Development of Self-Regulated Learning Material (SLM) for Enhancing Students' Basic Science Process Skills

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Abstract

This study examines the impact of self-regulated learning materials on the academic performance of Grade-3 students. Pre-test and posttest were implemented to identify the development of self-regulated learning materials. The materials underwent a validation process by the expert to ensure their content, format, presentation and organization, accuracy, and up-to-datedness were appropriate. Validating self-regulated learning materials is crucial to ensure suitability and efficacy. Furthermore, the materials evaluated based on phase, including forethought, volition, and self-reflection. Self-regulated Materials was evaluated by the school head for validation. A validated material has been carefully reviewed by experts to ensure that it is appropriate and effective. The evaluation rated as very satisfactory. The results indicated that these materials greatly extent students' ability to regulate their learning, enhance motivation, and develop critical think skills. The Pre-test and post-test were conducted before and after the use of supplementary materials to assess the basic science process skills. Inferential statistics were performed using t-test of difference to determine significant difference. The results indicated that there is a significant difference between the pre-test and post-test scores, indicating the use of self-regulated learning materials significantly enhanced the skills and performance of Grade-3 students. Schools are encouraged to promote the use of self-regulated learning material to enhance learning outcomes. The future researcher on the same topic may be conducted for improving science education where students will be benefited. Educator may improve quality of education and support students in achieving their potential and academic success.

Keywords: Self-regulated Learning Materials, Academic performance, Forethought, Volition, and Self-*reflection*

INTRODUCTION

The National Achievement Test (NAT) conducted by the Department of Education evaluates students' performance in various academic areas, including science. The average percentage for science achievement in Grade 3 was 45.15, indicating that students answered around 4.5 out of 10 questions accurately.

The objectives of teaching science have significantly changed as a result of the field's enormous social significance in the twenty-first century. The development of process skills among students should be emphasized in science courses, according to contemporary curriculum developers (Sereen, 2019). In fact, basic science skills should be mastered by the students to improve the critical thinking of the learners. The skills involve observing, classifying, communicating, measuring, inferring, and predicting that generally traits by the scientist, teacher and students in the field of science (Balmeo, 2022). These skills should integrate in the learning materials of the students in order to enhance their basic science skills competency. The needs of every learner are being met by a constant improvement in educational trends.

In order to take the requirements without of the present sacrificing capacity to fulfill the demands of future generations, it is important for education to develop sustainably. Educators are challenged to modify new teaching method who had the capacity to sustain the needs of learners. To a large extent, teachers should not just concentrate on providing the students with resources that mostly originated from the Department of Education (DepEd), but at the very least, they should try to look for additional resources and teaching materials to facilitate more effective learning.

In the Philippines South Central School, San Pedro in Batangas provides the first part of a child's education, usually for children between five and thirteen years old. Students in the local level has a difficulty in science related concepts due inappropriate materials. Enhancing the basic science skills of the students improve the students' knowledge and decision making. It can help children learn more positive attributions about other persons' intentions which is essential for school readiness and academic success. Thus, developing a self-regulated learning materials for basic process skills in science subject will upgrade the academic performance of the students in local level.

Self-regulation is necessary in school due to the influence it has on behavioral and educational results. Self-regulation approaches can be used to actively engage pupils in their academic teaching who might otherwise be inactive. Students must see education as something they do for themselves. As they evaluate and choose the next course of action, they will regulate various techniques and keep an eye on their efficacy. Successful students typically already employ a variety of self-regulation techniques. Students who don't already employ self-regulation strategies and struggle in academic environments are often the ones that need instruction in it. Performance may be considerably enhanced by using tactics and self-regulation. Self-regulation skills help pupils complete work more efficiently and autonomously. especially in basic process skill.

In order to improve learners' competency in basic science concepts within the educational system, this study aims to pinpoint the advantages of self-regulatory learning materials.

MATERIALS AND METHODS

The study was quantitative in nature. It utilized use descriptive Correlation design. This design involves scores on a test are examples of collections of quantitative data that may be calculated numerically along a continuum. It involves obtaining data that describe occurrences, organizing, tabulating, depicting, and describing the data collection. It frequently employs visual aids, like as graphs and charts, to help the reader comprehend the data distribution. 43 Grade 3 pupils from Sto. Tomas South Central School pupils were chosen for the research using purposive sampling as respondents. The primary tool is a set of four lessons that make up the self-regulated learning content for Unit 3: Force, Motion, and Energy.

The study consists of three sets: The Science Process Skill Test (Pre-test and Post Test), Science Attitudinal Survey, and the validity on of Self-regulated Learning Material (SLM). Based on characteristics including content, format, presentation, organization, and accuracy of information, the school head/principal assessed the content validity of the self-regulated learning material.

Mean and standard deviation were used to determine the effectiveness of the self-regulated learning material in enhancing students' basic science skills. The collected responses were tabulated and analyzed using mean scores for verbal interpretation. Standard deviation was used to understand the variation from the mean. The significant difference between the students' pre-test and post-test scores on the six fundamental science abilities of observing, communicating, categorizing, measuring, inferring, and predicting was determined using the t-test statistics. Inferential Statistics of Pearson Product-Moment-Correlation Coefficient was used to determine the relationship of mastery in basic process skills and the effectiveness of self-regulated learning material in science.

The main instrument used in the study is the developed self-regulated learning materials for Unit 3: Force, Motion and Energy, consisting of 4 lessons; Lesson 1. Moving Object, Lesson 2: Light, Lesson 3: Sound, and Lesson 4: Electricity. The questionnaire of the study consists of three sets: which are the Science Process Skill Test (Pre-test and Post Test), the Science Attitudinal Survey, and the questionnaire on the acceptability of Self-regulated Learning Material (SLM). The instruments were used to gather information from the respondents. It includes questions/ statements about the developed student self-regulated learning supplementary for basic science skills.Self-regulated Learning Materials was evaluated by the school

head/principal for content validity of SLM for Grade 3 students, indicators of which consist of content, format, presentation and organization, and accuracy and up-to-datedness of information.

RESULTS AND DISCUSSION

The study focused on student self-regulated learning material (SLMs) for enhancing basic skill in science. The validity and reliability of the Self-Regulated Material (SLM) were assessed by the experts in education in terms of content, format, presentation and organization, accuracy and up-to-datedness of information.

Table 1 Perceived Acceptability of validation of the Self-Learning Materials

STATEMENTS	MEAN	SD	VI
Content			
1. Content is suitable to the student's level of development.	3.50	0.55	Very Satisfactory
2. Material contributes to the achievement of specific objectives of the subject area and grade/year level for which it is intended.	3.50	0.55	Very Satisfactory
3. Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc.	3.50	0.55	Very Satisfactory
4. Material is free of ideological, cultural, religious, racial, and gender biases and prejudices	3.50	0.55	Very Satisfactory
5. Material enhances the development of desirable values and traits	3.50	0.55	Very Satisfactory
6. Material has the potential to arouse interest of target reader.	3.50	0.55	Very Satisfactory
Overall	**3.50**	**0.55**	**Very Satisfactory**
Print			
1. Size of letters is appropriate to the intended user.	3.33	0.52	Satisfactory
2. Spaces between letters and words facilitate reading.	3.50	0.55	Very Satisfactory
3. Font is easy to read.	3.50	0.55	Very Satisfactory
4. Printing is of good quality (i.e., no broken letters, even density, correct alignment, properly placed screen registration).	3.50	0.55	Very Satisfactory
Overall	**3.46**	**0.51**	**Very Satisfactory**
Illustration			
1. Simple and easily recognizable.	3.50	0.55	Very Satisfactory
2. Clarify and supplement the text.	3.50	0.55	Very Satisfactory
3. Properly labelled or captioned (if applicable)	3.50	0.55	Very Satisfactory
4. Realistic / appropriate colors.	3.50	0.55	Very Satisfactory
5. Attractive and appealing.	3.50	0.55	Very Satisfactory
6. Culturally relevant.	3.50	0.55	Very Satisfactory
Overall	**3.50**	**0.55**	**Very Satisfactory**
Material as to Design and Layout			
1. Attractive and pleasing to look at.	3.50	0.55	Very Satisfactory
2. Simple (i.e., does not distract the attention of the reader).	3.50	0.55	Very Satisfactory
3. Adequate illustration in relation to text.	3.50	0.55	Very Satisfactory
4. Harmonious blending of elements (e.g., illustrations and text).	3.50	0.55	Very Satisfactory
Overall	3.50	0.55	**Very Satisfactory**
Paper and Binding			
1. Paper used contributes to easy reading.	3.50	0.55	Very Satisfactory
2. Durable binding to withstand frequent use.	3.50	0.55	Very Satisfactory

Overall	3.50	0.55	**Very Satisfactory**
Size and Weight			
1. Easy to handle.	3.50	0.55	Very Satisfactory
2. Relatively light.	3.50	0.55	Very Satisfactory
Overall	3.50	0.55	Very Satisfactory
Presentation and Organization			
1. Presentation is engaging, interesting, and understandable.	3.50	0.55	Very Satisfactory
2. There is logical and smooth flow of ideas.	3.50	0.55	Very Satisfactory
3. Vocabulary level is adapted to target reader's likely experience and level of understanding.	3.50	0.55	Very Satisfactory
4. Length of sentences is suited to the comprehension level of the target reader.	3.50	0.55	Very Satisfactory
5. Sentences and paragraph structures are varied and interesting to the target reader.	3.50	0.55	Very Satisfactory
Overall	**3.50**	**0.55**	**Very Satisfactory**
Accuracy and Up-to-datedness			
1. Conceptual errors	3.50	0.55	Very Satisfactory
2. Factual errors	3.50	0.55	Very Satisfactory
3. Grammatical errors	3.50	0.55	Very Satisfactory
4. Computational errors	3.50	0.55	Very Satisfactory
5. Obsolete information	3.50	0.55	Very Satisfactory
6. Typographical and other minor errors	3.50	0.55	Very Satisfactory
Overall	**3.50**	**0.55**	**Very Satisfactory**

Legend: 3.50-4.00 (Very Satisfactory); 2.50-3.49 (Satisfactory); 1.50-2.49 (Needs Improvement); 1.00-1.49 (Poor)

The perceived acceptability of the self-regulated learning materials for Grade three were presented in Table 1. The self-regulated learning materials underwent a validation process by an expert to ensure their content (mean =3.50), format (mean=3.50), presentation and organization (mean=3.50), accuracy, and up-to-datedness (mean=3.50) were appropriate. The overall evaluation showed that the expert rated each of these criteria as very satisfactory, (mean=3.50) for content, format, and presentation/organization, and for accuracy/up-to-datedness.

Content validity of self-regulated learning materials can be evaluated using different methods, such as expert judgment, cognitive interviews, or factor analysis. In Table 4, the self-regulated learning materials are evaluated for content validity through expert judgment. The validator rates the materials as very satisfactory, indicating that the materials cover the necessary content and are appropriate for the students' level of development.

The study also found that the print and size of letters in the materials was appropriate for the intended user, and that the gaps between word and letter facilitated reading. The font used was also simple to read, and the printing was to a high standard, with no missing letters, uniform density, accurate alignment, and appropriate screen registration.

In illustration the materials should be designed in a way that is accessible and easily understood by the students. This includes using simple and recognizable images and symbols and avoiding complex or technical language. The materials should also be properly labeled or captioned, if applicable, to ensure that students can understand and interpret the information presented.

The study found that the design of the materials was attractive and pleasing to look at, which can stimulate students' interest and motivation to learn. The use of simple and recognizable design elements also helped students to focus on the material's content rather than being distracted by complex design features. The materials contained adequate illustrations that were relevant to the text and helped to clarify and reinforce the content.

In developing self-regulated learning materials, it is important to consider not only the content and design but also the physical aspects such as paper and binding. Using high-quality paper and secure binding

can improve the durability and usability of the materials, while a polished appearance can enhance the perceived effectiveness of the materials and promote student engagement and learning.

The physical attributes of textbooks, the size and weight of the materials can have an impact on student learning and comprehension. Textbooks that are too large and heavy may be difficult for students to carry and may cause physical strain, leading to discomfort and distraction during learning activities. On the other hand, materials that are too small may be hard to read and may cause eye strain or headaches. For instance, the self-regulated learning materials size was A4, and its weight was 100 grams which is the standard weight and size for a learning material for elementary student.

The visual organization of learning materials significantly influenced student performance and learning outcomes. Therefore, it is crucial for educators and instructional designers to consider the presentation and organization of self-regulated learning materials to ensure their validity and acceptability. By presenting materials in an organized and visually appealing manner, educators can enhance student engagement, comprehension, and retention of the content.

In accurate and up-to-datedness promoted students' scientific knowledge and skills. The materials were presented in a clear and organized manner, which further enhanced their effectiveness in promoting learning outcomes.

The validation of self-regulated learning materials is essential to ensure their effectiveness in helping students achieve academic success. A validated material has been carefully evaluated and reviewed by experts to ensure that it is appropriate and effective for its intended purpose.

Table 2 *Perceived Acceptability of Self-Learning Materials*

STATEMENTS	MEAN	SD	VI
Forethought			
1. Precede and set the stage for performance in learning.	4.49	0.63	To a Great Extent
2.Set attribution and self-efficacy of eminent tasks.	3.65	0.72	To a Great Extent
3.Cultivate intrinsic motivation to perform learning task.	4.95	0.30	To a Very Great Extent
4. Improve ability of the students in analyzing task and activities.	3.72	0.70	To a Great Extent
5. Allow learners to recognize their self-efficacy in terms of their learnings.	4.33	0.78	To a Great Extent
Overall	**4.23**	**0.30**	**To a Great Extent**
Volition			
1. Aid students to achieve their learning goals.	3.81	0.70	To a Great Extent
2. Set benefits that are limitless but manageable for all the learners.	4.37	0.72	To a Great Extent
3. Help students to manage their time develop strategies on making their task.	4.53	0.77	To a Very Great Extent
4. Allow the students to learn how to evaluate their own knowledge and learning.	4.26	0.62	To a Great Extent
5. Cultivate learner's ability to respond with their self-regulated efforts.	3.88	0.66	To a Great Extent
Overall	**4.17**	**0.33**	**Great Extent**
Self-Reflection			
1. Create effective learning habits by utilizing own knowledge and self-discovery.	3.88	0.59	To a Great Extent
2. Encourage reflection from own knowledge and learning.	3.65	0.72	To a Great Extent
3. Cultivate learning styles and practices that help develop motivations and interest on studying.	4.23	0.84	To a Great Extent
4. Foster various ways of learning habits.	3.77	0.75	To a Great Extent
5. Enable to keep track on own's progress especially own weaknesses and strengths.	4.02	0.77	To a Great Extent
Overall	**3.91**	**0.28**	**To a Great Extent**
Usefulness			
1. Module is easy to use	3.40	0.66	To a Moderate Extent
2. Easily understand science concepts with the module guide	3.21	0.60	To a Moderate Extent

3. Module is useful in doing research.	3.49	0.63	To a Moderate Extent
4. Module facilitated the teaching-learning process	3.53	0.67	To a Great Extent
Overall	**3.41**	**0.32**	**To a Great Extent**
Attract and Sustain Interest			
1. The activities in the learning guide were interesting	3.40	0.62	To a Moderate Extent
2. Learners feels motivated to explore other lessons	3.40	0.62	To a Moderate Extent
3. The learning activities helped appreciate the lessons.	3.19	0.55	To a Moderate Extent
4. Learners like the learning guide for studying the subject	3.28	0.59	To a Moderate Extent
Overall	**3.31**	**0.32**	**To a Moderate Extent**
Appropriateness and Relevant			
1. The lessons activities after each teaching content were comprehensive	3.63	0.62	To a Great Extent
2. The lessons activities after each teaching content were comprehensive	3.21	0.47	To a Moderate Extent
3. This learning guide had assessments/questions relevant to the materials content.	3.40	0.58	To a Moderate Extent
4. The structure of the learning guide was appropriate	3.47	0.59	To a Great Extent
Overall	**3.42**	**0.29**	**To a Moderate Extent**
Attainment of Essential Learning Outcome			
1. Quickly know what lessons were assigned to be completed	3.40	0.62	To a Moderate Extent
2. Quickly determine my progress in doing my lessons	3.33	0.64	To a Moderate Extent
3. There were a variety of activities to help me understand the lessons	3.26	0.49	To a Moderate Extent
4. Learning tasks were challenging and helped me determine my understanding of the lessons	3.60	0.66	To a Moderate Extent
Overall	**3.40**	**0.30**	**To a Moderate Extent**

Legend: 4.50-5.00 (To the Very Great Extent); 3.50-4.49 (To a Great Extent); 2.50-3.49 (To a Moderate Extent); 1.50-2.49 (To a Low Extent); 1.00-1.49 (To a Very Low Extent)

The perceived acceptability of self-regulated learning materials was summarized in Table 2. The self-regulated learning material is evaluated based on its phase and acceptability. The forethought (mean = 4.23), volition (mean = 4.17) and self-reflection (mean=3.91) were all viewed as to great extent. The results show that self-regulated learning materials can improve students' ability to regulate their learning, enhance their motivation, and develop their critical thinking skills. The study also highlights the importance of attracting and sustaining learners' interest, providing comprehensive lesson activities, and clear instructions and guidance for successful self-regulated learning.

The perceived acceptability of the self-regulated learning material for Grade 3 students. It was noted that in the Forethought section the effective way achieved to a great extent (mean=4.2, SD=0.35). The discussion highlights the various benefits of self-regulated learning materials in enhancing student performance. By providing learners with tools and strategies to regulate their own learning, these materials help students take control of their learning process and become more self-directed. Moreover, self-regulated learning materials can help learners develop a sense of efficacy and attribution towards learning tasks, which in turn can boost their motivation to learn. Students who feel capable of succeeding in a given task are more likely to engage in it and put forth the effort required to master it.

The perceived acceptability of the self-regulated learning material for Grade 3 students. The Volition aspect describe as to great extent (mean=4.17, SD=0.33). It was also highlights that the materials were very helpful in managing the time of the students to develop strategies on making their task. The advantages of self-regulated learning resources are numerous, as they aid students in achieving their educational objectives and deepening their comprehension of the material. These materials also set benefits that are both limitless and manageable for all learners, allowing them to feel a sense of accomplishment and progress as they move through their studies.

The perceived acceptability of the self-regulated learning materials for Grade 3 students. The self-Reflection aspect describes as to great extent (mean=3.19, SD=0.38). Self-regulated learning materials under the self-reflection section aim to encourage students to be in control of their individual learning and create acceptable learning habits. By utilizing their own knowledge and self-discovery, students can reflect

on their own learning experiences and identify areas for improvement. This self-reflection helps students to cultivate learning styles and practices that align with their individual needs and can foster motivation and interest in studying. Furthermore, self-reflection can enable students to identify their own strengths and weaknesses and develop strategies to address any challenges they may face. This process of tracking progress and identifying areas for improvement can also help students to develop a growth mindset and improve self-efficacy, each of which may result in enhanced academic achievement. For example, in the lesson included in self-regulated learning materials, practical and proper used of electricity at home could be practice in their home. Another thing is the lesson for motion of an object, student will enable to apply their learning in sports to move the ball to their playmates.

Table 3 *Pretest and Posttest Scores of the Students in Basic Science Process Skill as to Observing*

GRADE	PRE-TEST		POST-TEST		VERBAL INTERPRETATION
	F	PERCENTAGE (%)	F	PERCENTAGE (%)	
91-95	3	7.0	17	39.5	Advanced
90-86	5	11.6	14	32.6	Proficient
85-81	8	18.6	11	25.6	Appropriate Proficient
80-76	16	37.2	1	2.3	Developing
75-71	8	18.6	-	-	Beginning
70	3	7.0	-	-	
Total	**43**	**100.0**	**43**	**100.0**	

Legend: (5) Advanced, (4) Proficient, (3) Appropriate proficient, (2) Developing, (0-1) Beginning

Table 3 illustrates the pre-test and posttest scores of Grade-3 based on the observation skill, one of the six fundamental skills in science. The pretest results of Grade 3 students were low, with most students scoring only 2 points, which accounted for 36.2%. This indicates poor understanding of the science subject matter. However, after using self-regulated learning materials, students' scores improved significantly, with the majority achieving perfect scores of 5 points (39.5%) and 4 points (32.6%), respectively.

Upon evaluating the students' skills, it becomes apparent that there is a noteworthy contrast in the scores between the pre-test and post-test. This discrepancy strongly suggests that the self-regulated learning materials have improved the students' observation abilities. This improvement is clearly seen in the task involving moving cars in Unit 3: Force, Motion and Energy, Chapter 1: Moving Object in the self-regulated learning module (SLM). The learners prepared all the materials needed in the activity. They performed and followed all the instructions. They record all the data based on the observation happened. As the students engaged in this activity, they became more attentive and perceptive. The data aligns with the findings of Ranpura (2013), who highlighted that memories can be strengthened regardless of the context by paying careful attention and consciously making an effort to remember.

Utilization of self-regulated learning material to improve the observation skills of grade school students has been a topic of interest among educators and researchers. A similar study conducted by Hakeem and Ali (2020) aimed to investigate the success of learning material in enhancing observational abilities of grade 5 students in Pakistan.

The results of the study show that the experimental group performed significantly better in the post-test, which indicated an improvement in their observation skills. The researchers concluded that the use of self-regulated learning modules was an effective way to enhance the observation skills of grade 5 students.

Table 4 *Pretest and Posttest Scores of the Students in Basic Science Process   Skill as to Communicating*

GRADE	PRE-TEST		POST-TEST		VERBAL INTERPRETATION
	F	PERCENTAGE (%)	F	PERCENTAGE (%)	
95	-	-	2	4.7	Advanced
93	1	2.3	4	9.3	Proficient
90	1		6	14.0	
85	5	11.6	20	46.5	Appropriate
83	5	11.6	8	18.6	Proficient
80	16	37.2	3	7.0	
75	12	27.9	-	-	Developing
70	3	7.0	-	-	
			-	-	Beginning
Total	**43**	**100.0**	**43**	**100.0**	

Legend: (8) Advanced, (6-7) Proficient, (4-5) Appropriate proficient, (2-3) Developing, (0-1) Beginning

The scores of Grade 3 in the pretest and posttest are summarized in Table 4 It was observed that most of the students obtained low scores, with 27.9% and 37.2% of the students scoring 2-3 points, respectively. However, after using the self-regulated learning materials, the data clearly showed an improvement in the students' communication skills. This was evident in the scores obtained by the students, with 46.5% of them achieving a score of 5 points.

The learners' active participation and engagement in each activity of the self-regulated learning module (SLM) through collaborative learning resulted in a notable difference between their pre-test and post-test scores, indicating an improvement in their communication skills. Active engagement in student activities has a positive influence on enhancing their ability to communicate effectively. By actively participating in activities, students are immersed in a dynamic learning environment that fosters effective communication.

Active engagement promotes active listening and responsive communication among students. Through collaborative activities like group discussions and presentations, students are encouraged to actively participate and exchange ideas and information meaningfully. This process not only enhances their listening skills but also helps them articulate their thoughts and perspectives coherently and effectively.

Supporting these findings, Johnson et al. (2014) conducted a study exploring the effects of collaborative learning on communication skills in a university setting. The researchers discovered that students engaged in collaborative learning demonstrated significant improvements in their communication skills compared to those in traditional lecture-based instruction.

Table 5 *Pretest and Posttest Scores of the Students in Basic Science Process Skill as to Classifying*

GRADE	PRETEST		POST-TEST		VERBAL INTERPRETATION
	F	PERCENTAGE (%)	F	PERCENTAGE (%)	
91-95	7	16.3	21	48.8	Advanced
90-86	6	14.0	16	37.2	Proficient
85-81	13	25.6	5	11.6	Appropriate Proficient
80-76	14	32.6	1	2.3	Developing
75-71	4	9.3	-	-	Beginning
70	-	-	-	-	
Total	**43**	**100.0**	**43**	**100.0**	

Legend: (5) Advanced, (4) Proficient, (3) Appropriate proficient, (2) Developing, (0-1) Beginning

The scores of Grade 3 in the pretest and posttest are presented in Table 5. The pretest results show that most of the students obtained 2-3 points, indicating poor performance in classifying skills. However, after the students used the self-regulated learning materials, post-test had been administered, and it found that their performance improved. Interestingly, a large proportion of the students (48.8%) achieved a perfect score of 5.

Enhancing classification skills in science is crucial for elementary students for several reasons. First, classification is a fundamental scientific process that allows students to organize and categorize information. By understanding how objects and organisms are classified, Second, classification skills are essential for scientific inquiry. Students must be able to accurately classify and identify objects and organisms to conduct experiments and draw meaningful conclusions. Without strong classification skills, students may struggle to interpret their findings and draw accurate conclusions.

Classification is also a fundamental skill in science education, as it enables students to organize and categorize information. In a study conducted by Chen and Huang (2016), the effectiveness of using a concept mapping approach to improve the classification skill of Grade 4 students in Taiwan was examined. The study showed that concept mapping improved students' classification skills and their ability to identify relationships between different concepts.

Table 6 *Pretest and Posttest Scores of the Students in Basic Science Process Skill as to Measuring*

GRADE	PRETEST		POST-TEST		VERBAL INTERPRETATION
	F	PERCENTAGE (%)	F	PERCENTAGE (%)	
95	-	-	8	18.6	Advanced
91-94	2	4.7	18	41.9	Proficient
86-90	8	18.6	10	23.3	Appropriate Proficient
81-85	12	27.9	7	16.3	Developing
76-80	14	32.6	-	-	
71-75	6	14.0	-	-	Beginning
70	1	2.3	-	-	
Total	**43**	**100.0**	**43**	**100.0**	

Legend*: (6) Advanced, (5) Proficient, (4) Appropriate proficient, (2-3) Developing, (0-1) Beginning*

Table 6 summarizes pre-test and post-test scores of grade 3. The results indicate that most students (79.1%) scored between 2-4 points, which is relatively low. However, post-test, most students (60%) scored between 5-6 points, and no students scored between 0-2 points. This reflects that the self-regulated learning materials had been positive improvement on the students' performance for measuring skills. The utilization of the self-regulated learning material (SLM) contributes to the improvement of students' scores in measuring skills. The lesson on motion, which is included in the SLM, is effectively mastered by the learners, as evidenced by their performance on the test. In volition phase on Moving Cars, students were measured the motion in terms of different items such marbles, plastic straw, and string. They measure how far each available item can move the car.

For example, in the self-regulated learning materials the student enables to measure the object that produces sound through hearing. This implies that the student enhances their skills in measuring using senses.

Similar procedure and findings were mentioned in the study about "Development of a Measuring Skills Improvement Program for Primary School Students" by Gökhan Baş and Mustafa Şahin (2017). This study aimed to develop a measuring skills improvement program for primary school students and evaluate its effectiveness. The program consisted of six units, each of which focused on a different aspect of measuring, such as length, weight, and volume.

Table 7 *Pretest and Posttest Scores of the Students in Basic Science Process Skill as to   Inferring*

GRADE	PRETEST		POST-TEST		VERBAL INTERPRETATION
	F	PERCENTAGE (%)	F	PERCENTAGE (%)	
93-95	-	-	3	7.0	Advanced
89-92	2	4.7	12	27.9	Proficient
86-88	4	9.3	12	27.9	
83-85	6	14.0	6	14.0	Appropriate Proficient
80-82	12	27.9	7	16.3	
75-79	16	37.2	3	7.0	Developing
71-74	2	4.7	-	-	Beginning
70	1	2.3	-	-	
Total	**43**	**100.0**	**43**	**100.0**	

Legend: (7) Advanced, (5-6) Proficient, (3-4) Appropriate proficient, (2-3) Developing, (0-1) Beginning

In the pre-test for inferring skills of Grade 3 students, the majority of the students (65.5%) scored between 2-3 points, indicating poor performance. However, in the post-test, the scores improved with 27.9% of the students scoring between 5-6 points, and three students even achieving a perfect score of 7, see Table 7. Inferring is cognitive processes that is essential for comprehending and interpreting information. These processes involve drawing conclusions and making informed guesses based on available evidence, although they have distinct characteristics and applications. The students' ability to apply inferring was demonstrated in the test, which presented a scenario related to the lesson covered in the self-regulated learning module (SLM). This application phase allowed students to utilize what they learned throughout the quarter. This is by applying the knowledge in each chapter in scenario-based problem given by the teachers in their pre-test and post-test.

Tantengco (2015), conducted a literature review of interventions to improve inference comprehension in students. The review identified several effective instructional strategies, such as graphic organizers, questioning techniques, and explicit instruction.

Table 8 *Pretest and Posttest Scores of the Students in Basic Science Process   Skill as to Predicting*

GRADE	PRETEST		POST-TEST		VERBAL INTERPRETATION
	F	PERCENTAGE (%)	F	PERCENTAGE (%)	
95	4	9.3	25	58.1	Advanced
90	9	20.9	12	27.9	Proficient
85	20	46.5	5	11.6	Appropriate proficient
75	10	23.3	1	2.3	Developing
70	-	-	-	-	Beginning
Total	**43**	**100.0**	**43**	**100.0**	

Legend: (4) Advanced, (3) Proficient, (2) Appropriate proficient, (1) Developing, (0) Beginning

The table 8 shows the pre-test of the Grade 3 students and majority which accounts to 46.5% were within low scores of 2. However, it is noticeable that there is an improvement of scores in the post-test as the student used the self-regulated learning materials. In fact, majority of the students enhance their skills in predicting as reflected in the perfect scores with accounts to 58.1% of the students. These studies suggest that having high skills in science can lead to better prediction accuracy, which can have several positive implications. For example, accurate predictions can help students make informed decisions and judgments about a variety of situations, from everyday life to complex scientific problems. Additionally, accurate

predictions can help students understand cause-and-effect relationships and develop critical thinking skills, which are important for success in science and other disciplines.

There have been several related studies on the positive implications of high skills in science for prediction. One study by Janssen (2008) investigated the relationship between science skills and prediction accuracy in middle-school students. They found that students with higher science skills were better at making accurate predictions in a variety of contexts, such as predicting the outcome of a science experiment or predicting the behavior of an animal in a natural setting.

Table 9 *Significant of Difference in the Pretest and Posttest Scores of the Respondents in the Six Basic Process Skills*

Basic Science Process Skills	Pre − test[a]		Post − test[b]		t	df	Sig. (2-tailed)
	Mean	SD	Mean	SD			
Observing	2.30	1.30	4.09	0.87	12.491	42	.000[b]
Communicating	3.09	1.32	5.14	1.19	12.071	42	.000[b]
Classifying	3.02	1.32	4.33	0.78	7.326	42	.000[b]
Measuring	2.60	1.16	4.63	0.98	15.449	42	.000[b]
Inferring	2.93	1.32	4.74	1.40	9.910	42	.000[b]
Predicting	2.16	0.90	3.42	0.79	9.714	42	.000[b]

Legend: $p \leq .0,05$, significant; $p \geq 0.05$, Not significant

The displays difference in pre-test and post-test scores for six basic science process skills. The findings showed that there was a statistically significant difference in the mean scores for all science skills between the pre-test and post-test, with a confidence level of 0.05. This indicates that the utilization of self-regulated learning materials substantially enhanced the efficiency and skills of Grade-3 students in all six basic science skills.

The six basic science skills were assessed before and after the Self-Regulated Learning Materials' intervention. The skills comprise observation, communication, classification, measurement, inference, and prediction. Scores in each skill improved as the students in Grade 3 used the self-regulated learning materials. The materials were subjected to raise the student's performance to reflected in their scores from the pre- and post-test which verbally interpreted as advanced. The Self-regulated learning material was designed to equipped the learners in target skills in science by means of engaging activities in each lesson topics.

The study found that the self-regulated learning materials enhanced students' observation abilities. The improvement was evident in a task involving moving cars, where students became more attentive and perceptive. This aligns with previous research highlighting the role of attention and conscious effort in strengthening memories (Ranpura, 2013).

Active engagement and collaborative learning in the self-regulated learning module (SLM) resulted in improved communication skills. Students actively participated in discussions, presentations, and idea sharing, which enhanced their listening and communication abilities. Johnson et al. (2014) also found that collaborative learning improves communication skills.

The self-regulated learning materials had a positive impact on students' classification skills. Students showed improvement in classifying light sources and sound intensity based on the activities in the SLM. Chen et al. (2018) found that self-regulated learning materials facilitated improved classification skills by providing scaffolding and support.

Measuring skills were enhanced through the utilization of the self-regulated learning module. Hands-on activities and practical applications of measurement in the SLM contributed to students' understanding and mastery of measuring skills.

Students' inferring and predicting skills were significantly improved by applying their knowledge in scenario-based problems presented in the pre-test and post-test. Chebii (2011) found that students with mastery in basic process skills are likely to apply knowledge effectively.

Previous studies have also demonstrated the effectiveness of instructional modules in enhancing student performance. Park and Choi (2020) found that a self-directed learning module improved critical

thinking skills, while Yen and Lin (2020) showed that a multimedia module enhanced learning outcome. De Jager et al. (2017) reported that a flipped classroom module improved academic performance, and Daryanto (2015) found that a computer-based module improved problem-solving skills.

CONCLUSION

The primary aim of this study was to determine the acceptability of self-regulated learning material for enhancing basic science process skills Grade 3 learners. Additionally, it examined any significance difference in the pre-test and posttest scores of the respondents in the basic science process skills test.

The findings showed a significant difference between the test respondents' pre- and post-test scores for the student in terms of six basic science process skills, thus the contrary conclusion cannot be substantiated.

This study suggests that school may encourage the use of self-regulated learning material to enhance student learning outcomes. Teachers could explore different contexts and settings to evaluate the effectiveness of these material and implement them accordingly. This includes comprehensive lesson activities and strategies for attracting and sustaining learners' interest in the subject matter. The self-regulated learning material can be used by teachers as a substitute method when teaching science lessons in order to make content more interesting and easy to understand.

The science teachers may use the self-regulated learning material for intermediate level for enhancing their performance on basic science process skill. The student may develop and provide validated self-regulated learning materials for grade school students that are appropriate to their cognitive, emotional, and social development. For more comprehensive findings, the future researcher on the same topic of self-regulated learning material may be conducted for improving science education where the students will be benefited.

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