Volume 6, No.10, October 2019
Journal of Global Research in Mathematical Archives
ISSN 2320 – 5822
RESEARCH PAPER
Available online at http://www.jgrma.info

ORGANIZING EDUCATIONAL ACTIVITIES BASED ON INTERACTIVE METHODS ON MATHEMATICS SUBJECT

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Abstract: This article deals with some suggestions on how effectively organize math classes. Some interactive methods used in the learning process have been analyzed in the Functional Analysis lesson on the topic of “The spectrum and resolvent of linear operators”.

INTRODUCTION

Students' learning activities are reflected in their mental activities, such as listening to the lessons and analyzing the material, comparing and drawing conclusions. As is well known, in traditional education students learn by listening to the teacher's lectures and practical exercises prepared by the teacher, compiled and organized by the examples. In this reproductive learning process students become simple observers and listeners of the learning process by memorizing the arguments that the teacher writes, copying and replicating what they have learned.

These traditional methods of teaching and educating students based on the modern requirements is not available. That is why the practice of using a number of methods, such as question-answer, debate, problem-solving, modular, simulation games and open communication from student and teacher to active participants in the learning process is widely used. This article focuses on using interactive methods in the study of the theme “Linear operator's spectrum and resolution” on the subject of Functional Analysis.

USING OF INTERACTIVE METHODS

Many interactive teaching methods can be used in teaching the subject. One of these methods is the "Mind Attack" method. In this method the learners can freely collect and express ideas and on a particular problem and then come up with a solution. The "brainstorming" method has written and oral forms. As for oral form, we ask students whether the range of any linear operator is a limited set. Students make clear and concise statements based on their answers. In the written form, students write their answers on paper cards in a brief and visible way about the spectrum of the operator. Answers will be attached to a blackboard (using magnets) or a pinboard board (with a needle). It is possible to classify answers in the written form of the “Brainstorming” method. Using properly and positively this method gives opportunity the individual to think freely, creatively and non-standard.

Using the "Brainstorming" method provides an opportunity to interact all students, including to develop a culture of communication and discussion. For example, you ask the first student the following question: $A: l_2 \to l_2$, $Ax = (x_1, \frac{1}{2}x_2, ..., \frac{1}{n}x_n, ...)$ Is there a bounded spectrum of operators? If limited, give an example of a preserving circle. Then give the same question to the second student $A: l_2 \to l_2$, $Ax = (3x_1, x_2, \frac{1}{3}x_3, ..., \frac{1}{3^{n-2}}x_n, ...)$ is for an operator, for another student you can ask $A: l_2 \to l_2$, $Ax = (4x_1, x_2, \frac{1}{4}x_3, ..., \frac{1}{4^{n-2}}x_n, ...)$ can cover all students in the classroom by continuing the questions and so on.

The basic rules of using the "Brainstorming" method are:
1. The ideas expressed are not discussed and evaluated.
2. Any ideas expressed are taken into account, even if they are not true.
3. Every student must attend.

In this way, a problematic question is asked, ideas are listened and summarized, grouped and true or false answers are selected. Let us now explain the benefits of the "Brainstorming" method:

- the underestimation of results in the formation of different ideas in students;
- all students participate;
- feedback is visualized;
- the opportunity to check the initial knowledge of students;
- to stimulate students to the topic.

The method has the following disadvantages:
- Inability of the teacher to ask a question correctly;
- high level of listening skills requirements from the teacher.

Now let's move to the next method. This is a "Small group work method" where students work in a classroom to study the instructional material or to do the assigned task in order to activate the students.When using the "small group" method the teacher saves time compared to other interactive methods as a teacher can simultaneously engage and evaluate all students. Here's how to use the "Small Group" method:

Initially, the spectrum and components of the linear operator are explained and information about their finding is provided. Subgroups are then formed, for example group students are subdivided into 4 subgroups. Each of them is given tasks that the difficulty is equal. For example:

Task for Group 1: $A: L_2[0,1] \to L_2[0,1],\ (Ax)(t) = (t+1)x(t) - t\int_0^1 sx(s)ds$

Find the operator's essential and discrete spectra? Justify your answer.

Task for Group 2: $A: L_2[0,1] \to L_2[0,1],\ (Ax)(t) = (t^2+1)x(t) - t^2\int_0^1 s^2x(s)ds$

Find the operator's essential and discrete spectra? Justify your answer.

Task for Group 3: $A: L_2[0,1] \to L_2[0,1],\ (Ax)(t) = (t^3+1)x(t) - t^3\int_0^1 s^3x(s)ds$

Find the operator's essential and discrete spectra? Justify your answer.

Task for Group 4: $A: L_2[0,1] \to L_2[0,1],\ (Ax)(t) = (t^4+1)x(t) - t^4\int_0^1 s^4x(s)ds$

Find the operator's essential and discrete spectra? Justify your answer.

All groups will be given directions and four groups will be invited to give their answers after the set time. Group responses will be discussed, analyzed and evaluated.

Advantages of working in “Small groups”:
- leading to better mastering of learning content;
- improving communicative skills;
- it is possible to save time;
- all students are involved;
- There is an opportunity of intergroup self-assessment.

The disadvantages of the method of working in “Small groups”:
- as some subgroups have weak students, strong students are also likely to get low marks;
- lack of control over all students;
- negative inter-group competition may occur;
- there may be conflicts within the group.

In summary, teaching mathematics in higher education institutions using interactive methods above gives students the ability to think independently, develops thinking, develops creativity and increases the effectiveness of teacher-student interaction and produces guaranteed results in the learning process.

The lattice models associated with the system of three-particles on a lattices is considered in [1-6] and studied their essential and discrete spectrum. In the proving the main results the methods of Functional analysis and modern mathematical physics are used. The spectrum of the 2x2 operator matrices are investigated in the following papers [7-10]. Spectral properties of the 3x3, 4x4 and nxn operator matrices are studied in [11-21], [22,23] and [24], respectively.

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