Implementation of applied orientation learning in the process of lectural work and in the practical classes of mathematical analysis course

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Abstract. This article is dedicated to the implementation of an applied orientation course of mathematical analysis in pedagogical institute. problem of implementation applied orientation training mathematical analysis is one of the most important methods of teaching mathematics in pedagogical institue.in the beginning was revealed condition considered problems in the theory and practical's of training mathematical analysis. In the practical it is justified that course of mathematical analysis plays an important role in fundamental preparation of teachers of math's, especially in understanding the essence of applied orientation learning math is thematic and being master in mathematical modeling. Method for using applied tasks has been devolved that improves the efficiency of learning in the course of mathematical analysis. the technique for reading lectures and for conducting practical classes in mathematical analysis course has been proposed which has given it direction to applied orientation. For the purpose of realization of problematical method in learning as well as developing lectures on topic «specific integral».
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Introduction

Mathematical analysis plays important role in fundamental mathematical preparation of future's teacher not only in plan formation in student of particular level in mathematical culture but in plan of formation in himself scientific point of view, especially in following competency like understanding essence of applied orientation learning in mathematics, owning methods of mathematical modeling, ability of fulfilling inter subject connections.

Especially underlining the applied orientation nature of mathematical analysis course. It is always an active problem of giving school students the skills of constructing mathematical models, to give them skills of constructing and solving tasks like applied and practical nature.it means that it is essential to format profesnals skills in future's mathematics teachers for realizing of applied orientation nature of under learning mathematical courses. And this is needed,first of all in data of mathematical analysis.

Lecture has an important place in the institution learning system. Only in lectures student come across the world of new ideas and in front of him is opened wider perspective of using mathematical methods for defying the world around us in different practical situations.

For institute lecture in modern facilities there are different type of requirements: lecture must differentiate with its containing, logics and proves, its information(new info (delivery of speech and its access etc.

Lecture in higher schools focus on fulfilling in learning process following functions, information, orientation, methodical devolving and bringing up etc. However, as it is rule in lecture classes are realized efficiently two functions methodical and informatical, that's why no needed attention is paid to the orientation, devolving and bringing up activities.

Noticeable influence upon logic illustration is provided by choose method of learning.it is a well known fact that in high schools at present during the delivery of lecture is used illustration explaining method basically which no doubt of its all pluses do not help the students in devolving their artistic abilites.such type of guarantee can provide only method of problematical illustration and heuristic discussion.

In traditional lecture reading exists few disadvantages; it has often unilateral deductive character, students most of the time are busy in taking notes and not thinking about the material of lecture. Such type of learning is responsible for passive learning and indifference towards their studies in students. One of the solutions to this problem is enrichment of lecture with methodical basics of current science applying applied orientation which provides the students deep understanding of expounded theoretical material. Such type of enrichment, in turn demands certain applied orientation in course of lecture, which skillfully

applies different applications of teaching methods like; heuristic, problematic etc.

Advantage of application of problematic method in learning process is that it clearly helps students in solving different tasks of applied orientation using their creativity which helps them being activated in research processes. The need to use the problematic application follows; first of all, university students get a lot of ready made material without any special efforts; secondly, it helps in preparation the new specialists in schools who not only know how to solve problems and tasks concerned with math's but they know history and possible ways of its development in future.

Content of lecture in mathematical analysis course should meet higher requirements both in scientifically and methodically, and lecture should illuminate clearly programmer materials. However we must not forget about that listeners are the future teachers and obviously they will apply the methods used by the lecture in their future work. That's why in lecture reading processes and during the practical classes in mathematical analysis course teachers should use that method of learnings which will be learned by students in course of methodology of teaching mathematics.

One of such type of methods is problematic method of learning

Lectures on this topic in course of mathematical analysis has big opportunities in realization of applied orientation of expounded creativity material.

Below is given illustration of said development of one lecture.

Methodical development of lecture on topic «definite integral» [1].

Lecture get started by the examination of two tasks, these tasks are taken from different areas, one from geometry,second from mechanics. For their solution we will apply same method.

1) Task about curved area trapeze [1].

In school syllabus in elementary geometry followings are included; squares rectangular figures; triangle trapeze, polygon etc. The only curvilinear figure, square which is included in their studies is circle.

Let us see another geometrical task;

Calculate square of flat curvilinear figure,which is of enough general type. The object is limited curved from the top.

$$y = f(x), \quad a \le x \le b$$

$f(x) \ge 0$, c sides two straight $x = a$ and $x = b$ a below or downward segment axis is OX.

Such type of figure is called curvilinear trapeze. Task is to find out its square. Its square P before calculation will be like this [2]

$$P = \lim_{\lambda \to 0} \sum_{i=0}^{n-1} f(\xi_i)\Delta x_i \qquad (1)$$

Task of calculating square of curvilinear trapeze bring us to the review of limit of the form

$$\sigma = \sum_{i=0}^{n-1} f(\xi_i)\Delta x_i \qquad (2)$$

Like this,new approach in finding square of curvilinear trapeze is achieved with the help of applying operation limit transition, taken already from the well known understanding of square of rectangular. Finding the operation limit transition Not only the task of calculation of square of curvilinear trapeze,but for solving many other tasks of physics, in modern techniques and in natural history

2) Task about passed way [1]

Second task we will take from mechanics

Defang way S , passed material dot in interval of time from the moment t_0 t0 to T, if speed of movement of dot is known as function of time t, then $v = f(t)$.

Consider, that during first interval of time dot is moving with a constant speed which is equal $v_i = f(\tau_i)$.

For solving this task lets have a look upon boundary summit

$$s = \lim_{\lambda \to 0} \sum_{i=0}^{n-1} f(\tau_i)\Delta t_i \qquad (3)$$

By solving both task,as we can see the result is one and same calculated process and it bring us to review of operation limit transition (2) i.e

$$\lim_{\lambda \to 0} \sum_{i=0}^{n-1} f(\xi_i)\Delta x_i \qquad (4)$$

Studding such type of task bring us to the understanding of definite integral.

Definition: If exists final point of integral sum (2) $[\text{lambda}] \to 0$, not depended upon method of dividing interval $[a, b]$ by parts, nor upon choosing dots $[a, b]_i$, then this predel will be called definite integral of function $f(x)$ upon interval $[a, b]$ and presented by following symbol

$$I = \int_a^b f(x)dx \qquad (5)$$

And like this

$$\int_a^b f(x)dx = \lim_{\lambda \to 0} \sum_{i=0}^{n-1} f(\xi_i)\Delta x_i \qquad (6)$$

Function $f(x)$ in this case is called integral in interval $[a, b]$. Whereas a and b are lower and upper sides of integral respectively, $f(x)$ under integral function, x application of integration.

Returning to tasks,which we observed early we can use formulas which we used in the tasks for circle P curvilinear trapeze and passed way s in following way

$$P = \int_a^b f(x)dx, \qquad s = \int_{t_0}^{T} f(t)dt \qquad (7)$$

A question in the minds of students clicks here,development method of calculation of definite integral,as calculation of definite integral by method based upon definite integral as limit integral transitions it is rule it is connected with bigger difficulties even in simple situations. That's why the question arises here to find out another practical, confident and easy method for calculating definite integral. Such qualities provides us basic formula of calculating definite integral which is called Newton Leibniz [3] formula which is given as below

$$\int_a^b f(x)dx = F(x)\Big|_a^b = F(b) - F(a) \qquad (8)$$

This formula is helpful for close contact between two fundamental branches of mathematical analysis i. Differential and integral calculation. This connection at first was discovered by Newton and Leibniz [4]. That s why this formula unites their names. With the discovery of this formula the most important in mathematical analysis the concept of definite integral has gotten its bigger importance in mathematics and its calculation, which it has now a days. This formula has widely expanded the application of definite integral, and due to this formula now it is possible to solve different tasks of geometry, mechanics and other branches of physics with one and same method.

After the students get introduced with such method, we will proceed our task. Some tasks we will solve during the lecture while other we will solve in the practical classes. For solving such type of task three methods can be applied we will show it. We will show how to illustrate in example of one of these tasks [5].

Task 1. From a round log of diameter d it is required to cut beam of cross section in that way that it is in the saw horizontal position had a greatest strength.(it is well known fact that the strength is directly proportional to the product of the width of the section on square of the height section.)

Solution. First it is required to formalize tasks that is to convert tasks into adequate mathematical language, in our case into differential calculation. For this we will show width of section by x and high by h. Then strength is introduced by formula, $\varphi = kxh^2$ where k coefficient of proportion.

In addition the dependence between x and h is determined equally

$x^2 + h^2 = d^2$ wherefrom $h^2 = d^2 - x^2$. Substituting this value, we obtain function of one variable

$\varphi(x) = kx(d^2 - x^2)$, where $0 \le x \le d$. Compilation of function ends step of formalization. The resulting function is a model of the original problem.

Next step - It is step of solution of model tasks, in our case solution of current task. For this we investigate

$\varphi'(x) = k(d^2 - 3x^2)$,

$d^2 - 3x^2 = 0$, wherefrom $x = \frac{d}{\sqrt{3}}$.

As $\varphi(x)$ continuous on $[0, d]$, non-negative and $\varphi(0) = \varphi(d) = 0$, then it can be argued that $\varphi\left(\frac{d}{\sqrt{3}}\right)$ Will be the greatest value of the function i.e greatest strength. Where $h = \sqrt{d^2 - \frac{d^2}{3}} = d\sqrt{\frac{2}{3}}$ And relations

$$\frac{h}{x} = \frac{d\sqrt{\frac{2}{3}}}{d}\sqrt{3} = \sqrt{2}$$

Third stage - This is the stage of interpretation of the solution at this stage the solution is reduced to the ratio of the solution with the initial solution. In our case maximum resistance of beam on

bending will be in this case when height of cross section in $\sqrt{2}$ will be two times more than the width. Basics of professional pedagogical practical classes of mathematics in pedagogical institute is consisting of some purposes as,participation of future teacher in classes so that he can understand the role and exact place of tasks while teaching mathematics, to learn how to solve the tasks by himself and to teach these skills to others etc.

It puts before students two very important tasks; first is connected with selection of system of exercises and second is connected with his independent activity in the class.

In conclusion five followings are basic tasks while teaching future math's teachers;

1) Training (connected with formation in students system of mathematical knowledge and skills)

2) Developing (this helps in developing mathematical thinking)

3) Cultivating (this one is connected with formation of cognitive interest, independence and intellect in students)

4) Controlling (this is connected with the checking of quality of assimilation in students with the learning material)

5) Methodical (related with learning and task solving skills of future teachers)

First four functions were putted By Collagen. U.M. [6]. While methodical function was putted by A.J. Mordkovich [7] in his doctor's dissertation, in this formulated requirements towards selection of system of exercises for practical math's class in pedagogical institute.

A) System of exercises must give integrated views about all five functions of tasks.

B) If talking especially about such functions like training, developing,bringing up, and controlling than in each task one of these function appears contrastingly main however, it is not recommended to forget about other functions of task.

C) One should try that methodical function was among the leading in many problems which are included in system of exercises for current practical classes.

In our opinion inclusion of applied task in course of mathematical analysis allows successful combination of all deductive functions of a practical class i.e. screening, training and cognitive. Moreover,it helps solving the problem of preparation of future math's teacher who can successfully realize applied orientation of the course «algebra and basics of analysis» during the process of teaching in the school. Many applied tasks help in finding the largest and the smallest values given on the interval.

Task 2. In a given sphere enter a cylinder which is having the largest side surface [5].

Solution. Lets radius of sphere R, base of cylinder represented by r, then height of cylinder h is calculated by formula $h = 2\sqrt{R^2 - r^2}$ side surface S, by formula

$$S = 2\pi r 2\sqrt{R^2 - r^2}$$ wherein $0 < r < R$ hence

$$S' = 4\pi\left(\sqrt{R^2 - r^2} - \frac{r^2}{\sqrt{R^2 - r^2}}\right) = 4\pi\frac{R^2 - 2r^2}{\sqrt{R^2 - r^2}}$$

$S' = 0$ at $R^2 - 2r^2 = 0$ whence $\frac{R}{\sqrt{2}}$

Function S is continuous and positive on $[0, R]$. At the ends of segment it is equal to zero.

Hence inside of segment and exactly at $r = \frac{R}{\sqrt{2}}$, It has greatest value. Cylinder with such radius will be sought.

During practical classes in mathematical analysis is used widely individual approach during the learning process. Without paying attention to special features like thinking of student, quality of his memory and also his character and will we cannot achieve strong assimilation of material.

As individualization and it can achieve freedom of choice by students by their level of assimilation of theoretical material and getting skills of solutions of tasks and examples by them. Students are proposed three levels.

First it is satisfactory level and it is compulsory. Students which have not achieved this level cannot continue further training in current course. Obviously this level deals with full assimilation of students with programmer materials getting skills which are needed for their future professional activities.

Second level-Good level requires having skills of solving original tasks and solving non standard situations

Third level is excellent level and requires having skills of solving creative tasks and getting skills of investigating scientific problems of current course.

For example on the topic of Definite integral was given following tasks [5]:

Task3. By applying formula of Newton and Leibniz to find out integral

$$\int_0^{\pi/2} \sin^2 x dx$$

Task4. By using rule of changing application in definite integral,calculate integral [8].

$$\int_1^e \frac{\sin \ell nx}{x} dx$$

Task5. Calculate integral by method of integration in parts

$$\int_0^1 xe^x dx$$

For second level except examples and tasks of first level were proposed following tasks [9]

Task6. Calculate integral

$$\int_0^{\pi} \sqrt{\frac{1+\cos 2x}{2}} dx$$

Task7. Calculate integral

$$\int_{-7}^{7} \frac{x^4 \sin x}{x^6 + 2} dx$$

Solution of given examples suggests application of properties of definite integral and preliminary conversion of integrand function [10].

For third level except tasks of first two levels additionally proposed two tasks one from geometry and other from physical content.

Task8. Calculate square with restrictions of Bernoulli lemniscuses

$$r^2 = a^2 \cos 2\theta \qquad (a > 0)$$

Task9. Electrical charge E concentrated in early coordinates, repels charge e from dots (a,0) to dot (b,0). Determine the repulsive force F [5].

Solution of such type of tasks requires borrowing knowledge from other fields of science which appears as difficult thing for students.

Practical classes as our experience shows brings great benefit than those methods which were conducted before. They produce in students skills mathematizing the observed process and this is what which should be the characteristic of math's teacher.

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