR7* *Increases self-esteem-SR15*
ease the process		*Exploring what to observe-SR1* *Faster observation-SR8* *Easier observation…getting used-SR9*

From the responses presented, it can be deduced that students have developed being mindful of the investigation process as they now tend to look for specific details, know where to focus their observation, are sensitive to changes, and can easily identify the properties and characteristics of the subject under study.

The second subtheme showed that students could repeat observations to check accuracy. They realized that repeated observation is necessary to expose the similarities and differences of results and identify inconsistencies. The third and fourth subthemes were derived from the students' responses, have been able to perform laboratory experiments and ease the investigation process confidently.

The coded responses of the students pointed out that the utilization of alternative laboratory experiments aided them in improving their observation skills which leads them to be mindful of the process, ensure the accuracy of experimentation results, be confident in what they were examining, and ease the process of investigation. The result of the qualitative analysis agrees with the notion of Sheeba (2013) that science process skills can be developed using appropriate educational activities since it requires students to perform critical thinking and scientific inquiry.

Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

Furthermore, Ateş and Eryılmaz (2011) stated that these activities are important, especially for developing countries that cannot use the specific and high-cost materials to engage students in physically active science learning environment. As stated in the literature cited, the conduct of laboratory experiments furthers the science process skills development. Observing is one and is a pre-requisite in developing all other basic science process skills; that is why this skill must be improved and mastered.

Theme 2: Perceived Improvement in Measuring

Table 7. Students' Perceived Improvement in Measuring Skills

Subthemes	Codes	Responses
Alternative way of quantifying data and materials	improve estimation	*Be able to measure using estimation-SR1, SR19* *Mindful estimation-SR4* *Be able to estimate-SR8* *Ensuring equal estimates-SR13*
	use of alternative measurement	*Using alternative materials for measurement-SR6, SR12, SR13*
Quantifying data	ensuring precision	*Careful measurement-SR4, SR8* *Right measurement-SR6, SR15*
	prepare exact amount	*Using alternative measuring tool-SR4* *Understand what to do and measure exactly-SR9*
Ease the process	*Improved measurement-SR19* *Be able to estimate easily-SR20*	
Boost confidence	*Confident in using instrument for measuring-SR5* *Increase self-esteem-SR15, SR19*	
Needs improvement	*Because of the limited measuring instruments-SR3* *Add more measuring tool to be used-SR7, SR15* *Easier and correct way to measure and estimate-SR8* *Have some uncertainty-SR10*	

Four subthemes were identified from the perceived improvement of the students' measuring skills furthered detailed in the codes identified and responses where they were drawn. From the analysis of in-depth interview data, the students stated their heightened skills in executing alternative ways of quantifying data and materials, quantifying data, and easing the measurement process. The students also shared experiences on how the utilization of the alternative laboratory experiment boosted their confidence and cited how some that needs improvement can be helped and guided.

The students' responses regarding estimation and the use of alternative measurement are related to their competence in ensuring precision and preparing an exact amount. Lingam and Lingam (2013) added that the unavailability of resources in rural schools restricts teachers' ability to facilitate teaching and learning process effectively. The cited problem can be addressed by developing activities that can be conducted using readily available materials and utilizing alternative measures to execute the activity while ensuring that it can still met the desired objectives.

Theme 3: Perceived Improvement in Inferring

As seen in Table VIII, perceived improvement of the students' basic science process skills in terms of inferring stimulated four subthemes; explain the observed event, cause and effect and use of related observation, which was further detailed in the codes identified and responses where they were drawn.

Students need to be taught the difference between observations and inferences to be able to differentiate for themselves the evidence they gather about the world as the observations and the interpretations or inferences they make based on the observations. Teachers can help students make this distinction by first prompting them to be detailed and descriptive in their observations.

Table 8. Students' Perceived Improvement in Inferring Skills

Codes	Responses
Explain the observed event	*Can explain the observed event…getting used to-SR1, SR8, SR10, SR15, SR19* *Can explain the factors/aspects-SR3* *Make detailed explanation-SR7* *Relate recorded observations-SR13*
Cause and Effect	*Think of the reasons of observed changes/results-SR3, SR8, SR10* *Correct experiment results-SR5* *Relating observation to results-SR13*
Using related observation	*Explanation based on observation-SR5* *Getting idea from the given procedures-SR6* *Be able to give inferences easier-SR8* *Understanding the process–SR9, SR20* *Troubleshoot the problem-SR12* *Considering allot of factors-SR13*

Asking students questions about their observations can encourage them to think about the meaning of the observations and use their past experiences to help them interpret observations (Checkovich, 2010).

From Barman's (1992) suggested developmental sequence of science process skills, most students can develop skills if provided with the appropriate learning experiences to use these skills. During the coding process, it was revealed that the alternative laboratory experiment allowed the students to explore their ability to create explanations from a set of observations, identify the reason for the occurrences of events, state reasons why a certain event occurred, why it happened and used related observation to understand similar occurrences.

Burak (2009) looked into the relationship between science process abilities and the usage of an efficient laboratory in Chemistry. Graduates in the 21st century are expected to have two sets of current abilities. Students' thinking capabilities can be enhanced by learning science process skills (Bloom, 1956). Basic science process skills are consisted of observing (calculating, measuring, classifying, finding the relationship between space/time), hypothesizing, planning the experiment, controlling variables, interpreting data, drawing conclusions (inference), predicting, applying, and communicating (Choirunnisa, 2018).

Theme 4: Perceived Improvement in Classifying

Table 9. Students' Perceived Improvement in Classifying Skills

Subthemes	Codes	Responses
Properties and characteristics	Similarities and differences	*Easier way to identify the similarities and difference - SR2, SR6, SR10, SR12* *Learning how to identify the similarities and difference -SR3* *Focus on identifying similarities and difference-SR4* *Grouping similar ones-SR5* *More confident on identifying similarities and differences - SR7* *Improved on identifying similarities and differences - SR9* *Careful on classifying things based on similarities at differences. -SR13* *Seeing the similarities and differences-SR14, SR19*
	Distinguishing characteristics	*Improved grouping based on objects characteristics -SR8* *Improved in identifying similarities and differences- SR9*
	Sorting by quantity and quality	*Easier way to group based on their shape and size-SR9*

Scholarum: Journal of Education
www.scholarum.dlsl.edu.ph
Vol. 2, No. 1, August 2022

Consulting firm basis	Use observation data	*Grouping objects based from the conducted observation-SR1* *Faster way to classify based from the recorded results and observation-SR 6* *Use results of repeated observation-SR 7* *Improved classifying skills based on what is observed-SR8*
	Results-based analysis	*Improved grouping based from the results-SR8* *Confidence on the recorded results -SR9*
Confidence		*Confident on what I am doing-SR7, SR14* *Improved classifying skills - SR8* *Easier way to group-SR9*

In the table above, three different subthemes generated under classifying are expounded, showing the codes which further describe each and the responses transcribed. The three subthemes are properties and characteristics, consulting firm basis, and confidence. The first two subthemes from the three and two codes were identified, while the last one was designated to stand individually as a subtheme. The properties and characteristics subtheme refers to the assortment of students on objects to be classified in terms their quality and quantity, similarities, and differences, and distinguishing the characteristics.

After utilizing the alternative laboratory experiments, students are now not that hasty in classifying things, instead are looking for a firm basis for their classification. Two codes pointed-out how respondents consulted firm bases, using observation data and results-based analysis.

Among the six (6) basic science process skills, students evaluated themselves as mostly approaching being skilled in classifying.

However, a part still affected their over-all competence in this skill. Hence, the alternative laboratory experiments still integrate many tasks to develop the said skill further.

Theme 5: Perceived Improvement in Predicting

Table 10. Subthemes and Coded Responses of Students on their Perceived Improvement in Predicting Skills

Subthemes	Codes	Responses
Good prediction	accuracy	*Correct prediction-SR7* *Checking the accuracy of prediction based from the initial results-SR 8* *Making certain predictions-SR 10*
	Avoid guessing	*Not guessing anymore -SR 3* *Base the prediction on the results instead of mere guessing-SR 5* *Learn how to predict instead of guessing-SR 12*
	Learn how to	*Understand how to give prediction-SR 9* *Learn how to predict after doing the given experiments -SR 12*
Predicting from recorded data		*Explain my prediction based from the observation data-SR 1, SR5, SR15, SR20* *Be able to specify the basis of my predictions-SR 4* *Be able to make good prediction because we are the ones doing the experiments on our own. -SR 6* *Bale to think of the possible events or results of the experiments-SR 8* *Getting idea from the procedure, set-up and data results in making predictions -SR 1, SR19*
Gain confidence		*Learn how to give possible experimental results-SR 1* *Confident on the written predictions-SR 2* *More accurate prediction-SR 8, SR 10*

The three (3) identified subthemes are good prediction, predicting from recorded data, and gaining confidence. The first subtheme, good prediction, was generated from accuracy codes, avoiding guessing, and learning how to (predict). The deduced codes of predicting data and gaining confidence meanwhile assume second and third subthemes, respectively.

Predicting skills refer to how observation, data results, and occurrences can be used to tell what will happen next or the result that will be obtained given a certain case or situation. Here three subthemes emerge from the generated codes of the respondents' interview data on perceived improvement in predicting skills.

Here, students can make an accurate prediction with confidence based on observation and data results to avoid guessing. However, the most occurring response was that the students predicted based on the data.

Theme 6: Perceived Improvement in Communicating

The last theme can somewhat be described as the skill needed to express and use the preceding five basic science process skills. It involves conveying of the observation taken and data results summary, interpretation, and analysis. It also includes a clear and explicit way of stating hypothesis and explaining answers and solutions to the problem.

Table 11. Coded Responses of Students on their Perceived Improvement in Communicating Skills

Codes	Responses
presenting data	*Taking note of every details while performing the experiments-SR4, SR13* *Improved completion of the data table-SR 5, SR 8, SR9, SR10, SR12, SR13, SR20* *Easier to answer the guide questions-SR 9* *Can explain the results based from the recorded observation-SR 14*
explaining results	*Realize that can explain the results on their own based from the data table-SR 2, SR13* *Can explain the data recorded-SR 8, SR15* *Can finished the analysis questions faster based from the data table-SR 9, SR14, SR20*
realize the importance of data	*Realize importance of data table for clear results interpretation -SR 3* *Avoid hasty filling up of data table-SR 19*

There are three (3) persisting codes for this theme, presenting data, explaining results, and realizing the importance of data. The first two were the most frequently occurring codes. Presenting data here covers the recoding the observation details in a textual and tabular format completely and correctly. The results were deduced meanwhile from the statements, explaining what is in the table, providing the explanation of the recorded data, and answering the guide questions completely. The last definite code of realizing the importance of the data meanwhile is reflected by how essential it is to clearly and accurately interpret the results.

CONCLUSION AND RECOMMENDATIONS

The Grade 8 students are less skilled in the basic science process skills. The developed alternative laboratory experiments in selected contents for Chemistry 8 are ready for utilization in school or at home. Teachers gave a high acceptance of alternative laboratory experiments' use to promote holistic development. There is an improvement in all the basic science process skills of the students based on their perception relative to the use of ALE.

For the improvement of the study, it is recommended that: (1) The pure qualitative design may be used to increase the reliability of research results for distance learning; (2) A Quantitative experimental method may be employed to reveal the improvement level of students' skills when time and situation permit; (3) Population and wider scope in the research locale may also be considered to obtain more valid and reliable results; and, (4) Further validation of the developed output may be applied to be commendably used in the home school scheme.

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