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Scenario-Based Microlearning Strategy for Improved Basic Science Process Skills in Self-Directed Learning

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Abstract

This study determined the effectiveness of scenario-based microlearning strategy in improving the basic science process skills in self-directed learning of sixth grade students. Descriptive correlational through a pre-test – posttest and survey strategies was utilized. The pretest and posttest results measured the effectiveness of the strategy in improving the basic science process skills whereas the survey results were correlated to identify the significant relationship between the students' use of scenario-based microlearning strategy and their post-test scores. The findings indicated that respondents were very satisfied on the use of the strategy as to scenario construct and its alignment to learning style. They feel satisfied in terms of the content covered and form which revealed their very high level of planning and changing skills. The pretest and posttest showed a significant difference in all terms, except for classifying. A significant relationship was revealed between the students' use of the strategy and their posttest scores as well as the use of the strategy and level of self-directed learning skills. The findings suggest the use of scenario-based microlearning strategy as an alternative approach in teaching science to improve the basic science process skills and self-directed learning skills of learners.

Keywords: *scenario-based microlearning strategy, basic science process skills, self-directed learning, perceived experience*

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1. Introduction

The science education aims to develop scientific literacy among students. As such, the curriculum envisions the development of scientifically, technologically, and environmentally literate and productive members of society who manifest skills as a critical-problem solver, responsible stewards of nature, innovative and creative citizens, informed decision makers, and effective communicators. With the demanding nature of subject objectives, content and processes are interrelated; without science content, learners will have difficulty in developing science process skills. Development of science process skills among elementary learners is significant because it the foundation of learning more complex skills. This means that developing these student's skills enable them to understand the knowledge or concepts, independently discover and acquire necessary facts, concepts, and values.

According to Karamustafaoglu (2011) as cited by Supriyatman and Sukarno (2013), science process skills (SPS) includes observing, asking questions, classifying, measuring, and predicting while NARST.org refers to observing, inferring, measuring, communicating, classifying and predicting. Ostlund (1992) as cited by Ergül et al. (2011) affirms that SPS are the building-blocks of critical thinking and inquiry in science. Unfortunately, learners showed low performance in the national and international science subject assessments. Results also show that among the subjects being taught in the class, science is one of the subjects gaining low Mean Percentage Score (MPS) along with English and Mathematics. According to SEI-DOST & UP NISMED (2011), the reasons affecting students' performance include the quality of teachers, the teaching-learning process, the school curriculum, instructional materials, and administrative support.

With various learning modalities during pandemic, Self-Learning Modules (SLMs) are the primary learning resources for the learners aside from textbooks and other printed materials. However, some learning modules and textbooks fail to arouse students interest because of large masses of data or content information. They find it difficult to absorb large amount of information being presented in the SLMs and textbooks. Likewise, they may not see the relevance of the topics to their personal lives because some activities were not contextualized. Learning Modules given to the learners are self-directed, this means that leaners also need to have the skills for learning aside from the skills that they need to perform in science lessons. In self-directed learning, individuals must know how to take charge of their learning including the processes of planning, developing, adapting and changing (Brandt, 2020). This is the process

where individuals take time to plan, continue and evaluate their learning experiences (Merriam & Baumgarther, 2020). However, students are disadvantaged with some distractions at their home learning environment.

Given the challenges and difficulties in learning science in the new normal of education, instructional materials, teacher's methodology, integration of technology and learner's skill development, this study assessed the researcher's implementation of the student-centric scenario-based microlearning strategy in science to see its effectiveness and its relationship to the learners' basic science process skills and self-directed learning skills.

2. Literature review

2.1 Scenario-Based Microlearning

Scenario-Based Learning (SBL) is a useful method for active learning like case-based education and uses a realistic setting in which challenges are given in a certain order and options are available to help the learner achieve a goal (Tupe, 2015). As a method of life-like scenarios, it uses digital media to give context to training content and make the topics more relatable (Galhotra, 2020). It is also a method to organize instructional materials with chunked scenarios that learners are efficiently able to learn (University of Wisconsin, 2015). The framework starts with informing a scenario by providing text and images followed by decision making through multiple choice and the like and reviewing decisions made by providing additional instruction.

SBL is a great instructional strategy in an online training as it utilizes active learning approach where real-life scenarios offer relatable learning experiences (Jagga, 2021). According to Sengupta (2019), it works in developing hard skills which involve the cognitive part of the brain because it creates emotional and behavioral connection with the learner. In addition, learners develop soft skills in making choices and relating them to the situation. It also promotes situational awareness because students can learn making correct decision based on the given scenario. This strategy creates authentic experience and learning in a safe training environment that learners can apply what they learned with confidence (Sheldon, 2020).

A microlearning approach is necessary to make SBL more effective. This extra is the broad range of scenarios or situations that train people skills and situational awareness. A content-rich story engages emotion and learners feel the relatedness to the topic. Storytelling

scenarios when implemented with static picture, text, animated or live videos can be interactive for learners (Maddox, 2018).

2.2 Basic Science Process Skills and Self-Directed Learning

Science process skills involve means and methods to reach scientific information that allow pupils to think scientifically (Yumusak, 2016). The theory, principles, and laws are part of science content which are included in scientific knowledge (Erturk et al., 2010). It refers to the basic skills of facilitating learning, allowing learners to be engaged and participative, developing autonomy, retention of learning and providing solution to a problem through research. Science process skills are divided into two groups: basic and integrated process skills. The basic process skills include observing, asking questions, classifying, measuring and predicting while integrated process skills include identifying and defining variables, interpreting data, manipulating materials, recording data, formulating hypotheses, designing investigations, making inferences and generalizations (Karamustafaoglu, 2011). When an individual learned these things, they are learning scientific knowledge through science process skills. The science process is beneficial not only in science, but in every scenario that necessitates critical thought. Observing traits, measuring quantities, sorting/classifying, inferring, forecasting, testing, and communicating are examples of science process abilities (Vitti and Torres, 2016).

Self-Directed Learning (SDL) is a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes (Kamilali & Sofianopoulou, 2013). As cited by Brandt (2020), SDL includes five processes: one's initiative in identifying his needs, identifying their goals, determining resources needed, ability to discern, and assessing and evaluating learning outcomes. In SDL, the responsibility to learn shifts from an external source (teacher, etc.) to the individual. Control and active involvement of the learner in the learning process is crucial in this process. It includes the conceptualization, design, implementation and evaluation of learning guided by learners (Brookfield, 2009) and may be referred to as a method of organizing learning which learners control the task of learning. In order to achieve learning objectives, individuals take responsibility for their own learning and embrace individual autonomy and preferences (Kaufman, 2003).

2.3 Theoretical Framework

The theory of situated learning, cognitive load, and information processing served as the bases for the conceptualization of the study.

Situated learning theory argues that learning best happens in the context of the experience. It gives great emphasis on building understanding through relating and interacting with others. Situated learning provides learners the chance to be engaged with real-life events, problems, and tasks in a context. Students learn better when presented with realistic problems which they need to think through and act on it (Kurt, 2021). As such, this theory illuminates the elements of scenario-based microlearning strategy where learners are offered with contextualized scenarios related to experiences.

Cognitive Load Theory suggests that learning happens best under conditions that are aligned with human cognitive architecture. It is concerned with techniques for reducing working memory load in order to facilitate the changes in long term memory associated with schema acquisition (Solomon, 2018). The theory of cognitive load can be best applied in the areas where learning concepts are complex or challenging competencies. It is evident that people will have difficulty in learning broad lessons and dividing the learning task little by little from broader to specific would help the learners achieved learning goals.

Information Processing Theory by George Miller has two theoretical ideas. One concept is “chunking” and the capacity of short term memory. A chunk could refer to digits, words, chess positions, or people’s faces. The concept of chunking and the limited capacity of short term memory became a basic element of all subsequent theories of memory. An example of chunks is the ability to remember long sequences of binary numbers because they can be coded into decimal from, this way the chunks are meaningful.

3. Methodology

The study employed descriptive correlational and pre-test –posttest design for mustering necessary information and data. A correlational research design investigates relationship between variables without the researcher manipulating any of them (Bhandari, 2022). On the other hand, in descriptive comparative design, the researcher manipulated an independent variable and measure its effect on a dependent variable. It was utilized since the study aimed to determine the effectiveness and relationship of scenario-based microlearning strategy in improving the respondents’ basic science process skills and self-directed learning.

The respondents of the study were the group of Grade six pupils enrolled in one public elementary school in the Division of Quezon Province in the Philippines during the academic year 2021-2022. The group has 40 students under the teaching supervision of the researcher as Science 6 teacher. The grade six pupils were chosen as the respondents of the study as they experienced distance learning and has been using Self-Learning Modules since academic year 2020.

The researcher-made pretest and posttest exam, composed of 50 item multiple-choice questions based on the competencies in the third grading quarter of Science 6, assessed the respondents' basic science process skills before and after the implementation of the strategy in terms of observing, inferring, communicating, classifying, and predicting. A researcher-made survey questionnaire on the perceived experience of the respondents on the use of the strategy was administered after the implementation. It was based from the elements of scenario-based microlearning in terms of scenario-construct, content covered, alignment to learning style and form. Another researcher-made survey questionnaire on the assessment of the level of self-directed learning skills was also given after the exposure to the strategy. Specifically, there were five statements in each self-directed learning skill namely: planning, developing, adapting, and changing. Both survey questionnaires used a four point Likert-scale where the respondents may agree or disagree. These survey questionnaires were validated by a supervisor, a school head, two master teachers, and a language expert and it went through pilot testing and reliability test. The reliability test performed on the assessment of the level of self-directed learning skills of the respondents revealed that self-directed learning skills in terms of planning had internal consistency of 0.715 interpreted as "acceptable" and while developing, adapting, and changing had internal consistency of 0.824, 0.873, and 0.803 respectively and interpreted as "good".

Lesson exemplars utilized in this study was based from the scenario-based microlearning strategy. It followed the design format prescribed by the Department of Education based on PIVOT I-D-E-A (Introduction, Development, Engagement, and Assimilation) Lesson Exemplar. It included the Most Essential Learning competencies (MELC) in the third grading period of Science 6. Moreover, the lesson material aligned to the lesson exemplar was entitled Scenario-Based Microlearning Lessons in Science 6. It was developed by the researcher based on the Most Essential Learning Competencies (MELCs) in the third grading period of Science 6. Similar to the lesson exemplar, it followed the lesson format prescribed by the Department of Education for lessons materials based on PIVOT I-D-E-A (Introduction, Development, Engagement, and

Assimilation) lessons. The materials were checked and validated by a district content evaluator, language evaluator, and technical evaluator.

The gathered data obtained were analyzed by utilizing both descriptive and inferential statistics. Mean and standard deviation were used to describe the responses of the learners in terms of perceived experience on the use of scenario-based microlearning strategy and the level of self-directed learning skills. Frequency count and percent distribution determined the number and portion of respondents in different performance level in terms of basic science process skills test. In determining the significant difference between the mean pre-test and mean posttest scores of the respondents, paired t-test was utilized. Pearson Product-Moment Correlation were used to calculate the significant relationship.

4. Findings and Discussion

Table 1 shows the result of the survey on the perceived experience of the respondents on the use of scenario-based microlearning strategy in terms of four categories namely; scenario-construct, content covered, alignment to learning style and form. Each category is composed of five indicators where the respondents provided their level of agreement and satisfaction.

In terms of the perceived experience as to scenario construct, the overall mean of 3.525 reveals that the respondents strongly agree towards the statements. This means that the respondents are very satisfied with how the scenarios are constructed in the lessons. The students perceived that scenarios used in the lessons are relatable, reflective, motivating, engaging, and help them solve problems or activities. These are similar to Jagga (2021) that SBL is a great instructional strategy in online training because it utilizes active learning approach where real-life scenarios offer relatable learning experiences.

As to the perceived experience on how the content is covered in the lesson, the overall mean of 3.465 reveals that the respondents agree towards statements. This implies that the respondents are satisfied with how the contents are covered in each lesson. Since the topics in the lessons were chunked and sub-tasked, the learners were able to focus on understanding and accomplishing the tasks. Relative to the suggestion of BenchPerp (2021), effective teaching through microlearning requires implementers to consider the theory of cognitive load where repeated or unnecessary information can be removed to reduce the cognitive load.

Table 1

Perceived Experience on the Use of Scenario-Based Microlearning Strategy

Statement	Mean	SD	VI
Scenario Construct			
1. The scenarios in the lessons are relatable to my experiences.	3.20	.516	A
2. The scenarios presented in the lessons help me reflect on my learning.	3.88	.335	SA
3. The scenarios in the lessons offers real-life experiences.	3.50	.555	A
4. The lessons provided engaging and motivating tasks and activities through the scenarios.	3.33	.526	A
5. The scenarios of the lessons make it easy to solve problems and activities.	3.72	.452	SA
Overall	**3.525**	**.1794**	**SA**
Content Covered			
1. The content of every lesson is short but meaningful.	3.57	.675	SA
2. The contents of the lessons are suitable to my learning needs.	3.58	.549	SA
3. The objectives of the lessons are achievable for me.	3.38	.586	A
4. Short span of time is needed to accomplish each tasks in the lesson.	3.05	.677	A
5. The content of the lessons help me do the tasks.	3.75	.439	SA
Overall	**3.465**	**.2914**	**A**
Alignment to Learning Style			
1. The Illustrations of scenarios helped me understand the lessons.	3.73	.452	SA
2. The scenarios of the lessons make it interesting to read.	3.62	.490	SA
3. The scenario-based tasks offer hands-on activities.	3.50	.555	A
4. The lessons provided opportunities to demonstrate my skills.	3.60	.591	SA
5. The materials used for learning were suited to how I usually learn.	3.43	.636	A
Overall	**3.575**	**.2835**	**SA**
Form			
1. The scenarios in the lessons is presented in series form which is effective.	3.63	.490	SA
2. The form of the material is appropriate to my needs as a learner.	3.55	.639	SA
3. The material format is flexible and can be viewed using other devices.	3.12	.686	A
4. The text and illustrations of the materials are simple and recognizable for me.	3.53	.599	SA
5. The design and layout of the materials are attractive and pleasing to me.	3.55	.552	SA
Overall	**3.475**	**.3061**	**A**

Legend: 3.51- 4.00- Strongly Agree (Very Satisfied); 2.51-3.50-Agree (Satisfied); 1.51- 2.50- Disagree (unsatisfied); 1.00- 1.50-Strongly Disagree (Very Unsatisfied)

Moreover, the overall mean of alignment to learning style which is 3.575 reveals that the respondents strongly agree on the statements. This means that the learners are very satisfied on how the lessons are aligned to their method of learning which address their needs and the way they enjoy learning as lesson materials presented stories in the scenarios. Similar to the description of Maddox (2018), content-rich story engages emotion and learners feel the relatedness to the topic. Storytelling scenarios when implemented with static picture, text, animated or live videos can be interactive for learners.

Lastly, the respondents agree towards the statements pertaining to the form of scenario-based microlearning strategy as the overall mean shows 3.475. This explains that they are satisfied on how the materials of the lessons are presented which help them understand the lessons. The materials given to learners were in two forms, digital and printed. Learners who have gadgets at home were able to view the material digitally and each learner was also provided with a printed copy. It is inclined to the claim of Ghasia and Rutalola (2021) where microlearning methods can be complemented with other modalities and modules can be reformatted with microlearning characteristics and be delivered to the learners.

Table 2

Pre-test and Posttest Result on the Basic Science Process Skills Test

PRE TEST SCORES										
Level	**OBS**		**INF**		**COM**		**CLAS**		**PRED**	
	Ƒ	**%**	**Ƒ**	**%**	**Ƒ**	**%**	**Ƒ**	**%**	**Ƒ**	**%**
Beginning	7	17.5	5	12.5	21	52.5	6	15.0	13	32.5
Developing	23	57.5	12	30.0	12	30.0	16	40.0	14	35.0
Approaching Proficiency	7	17.5	18	45.0	6	15.0	9	22.5	11	27.5
Proficient	3	7.5	5	12.5	1	2.5	6	15.0	2	5.0
Advanced							3	7.5		
TOTAL	40	100	40	100	40	100	40	100	40	100
POSTTEST SCORES										
Level	**OBS**		**INF**		**COM**		**CLAS**		**PRED**	
	Ƒ	**%**	**Ƒ**	**%**	**Ƒ**	**%**	***f***	**%**	**Ƒ**	**%**
Beginning	1	2.5	0	0	12	30.0	5	12.5	0	0
Developing	9	22.5	6	15.0	12	30.0	11	27.5	10	25.0
Approaching Proficiency	16	40.0	12	30.0	10	25.0	14	35.0	13	32.5
Proficient	12	30.0	15	37.5	5	12.5	8	20.0	14	35.0
Advanced	2	5.0	7	17.5	1	2.5	2	5.0	3	7.5
TOTAL	40	100	40	100	40	100	40	100	40	100

Legend: OBS - Observing; INF – Inferring; COM – Communicating; CLAS – Classifying; PRED – Predicting

Table 2 shows the scores of the respondents on the pre-test and posttest in the basic science process skills test in terms of observing, inferring, communicating, classifying, and predicting. The pre-test scores reveal that most of the respondents are in the developing level. After the implementation of the strategy, the posttest scores show that most of the respondents fall under approaching proficiency level and proficient level.

Under observing skill, the learners are required to use their senses in order to gather information about an object or event. The pre-test scores show that the biggest percentage (57%) of the respondents are in the developing level during the pre-test exam while the posttest result indicates that the performance of the respondents has improved as the largest percentage (40%) of them are in the approaching proficiency level. This implies that the activities provided in the lesson of gravity, friction, and energy require learners to perform experiments to observe and analyze the result of their outputs.

It can be gleaned from the pre-test scores under inferring skill, where learners need to make an educated guess about an object or events, the biggest percentage of the respondents are in the approaching proficiency level (45%). The posttest results reveal better performance as the largest percentage (37%) of the respondents fall under proficient level. Hence, the learners' prior knowledge and new experiences on the utilization of lesson material contribute to their better performance in making educated guess to answer the situational assessments.

On the other hand, communicating skill shows that the 30% of the respondents are in the beginning level and developing level, but the percentage of beginning level from the pre-test (52.5%) has decreased. It also reveals improvement as the number of learners move to a higher level of performance because of the increase in percentage on other approaching proficiency up to advanced level.

Moreover, under classifying skill, where learners are expected to group or order objects or events based on the criteria, the biggest percentage of the learners (40%) fall under developing level. It is notable that even in the pre-test exam, 15% of the respondents are in the proficient level, and 7.5% are in the advanced level. In the posttest, the results reveal the biggest percentage of the respondents are in the approaching proficiency level (35%). The learners were able to practice their classifying skill, specifically in the lessons of simple machines where the activities focused on classification. Through this, learners were able to group objects or things according to its function, criteria or characteristics.

The table further reveals in predicting skill, the respondents show better performance in the post-test under predicting skill where most of them are at the proficient level (35%), compared to the result of pre-test where most of the learners are in developing level (35%). Since leaners were exposed to task-scenario-based tasks, it greatly influenced how they anticipate the future based on the pattern of evidence. The topic about the safety precautions on handling

simple machines provides way to practice learners' predicting skill as they experience the activity and determine what would happen to a certain scenario or situation.

The implication of the results is similar to what the literature claims that using scenario in lesson can contribute positively in the pupils' learning. For instance, Tupe (2015) found SBL a useful method for active learning that gives a good foundation. SBL, like case-based education, uses a realistic setting in which challenges are given in a certain order and options are available to help the learner achieve a goal.

Table 3

Level of Self-Directed Learning Skills after Exposure to Scenario-Based Microlearning Strategy

Statement		Mean	SD	VI
	Planning			
1.	I identify my strengths and weaknesses in learning.	3.43	.594	A
2.	I make my own schedule while learning.	3.18	.636	A
3.	I set my objectives or goals when learning.	3.60	.496	SA
4.	I prepare the things I need before studying.	3.88	.404	SA
5.	I make sure to have a good space for learning.	3.68	.474	SA
	Overall	3.550	.2855	**SA**
	Developing			
1.	I make sure to follow the schedule I set for learning.	3.48	.679	A
2.	I apply/practice what I learned in the lessons.	3.68	.474	SA
3.	I review the lesson again if I do not get it the first time.	3.43	.549	A
4.	I use different way of learning, like using gadgets and other learning resources.	3.05	.639	A
5.	I use my prior knowledge to understand the new lesson.	3.65	.483	SA
	Overall	3.455	.2717	**A**
	Adapting			
1.	I am willing to collaborate and share my knowledge.	3.12	.686	A
2.	I treat mistake/failure as a learning opportunity.	3.40	.545	A
3.	I stay focused and determined in learning even at critical or difficult times.	3.43	.549	A
4.	I am eager to learn new skills or to try new things.	3.65	.580	SA
5.	I am open to feedback about my learning progress.	3.33	.474	A
	Overall	3.385	.2949	**A**
	Changing			
1.	I am open to changes when it comes to my learning.	3.75	.439	SA
2.	I am open to new ideas when learning.	3.45	.597	A
3.	I am willing to change my ideas for better way of learning.	3.55	.552	SA
4.	I willingly accept advice from others when it comes to my learning.	3.80	.405	SA
5.	I ask assistance when there is a problem I cannot resolve.	3.28	.599	A
	Overall	3.565	.2517	**SA**

Legend: 3.51- 4.00- Strongly Agree (Very High); 2.51-3.50-Agree (High); 1.51- 2.50- Disagree (Low); 1.00- 1.50- Strongly Disagree (Very Low)

Table 3 shows the result of the survey for the level of self-directed learning skills of the respondents after being exposed to scenario-based microlearning strategy in terms of four categories namely; planning, developing, adapting, and changing. Each category is composed of five indicators where the respondents provided their level of agreement.

In terms of self-directed learning skills as to planning, the overall mean of 3.550 reveals that the respondents strongly agree towards the statements. This indicates that the respondents have very high level of planning skills. The respondents tend to plan their own learning considering different factors such as time, resources and environment corresponding to the description of Kaufman (2003). It is viewed target that learners strive to achieve by taking responsibility for their own learning and embracing individual autonomy and preferences.

As to the developing skill, the overall mean of 3.455 reveals that the respondents agree to the statements. This means that they have a high level of interest in learning which is being developed through the application of prior knowledge and utilization of available learning resources. Similar to the description of Leong (2020), curiosity builds interest on the part of the learners and through the process of self-directed or self-regulated activity, learners can develop a more advanced forms of cognition.

Furthermore, the overall mean of adapting skill which is 3.385 discloses that the respondents agree on the statements. This indicates that they have high adapting capability when it comes to self-directed learning. The respondents show that they are able to adapt into different situation towards their own growth and learning. Similar to the findings of Sheldon (2020), exposure to scenario-based learning is beneficial to learners. It creates authentic experience, students learn in a safe training environment and learners can apply what they learned with confidence.

Lastly, the respondents strongly agree towards the statements pertaining to changing skill as the overall mean shows 3.565. The results indicate that the respondents have a very high level of response to changes while learning and they are open to changes. This implies that respondents have a positive response on the implementation of a new strategy in learning science which is the scenario-based microlearning strategy. The learners are able to reflect on their strengths and weaknesses and assess their skills and abilities. This was visible from the reflection made by the learners as part of the tasks in each lesson where the learners have to identify the part of the lesson which they enjoy and find themselves struggling. It supports the self-directed

learning processes provided by Malcolm Knowles cited by Brandt (2020) which includes the process of assessing and evaluating learning outcomes.

Table 4

Test of Difference in the Pre-test and Posttest Scores

Basic Science Process Skills	Mean Diff.	SD	Paired Differences			T	df	Sig. (2-tailed)
			Std. Error Mean	95% CID Lower	95% CID Upper			
Observing	2.150	1.819	.288	-2.732	-1.568	7.474	39	.000
Inferring	2.700	2.090	.331	-3.369	-2.031	8.169	39	.000
Communicating	.750	1.565	.247	-1.250	-.250	3.031	39	.004
Classifying	.125	2.015	.319	-.769	.519	.392	39	.697
Predicting	2.550	1.921	.304	-3.164	-1.936	8.396	39	.000

Table 4 presents the significant difference in the scores of the respondents before and after being exposed to scenario-based microlearning strategy. The obtained data reveal that there is a significant difference in the scores of the respondents at 0.05 level of significance among all the skills, except for classifying. The results indicate that there is notable improvement on these skills of the respondents in basic science process skills test.

The scenario-based microlearning strategy used in the lessons and in the tasks help learners to improve their basic science process skills in terms of *observing*. Most of the tasks in the materials require learners to observe the environment and experience the real scenario at home. It also explains the theory of situated learning which provides learners the chance to be engaged with real-life events, problems, and tasks in a context.

Additionally, the scenario-based microlearning strategy enable learners to increase their scores in terms of inferring skill. Every after the scenario-based activity of the lesson, inferential questions were provided to guide the learners in accomplishing the tasks. As the findings of Dewitz (2017) showed that when learners are exposed to inferential questions, they will read more deeply and engage in inferential thinking.

Furthermore, there is a significant difference in terms of communicating which means that the strategy is effective in improving their skill. The lesson materials offer engaging images and illustrations which guide learners in expressing their idea through words or conveying their

thoughts through graphics. This supports Garner (2017) that illustration is a way of communication through images that helps create interest and captures people's attention spans.

On the other hand, it can be gleaned that there is no significant difference in the scores of the respondents in terms of *classifying skill*. The result indicates that the lesson materials given to the learners requires more activities in order to improve their classifying skill. Ramesh (2017) suggested that teachers need to adopt constructive method of teaching wherein materials, substances and etc. is being given to students for classification.

Lastly, the data obtained show that there is a significant difference in terms of predicting skill. Therefore, the exposure to various scenarios in the lessons enable learners to predict an outcome based from the situations or instances. Barman et al. (2008) stated that prediction is based from the result of previous experiences. He gave emphasis on the importance of past observation regarding a particular event in the reliability of a prediction.

Table 5

Test of Relationship Between the Perceived Experience on the Use of Scenario-Based Microlearning Strategy and the Post-test Scores in Basic Science Process Skills Test

Scenario-Based Microlearning	**Science Process Skills**				
	Observing	Inferring	Communicating	Classifying	Predicting
Scenario Construct	-.067	0.19	-.151	-.037	.247*
Content Covered	-.007	-.027	.118	-.198	.109
Alignment to Learning Style	-.067	.205*	-.027	-.053	.122
Form	-.071	0.77	-.047	-.010	.330*

***Correlation is significant at the 0.01 level (2-tailed)*
**Correlation is significant at the 0.05 level (2-tailed)*

The table 5 presents the relationship between the perceived experience of the respondents on the use of scenario-based microlearning strategy as to scenario construct, content covered, alignment to learning style, and form with post-test scores of the respondents on basic science process skills in terms of observing, inferring, communicating, classifying, and predicting.

The obtained data reveal that there is a significant relationship between the scenario-construct and predicting skill. This indicates that the how the scenarios are constructed in the lesson material help learners to identify a possible outcome for a future event based on the

pattern of evidence. Cote (2021) emphasized that analysis of data is significant to forecast potential scenarios which can help produce strategic decisions.

The table also shows that alignment to learning style has significant relationship with inferring skill. The lesson materials offer various comic-style scenarios about the topics, learners tend to enjoy learning as they read the stories. Boris (2019) cited that a well-told story can be remembered more accurately and longer than learning with just facts and figures.

Finally, it can be gleaned that form is significantly related to predicting skill. This indicates that how the lesson materials are presented to the learners help them forecast a future event based on evidence. Gaither (2011) stated that in order to successfully make predictions about informational text, teachers should make sure to include time for instruction, modelling, and practice.

Table 6

Test of Relationship Between the Perceived Experience on the Use of Scenario-Based Microlearning Strategy and the Self-Directed Learning Skills

Scenario-Based Microlearning	**Self-directed Learning**			
	Planning	Developing	Adapting	Changing
Scenario Construct	.466**	-	.463**	.440**
Content Covered	.348*	-	.358*	-
Alignment to Learning Style	-	-	.363*	-
Form	.337*	.405**	.479**	.328*

***Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

Table 6 shows the relationship between the perceived experience of the respondents on the use of scenario-based microlearning strategy as to scenario construct, content covered, alignment to learning style, and form with their self-directed learning skills in terms of planning, developing, adapting, and changing.

The obtained data reveal that scenario construct has significant relationship with planning, adapting, and changing skill. This means that the learners were able to improve their planning skill by considering how the scenarios are constructed in the lesson materials. Moreover, the scenarios presented in the lessons help learners to adapt and change because every lesson offers opportunity for learners to reflect on their own learning where they need to identify what they learn and how they feel about a particular lesson. Cavilla (2017) emphasized that

reflection as a tool for learning has the transformative ability to change the way the students think and adapt their effort, motivation, and ability to accomplish certain tasks.

The table also shows that the content covered is significantly related to planning and adapting skill. The lesson materials for the strategy considered the element of microlearning which offers well-planned chunked lessons and bite-size activities. It helped learners to plan their learning by allotting shorter time to accomplish the tasks in the lessons. Patel (2022) suggests planning to produce quality outputs consider the time spent to achieve goals.

Moreover, the table reveals that alignment to learning style has significant relationship with adapting skill. The learners were able to align and adapt their style of learning as to what is needed to be demonstrated or performed based on the activities. Similar to Sengupta (2019), scenario-based microlearning does not only improves hard skills, but it also works for soft skills such as adapting skill where learners are able to make choices along the way and they are to relate to the different situations.

Lastly, the form of scenario-based microlearning strategy is significantly related to all of the skills in self-directed learning. The flexibility of the lesson materials help learners adapt and change based on their accessibility to gadgets and other forms of learning. Relevant to Kadhem (2017), the quality of course's design in terms of delivering the required information and activities is critical to its success.

5. Conclusion

The primary aim of this study was to determine the effectiveness and relationship of scenario-based microlearning strategy in improving the basic science process skills and self-directed learning Grade 6 pupils. Additionally, it examined any significance difference in the pre-test and posttest scores of the respondents in the basic science process skills test. It further examined any significant relationship between the perceived experience of the respondents on the use of the strategy and their posttest scores in the test and in their level of self-directed learning skills.

The results revealed that the learners feel very satisfied in terms of their experience in the use of scenario-based microlearning strategy as to scenario construct and its alignment to learning style and feel satisfied in terms of content covered and its form. The performance of the

respondents in the basic science process skills test showed better scores in the posttest result as most of the learners fall under proficient level in inferring and predicting skill; approaching proficiency in terms of observing and classifying skill; and developing level under communicating skill. It further revealed that a very high level of planning and changing skill were shown by the respondents and a high level of developing and adapting skill were demonstrated. Significant difference was found in the pre-test and posttest scores of the respondents in all of the basic science process skills, except for classifying skills. The test of relationship disclosed significant relationship between the perceived experience of the respondents on the use of the strategy and their posttest scores. Likewise, significant relationship was shown between the perceived experience of the learners on use of the strategy and their level of self-directed learning skills.

This study suggests that teachers may use scenario-based microlearning strategy as an alternative approach in teaching science lessons to make topics more engaging and relatable. Teachers are also encouraged to provide activities which can further enhance basic science process skills of learners. It is also recommended that further studies may to be conducted regarding the same area of concentration or with different variables to see more comprehensive findings. This may improve Science education and benefit more learners.

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