



TEACHING DOMAIN AND RANGE OF RATIONAL FUNCTIONS USING EXPLICIT TEACHING: A LESSON STUDY

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DOI: <https://doi.org/10.54476/ioer-imrj/143637>

ABSTRACT

This study aims to evaluate and assess the teaching strategy to teach the Domain and Range of Rational Functions. A lesson is developed to implement the strategy and is demonstrated. The Lesson Study participants are Mathematics Teachers who serve as the students for the demonstration. Exploratory research was used to investigate if the strategy would be effective for the students and to formulate suggestions for developing lessons. The results show that an explicit learning and collaborative approach makes the class discussion interactive when teaching domain and range of rational functions. However, the teacher should be mindful of giving enough time to review or recall motivation and those struggling with using the application.

Keywords: Lesson Study, Domain and Range, Rational Functions, collaborative approach, explicit type

INTRODUCTION

Considering Mathematics to be difficult, it is a subject that is frequently taken for granted. It is saddening to learn that many students exclude Mathematics as a subject because they believe it to be too impractical, abstract, and lacking in emotional appeal. Rational Equations, an equation containing at least one fraction whose numerator and denominator are polynomials, may sound like a difficult topic for students, as it contains fractions and polynomials in one. Rational

functions are seen in many areas of study, such as science, engineering, business, and economics; thus, studying and understanding this topic is very important.

Students in different grade levels encountered many problems and errors in solving rational functions. Simplifying rational functions may be tricky for students as they were confused about simplifying rational expressions and finding the LCD of two or more rational expressions expressed in polynomials. Cetin (2022), in its pedagogical research, found out that none of the 108

respondents reached the correct solutions with the correct step in solving rational equations, similar to the result of other researchers.

As misconceptions in solving rational functions arise, the depth of knowledge of a teacher in the subject matter is very important. According to Shulman's theoretical framework, teachers must be knowledgeable in two different areas: (a) content, commonly known as a "deep" understanding of the subject itself, and (b) curriculum creation. Content knowledge includes what is referred to as the "structure of knowledge"—the theories, guiding principles, and ideas of a specific subject. It focuses on the teaching process, including the best ways to depict and communicate knowledge to students as well as how to help them acquire particular concepts and subject matter. Ball & Cohen (1996) state once more that the greatest ways for instructors to learn are through observation of students and their work, close collaboration with other teachers, study, practice, and reflection.

The rationale for this lesson study is to evaluate a teaching methodology of Domain and Range of Rational Equations using Explicit Teaching. The difficulty of the concept of a function contributes to complications when students learn of functions and their graphs (Leinhardt, Zaslavsky, & Stein, 1990). To understand the concept of a function, students must understand the sub-concepts, such as correspondence, domain, and range.

OBJECTIVES OF THE STUDY

This study is intended to evaluate a Domain and Range of teaching methodologies. It specifically aimed to achieve the following:

1. To decrease in morale of students by using an explicit approach to learning the Domain and Range.
2. To determine the experience of the students in using the Class In application.
3. To ascertain the suggestions given by the students to enhance the lesson study further.

METHODOLOGY

This is research conducted to a Mathematics class of Marikina Polytechnic College, Foundation of Mathematics. A demonstration teaching was prepared and delivered to a class of graduate studies to assess and evaluate the different techniques, strategies, and platforms in teaching Mathematics, specifically in identifying the domain and range of rational functions. Assessing and evaluating the demonstration teaching were the professor of the subject and the students themselves of the said course.

Furthermore, the researchers were inspired by the research work of Roxas et.al (2018), Teaching Chain Rule using the Composition of Functions. Exploring the difficulties met by students in the Composition of Functions.

In this research, teaching this skill could help many students who have difficulty identifying the domain and range of rational functions.

Planning Stage

"Alone we can do so little; together we can do so much."- Hellen Keller

The researchers were inspired by the quotation above, so they gathered to brainstorm what Mathematical skills would be discussed in the class. They first came up with

other Mathematical skills to tackle but ended up demonstrating the domain and range of rational functions.

First, Group Chat was created for the dissemination of information for the members of the group, and it was the best way to communicate. The researchers agreed to a Virtual meeting at every opportunity to start with. In their first virtual meeting, they concurred to have each part accomplished. Each of the members was given time to finish the work given.

Next, another virtual meeting was made between messages in the group chat to improve the work. Platforms, strategies, and techniques to apply in demonstration teaching were talked through. The researchers go along with the Explicit Teaching Strategy and Collaborative Learning Strategy with ClassIn as the platform for teaching.

In addition, they concluded that there should be a demonstration teaching among them as a group before the final demonstration teaching to the class of Sir Roxas.

Simulation Stage

The last step to be accomplished before the final demonstration is the simulation of teaching to the group itself. This was done to observe the things that need to execute and those that need to change or improve. It helps the researchers to identify which variables are important to the lesson.

Dimitrios Vlachopoulos and Agoritsa Makri (2017) claim that simulation scenarios promote improved social and communication skills, which enhance knowledge through active collaboration and engagement. As a

result, feedback from the simulation from each group member was very useful in improving the work. Each of the suggestions was noted and included in the lesson's development.

The group reflected on this to achieve the goals of delivering the teaching process for the students to benefit from it. During the simulation, the group was given more views and reviews on how the lesson will be taught for a better understanding of the part of the students.

Implementation Stage

The researchers used explicit teaching strategies to engage the students in more interactive learning. Dale (1969) proposed that learners could obtain more knowledge through what they do. The researchers made a collaborative activity that engages the students with peers or other more knowledgeable students. In a learning process, the students learn with their teacher's guidance and other students' engagement. (Vygotsky, 1978).

Discussion and Phenomena Stage

After the demonstration, a focus group discussion was conducted to narrate the process of before, examining, assessing and evaluating the lesson. The participants were interviewed by asking questions related to the demonstration, what they thought went well and what did not, what they expected, and what they could suggest to enhance the strategies. The interview was recorded and translated to the best of the researcher's capabilities. These interviews served as the data for this Lesson study.

RESULTS AND DISCUSSION

The data obtained from the evaluators of the Lesson Study are summarized according to the order and how the Lesson transpired. In accomplishing the objectives, the researchers came up with three phases; preparation, implementation, and evaluation. Every phase is supported by different subphases, which are as follows:

Preparation Phase

This part shows the preparation made by the researchers in teaching the Domain and Range of Rational Functions to find the most suitable way to reach the students' interest during the discussion.

1.1. Planning and Identifying References

In preparation for this lesson study, the lesson presenter shared the following insights in his preparation for the lesson study.

“Since the domain and range of a rational function is one of the subjects in Senior high school, we decided that I would be the presenter. And also, I am teaching Grade 11 STEM and have prepared lessons for this topic, so I let my groupmates check my prepared PowerPoint presentation and the strategies used in teaching the topic. After that, my group mates give suggestions on how to make the discussion interactive and teach mathematical terms properly. “

- Presenter

“Upon searching interactive applications, each of the members suggested different interactive whiteboard applications. I suggested that we use the ClassIn application since the school I work in uses the said application. I persuaded my group mates to

use ClassIn because the application has many features”. - Presenter

This is then noted by the group of researchers, which gave them the idea of the domain and range of rational functions. They also came up with an application that can be used to interact with the students while teaching the step-by-step procedures for getting the domain and range of rational functions.

1.2. Guidelines

Guidelines help the teacher maintain class routines and give them time to process the information to ensure they receive all the information. Preparing guidelines on downloading and using the application for first-time users is important, so it will not consume time. Installing the application became an issue because some evaluators had difficulty installing the ClassIn application.

“The application installation process was time-consuming, and I was hesitant to register my contact number since it was required to enter the application. I would prefer just using my email instead of my contact number. The applications offer different tools that are good for online teaching”. - Evaluator A

In preparation for the demonstration, the group prepared guidelines on downloading and using the ClassIn application.

1.3. Simulation

To facilitate a flawless implementation as well as to optimize the time in delivering the lesson, especially on how to manage the time in the ClassIn application. The lesson is tested

with group members, and the findings show that:

“The demonstrator should give pre-activity or recall of the past lessons.” - Researcher A

“The demonstrator should define domain and range.” - Researcher B

“In presenting the steps in finding the domain and range, the demonstrator should give an example in every step.” - Researcher C

The group members’ findings showed that simulating the lesson will give you an opportunity to foresee what could be wrong in your lesson and the needed changes in the discussion.

2. Implementation

In the execution of the prepared lesson, the researchers opted to implement this pedagogy;

2.1. Collaborative Approach

For a deeper and more meaningful learning experience for the students, the teachers suggested and approved the following approaches from when evaluators displayed productive and noticeable learning during the demonstration.

“I love the use of breakout rooms; it encourages collaboration”. - Evaluator B

“Giving group activities are good because it makes the learners interact with each other; however, the facilitator should monitor the members of the group if anyone is participating”. - Evaluator C

Breakout rooms feature in the ClassIn application is a good way of conducting group activity on how to find the domain and range of rational functions; since it is a step – by – a step procedure, anyone in the group can freely write and discuss their answers.

3. Evaluation

Evaluation gives a chance to enhance and improve your work. It makes sure that the interactive goals and objectives are being achieved. The evaluations during the focus group discussion are as follows:

3.1. Review or Recall as Motivation

“The pre-activities are okay; however, it can be better if there is a long time”. - Evaluator D

“I think the questions on the motivation part are quite hard for a limited time to answer”. - Evaluator E

The evaluators noticed that the time given to the review or recall part of the lesson was not enough, considering that the given equations are quite difficult.

3.2. Application

“It is better if, during the engagement activity, instead of letting the students type their answer in the chat box, the presenter should use the responder tool in ClassIn, and instead of waiting for the students to raise their hands, you can use the random selector tool in ClassIn.” - Evaluator F

“The application installation process is time-consuming. I was hesitant to register my contact number since it was required to enter the application; I would prefer just using my

email instead of my contact number. The applications offer different tools which are good for line teaching". - Evaluator A

The ClassIn application used during the demonstration is free and not registered in a premium account. Still, the demonstration was successful. Installing and joining the classroom of ClassIn is time-consuming, so the researchers gave the guidelines earlier so that the evaluators could install and download the application. Giving guidelines beforehand is very important.

3.3. Mastery of the Lessons

"The instructions are detailed and easy to follow. The topic might be difficult to the actual students, but the demonstrator showed mastery of it and can pull it off in an actual class setting". - Evaluator H

Since the teacher is handling SHS students, the teacher is familiar with the topic. The presentation also improved with the suggestions and help of the other members.

CONCLUSIONS

Explicit Teaching and Collaborative Learning have been proven once again as some of those effective strategies in teaching. The "I do, We do, you do" will never be obsolete in teaching, especially in Mathematics. In using the Explicit Strategy of Teaching, lessons were stated clearly and in complete detail, leaving no room for confusion or doubts for students. Collaborative Learning, in the same manner, is very engaging to the learners since they feel a sense of belongingness. Students were given the opportunity to work and grow with each other. Additionally, using the ClassIn platform for online classes, the breakout session was very

encouraging for each of the members to participate.

The evaluators appreciated how the lesson turned out. Students have engaged actively since the demonstrator showed expertise in teaching the skill.

RECOMMENDATIONS

In preparation for the teaching domain and range of rational functions, different phases were performed - preparation, implementation, and evaluation phase. The lesson must be taught by repeating the step - by - steps procedures. Conducting a simulation also helps to improve the demonstration. In the strategy for teaching the lesson, ClassIn application can be used as a collaborative learning approach.

In order to have an effective discussion and learning, it suggested that the teacher should: (a) give enough time to answer the equation, (b) have the lesson checked by the group members, (c) has prepared guidelines for using the third - party application (d) checked the students if they are participating in the group activity.

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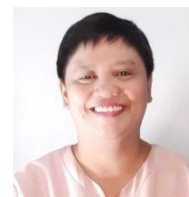
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