

ABOUT A WAY TO EVALUATE STUDENTS 'INDEPENDENT LEARNING

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Annotation: The method proposed as one of the solutions to the problem of assessing the independent learning of students proves to be one of the criteria of assessment that is actively used today. It has been shown that this method can be used in the assessment of independent study of theoretical mechanics.

Keywords: independent learning, static exact, static uncertain, general vector, general moment, invariant, velocity, acceleration, forced oscillating motion, force of inertia, principle, students, bank of questions.

Theoretical mechanics taught in higher education institutions helps students to form important features such as finding technical solutions, logical thinking, analysis of facts, generalization and division into organizers, concise description. The main task of professors and teachers working in this field is to present the subject to students in a more understandable, interesting and visual way, to create a methodological framework for the full mastery of independent educational topics by students. The use of Venn diagrams in organized lessons is presented in the works [1,4,8,13]. Practical solutions have been given in the study [3] to increase the visualization of lessons by applying the cluster method to the teaching process. Research [2,12] discusses ways to increase student engagement in the classroom. Studies on the application of the confusing logic chain method to the science of theoretical mechanics are presented in [6,9,10,11]. The results of theoretical and pedagogical research on the digitization of education are described in [14 - 17].

The method of "confusing logical chain" is used effectively in the study of cause-and-effect relationships of any event. When a student confuses information such as formulas, phrases, definitions, axioms, theorems in the process of studying independent learning topics, he learns to match the correct ones from them. Students will need to place them correctly, putting each answer in its place in order. For example, students of the Institute of Technology "Machinery and Equipment" study Theoretical Mechanics in the second semester of the first year. The topics of independent study are given below:

Independent study topics

1. Laws of friction in sliding. Friction angle. Friction cone. Equilibrium of bodies in terms of friction.
2. Static explicit and static indefinite issues. Equilibrium of a system consisting of several bodies.
3. Invariants of a system of forces in space.
4. The instantaneous center of accelerations of plane points
5. The effect of environmental resistance on the forced oscillating motion of a material point.

6. Shear and Coriolis inertial forces. The effect of coriolis inertial forces on terrestrial bodies.
7. Calculate the moments of inertia of bodies with respect to parallel axes. Moments of centrifugal inertia. Moments of inertia about an arbitrary axis passing through a given point of the body.
8. Determine the dynamic pressure exerted by a rigid body rotating on a fixed axis on the axis of rotation using the D'alambert principle.
9. Apply the principle of possible migration to the determination of coupling reactions.

Theoretical Mechanics is devoted to independent study "Laws of friction in sliding. Friction angle. Friction cone. Let us consider the application of the topic "Equilibrium of bodies in terms of friction" to check the independent study. In this case, students are offered a set of no more than 5-10 questions on the topic. The following is a table corresponding to the above topic:

Find compatibility in the following questions:

1	Show the formula for calculating the friction force in rolling	1	$F_{ish} = f \cdot N$
2	How the friction force is directed	2	$\vec{R} = \vec{N} + \vec{F}_{ish}$
3	How static problems are solved given the friction force	3	Equilibrium equations are solved by adding the formula for finding the friction force
4	Show the formula for calculating the friction force in sliding	4	$F_{ish} = \frac{\delta}{R} \cdot N$
5	Show the formula for the total reaction force	5	It is always in the opposite direction

Correct answers (4, 5,3,1,2).

This method should now also take into account their knowledge of independent study topics for intermediate control in the field of theoretical mechanics. Therefore, a variant of the bank of questions covering independent study is given below. In this case, the level of mastery of the studied topic is used to conduct an intermediate assessment of students' knowledge in a non-traditional way. The number of questions in a structured table is usually taken as 10-20.

Find compatibility in the questions:

1	The number of unknowns in a given problem is greater than the equilibrium equations. What kind of issue is this?	1	Static is a definite issue
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2	The connection is given in the plane. How many equilibrium equations are formed for them?	2	The system of forces consists of only one principal vector
3	Give a definition of a static exact issue	3	When an arbitrary system of forces in space is brought to a point, the given forces are exchanged for a head vector equal to the geometric sum and the head moment equal to the geometric sum of the added pair of moments
4	In the case under consideration, the number of equilibrium conditions is 6 and the number of unknowns is 5. What a matter	4	Static uncertainty
5	Show the formula for calculating the friction force in rolling?	5	To the geometric sum of the added pair moments
6	What is the main vector of the system of forces?	6	Always the opposite of action
7	How is the basic theorem of statics expressed?	7	If the number of unknowns in a given problem is equal to or less than the equilibrium equations
8	What is the velocity vector of the system of forces?	8	$F_{ish} = \frac{\delta}{R} \cdot N$
9	How is the friction force directed?	9	The geometric sum of all the forces acting on the system
10	What happens if the starting torque is zero?	10	At the point where the structure joins, it is divided into two parts, and for each part, 3 separate equations and a total of 6 equations are formed. Addition of 2 equations of reaction forces at the point of connection to it, a total of 8 equations

Correct answers (4,10,7,1,8,9,3,5,6,2).

The application of the proposed method now in the final assessment of students' knowledge on the topics allocated to the independent study of theoretical mechanics also gives positive results. In this case, materials are selected from a bank of questions covering topics of independent study of the subject. Given that the final control is usually designed to take at least a few hours, a spreadsheet consisting of 15-30 questions from all topics of independent study is recommended for students. An

increase in the number of questions usually allows a more accurate assessment of a student's level of knowledge.

Determine the compatibility in the questions:

1	How are the problems solved considering the friction force?	1	A point on a solid body whose acceleration is zero at a given moment
2	What is the difference between static explicit and implicit issues?	2	Equilibrium equations are formed by adding the forces of inertia to the series of reaction forces.
3	How are the reaction forces of a solid body found?	3	Giving a possible shift to the reaction force to be found, the problem is solved by zeroing the work done
4	What is the definition of the instantaneous center of acceleration?	4	The equation of equilibrium is solved by adding the formula of friction force to the series
5	Show the differential equation of forced oscillating motion?	5	$J_{xy} = \sum m_k x_k y_k, \quad J_{yz} = \sum m_k y_k z_k, \quad J_{zx} = \sum m_k z_k x_k$
6	Show the law of forced oscillating motion under the influence of ambient resistance?	6	$I_z = I_{cz} + m \cdot d^2$
7	Show the formula for the moment of inertia of centrifugal force?	7	$\ddot{x} + 2b\dot{x} + k^2 x = P_0 \sin(pt + \delta)$
8	Find the form of the Huygens-Steiner theorem formula?	8	$x = ae^{-bt} \sin(\sqrt{k^2 - b^2} \cdot t + \alpha) + \frac{P_0 \sin(pt + \delta + \beta)}{\sqrt{(k^2 - p^2)^2 + 4b^2 p^2}}$
9	How is dynamic pressure found?	9	If the number of unknowns in the problem is equal to or less than the number of equilibrium equations, it is

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			called a statically definite problem, otherwise it is called a statically uncertain problem.
10	Explain the D'alambert principle?	10	$\vec{a}_B = \vec{a}_A + \vec{a}_{AB}$
11	What is a possible move?	11	Any infinitely small migration that satisfies the connections made to the system
12	How is the principle of possible migration expressed?	12	Vibrational motion when the frequency of free oscillation is equal to the frequency of forced oscillation
13	How are the basic reaction forces found using the principle of possible displacement?	13	The structure is divided into two parts, the balance of each of which is checked separately
14	What is a resonance phenomenon?	14	In order for an ideal, non-releasing stationary system to be in equilibrium, the sum of the active forces applied to it in any possible displacement of the system must be zero and sufficient.
15	By which formula is the acceleration of an arbitrary point on a body in plane parallel motion found?		The active forces acting on the system, if we add the reaction forces at any time to the number of contact reaction forces, their sum is zero.

Correct answers (4,9,13,1,7,8,5,6,2,15,11,14,3,12,10).

The final conclusion is that as a result of the use of the method of "confusing logic" in the assessment of students' knowledge of the subjects allocated to independent study of theoretical mechanics, students can independently organize the topics they study, divide them into components, compare with other topics, understand new information. skills are formed. The use of this method in the assessment of students' knowledge on the topics of independent study allows students to systematically study the knowledge of science, to organize what they have learned, to divide it into parts, to distinguish them from each other. As a result of applying this method, the level of knowledge of students will increase significantly. Expands the teacher's ability to objectively determine the level of knowledge of students, to conduct intermediate and final assessments.

References:

1. Zokirjon Mahmudov. "Application Of Venn Diagrams In Lectures On Theoretical Mechanics". International Journal of Progressive Sciences and Technologies (IJPSAT) Vol.24 No.1 December 2020. pp. 219-222.
2. Zokirjon Mahmudov Sotivoldievich. "A Way To Increase Students Activity In The Organization Of Lectures". International Journal of Progressive Sciences and Technologies (IJPSAT) Vol.25 No.1 February 2021. pp. 90-92.

INTERNATIONAL SCIENTIFIC AND PRACTICE CONFERENCE ON " INTERNATIONAL EXPERIENCE IN INCREASING THE EFFECTIVENESS OF DISTANCE EDUCATION: PROBLEMS AND SOLUTIONS" *SPECIAL ISSUE., 27th JANUARY., 2022., Maharashtra, India*

3. Mahmudov Z.S., Daminov J.A., Rahimov A.M. "The Use Of Cluster Method In Lectures On Theoretical Mechanics". International Journal of Progressive Sciences and Technologies (IJPSAT) Vol.27 No.1 Junio 2021, pp. 145-147.
4. Mahmudov Z.S., Najmiddinov I.B. "Improving the quality of education on the basis of demonstrations in lectures". International Journal of Progressive Sciences and Technologies (IJPSAT) Vol.27 No.2 July 2021, pp. 80-85.
5. Dehkanov U.G., Z. Mahmudov S. "The use of non-conventional power sources is a pequirement of the period". Academcia Globe: Inderscience Research: volum 2, Issue 7, July, 2021, pp. 121-126.
6. Zokirjon Mahmudov Sotivoldievich. "About a new way of assessing students' knowledge in lectures". International Engineering Journal for Research & Development, 2021, volum 6, Issue 5. www.iejrd.com
7. ПОВЫШЕНИЕ БЛАГОСОСТОЯНИЯ НАРОДА-ОСНОВНАЯ ЦЕЛЬ ГОСУДАРСТВА З.С. Махмудов, У.Г. Дехканов. Электронный инновационный вестник, 2021. №3. Стр. 12-14. www.elvestnik.com.
8. DEMONSTRATION IN IMPROVING THE QUALITY OF EDUCATION Z.M. Sotivoldievich, K.V. Rakhimdjanovich. Conference Zone, 304-308
9. The Problem Of Organizing Exhibitions Of Theoretical Mechanics Lessons Z.M. Sotivoldievich, K.V. Rakhimdjanovich. Design Engineering, 9569-9572
10. About the Method of Assessing Students' Knowledge Z.M. Sotivoldievich, K.V. Rakhimdjanovich. Design Engineering, 9579-9585
11. A Method of Assessing Students' Knowledge in Practical Classes. Z.M. Sotivoldievich . Design Engineering, 9573-9578
12. К вопросу о повышения качества лекционных занятий будущим энергетикам З.С. Махмудов, М.М. Тошмирзаев Интернет-портал "Онлайн-электрик", 2014.
13. Применение диаграммы Венна на занятиях. Махмудов З.С. Электронный инновационный вестник. 2021.№1. стр 4-6. www.elvestnik.com.
14. TECHNOLOGIES FOR SHAPING THE DIGITAL CULTURE OF UNDERGRADUATE STUDENTS IN THE INFORMATION-EDUCATIONAL ENVIRONMENT. Maxmudov Abrorjon Zakirovich. INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT, ENGINEERING AND SOCIAL SCIENCE. Volume: 16 Issue: 02 in February 2022.
15. THE DIALECTICAL UNIFICATION OF THE DIGITAL SOCIETY AND THE HUMANIZATION OF HIGHER EDUCATION. Maxmudov Abrorjon Zakirovich. GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ). Vol. 10, Issue 2, Feb. (2022).
16. BAKALAVR TALABALARINING RAQAMLI MADANIYATI ASOSIDA RAQOBATBARDOSHLIK SIFATINING AFZALLIKLARI. Maxmudov Abrorjon Zakirovich. НамДУ илмий ахборотномаси - Научный вестник НамГУ 2021 йил 11-сон. 418-423.
17. RAQAMLI JAMIYAT VA RAQAMLI MADANIYAT. Maxmudov Abrorjon Zakirovich. НамДУ илмий ахборотномаси - Научный вестник НамГУ 2021 йил 12-сон. 549-552.