DEVELOPING CREATIVE COMPETENCE THROUGH THE FORMATION OF SCIENTIFIC GENERALIZATION IN STUDENTS

Makhmudova Dilfuza Melievna
National University of Uzbekistan named after Mirzo Ulugbek,
Associate Professor, Doctor of Philosophy in Pedagogical Sciences (PhD
&
Akhmedova Zakiya Narimbetova
Senior teacher of Chirchik Pedagogy Institute

ABSTRACT

It is known that the development of creative competence is based on the development of independent thinking. This can be done in the following areas: scientific generalization-induction, ability to apply scientific results to specific problems - deduction and finally to be able to feel the contradictions between scientific generalizations and processes occurring in nature. The following article deals with the problem of developing students' creative abilities and scientific generalization based on solving problems of mechanics.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Fostering and upbringing of young people for creative scientific work has always been the basis for the successful development of science and these tasks are carried out in our country, mainly in higher education. The development of creative activity in students requires special attention. This complicates the process of working with such students. The reason is that spending a lot of time working with them (especially in the early days) will require creating conditions for them to be able to tell each other their results (e.g. organizing small workshops).

This following article deals with the problem as implementation of scientific generalization in the classroom. Numerous psychological and pedagogical studies have been devoted to the study of these cases, for example N.A. Menchinsky, D.N. Bogoyavlensky, V.I. Zikova, E.N. Kobanova-Meller, G.V. Zlotsky, Z.I. Kalmikova's investigations can be included here.

Experience has shown that students have more opportunities to develop independent thinking and, consequently, to develop creative abilities by solving problems in mathematics and physics. In the teaching of mathematics and physics, this work can be started in the 1st and 2nd courses.

The questions given in the usual textbooks and problem sets are not always aimed at developing independent thinking. They are mainly aimed at strengthening and mastering the basic elements of the topic. This is natural. Therefore, the solution of these problems often ends with the collection of data and putting it into the necessary formula. It is only possible to find the desired formula for the student independently.

In our view, students should be given questions that are vague with one or more subtle areas. For example: A tourist is lost in a forest in the form of a strip (a part of a plane bounded by two parallel straight lines). How should he try to get out of the woods? The student must find a trajectory that the tourist can definitely get out of the woods. Another question: there given two points A and B that do not lie in a vertical straight line in the vertical plane. Find a line connecting A and B so that the material sphere rounded from point A along this line reaches

ISSN 2056-5852

point B as soon as possible. This is the famous "Brakhistakhron problem", which can be easily solved by a student who is familiar with variation calculation. Such issues are usually offered to students in Olympiads.

In this article we have focused on how to develop scientific generalization in students by developing a scientific-methodological approach.

Putting common issues. Let us consider the motion of the non-inertial points E “escaping” and P “chasing”. The direction of motion of the points can be changed arbitrarily, and its magnitude is limited by fixed numbers. E point velocity is limited by the number *v*, *k*, and point velocity P is bounded by *u* and *l*.

Thus the equation of motion of the points can be written as follows

$$\dot{r}_{\mathrm{E}} = \upsilon,\ |\upsilon| \le k,\ \dot{r}_{\mathrm{P}} = u,\ |u \le l|$$

Here r_{E} $-$E point’s radius and vector; r_{P} is P point’s radius and vector; $\upsilon -$E point’s vector speed; $u -$P point’s vector speed. P point moving along the Ox beams is in the initial $t = t_0$ time E_0 (Figure 1)

If

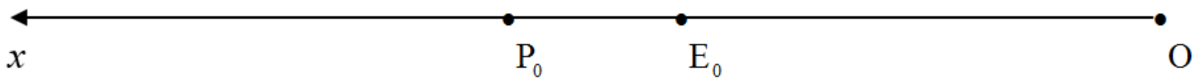

Figure 1

P point is at $t = t_0$ time, $\mathrm{P}_0 \ne \mathrm{E}_0$ and $\mathrm{P}_0\mathrm{E}_0 = L > 0$ position. Besides, there is given optional $\varepsilon > 0$. Lets say P point moving along the Ox beam with *k* speed movement is optional. E point is required to control in a such way, that as a result in all cases of $t \ge t_0$ nominal movement is around the ε, P from “escaping” stays in non 0 distance, it means it shouldn’t catch the chaser.

Problem 1. If $k > 4$, the following problem has a positive solution.

Solution. We suggest to the point E quickly moving with the speed *k* first along the broken line $\mathrm{E}_0\mathrm{E}_1\mathrm{E}_2\mathrm{E}_3$ (see Figure 2), then again along the beam Ox.

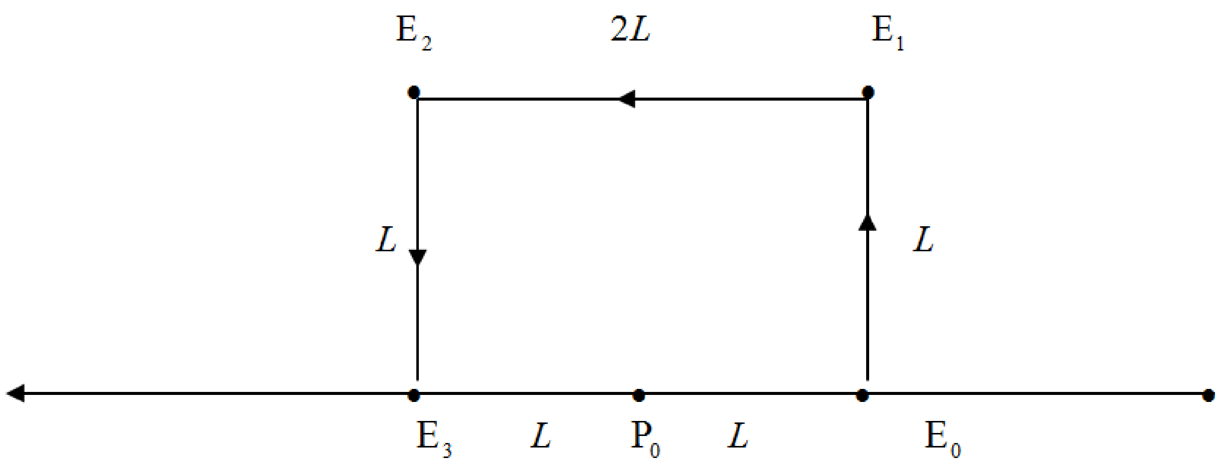

Figure 2

If escaping E point moves like this, in all $t \geq t_0$ P doesn't catch with chase point. Now we really show that in $t = t_0$ is $P_0 \neq E_0$, then E_0, E_1, E_2, E_3 broken line will not be $P \neq E$. At $t = t_0$ time P point is at P_0 position, it's maximal speed is equal in 1 and y catches the distance L at t time.From the figure we can see $E_0E_1E_2E_3$ broken line all points are in P_0 that is not little than L distance. E point at $t = t_0$ time E_0 position and the speed is equal to $k(> 4)$, y $E_0E_1E_2E_3$ broken line length $4L$ catches the distance at $T = \frac{4L}{k} < L$ time. Thus, P escaping point moves from P_0 position along the Ox beam straight to E_3 point with maximal speed *l*, it cannot reach the E escaping point. Escaping E in the movement the next E_3 along the Ox beam to the fugitive, it is possible to make sure that the fugitive cannot reach P chaser. Part 1 of the issue has been resolved.

In the second part of the problem, E should stay around the $\varepsilon > 0$ nominal movement. This condition can be fulfilled by minimizing *L*. For this, $L < \varepsilon$ the escape point is enough to wait for this inequality to be satisfied.

Problem 2. If $4 \geq k > \pi$, the following problem has a positive solution.
Solution. We suggest to the point E quickly moving with the speed *k* first along the broken line E_0, E_1, E_2 (see Figure 3) the center is in the P_0 point along the circle with the radius *L*, then again along the beam Ox.

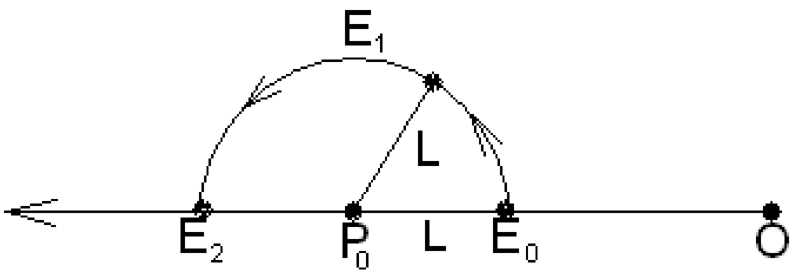

Figure 3

If the escaping point E acts in this way, in all cases $t \geq t_0$, the chasing point P is not caught. In fact, we show that in $t = t_0$ is $P_0 \neq E_0$, now E_0, E_1, E_2 it is no longer in $P \neq E$ motion in a circle piece. In $t = t_0$ time P point is in the P_0 position, its maximum velocity is *l*, *y* catches the *L* distance in time *L*. E_0, E_1, E_2 an arbitrary point of the circle piece is located at a distance from P_0 the point *L* according to its construction. E point reaches the distance E_0, E_1, E_2 circle piece length $\pi\ L$ the distance in time $\pi\ L$. As in the previous example, the P chaser cannot catch the E moving point in the circular motion. It is clear that the point E cannot reach the point P in the motion of the light Ox in the position E_3. The first part of the problem is solved; the second part is solved similar to problem 1.

Problem 3. If $\pi \geq k > 1$, the following problem has a positive solution and the distance from P chase point to e escaping point will not be less than *L*.

Solution. Now we deal with constructing the line which is required for E escaping point. We suggest moving E point quickly moving with the speed *k* first along the broken line E_0, E_1, E_2 firstly (see Figure 4), then along the post constructing line, then along the Ox beam.

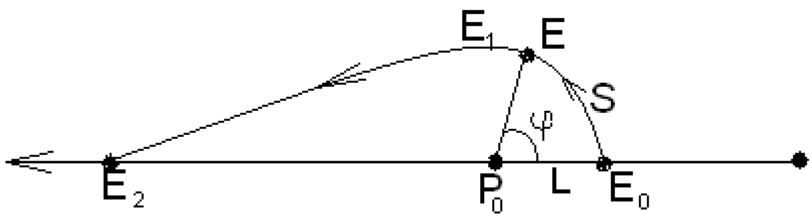

Figure 4

E_0, E_1, E_2 comes from the task $EP \geq L$. For this, we determine Б $r = r(\varphi)$ by P_0 (P in the position $t = t_0$) the distance from the fixed point to the moving E point; by φ - with $1E_0P_0$ cut EP_0 the angle between the cuts; s -by E_0E we determine the length of the curved piece.

According to the triangle inequality $EP \geq EP_0 - P_0P = r(\varphi) - P_0P$. P as the velocity of the point is not greater than 1, and the speed point is not bigger than 1, $P_0P \leq u \cdot (t - t_0) \leq \frac{s}{k}$. Here we obtain:

$$EP \geq EP_0 - \frac{s}{k} = r(\varphi) - \frac{s}{k}.$$

Here the point e is a passed way, for s we have used $s = k(t - t_0)$ expression. In E_0, E_1, E_2 line for fulfilling the task $EP \geq L$

$$r(\varphi) - \frac{s}{k} = L, \quad r(\varphi) = \frac{s}{k} + L$$

is enough. Now by differentiating both parts of this expression we obtain the following equation in the polar coordinate system.

$$dr = \frac{1}{k} ds = \frac{(dr^2 + r^2 d\varphi^2)^{\frac{1}{2}}}{k}$$

We integrate this differential equation $r(0) = L$ in the initial condition. We square both parts of the equation, separate the variables, and then integrate to get:

$$dr^2 = \frac{dr^2 + r^2 d\varphi^2}{k^2} \quad ; \ (1 - \frac{1}{k^2}) \frac{dr^2}{r^2} = d\varphi^2;$$

$$\frac{k}{\sqrt{k^2 - 1}} \cdot \frac{dr}{r} = d\varphi; \quad \frac{k}{\sqrt{k^2 - 1}} \int_0^{\varphi} \frac{dr}{r} = \int_0^{\varphi} d\varphi; \ \frac{k}{\sqrt{k^2 - 1}} (\ln r(\varphi) - \ln r(0)) = \varphi;$$

$$\ln \frac{r(\varphi)}{L} = \frac{\sqrt{k^2 - 1}}{k} \varphi;$$

$$r(\varphi) = Le^{\frac{\sqrt{k^2-1}}{k}\varphi}.$$

As you know, it gives a logarithmic helix $r(\varphi) = Le^{\frac{\sqrt{k^2-1}}{k}\varphi}$ in the polar coordinate system, which means that the line E_0, E_1, E_2 that satisfies the condition of the problem is the part of the $0 \le \varphi \le 180^0$ logarithmic helix found.

It is understandable that, if the escaping E point moves along this spiral, it will remain $EP \ge L$ in the league according to its construction, which means that the E point is not only caught P point, but also moves around the a distance L and falls into the light again. The fact that point E is in motion in light $EP \ge L$ easily derived from the above considerations. The second part of the problem is solved as in problem 1.
We offer students to solve the following problems independently:
Problem 4. How to solve a problem if there are 2 or 3 followers in the general problem? What if they are n?
Problem 5. How to solve problems 1,2,3 if the condition that the point E in the general problem remains around the nominal trajectory when it is removed?
Problem 6. The coordinate axis Oxy is included in the plane and is covered with a grid as in Problem 6.
Escaping E point $\dot{z} = \upsilon$, $|\upsilon| \le 1$; P_1 and P_2 chase points $\dot{z}_1 = u_1$, $|u_1| \le 1$, $\dot{z}_2 = u_2$, $|u_2| \le 1$ aspects of legitimacy $10L \times 10L$ moving on a net inside a square. Can the chasing points catch the escape point?
Problem 7. In the plane, the escape E point is at the center of the equilateral triangle, and the 3 escape P_1, P_2, P_3 points are at the ends of that triangle.
Their equation of motion is consistent:

$$\dot{y} = \upsilon,\ |\upsilon| \le k,\ \dot{x}_i = u_i,\ |u_i| \le 1,\ i = 1,2,3.$$

What condition must the k satisfy where escaping E point head meet in order to move at maximum speed along the beam at this point and get out without being caught by P_i chasers?
We encourage students to familiarize themselves with the following topics and literature:

1. One task of avoiding many pursuers ([1],VIII chapter , 181-198 pages).
2. The challenge of avoiding meeting in the differential games of many of people [2].

[1] During the reading of the theme “An issue of avoiding too many students” in the book, students will have the opportunity to get acquainted with many other issues of practical importance. This book also covers the search for an object without complete information about it. In the article [2], this problem has been studied when the motion of objects was written with very complex differential equations. Also, this article includes various details of generalizations and examples.

REFERENCES

1. Chernousko F.L., Melikyan A.A. Game management and search tasks. -Moscow: 1978.270p.
2. Mishchenko E.F., Nikolsky M.S., Satimov N. Proceedings of Mathematical Institute named afrer V.A. Steklova.-Moscow: 1977. - P.143.
3. Zlotsky G.V. Psychological-pedagogical and methodological- mathematical preparation of students of university mathematicians for professional and pedagogical activities. Problems of education. - Tashkent, 2000, Volume № 2, - P. 28-30.
4.Makhmudova D.M.,Methodology for the Formation of Creative Competence of Future Teachers in the Process of Teaching Mathematics based on a Special Complex of Tasks //

International Journal of Psychosocial Rehabilitation ISSN:1475-7192, Volume 24 - Issue 2, February, 2020.– P. 616-627. https://www.psychosocial.com/article/PR200376/9945/