

УДК 378.

*Avdeeva A. N., candidate of technical sciences, associate professor,  
Associate Professor of the Department of Materials Science and Mechanical  
Engineering  
Tashkent State Transport University  
Uzbekistan, Tashkent*

**ACTIVE METHODS OF ORGANIZING CLASSROOM LESSONS  
IN THE DISCIPLINE "METROLOGY AND STANDARDIZATION"**

***Abstract:** the article presents active methods that turn into inactive ones, which can be used in classroom lessons in the discipline “Metrology and standardization”. Conclusions are drawn about the support of the methods under consideration. Examples of the joint use of traditional and modern pedagogical methods are given.*

***Key words:** standardization, metrology, active lecture, interactive lecture, problem-based lecture, joint lecture of two teachers, visual learning tools, pedagogical methods.*

By decree of the President of Uzbekistan, reforms are being carried out in the higher education system of the Republic, the main goal of which is to educate “competitive specialists of international level” [1]. Since modern requirements for a university graduate include not only professional skills, but also universal competencies, for the development of which classical teaching methods are not enough. Teachers of the Tashkent State Transport University continuously improve the learning process, “introducing modern pedagogical technologies” [1].

The discipline “Metrology and Standardization” is a general education discipline that student’s study in the fifth semester of their studies.

The lecture is still the main form of information transfer from the teacher to the students, and since the dominant channel of perception is vision, not a single

modern lecture session can do without a presentation, especially in a technical discipline. Lecture-visualization is the main “weapon” of the teacher, which not only attracts and holds the attention of the audience throughout the lesson, but also, according to the laws of memory, increases understanding of the educational material. “The lecture should not only be heard, but also seen, through posters, drawings, flowcharts, maps, tables, graphs, photographs, video materials” [2]. It takes a lot of time and energy to prepare for such a classroom session, but the result is worth the cost. In the discipline “Metrology and Standardization”, visualization of educational material is required for each lecture. For example, in the module “Interchangeability”, bachelors get acquainted with the types of connections of mating parts of mechanisms and machines, learn about the types of shape deviations and surface roughness of the connected parts. Errors in manufactured parts are measured in thousandths of a millimeter, therefore, for a complete understanding, the presentation of these topics includes not only drawings with symbols, but also educational video clips with enlarged frames. Another method of conducting a lecture lesson, used at the Department of Materials Science and Mechanical Engineering, is a binary lecture. This method has several modifications. Firstly, the assistant of the department, who is preparing to become a senior teacher, can act as a partner to the main lecturer and give lectures on the discipline “Metrology and Standardization”. In this case, a lecture by two teachers turns into a “master class”, which has a number of advantages: the transfer of the skills of the leading lecturer begins already at the preparatory stage, when choosing and developing a lesson scenario, while conducting a lesson; there is no need to invent imitative situations - the audience creates them naturally; the assistant receives maximum attention from the lecturer, while in a regular “master class” more than five people are passively present. Another advantage of a binary lecture is the two-way exchange of experience, because anyone, even an experienced

teacher, has something to learn from young ones [3]. Sometimes the leading student in studies acts as an assistant, if he has the desire and the necessary intellectual level.

In practical classes in metrology, department employees use the method of working in pairs and the “leader-follower” method. When solving problems on constructing tolerance fields for typical connections of mechanisms and machines, after a frontal analysis of the general example, everyone is given an individual task. Those sitting on the right get one type of connection, for example, “with a gap,” and those on the left get another type—an interference connection. Everyone decides, first, their own option, and then explains their decision to the person sitting next to them at the desk. When one of the students fails to cope with his task, the work of equal partners moves into a situation where the leading student helps the lagging student solve an example, that is, into the “leader-follower” method. If at the desk both students are “weak”, which happens very often in practice, then the teacher transfers them to those who have already completed the task, having previously taken their permission [4].

The “Metrology and Standardization” course includes laboratory work, two of which are performed using a vertical optimeter: “Determination of the maximum and actual dimensions of a part” and “Determination of deviations in the shape and location of the surfaces of parts.” An optimeter is a tool for measuring deviations of the actual dimensions of parts from the nominal ones, which requires an explanation and control of the assimilation of the principle of its operation for each student individually. When concentrating on each individual student, the teacher loses control over the remaining audience, which negatively affects the quality of teaching. To fully cover students and save classroom time, teachers of the Department of Materials Science and Mechanical Engineering practice the method of mutual learning in small groups.

The algorithm of the method includes the following stages: the teacher explains the sequence of work on the optimizer to the whole group; the group is divided into syndicates, depending on the number of instruments used; each subgroup nominates its representative (pedagogical practice shows that it is more expedient and faster for the “leader” of the syndicate to be chosen by the teacher himself); the teacher measures the part on the optimizer together with each of the selected bachelors, monitoring the correctness of the operation; the student, who has mastered the principle of taking measurements, remains near the instrument to transfer the acquired skill to the rest of the subgroup members. This method optimally improves the process of laboratory work: increases motivation; saves time; reaches the entire audience; allows the teacher to completely control the audience; and, as a result, increases the assimilation of material [5].

If in a group there are more people who want to take the place of a teacher than there are measuring instruments, then another modification of the mutual teaching method can be used, when an explanation of how to use the optimizer is passed on “through the chain” from student to student. In this case, on the one hand, there is a maximum level of motivation to complete laboratory work, and on the other hand, so that at some point the weak student does not distort the correct information, the teacher is forced to return to individual control. The considered method does not require special preparation, but its successful use is only possible if the lecturer has professional competencies. This method not only arouses sincere interest in students and helps them easily master complex material, but also develops personal qualities. Psychologists say that teamwork increases a person’s ability to express himself, tolerance, empathy, and gives the opportunity to reveal himself, even to the most modest student.

The methods of teaching the discipline “Metrology and Standardization” discussed in the article, used at the Department of “Materials Science and

Mechanical Engineering”, Tashkent State Transport University, are effective in their application, they have educational motivation, turning the educational process into an active and interactive one, and have an individual and differential approach to students , develop in them the universal competencies necessary for a modern, competitive specialist.

### References

1. Указ президента республики Узбекистан об утверждении концепции развития системы народного образования Республики Узбекистан до 2030 года. URL: <https://lex.uz/docs/4312783> (дата обращения: 5.10.2021)
2. Н. К. Турсунов, А. Н. Авдеева, Ш. И. Мамаев, Д. И. Нигматова  
МЕТРОЛОГИЯ И СТАНДАРТИЗАЦИЯ: РОЛЬ И МЕСТО  
ДИСЦИПЛИНЫ В ПОДГОТОВКЕ СПЕЦИАЛИСТОВ  
ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА РЕСПУБЛИКИ  
УЗБЕКИСТАН // Academic research in educational sciences. 2022.  
№TSTU Conference 1. URL: <https://cyberleninka.ru/article/n/metrologiya-i-standartizatsiya-rol-i-mesto-distsipliny-v-podgotovke-spetsialistov-zheleznodorozhnogo-transporta-respubliki-1> (дата обращения: 07.11.2023).
3. Авдеева А.Н. Принципы построения и проведения интерактивной лекции // Вестник науки и образования, 2020. № 8-1 (86). С. 107-109.
4. Авдеева А.Н. КОЛЛЕКТИВНАЯ ФОРМА ОБУЧЕНИЯ НА ПРАКТИЧЕСКИХ ЗАНЯТИЯХ ПО МОДУЛЮ "ВЗАИМОЗАМЕНЯЕМОСТЬ" // Теория и практика современной науки. 2021. №11 (77).
5. Авдеева А.Н. Бинарное аудиторное занятие как форма мастер класса // СОВРЕМЕННЫЕ ИССЛЕДОВАНИЯ В ПСИХОЛОГИИ И ПЕДАГОГИКЕ. –2021. – С. 24-27.