Implementation of Soft Skill-Based Metacognitive Approach in Improving the Critical Thinking Skills of Pre-Service Teachers

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Abstract

Even though critical thinking abilities are emphasized as being essential for Pre-Service Teachers (PSTs), it has been discovered through studies that PSTs' critical thinking abilities fall short of expectations. Soft Skills-Based Metacognitive Approach is a learning approach which utilizes learning capability particularly in critical thinking skills. This study aims to determine the Implementation of Soft Skills-Based Metacognitive Approach in Improving the Critical Thinking Skills of Pre-Service Teachers based on the three categories; Analysis, Evaluation and Self-Regulation through pretest and posttest score. Pre-experimental research design was we used in this research to know the difference between the pretest and posttest scores of the respondents since this method includes observing a participant or a group after an approach has been administered to see if the intervention has the potential to impact improvement. The respondents include twenty-one (21) first-year students, taking Bachelor of Secondary Education Major in Mathematics in one of the universities in Laguna. Set of word problems were used in this study to test the students before and after the performance. The data results showed that there is a significant difference between the pretest and posttest score of students' performances in analysis, evaluation and self-regulation. The study found that using a soft skills-based metacognitive approach is effective in improving students' critical thinking skills. Thus, mathematics teachers are encouraged to incorporate the said approach into their learning set up . The researchers recommend that future researchers use a larger sample size to validate the study's findings.

Keywords: Critical Thinking Skills; Pre-Service Teachers (PSTs); Soft Skill-Based Metacognitive Approach

1. Introduction

Learning plays a vital role in students' achievement. It enables individual to acquire the essential skills and information to attain his or her objectives. One of the most important aspects of learning is that it allows you to broaden your mind and develop skills that will help you achieve certain objectives (Usman and Madudili, 2019). Ayabale et al. (2020) mentioned several factors in learning that have been identified to influence student accomplishment in mathematics, including student attitude, instructor attitude, teaching

methods, classroom environment, gender stereotypes, and parental factors.

Furthermore, Aflalo and Gabay (2013) assert that the teachers utilize learning approaches to assist students comprehend the content in detail. In this situation, the instructor is in charge, with an emphasis on planning, processing, and methods of implementing the learning. According to Prastiwi (2011), developing students' soft skills in learning is absolutely essential so that they can adapt to their surroundings, maintain good morals, and solve problems in their own lives. Which Doyle (2020) have mentioned that soft skills are personal characteristics required for workplace success such as time management, networking, teamwork, creative thinking, and problem solving. Personal habits and traits impact on how you operate, both alone and with others. Aside from that Tanner (2012) states that metacognitive method is teaching students how to think about how they think and how they approach learning. The combination of these two was used in this study as a learning approach which is the Soft-Skill Based Metacognitive Approach.

As per Faridah and Nasikhah (2019), the Soft Skills-Based Metacognitive Approach is a learning approach used in mathematics learning that includes metacognitive elements as well as the use of student soft skills; learning is accomplished through five stages: initial discussion, independence, group discussion, group presentation, interpretation, and conclusion generation. This strategy utilized the students learning particularly in critical thinking skills. Wherein Dwyer et al. (2014) have mentioned that critical thinking is a metacognitive technique that increases the likelihood of reaching a logical conclusion to an idea or solving a problem by making conscious and reflective assessments.

Sukma and Priatna (2021) states that critical thinking skills (CTS) belong to the most essential competencies in the present day. According to Whiting (2020) of World Economic Forum, Future of Jobs Report in the top 10 skills of 2025 both critical thinking skills and problem solving are under these skills needed in the coming years. The type of skill used for these two is problem solving where it assessed the critical thinking of a person mathematically. Syafril et al. (2020) also states that critical thinking is one of the thinking skills needed in this time where information is dynamically. Snyder and Snyder (2008) as cited in Scholastic (2011) also mentioned that critical thinking benefits students because it teaches them how to think rather than what to think about every subject or issue, they faced. Furthermore, Ismirawati et al. (2020) mentioned that students who can think critically will be better able to comprehend the world around them, perform better, make better decisions, and have a greater eagerness demonstrates the importance of critical thinking skills in student achievement and performance. Wherein the proponents used in this study to measure their level of critical thinking are PSTs.

With accordance to PSTs Mufidah and Dinamika (2019) mentioned that professional development for teachers is a long process that should begin in college. According to Allamnakhrah (2013), a pre-service teacher, all components of teacher education programs should be completely integrated in order to develop future teachers to be models of superior thinking techniques. Furthermore, Çelik and Özdemir (2020) stated that teachers and teacher candidates must increase students' mathematical thinking, problem-solving, reasoning, and critical thinking skills when designing and implementing their teaching activities.

In the result of 2018 Program for International Student Assessment (PISA), Philippines ranked second-to-last in Mathematics, with 353 points (below level 1) compared to an OECD average of 489. It is often assumed that the majority of students dislike mathematics due to a variety of challenges relating to education and learners' cognitive, emotional, and psychomotor qualities, subject content, and learning environment (Gafoor and Kurukkan, 2015). Wherein Alliance for Education (2013) have mention that this programed is intended to assess students' ability to use their knowledge to think critically, solve problems, and communicate what they know.

Aside from that, despite the necessity of critical thinking abilities for PSTs being stressed in research, it has been discovered that PSTs' critical thinking skills are insufficient. One of the greatest challenges for schools in developing critical thinkers is that instructors lack critical thinking tendencies and abilities. Another study revealed that university students who lacked content understanding had weak critical thinking skills (Lin, 2014). Furthermore, according to Demiral (2014) and Demiral and Epni (2018), if

overall examination of the literature evaluated for critical thinking skills reveals that critical thinking abilities of PSTs who will be educators in the next years are insufficient, as are topic knowledge gaps.

Basri et al. (2019) also mentioned that among the six critical thinking sub-skills proposed by Facione (2015) (interpretation, analysis, evaluation, inference, explanation, and self-regulation), the analysis, evaluation, and self-regulation sub-skills were the least comprehended by students when compared to other critical thinking sub-skills. In that case, the researcher concentrated on three critical thinking subskills: analysis, evaluation, and self-regulation.

Furthermore, Improve Critical Thinking Ability and Mathematical Representation of Junior High School Students Through Soft-skill Based Metacognitive Approaches by Faridah et al. (2019) several ideas were proposed, including the use of mathematics learning in conjunction with a soft skills-based metacognitive approach. The instructor should select it as one of the learning techniques that may be used to strengthen students' critical thinking abilities as well as for potential development. As response, researchers seek to use a soft skills-based metacognitive approach to see if PSTs critical thinking skills improved after the implementation.

2. Review of Related Literature

2.1. Soft Skill-Based Metacognitive Approach

Soft Skill-Based Metacognitive Approaches are a learning approach used in mathematics learning which includes metacognitive variables accompanied by the application of student soft skills (Faridah and Nasikhah, 2019). It has been mentioned from their study that metacognitive approach based on soft skills help learners to explain their knowledge using the guidelines provided, so that students may govern and control every cognitive process they engage in.

Murni et al. (2013) stated that metacognitive learning based on soft skills develop metacognitive behaviour and empowering soft skills so that the students have a consciousness in planning, monitoring, and evaluating thinking process and activity in solving problem. Metacognitive learning based on soft skills has also been concluding to made students feel comfortable in following learning. Based to the findings of their study enhancement in Mathematical Problem-Solving Ability (MPSA) of the students who received Soft Skill- Based Metacognitive Learning (SSML) approach is higher than those who got Conventional Learning (CL) approach. And according to them in every activity of the students in the learning process of development values of soft skills such as: religious, self-confident, independent, curiosity, hard work, courtesy, respect, honesty, and cooperation. When opening the lesson, were empowered values of soft skills such as: religious, confident, polite, and honest. Soft skills qualities such as self-assurance, collaboration, independence, compassion, respect, logicalness, civility, and honesty were empowered as the discussion group acquired more influence. When the discussion group was empowered, soft skills qualities such as self-confidence, teamwork, independence, caring, respect, rationality, politeness, and honesty were demonstrated.

Furthermore, Mitsea et al. (2021) concluded that soft skills are fully trainable. Individuals can develop adequate cognitive and socio-emotional abilities that allow them to be included in the academic, working, and social environments when they practice their metacognitive skills, and teachers play a role in this learning.According to Robles et al. (2017), one of the attributes that a teacher should have is soft skills competency. The teachers' strong soft skills competence level indicated that they are effective in carrying out their responsibilities and functions to improve school performance. Based on the findings of Agcam and Dogan's (2021) study, there is a need for research to improve pre-service teachers' soft skills because they are expected to be role models for their future students and thus should be competent in initiating and maintaining interaction with other people, negotiating conflicts, particularly among students, foremost groups, striving diligently, and fulfilling their other duties.

As mentioned by Faridah and Nasikhah (2019), with soft skill-based metacognitive approach learning done through five stages and these are: initial discussion; independence; group discussion; group presentation; and reflection and making conclusion.

Initial Discussion. Hamann et al. (2012) reveals that student perceptions confirm that discussions improve student learning. When compared to other types of conversations, small-group discussions are more likely to generate learner motivation and engage students with the material.

Independence. According to Meylinda et al. (2021), there are differences in the improvement of students' mathematical communication skills between those taught with problem-based learning models and those taught with guided discovery learning models, as well as differences in the level of students' mathematical learning independence between those taught with problem-based learning models and those taught with guided inquiry based models.

Group Discussion. Hafiz and Dahlan (2017) state that learning allows students to discover mathematical topics on their own through group discussion activities. Apriliana et al. (2019) claimed that changing the learning process through interactive learning is an approach for increasing students' critical thinking abilities. In line with that Parrish (2017) conclude that students that work together as a group will increase their critical thinking, mathematical confidence, mentality, and academic performances. As they share what they see, explain what they're thinking, and take an active role in figuring out how to address the problem, kids' critical thinking will improve. They will gain confidence in mathematics since they will be able to solve problems on their own or in groups. Students with a growth mind-set understand that their math abilities can improve by focusing on mathematical thinking rather than correct or wrong answers. Finally, in order to enhance their performance, students see math as a collection of ideas that they can study and sort out through cooperating with others. In addition, Slavin (2015) states that activities based on cooperation among small groups in the classroom carried out highest level in the cooperative learning paradigm.

Group Presentation. In study of Nor and Shahrill (2014) shows that the mean of the entire class's pre-test went from 29.80 to 67.05 in the post-test, a 37.25 increase, indicating a significant improvement and demonstrating the favourable influence of combining posters and oral presentations on students' in group understanding and mathematical knowledge.

Reflection and making conclusion. In general, students' ability to self-reflect on how and what they have learnt can be improved by engaging in continuous reflection journal writing, although this effect was not measurable enough to lead to academic performance improvements. In the literature, there is also an underlying notion that students who are better at self-reflection do better academically (Lew and Schmidt, 2011).

2.2. Critical Thinking Skills

The word "critical thinking" refers to the application of cognitive skills or approaches that enhance the possibility of an intended outcome. The capacity to think critically is described as the ability to make wise judgments and successfully acquire new knowledge. Critical thinking is the ability to make accurate and suitable judgments in everyday life by applying rational thinking, interpreting, analyzing, and evaluating information (Chukwuyenum, 2013).

According to Ennis (2011), critical thinking is the intellectual and analytical process of determining what to believe and do. Indeed, the concept of critical thinking is founded on reason. As supported by

Nuriadin et al. (2015) stated that someone who employs reflective thinking will be able to identify problems, select alternative solutions, analyze problems and evaluate solutions, and conclude and choose the best solution to the problem at hand. Students with critical thinking skills absorb information logically and evaluate what information is significant and what is not. Students who are able to think critically can respond to difficulties and make good decisions. (Su et al., 2016). The same thing also expressed Fahim and Masouleh (2012) that critical thinkers will become better problem solvers and decision-makers.

Another benefits of critical thinking abilities for students is that they make them more self-sufficient, confident, and capable of solving problems effectively in both daily and situational circumstances (Adi and Junining, 2013). As Ratnasari (2018) said that critical thinking abilities in mathematics are necessary for all students. Critical thinking has been identified as a critical determinant in distinguishing between students who are merely performing the arithmetic and those who genuinely comprehend what they are doing. In order to arrive at a solution, students utilize critical thinking to choose the best way from a number of possibilities. A math class can include critical thinking just as much as learning about concepts, calculations, formulae, and theorems. Activities that stimulate critical thinking will also encourage students to think and speak in mathematical terms (Aini et al., 2019).

Also along the same line, It is required in the field of mathematics education to assess whether pre-service teachers have a predisposition to think critically, to educate them with critical thinking abilities, and to develop mathematical thinking techniques (Celik and Ozdemir, 2020). Jacobs et al. (2010) showed that teachers find it difficult to comprehend students' mathematical thinking, but these skills can be improved. As a result, the capacity to think critically is a vital skill that teachers' candidates/students must possess, because issues in all facets of modern life are becoming increasingly complicated (Sari et al., 2017). Belecina and Ocampo (2018) also added that critical thinking abilities may be employed, implemented, and developed in mathematics instruction using effective cognitive strategies. By pushing students to explore for new solutions when tackling mathematics issues, critical thinking can help them develop innovative problem-solving choices.

Furthermore, according to the study of Hasanah et al. (2019), critical thinking skills are one of the life skills students should have so that students are not only able to understand the subject matter well, but also as a provision for students to deal with and solve problems in daily life through contextual phenomena. The result of their study has an average score of students' critical thinking skills which is still in a low category (46.87%).

According to Florea and Hurjui (2015), the point of view of social learning is through critical thinking processes. They also profited on higher level tasks, such as collaborative creative work. Saputra et al. (2019) conclude in their study that students were able to strengthen their critical thinking abilities because they were actively engaged in group discussion activity while solving the challenges presented in the case study supplied by the teacher at the start of the learning session.

According to the findings of Belecina and Ocampo (2018), the usage of issue scenarios fosters improved critical thinking in problem solving among students. It improves motivation and provides a tool for learners to arrange their knowledge. Problem situations that require students to express declarative and procedural knowledge are appropriate for evaluating their critical thinking. Furthermore, these problem circumstances help students become more thoughtful and metacognitive, especially when assessing problems.

Facione (2015) identified six capability of critical thinking emerging in learning process through the ability (interpretation, analysis, evaluation, inference, explanation, and self-regulation). On the other hand, with regards to the study conducted by Basri et al. (2019) it reveal that among of this six critical thinking sub-

skills they stated that the analysis with 46%, evaluation with 17%, and self-regulation with 21% are became the lowest critical thinking sub-skills learned by pupils vs. other critical thinking sub-skills.

Analysis. It is utilized to recognize the proposed and genuine inferential connections among explanations, questions, ideas, depictions, or different types of portrayal expected to communicate conviction, judgment, encounters, reasons, data, or feelings. The three sub-abilities of investigation are inspecting thoughts, recognizing contentions, and examining contentions (Facione, 2015).

Evaluation. This characterized the assessment into evaluation the validity of explanations or different portrayals which are records or depictions of an individual, discernment, experience, circumstance, judgment, conviction, or assessment; and to survey the coherent strength of the genuine or proposed inferential connections among proclamations, portrayals, questions or different types of portrayal (Facione, 2015).

Self-regulation. It is a skill to monitor one's cognitive activity, elements used in the solving problem, especially to apply skills in analyzing and evaluating (Facione, 2015). Self-regulation is the ability to intentionally adjust, regulate, and fine-tune cognitive capacities as well as mental and emotional states through decisions (Mitsea et al. 2021).

2.3. Conceptual Framework

Independent Variable   **Dependent Variable**

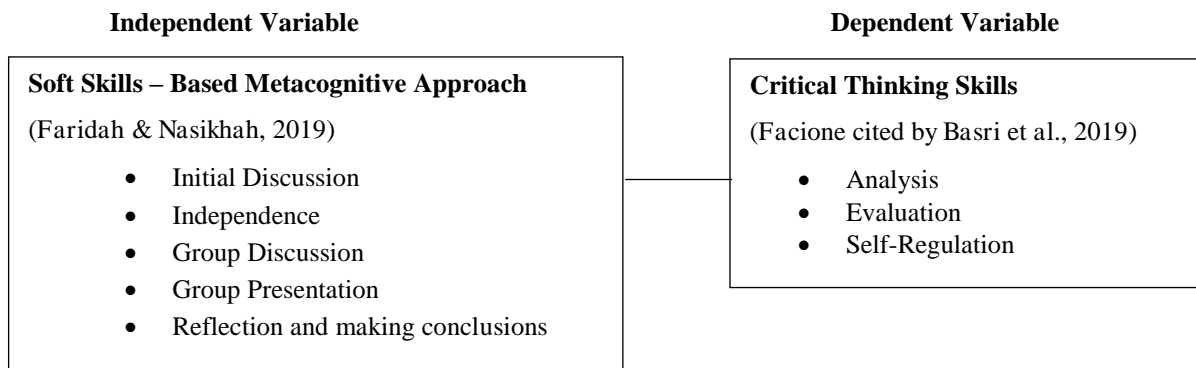| **Soft Skills – Based Metacognitive Approach** (Faridah & Nasikhah, 2019)
 • Initial Discussion
 • Independence
 • Group Discussion
 • Group Presentation
 • Reflection and making conclusions | **Critical Thinking Skills** (Facione cited by Basri et al., 2019)
 • Analysis
 • Evaluation
 • Self-Regulation |

Figure 1. Research Paradigm (Independent and Dependent Variable)

The figure 1 shows the research paradigm of the study consisting of independent and dependent variables. It shows the relationship between Soft Skills–Based Metacognitive Approach as the independent variable and Critical Thinking Skills as dependent variable.

3. Objectives of the study

This study aims to determine the Implementation of Soft Skills-Based Metacognitive Approach in Improving the Critical Thinking Skills of Pre-Service Teachers. Specifically, it seeks to answer the following questions:

1. What is the pretest and posttest scores of the students in their critical thinking skills before and after the implementation of soft-skills based metacognitive approach in

1.1 Analysis;

1.2 Evaluation; and

1.3 Self-Regulation?

2. Is there any significant difference between the pretest and posttest scores of the students in their critical thinking skills before and after the implementation of soft-skills based metacognitive approach?

4. Research Hypothesis

- There is no significant difference between the pretest and posttest scores of the students in their critical thinking skills before and after the implementation of soft-skill based metacognitive approach.

5. Research Methodology

5.1. Research Design

This study employed pre-experimental research design particularly one-group pretest-posttest design which will be used to know the difference between the mean pretest and posttest score of PSTs in their critical thinking skills before and after the implementation of soft-skills based metacognitive approach. The three critical thinking skills to be measured are the analysis, evaluation and self-regulation.

5.2 Respondents of the study

In this study the researcher used purposive sampling technique in selecting the target group of students wherein it chooses specific elements from the population to be representative of PSTs. A total of twenty-one (21) students from first-year taking Bachelor of Secondary Education Major in Mathematics in one of the state universities in Laguna Province are selected to utilize this study due to their knowledge and qualifications.

5.3. Instrumentation

The instruments utilized in this study were created so that the researchers could obtain and collect all of the necessary data and information.

Lesson Exemplar. A lesson exemplar accompanied by a Soft Skill-Based Metacognitive Approach has been created through following the five stages which is the Initial Discussion, Independence, Group Presentation, and Reflection and making Conclusion. It was also made in compliance with the course syllabus of first year college of education major in Mathematics for the second semester in Logic and Set Theory particularly in set operations. The discussion carefully follow the stages in learning to assure that all approach are properly implemented and successfully used.

Pretest and Posttest Assessment. The researchers also employed pretest and posttest assessment before and after the discussion which the said approach has been used to measure the students' critical thinking abilities. The test are consist of six items which it measures the critical thinking skills in terms of (2) analysis, (2) evaluation and (2) self-regulation.

Validation. To ensure the quality of instruments before administering to students' further validation is done with the help of teachers with expertise in the field of Mathematics and English which focused on the grammar of the instruments to be used. It has also undergo through the procedure of verifying so that these research instruments are both valid and effective before implementation.

Final Revision. All the suggestions prior to implementation and recommended sentence constructions in grammar were utilized before conducting the research study.

5.4. Data Collection Procedure

The topic was created and presented to the Dean's office for approval after many consultations between the researcher and the research adviser. The manuscript was reviewed by a team of experts to ensure that the material was of good quality. Suggestions and adjustments made by the panel experts were taken into account and implemented for the purpose of refining the idea prior to the study's actual implementation.

Following the validation of the research equipment and the approval of the sought authorization to conduct the study from the university's respected offices, the researchers prepared all the things needed in the virtual meeting with students. Creating group chat via messenger with the students for further announcement of exact date, time and link for their virtual session with the researchers.

The researchers begin with the first stage which is the 'Initial Discussion' where this time allocated for the instructor and discussed the topic with relevance to critical thinking via Google Meet/Zoom Meeting. After the discussion, the students answered short activity. Succeeding the initial discussion time has been given to students for 'Independence' where they received certain time analyzing and answering the activities on their own.

Following the short activity students gathered as a group and discussed the questions to answer based on the given problem solving posted by the instructor. Which they applied 'Group Discussion' and brainstorming as they worked on the activity. The purpose of the group discussion is for students to exchanged their ideas and to gained knowledge with others to collaborate and evaluate the answer.

After the group discussion they have 'Group Presentation' which they presented their answers as a group. They are also allowed to add ideas and clarifications while the presentation is in progress.

Lastly, 'Reflection and making conclusions' where in the students gave their reflections from what they have learned from the instructors' discussion and their collaboration with peer. Giving their insights on how the stages or discussion helped them in answering the activity. The scores of the pretest gathered before the implementation and the posttest data after the session are analyzed statistically by the statistician.

5.5. Ethical Consideration

When dealing with test findings and respondents' personal information, the researcher maintained absolute confidentiality. The results of the data collection are accessible only to the researcher and thesis supervisor. The identities of the responders are not disclosed in this publication.

5.6. Data Analyses/Statistical Treatment

After gathering all the scores in pretest and posttest it has been forwarded to the statistician. The statistical tools used to answer the research questions are frequency and percentage which analyzed the level of critical thinking skills of students. To support the hypothesis whether there is no significant or significant difference on the critical thinking skills of the students Wilcoxon Signed Ranks Test was used were it used to assessed the difference between pretest and posttest scores on same group in terms of analysis, evaluation, and self-regulation.

6. Results and Discussion

Table 1. Pretest Scores in Analysis

| Score | Pretest | | Verbal Interpretation |
	f	%	
9-10	3	14.3	Advanced
7-8	11	52.4	Proficient
5-6	5	23.8	Approaching Proficiency
3-4	2	9.5	Developing
1-2	-	-	Beginning
TOTAL	**21**	**100.0**	

Legend: 9-10: Advanced, 7-8: Proficient, 5-6: Approaching Proficiency, 3-4: Developing, 1-2: Beginning

Table 1 depicts pretest scores of the student-respondents in the analysis part of critical thinking skills. 52.4% of the students which is 11 out of 21, got 7-8 points in the analysis part of the assessment which is under the proficient level. This implies that PSTs are somehow able to analyzed given statement, collect data and determine what is being ask in the given word problems in accordance to set operations, however there are still one error or missed information.

Generally, most of the students was not able to complete the given data needed from the question presented so more than half of the class are under to proficient level with a percentage of 52.4 which means the students have a fair performance in analyzing the given statement, collecting data and determining the given data being asked in the problem. Thus, it is a consideration of the learners' prior knowledge, abilities, points of view, and perceived needs are an important part of a learner analysis process. As a result, it is a learning process that involves change in knowledge; it is not something that is done to learners but rather something that learners do themselves (Brown & Green, 2015). After the implementation of soft-skill based metacognitive approach the students take posttest.

Table 2. Posttest Scores in Analysis

| Score | Posttest | | Verbal Interpretation |
	f	%	
9-10	15	71.4	Advanced
7-8	6	28.6	Proficient
5-6	-	-	Approaching Proficiency
3-4	-	-	Developing
1-2	-	-	Beginning
TOTAL	**21**	**100.0**	

Legend: 9-10: Advanced, 7-8: Proficient, 5-6: Approaching Proficiency, 3-4: Developing, 1-2: Beginning

Table 2 depicts the scores of the students in analyzing part of the posttest assessment. It shows that 15 or 71.4% of the students, scored under advanced level which students got 9-10 points. Students therefore demonstrate a significant improvement in analyzing given statements, collecting data and determining what was asked in the problem with single or non-missed information. This indicates that there is a great improvement from the scores before and after the implementation of the said approach. This implies that implementation of a soft-skill based metacognitive approach improves the students' analyzing skills in solving problems involving set operation word problems.

It shows that most of the students were able to complete the given data needed from the question presented, so the majority of the students are at the advanced level with a percentage of 71.4, indicating that the students performed well in analyzing the given statement, collecting data, and determining the data or information being asked in the problem. Which is a good indicator since according Becker et al. (2014) the study of process of determining a learner's vital characteristics, such as their demographics, prior knowledge, and social requirements is characterized as "learner analysis" which is present in this assessment.

Table 3. Pretest Scores in Evaluation

Score	Pretest f	%	Verbal Interpretation
9-10	7	33.3	Advanced
7-8	3	14.3	Proficient
5-6	3	14.3	Approaching Proficiency
3-4	5	23.8	Developing
1-2	3	14.3	Beginning
TOTAL	**21**	**100.0**	

Legend: 9-10: Advanced, 7-8: Proficient, 5-6: Approaching Proficiency, 3-4: Developing, 1-2: Beginning

Table 3 represents the varied pretest scores of the students in the evaluation part of the pre-test assessment. 33.3% of the students which is 7, got scores between 9-10 points which belongs to advanced level. This implies that some of the students have an initial ability to evaluate given mathematical statements, draw conclusions and provide correct answer suitable to the task at hand even before the implementation of Soft Skills – Based Metacognitive Approach. On the other hand, 14.3%, of the students which is 3, got lowest points which indicates that they were not able to provide complete conclusions and was not able to generate correct solutions which are suitable for the task at hand in the evaluation part of the test. It can also be inferred from the table that preservice teachers have a varied level of evaluating skills as the table demonstrates a varied scores of the students from beginning level to advanced level.

Generally, there are still students who are not able to evaluate set operation problems and make complete and valid conclusions of the given task. And even though some of the students are able to reach the highest level which is advanced, most of the students are still under the lower levels which implies that there is still a need for a comprehensive sharpening of student's evaluation skills. According to Su et al. (2016) students who have the ability to think critically can respond to the problems and evaluation correctly which it in the result of pretest evaluation of Student 6 was not able to evaluate correctly. Thus, it shows that critical thinking before the implementation of approach is not sufficient.

Table 4. Posttest Scores in Evaluation

Score	Posttest f	%	Verbal Interpretation
9-10	18	85.7	Advanced
7-8	3	14.3	Proficient
5-6	-	-	Approaching Proficiency
3-4	-	-	Developing
1-2	-	-	Beginning
TOTAL	**21**	**100.0**	

Legend: 9-10: Advanced, 7-8: Proficient, 5-6: Approaching Proficiency, 3-4: Developing,1-2: Beginning

Table 4 represents the scores of the students in the evaluation part of the post- test assessment. It shows that 18 students which is 85.7%, scored under advanced level. This means that most of the students are able to score 9-10 points which implies that students are able to evaluate the given statement in regards with set operation problems, make inferences, and produce an accurate response that was appropriate for the task at hand. This indicates that majority of the students demonstrate a significant improvement in terms of evaluating word problems after the implementation of the Soft Skills – Based Metacognitive Approach.

As a whole, it is clearly shown that there is a significant increase in the scores of students in pretest and posttest results from having 7 students at advanced level in pretest assessment, it turns out into 18 students in posttest after the implementation of the approach. It indicates that from a scattered level of student's evaluation skills ranging from beginning to advanced level, students demonstrate a considerable improvement where most of the students are able to score under advanced in terms of evaluating set operations problems and providing valid and clear conclusions after the implementation of soft skill based metacognitive approach. It has mentioned in the study of Hyder et al. (2020) the teachers learning approach has a significant impact upon how children evaluate ideas. Effective teaching is also thought to be significant for increasing student achievement.

Table 5. Pretest Scores in Self-Regulation

Score	Pretest f	%	Verbal Interpretation
9-10	1	4.8	Advanced
7-8	11	52.4	Proficient
5-6	4	19	Approaching Proficiency
3-4	3	14.3	Developing
1-2	2	9.5	Beginning
TOTAL	**21**	**100.0**	

Legend: 9-10: Advanced, 7-8: Proficient, 5-6: Approaching Proficiency, 3-4: Developing,1-2: Beginning

Table 5 shows the pretest result of the student-respondents scores under self- regulation. It is inferred from the table that preservice teachers' level of self-regulation scattered from beginning to advanced level, however, most of the students scored under proficient level. 52.4% of the students which is 11, scored 7-8 points which demonstrate that students are able to provide their own solutions and illustration of the problem but committed one mistake or error. This implies that students are somehow able to generate their own solution and conclusion, however there is missed information or error committed.

Overall, most of the students was not able to give complete solution of their own and same as providing illustration, so the majority of the students are under proficient level, indicating that the students was capable on their own understanding in solving set operations even though there are minor mistakes. In connection with that, in the study of Surya (2017) states that students have difficulties answering word problems because they misinterpret the problem, don't grasp the words and phrases, and have trouble understanding it, thus the students cannot illustrate it.

Table 6. Posttest Scores in Self-Regulation

Score	Posttest f	%	Verbal Interpretation
9-10	14	66.7	Advanced
7-8	5	23.8	Proficient
5-6	2	9.5	Approaching Proficiency
3-4	-	-	Developing
1-2	-	-	Beginning
TOTAL	**21**	**100.0**	

Legend: 9-10: Advanced, 7-8: Proficient, 5-6: Approaching Proficiency, 3-4: Developing,1-2: Beginning

Table 6 depicts the post-test result of the students' scores under self-regulation assessment. This represents that most of the students demonstrate an improvement after the discussion of set operations in mathematics with the use of Soft Skills – Based Metacognitive approach. 66.7% or 14 students got 9-10 points, which in turn represents that most of the students have improved their self-regulation skills in posttest and it is interpreted as an advanced level.

It implies that the students' ability to recognize a problem and generate correct answers by providing their own solutions and illustrations to the problem has been improved after the implementation of the approach. With the help of the five stages of approach students have broadened their knowledge in solving word problems on their own understanding. Wherein in middle school graders, self-regulated learning has also mentioned that improves in-depth processing and consequently performance on inferential questions but not on factual questions. Opportunities for self-regulated learning improved both students' cognitive engagement and emotional experience (Gafoor & Kurukkan, 2016).

Altogether, it is clearly shown that there is an increase in the score of students in pretest and posttest from having only 1 student in advanced level in pretest turns out into 14 students in posttest after the implementation of approach. It implies that students are knowledgeable enough and aware on their own ideas in providing their own solutions which is timely correct with what is being asked. The ability to self-regulate is vital to the learning process. It can help students develop better academic performance and academic skills, apply learning strategies to improve learning achievement, monitor their performance, and evaluate their learning achievement. Teachers should therefore be familiar with the factors that influence a learner's ability to self-regulate, as well as the approaches they can use to identify and encourage self-regulated learning (SRL) in their classrooms (Zumbrunn et al., 2011).

Table 7. Mean Pretest and Posttest

Critical Thinking Skills	Pretest		Verbal Interpretation	Posttest		Verbal Interpretation
	Mean	SD		Mean	SD	
Analysis	7.00	1.55	Proficient	9.10	1.30	Advanced
Evaluation	6.29	3.23	Developing	9.62	0.86	Advanced
Self-Regulation	6.05	2.09	Developing	8.90	1.48	Proficient

Legend: 9-10: Advanced, 7-8.99: Proficient, 5-6.99: Approaching Proficiency, 3-4.99: Developing,1-2.99: Beginning

Table 7 shows the mean pretest and posttest of each category of Critical Thinking Skills after students were exposed in soft skill-based metacognitive approach these skills are divided into three parts: Analysis, Evaluation and Self-Regulation. It literally shows there is an increase in scores after the implementation of soft-skill based metacognitive approach to the students. In the pretest scores in analysis part from 7.00 overall mean score, students are able to get overall mean score of 9.10 in the posttest which has 2.10 difference after the utilization of the approach. Which means that students were able to analyzed the more comprehensively the given statement as well as collect all the needed data and determine what is being ask in the problem correctly in the posttest. On the other hand, evaluation got the highest positive difference in the mean which students evaluation skills was improved from 6.29 overall mean score, students attained 9.62 overall mean score in the posttest which has 3.33 difference. This shows a positive improvement on students' evaluation skills which is to draw conclusions by evaluating the given problem and also to generate correct solution which suitable for the task at hand after the approach was employed. In self-regulation there is also a remarkable increase in the mean from 6.05 overall mean score, students are able to get overall mean score of 8.90 in the posttest which has 2.85 difference. This implies that there is an improvement after the implementation of approach on how students recognize a problem and generate correct answer by providing their own solutions and illustration to the problem. The results from the table 7 shows that there is a positive change and increase in scores of students through the use of soft skill-based metacognitive approach.

Furthermore, from the given mean scores all the results have been classified in different verbal interpretation based on the results of pretest and posttest. In the analysis part in the pretest, students were classified proficient which definitely changed after the posttest which they turned in advanced level. Same as with the evaluation part of the pretest where it clearly shown that students were under developing level and surprisingly achieved to be in advanced level after the implementation or posttest part. And lastly, in self-regulation part were students are also under developing level and later on have positive increase in scores after the discussion which brings them in proficient level of learning. Wherein in the study of Murni et al. (2013) it has mentioned that there are significant differences in mathematical problem-solving capacity between students who received soft skill-based metacognitive learning and those who received traditional teaching methods. Significantly, students who received the soft skill-based metacognitive learning method improved their mathematics problem-solving ability more than those who received the traditional teaching methods.

Table 8. Test of Difference - Wilcoxon Signed Ranks Test

Critical Thinking Skills	Z	Sig. (2-tailed)
Analysis	-3.426[a]	.001
Evaluation	-3.449[a]	.001
Self-Regulation	-3.131[a]	.002

Legend: If p-value (Sig.) < 0.05, then it is statistically significant, If p-value (Sig.) >0.05, then it is NOT statistically significant.

Table 8 shows that there is a significant difference between the pretest and posttest scores of the students who were exposed to the Soft Skill-Based Metacognitive approach as a teaching strategy in improving students' critical thinking skills which views the overall assumptions of the given data presented on the tables above with the used of Wilcoxon Signed Ranks Test.

The result shows a positive difference between scores of pretest and posttest. From the given data it was subjected to statistical analysis where the difference in score of the students in analysis part from pretest and posttest are (z = -3.426[a], p = .001) with a large effect size (r =0.53) which indicates that there is a significant positive difference according to the given 2-tailed value. Therefore, hypothesis is not supported. In evaluation part, the difference in score of the students from pretest and posttest are (z = -3.449[a], p = .001) with a large effect size (r = 0.53) which demonstrates that there is a significant difference from the given 2-tailed value. Indicating that there is a significant difference after conducting the approach. Thus, the hypothesis is not supported. In terms of self-regulation part, the difference in score of the students from pretest and posttest are (z = -3.131[a], p = .002) with a medium effect size (r = 0.48). This reveals that there is a significant difference based from the given 2-tailed value. There is also a positive difference after the implementing of approach. As a result, the hypothesis is not supported.

Overall, there is a significant difference between the mean pretest and posttest score of the students in their critical thinking skills before and after the implementation of soft-skills based metacognitive approach. For that reason, it can be concluded that soft-skill based metacognitive approach with the used of its five stages in teaching affects the level of the students' critical thinking and in solving set operations in word problems. This is parallel to the study of Faridah and Nasikhah (2019) which based on the results of their study and its discussion, it can be concluded that there are differences in critical thinking skills and mathematical representations between students taught with a soft skills-based metacognitive approach with students taught with conventional approaches. Increased critical thinking skills and mathematical representations occur at a moderate stage. Therefore, the hypothesis was not sustained.

7. Conclusions and Recommendations

1. It was found out in the study that using a soft-skill based metacognitive approach has a positive effect in improving students' critical thinking skills particularly in analysis, evaluation and self-regulation in terms of solving set operation problems as it has shown an increased in their posttest scores. Thus, mathematics teachers are encouraged to incorporate the said approach in teaching.

2. Results in the study also showed a significant difference before and after the implementation of approach which is good indicator that students were able to acquire the knowledge and ideas in set operations through the help of approach. In that case, instructors were suggested to use the five stages of soft-skill based metacognitive approach as it seen to be undoubtedly helpful to students in working independently, critically, and collaboratively, as well as building their soft-skills.

3. It was also suggested for future researchers to use the findings to conduct a similar study involving a soft skill-based metacognitive approach to improving students' critical thinking skills in larger scale. As well as to validate the findings, the researcher suggests conducting a comparative study in a face-to-face learning environment in larger sample size of students.

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