Boomerang Technology in Teaching Primitive RecursiveFunctions

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ABSTRACT

The article describes how to teach "Complex Numbers" using Boomerang technology. Boomerang technology is convenient for the study of topics with different content and character (problematic, controversial, different meanings), including oral and written forms of work, and during one session each allows the participant to perform various tasks, in turn in the role of a student or teacher, to collect the required score, to teach students in the classroom, outside the classroom towork with different literature, texts, memorize the studied material, so to be able to express themselves freely and to evaluate all students during a lesson.

Keywords: Complex numbers, Boomerang technology, lesson, student, teacher,topic, assessment, group, teaching materials

Currently, there are many types of training in advanced pedagogical technologies (interactive methods), which are selected according to the characteristics of the subject of the lesson and the intended goals, and are prepared accordingly. This is very important when passing math lessons. In this case, specific requirements are placed on the students' preparation. In particular: mastering the necessary knowledge for active participation in training, readiness for communication, working in mutual cooperation, independent thinking, skills to freely express and defend one's opinion, etc.

A sickle-shaped throwing weapon, which ensures that the thrown object returns to the thrower, is called a boomerang. The meaning of the boomerang method in education is that the problematic issue or topic raised by the pedagogue is returned to the teacher in oral or written form after being mastered by the students.

1. If there are 4 parts of topics in the lesson plan, students in the classroom are also divided into 4 groups. The first part of the plan is presented to each of the students of the first group with the answers prepared by the subject teacher. In this way, the other parts of the plan, along with their answers, will be distributed to the students of groups with appropriate numbers. Students in each group study one part of the topic presented to them with their answers according to the rules set by the teacher.

2. After that, students of 4 groups are mixed and 4 groups of new composition are formed. In each of these new groups, more than one student from each of the first 4 groups is achieved. As a result, there is an opportunity to study the entire educational material as a whole team. It is important that students develop the skills and abilities to learn the educational material independently, work in cooperation, and explain what they know to others.

3. After completing the group study of the topic according to the rules set by the teacher,

students return to their original groups and the question-and-answer session begins. Based on the organization of the teacher, questions are given to one team by other groups. One student chosen by them from the team writes down the scores of their partners, sums them up, and submits the results to the teacher. All groups will be quizzed in this way. 3 points are given to the student who answered the question correctly, 2 points to the one who made a correct addition, 1 point to the one who made a correct replica, and 0 points to the one who did not express an opinion at all.

4. Each group prepares one question on the topic and invites other groups to answer it. 3 points will be added to the total score of the team that answered correctly, and 0 points will be given to others. If no one can answer, if the team that created the question answers, 3 points will be added to their total score.

Now, to evaluate each student, pre-prepared test tasks on the subject are distributed to them. The results of the work of one group are checked by the students of the other group based on the prepared answers, and points are given according to the scale provided by the teacher.

5. The lesson is strengthened and summarized by the teacher with the participation of students. Teams and students are announced and encouraged. Assignments and tasks needed for the next lesson are formed.

If there is a shortage of class time depending on the level of preparation of the students of the group, the size of the educational materials, ease or difficulty, the fourth stage may not be held.

Boomerang technology transfer steps

Stage 1. Students of the group are divided into small groups of 4-5 people;

- the teacher gives each group and each of its members specific handouts for independent learning, thinking and memorization. Their number depends on the number of groups and students. If there are 5 sub-groups, then the general topic is divided into 5 sub-texts and given to each group;

- for the activity to be effective, the text given to each group is given to each student. Thus, 5 groups will have 5 different texts based on a common theme, and each student will have a text that falls into his group.

As an example, let's divide the topic "Complex numbers" into 5 parts and distribute it to small groups:

1. Complex number and its algebraic, trigonometric, exponential forms and operations on them.
2. The main theorem of algebra.
3. Cubic equation
4. Cardano formula.
5. Higher order equations.

Stage 1. The teacher tells the group that the members of the group should study the text individually, memorize the text, and then, if necessary, tell it to others or the teacher, and learn the text as much as possible. 10-15 minutes depending on the size. He himself observes the work of the group and students.

Stage 3. The teacher comes to each group with small pieces of paper with pre-prepared numbers and asks the group members to draw one number from these pieces of paper (the number of pieces of paper depends on the number of students in the group, for example, 5 in the group If there is one person, the numbers on the paper are made as 1,2,3,4,5. All students in small groups should take a paper with numbers written on it. There are as many groups as there are numbers on paper based on the number of group members. The teacher asks the students to form new groups according to the numbers. For example, those who received the number 1 form one new group, those with the number 2 form the second group, those with the number 3 form the third group, those with the number 4 form the fourth group, and those with the number 5 The students are asked to form a group of five.

Step 4. When new groups are formed by numbers, one representative from the previous

groups is automatically collected in each new group, that is, if 5 different texts are studied, one representative from each is collected in this new group. 5 students and 5 different texts are collected on the topic.

Step 5. Each member of the newly formed group now takes on 2 tasks, i.e. teacher and student, and functions as follows:

- as a teacher (instructor), he talks about the material he has learned before, draws everyone's attention to the main points of the material he has learned independently, checks the understanding and mastering abilities of other group members.

- as a student, he listens, analyzes, thinks and tries to remember the texts that the group members speak, explain and speak in turn.

- the teacher informs them that they should only speak their texts and gives them about 20 minutes (time is allocated depending on the size of the text and the difficulty or ease of the general topic).

At this stage, all the material distributed at the beginning of the training is considered to be mastered by the students.

Step 6. After the members of the group speak their texts to each other, and after everyone has learned these texts, the teacher asks the members of each group to each other to check how much the learned material has been mastered by the members of the group. z explains that they can ask questions based on the texts. Thus, internal control is carried out within the group, that is, through questions and answers. This helps the students in the group to determine the level of mastery of the materials they have shared with each other, and to further strengthen their own knowledge.

Step 7. The teacher asks all the students to return to their previous places, that is, the students return to their groups at the beginning of the lesson.

Step 8. The teacher says that all students in the classroom are familiar with the distributed written materials, and that they have full knowledge of them, so that they can ask each student about the material studied.

Step 9. In order to determine the degree to which the distributed educational material has been mastered by the students, the teacher explains that he evaluates the students' answers to the control questions through rating points, for example, the answers to the questions - if there is a complete answer - 3 points, additional if it is done - 2 points, if a bite is thrown from the sitting place - 1 point, if there is no answer - 0 points.

In the grading system, it is possible to assign 5 marks for a complete answer, 4 marks for an addition, 3 marks for missing a bite, and 2 marks for not answering.

In order to evaluate the answers of the group members in the order indicated above, each group can assign one of the group participants as a "counter" (the "counter" also participates in the question-and-answer dialogue taking place in the circle)).

Step 10. The teacher addresses the students with questions (5-6) based on the handouts (questions should be relevant to all texts as much as possible, and the teacher tries to include all students in the classroom to answer).

Sample questions:

1. What is a complex number?

2. What is the algebraic form of a complex number?

3. How to find the sum, difference, multiplication and division of complex numbers?

4. What is the trigonometric representation of complex numbers?

5. What is the formula of muavr?

6. What is Euler's formula?

7. What is the fundamental theorem of algebra?

8. What is Cardano's formula?

9. What methods do you know to solve

higher order equations?

After answering the set questions, the teacher writes the points collected by the groups on the board and moves on to the next stage of the exercise.

Step 11. The teacher tells each group to prepare one question based on the content of their written materials and gives the groups 5-7 minutes to prepare the question.

Step 12. The groups ask each other questions, and the "counters" in the groups evaluate the answers of the group members according to the above procedure. If the answers are correct, the group that asked the question does not fill in the answer.

Step 13. The teacher once again writes the points scored by the group members on the board and determines the total value of the points (grades). The total value of the accumulated points (grades) is divided equally among all group members (on the basis of agreement). Note: if there is a disagreement on the part of students in dividing the accumulated points equally among the group members, that is, some group members actively participated in the group's activities and were passive in the general collective activity, or if they did not participate at all, they were not interested, in such a case it is up to the group members to solve the situation. The group's solution is correct, or the teacher can express his opinion, as he monitors the students' responses, active or passive, during the lesson.

In general, even if the student did not show activity, or did not participate in the questions and answers, he can be given the smallest score, taking into account that he has memorized something in the course of the lesson. This encourages the student to be more active in this type of lessons later. If a situation like the one above arises, each teacher can solve it by himself, depending on the situation, or he can leave it to a group or team.

Sometimes a group's "scorekeepers" may make inaccuracies or add ups in their scoring, resulting in some groups' total scores being very little different from those of other groups. The teacher mentions in advance that the students' true assessment depends on their chosen "accountants". If the total accumulated points, when distributed among the group members, exceed the maximum points set for this exercise, then the necessary points for this exercise can be deducted, and the surplus can be transferred to the next exercise or the final control.

Step 14. The teacher ends the lesson after scoring each student.

He evaluates the work of students, expresses his opinion on the given answers and addresses them with the following questions:

- What did you learn from today's training?

- what did you learn?

- what was new for you?

- what else would you like to know?

Step 15. The teacher listens carefully to the students' answers, thanks them and ends the lesson.

This technology is aimed at learning the educational material in a deep and integrated state, creatively understanding it, and freely mastering it during one session. Using the technology presented in the article, it is possible to organize classes effectively [1-30]. It is recommended to use various modern pedagogical technologies in order to increase students' interest during the training session. The use of modern educational technologies not only increases students' interest in science, but also helps them acquire deep knowledge and skills.

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