

# Topical Issues of Introducing Innovative Methods of Conducting Mechanics Lectures and Seminars at Technical Universities

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**Abstract.** The article is dealing with studying innovative methods of conducting lectures and seminars at technical universities. To implement these methods, the teacher is required new organizing of the working time in order to accept and to master modern teaching methods. There is considered the problem of designing and applying the educational process of the university in active, personality-developing forms and methods of teaching students. Examples of innovative lectures and seminars are given. There are considered innovative methods used by teachers when conducting seminars on the cycle of disciplines «Mechanics», designing and implementing features. The listed methods of designing and conducting seminars do not exhaust the entire arsenal of active, developing forms of teaching students. Creative teachers are actively looking for new innovative educational technologies.

**Keywords:** pedagogical innovation, educational technology, lecture, seminar, innovative methods, problem lecture, conversation lecture, discussion lecture, provocation lecture, press conference lecture, brainstorming method, round table method.

## Introduction

Today, the advanced processes that have matured in education are one of the most important areas, and as a consequence, self-discipline and correct organization of their time are required from the teacher to prepare and master the techniques.

The analysis of scientific literature, discussions at conferences and seminars show that modern education is unthinkable without innovative processes; the employee's creative ideas have become the most important product of his activity. To solve this problem, the teacher needs a new organization of working time in order to accept and master modern teaching methods, which actualizes the problem of technological support for the formation of students' research competence. The need to introduce innovative changes in the professional training of students is also due to the fact that today for future leaders and employees there is required not only deep knowledge but also the ability to acquire new knowledge in a rapidly changing situation and to use it for designing their own activities and the activities of subordinates. This dictates the need to search for the most effective forms, methods and technologies of teaching [1].

It should be noted that recently there have

been published works that reveal modern teaching technologies in higher education [2, 4, 5].

The article will consider innovative methods used by teachers at the lectures and seminars at the university [6].

Relevance. Studying a huge number of works on various teaching technologies, where there are observed both traditional and ultramodern methods, you understand that teaching is not limited only to classical traditions [1, 2, 3]. Briefly, we would like to dwell on those methods of conducting classes that can be applied to the disciplines taught at the Department of Mechanics, combining the entire range of disciplines of this cycle with its difficulties and peculiarities. Immediately, there should be noted the difficulties students face when studying. First of all, this is the content of the main tasks, the proposed circumstances, search for solutions to scientific research.

The research purpose is to find such methods of training specialists, which would be aimed at high-quality mastering of knowledge.

Tasks. When mastering the tasks of the cycle under study, three points can be distinguished: first of all, developing the paradigm of independent work, its introduction into the learning process and

summing up the results obtained. An integral part of independent work is the use of modern information technologies. In the modern world knowledge is changing and quickly becoming obsolete even before students have time to acquire it. Therefore, it is necessary to look for more and more new forms of acquiring knowledge. The classes themselves can be divided into two types: traditional and advanced. Traditional classes, in other words, the classic ones, are reduced to a simple and understandable question-answer scheme, preparation of an abstract, its discussion. Advanced methods provide, first of all, the opportunity to approach creatively the conduct of both the material and preparation of the seminar participants themselves. It can be a didactic game and stormy discussions of painful issues closely related to the future profession.

**The research results.** At a technical university, the most important role is given to the lecture, which is at the same time the most difficult type of work, is a creative process in which both the lecturer and the students participate simultaneously. The main task when listening to lectures is to learn thinking, to understand the ideas presented by the lecturer. Lectures are most fully assimilated by those students who, on the eve of the lecture, devote time to revising the previous lecture. Lectures are divided into two groups: traditional and non-traditional (innovative). In the educational process, a number of situations arise when the lecture mode of teaching cannot be replaced by any other.

The lecture performs the following functions: informational (sets out the necessary information), stimulating (awakens interest in the topic), educating, developing (evaluates phenomena, develops thinking), orienting (in the problem, in the literature), clarifying (aimed primarily at the formation of basic concepts science), convincing (with an emphasis on the system of evidence), systematizing and structuring the entire body of knowledge.

Currently, alongside with supporters, there are opponents of the lecture presentation of educational material, who believe that the lecture teaches you to passively perceive other people's opinions, inhibits independent thinking, is necessary only in the absence of textbooks, and in general, many students at the lecture only have time to mechanically record the words of the lecturer [3].

However, experience shows that rejection of

lectures reduces the scientific level of students training, violates the consistency and uniformity of work during the term. Therefore, the lecture continues to be the leading form of organization of the educational process at the university. The main disadvantage of traditional lectures at the university is the students' passivity with a high one-sided activity of the teacher. Therefore, now there are non-traditional lectures that contribute to increasing the activity of students in the classroom. The types of such lectures are presented in Figure 1.

The above disadvantages can be largely overcome by using the so-called non-traditional forms of lectures: problem lecture, lecture-talk, lecture-consultation, lecture provocation, lecture-conference, lecture-visualization.

Let's consider the features of the preparing and conducting each of these types of lectures. At a lecture of the problematic nature, students are in a constant process of mutual creativity with the teacher, i.e. they are co-authors of problem solving. Knowledge acquired in this way becomes the property of students and grows into their beliefs. Self-acquired knowledge is stronger and easier to actualize; it has the properties of transferring to other situations. Problem solving develops intellectual abilities and increases students' interest in the content of professional training. This is a complex type of lecture, it is usually conducted by experienced teachers, associate professors and professors, as a rule.

A lecture-conversation or a "dialogue with the audience" is the most common and relatively simple mode of active involvement of students in the educational process. This lecture assumes direct contact between the teacher and the audience. The advantage of a lecture-conversation is that it allows drawing attention of students to the most important issues of the topic, to determine the content and pace of presentation of educational material, taking into account the characteristics of students. The listeners in a lecture-conversation can be attracted by various methods, for example, by puzzling students with questions at the beginning of the lecture and during its course, as already described in a problem lecture, the questions can be of an informational and problematic nature, to clarify the opinions and level of awareness of students on the topic under consideration, the degree of their readiness to perceive the subsequent material. Questions are addressed to

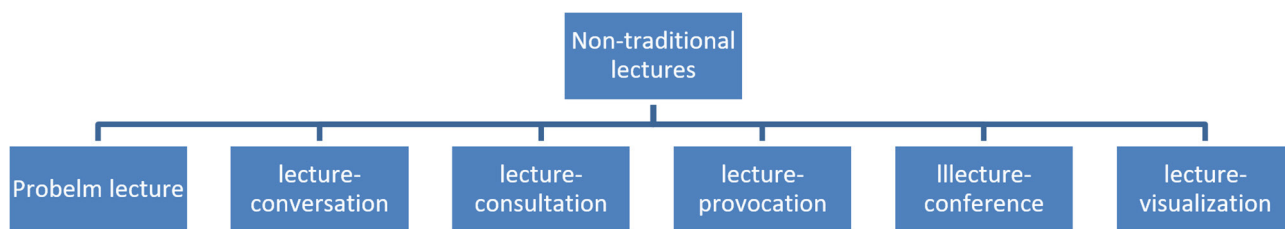


Figure 1 – Non-traditional types of lectures

the entire audience. Students answer from the field. If the teacher notices that one of the students is not participating in the conversation, then the question can be addressed personally to that student, or there is asked his opinion on the problem under discussion.

A lecture-consultation. This type of lecture is preferable when studying topics with a clearly expressed practical focus. There are several options for conducting such lectures, which are presented below. Option 1. During the first part of the lecture, students prepare questions to which the teacher answers with the involvement of the students themselves. Option 2. The teacher collects questions from students in writing in advance. During the lecture, the teacher answers these questions and organizes a free exchange of opinions among students. Option 3. The teacher prepares in advance the questions to be answered in class.

A lecture-provocation is a type of lecture with pre-planned mistakes. Its main feature is that the teacher announces the topic of the lecture in the introductory part and informs of the presence of planned errors in the upcoming lecture. These errors can be in the definition of concepts and categories, dates, events, surnames, quotes, etc. During the lecture, students should notice and then explain the mistakes that were "made" by the teacher.

At a lecture-press conference, two or three teachers of different subject areas can take part. The teacher names the topic of the lecture and asks students to ask him questions on this topic in writing. Each student must within 2-3 minutes formulate the most interesting questions, write on a piece of paper and pass it on to the teacher. Then the teacher within 3-5 minutes sorts the questions according to their semantic content and begins to give a lecture. The presentation of the material is not built as an answer to each question asked but in the form of a coherent disclosure of the topic, in the process of which the corresponding answers are formulated. At the end of the lecture, the teacher conducts a final assessment of the questions as a reflection of the knowledge and interests of the audience.

A lecture-visualization involves the use of illustration, demonstration, and video techniques. The illustration method provides students with the display of illustrated materials, manuals: paintings, posters, diagrams, drawings, graphs,

diagrams, portraits, maps, layouts, atlases, images of information on a chalkboard, etc.

Let's consider the innovative methods used by teachers when conducting seminars on the cycle of disciplines "Mechanics", the design and implementation features. The problems that students face in studying the disciplines of the cycle "Mechanics" are as follows: the content of the main tasks of "Mechanics", complex; including atypical terms and conditions; scientific research. Great importance presents the interaction of the subject activity of teaching and normative methods of solving the main tasks of "Mechanics" in the educational process. The methodological system of independent work in teaching the disciplines of the cycle "Mechanics" (theoretical mechanics, strength of materials, structural mechanics, theory of mechanisms and machines, engineering mechanics) has three levels of design: creating an ideal model for students' independent work, implementing an ideal model in the educational process, correcting and summing up the results of independent work.

To implement these levels, seminars are held, which should consolidate, deepen and expand students' knowledge of the studied discipline and develop them as subjects of educational and professional activities.

Seminars are held on the most complex issues (topics, sections) of the curriculum in order to form students' general cultural and professional competencies. University seminars can be divided into two types: traditional and innovative [7].

Traditional seminars are held in the question-and-answer mode, in the mode of reports and messages or discussion of abstracts. The innovative forms of seminars are presented in Figure 2.

Seminar class in the form of a didactic game. At the university, a didactic game should have a professional orientation. Learners can visibly see the role-playing functions in their future professional activities.

Seminar in the form of debates is distinguished by elaboration of the dispute procedure, which makes the participants face the need to show sharpness of mind, express themselves succinctly, concisely, "take a punch", show volitional qualities, follow the time limit.

Seminar using the brainstorming method.

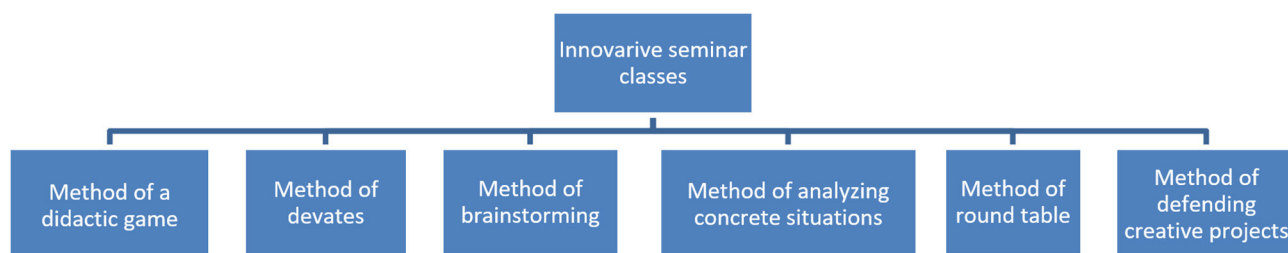


Figure 2 – Innovative forms of seminars

The main essence of this method is generation of new ideas without any criticism followed by their analysis, assessment, comparison and selection of the best solution.

Seminar using the method of analysis of specific situations. Such a seminar involves preparing a set of specific professional situations for students.

Seminar using the round table method. This method is a kind of dialogue and is based on the principle of collective discussion of the problem. In advance, students are invited to prepare questions of interest to them within the topic of the class.

Seminar in the form of defending creative projects. The project method in education involves students solving a problem. They can be carried out in one academic discipline (subject projects) and in several disciplines (interdisciplinary, integrated projects).

The listed methods of designing and conducting seminars do not exhaust the entire arsenal of active, developing modes of student learning. Creatively working teachers are actively searching for new innovative educational technologies [8].

### Conclusions

1. This paper discusses implementing innovative methods of conducting lectures and seminars on mechanics at technical universities.

2. Having attended open classes and made the analysis, we can draw the following conclusion: the positive point in the discussion is that the students will agree with the teacher's point of view with great willingness, rather during the discussion than during the conversation, when the teacher only indicates the need to accept his position on the issue under discussion.

This method allows the teacher seeing how effectively the students use the knowledge acquired during the discussion. The negative point is that students can incorrectly define the area of study for themselves or not be able to successfully discuss emerging problems. Therefore, the whole class can be confusing. In this case, listeners can strengthen their own opinion but not change it.

3. A problem lecture differs from a traditional one in that in a traditional lecture such means as explanation, illustration, description are used, and a problem lecture is based on the logic of sequentially modeled problem situations by posing problem questions or presenting problem tasks.

4. In the class, the teachers show how to transform oral and written information into a visual form. Moreover, the slides used not only supplement the verbal information but are themselves carriers of information. A lecture-visualization contributes to the creation of a problem situation, the resolution of which, in contrast to a problem lecture, where questions are used, occurs on the basis of the analysis, synthesis, communication, collapse or deployment of information, that is, with the inclusion of active mental activity. In a problematic issue, in a problem situation, there should always be a contradiction, for example: a contradiction between a theoretically possible way of solving a problem and its practical inexpediency, a contradiction between scientific facts and everyday ideas of students.

5. The innovative methods of conducting lectures and seminars proposed here can help teachers in planning, analyzing and monitoring knowledge in the educational process.

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**Техникалық университеттерде механика бойынша дәрістер мен семинарларды өткізудің инновациялық әдістерін енгізудің өзекті мәселелері**

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**Аңдатпа.** Мақала техникалық жоғары оқу орындарында дәрістік және семинар сабақтарын өткізудің инновациялық әдістерін зерттеуге арналған. Бұл әдістерді енгізу үшін оқытушыдан оқытудың заманауи әдістерін қабылдау және игеру үшін жұмыс уақытын жаңаша ұйымдастыру талап етіледі. Жоғары оқу орнының білім беру процесінде студенттерді оқытудың белсенді, тұлғалық-дамытушылық формалары мен әдістерін жобалау және қолдану мәселесі қарастырылады. Инновациялық дәрістік және семинарлық сабақтардың мысалдары келтірілген. «Механика» пәндер циклі бойынша семинар сабақтарын өткізу кезінде оқытушылар пайдаланатын инновациялық әдістер, жобалау және өткізу ерекшеліктері қарастырылды. Семинар сабақтарды жобалау мен өткізудің аталған әдістері студенттерді оқытудың белсенді, дамып келе жатқан формаларының барлық арсеналын қамтымайды. Шығармашылықпен жұмыс істейтін оқытушылар жаңа инновациялық білім беру технологияларын белсенді іздену үстінде.

**Кілт сөздер:** педагогикалық инновация, білім беру технологиясы, дәріс, семинар, инновациялық әдістер, проблемалық дәріс, әңгіме дәрісі, дискуссиялық дәріс, арандатушылық дәріс, баспасөз-конференция дәрісі, ми шабуылы әдісі, дөңгелек үстел әдісі.

#### **Актуальные вопросы внедрения инновационных методов проведения лекционных и семинарских занятий по механике в технических вузах**

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**Аннотация.** Статья посвящена исследованию инновационных методов проведения лекционных и семинарских занятий в технических вузах. Для внедрения этих методов от преподавателя требуется новая организация рабочего времени для того, чтобы принять и освоить современные методы преподавания. Рассматривается проблема проектирования и применения в образовательном процессе вуза активных, личностно-развивающих форм и методов обучения студентов. Приводятся примеры инновационных лекционных и семинарских занятий. Рассмотрены инновационные методы, используемые преподавателями при проведении семинарских занятий по циклу дисциплин «Механика», особенности проектирования и проведения. Перечисленные способы проектирования и проведения семинарских занятий не исчерпывают всего арсенала активных, развивающих форм обучения студентов. Творчески работающие преподаватели ведут активный поиск новых инновационных образовательных технологий.

**Ключевые слова:** педагогическая инновация, образовательная технология, лекция, семинар, инновационные методы, проблемная лекция, беседная лекция, дискуссионная лекция, провокационная лекция, лекция пресс-конференция, метод мозгового штурма, метод круглого стола.

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