Visualization Lecture in the Digital Educational Process at the University

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Abstract. Information and communications technology appears to be the only way to achieve educational goals, meeting needs of the modern generation. The purpose of the research is to analyze a visualization lecture as an effective form of learning in the digital educational process. The work is devoted to the study of modern visual methods. The effectiveness of a visualization lecture as a form of conducting classes is confirmed by the results of testing students’ knowledge, questionnaires. We conducted a study on the use of visualization and its significance for the development of digital education. For this purpose, 2 groups were selected: the first of them continued to study according to the usual program, and the second became experimental. In the latter, visualization lectures were held during the semester, i.e. using presentations, tables, graphs, clusters, video lectures, and other materials both from the teacher and prepared by students.

Keywords: A visualization lecture · The digital educational process · The method

1 Introduction

The COVID-19 pandemic has triggered deep changes in all spheres of life, education systems being no exception. Teachers faced a myriad of challenges having no choice but to rapidly find new approaches inspiring students to adapt to the new reality, therefore improving the quality of education.

Global informatization naturally affects the education process, impelling teachers to identify current trends and introduce pedagogical technologies into classroom environment with the aim to achieve beneficial learning results. Information technology in the educational process includes computer training programs (electronic textbooks, simulators, testing systems); telecommunications tools, such as e-mail, teleconferences, communication networks; digital libraries. The latest technologies integrated into teaching can bridge the generation gap existing between teachers and students, encouraging desirable response and bringing beneficial educational perspectives.

Information and communications technology appears to be the only way to achieve educational goals, meeting needs of the modern generation. The traditional Sage-on-the-Stage approach proves its inefficiency, while distant learning appeals to the educational...
needs of present generation, referred to by various terms as Digital One [1], Digital Natives [2], iGeneration, Gen Tech [3, 4], the Net Generation [5]. Online teaching, being the only way-out in present day lockdown, meets preferences of the new generation cohort, being technologically savvy, their information-age mindset easily adapting to new online classes.

It is possible to boost academic performance by combining traditional means with the latest achievements of science and technology. The ICT is seen as a combination of technical devices and didactic tools used to process and present information [6]. The researchers underline various characteristics of effective teaching by means of information and communications technology, among which social interaction, contextual sensitivity, connection to different sources and data, individuality as a way to adapt the process of teaching to individual students’ needs [7], there are no time or place restrictions, high degree of cooperation, autonomy which enables students to control their learning [8].

Numerous and quite convincing examples are demonstrated proving effectiveness of information and communications technology in the pedagogical process, which can be used at the stage of presenting educational material, its drilling and consolidation, control and self-control.

E-teaching and e-learning applications, various online platforms undoubtedly help to endure the education process [9]. E-learning brings societal benefits during the current pandemic. Nevertheless, any educational programs must necessarily be checked for their proper pedagogical effect, pass their own kind of expertise, taking into account the value criteria. It is necessary to take into account possible negative impact of technology on the psychological and emotional state of students and, ultimately, on their health. Infomania, the state of information overload, causes serious health hazards and threat to overall wellbeing. The role of a teacher is to find balance, using the ICT as an effective teaching tool in order to achieve beneficial learning results.

The World Health Organization added gaming to the section on addictive disorders. Digital-/video-gaming is characterized by a person’s inability to control time for play with the priority given over other daily activities and interests, which brings significant impairment in personal, social, educational and other areas of life. People who engage in digital-/video-gaming activities are to be alert to the amount of time spent [10].

The role of a teacher is to find balance, using contemporary educational approaches with the ICT viewed as an effective teaching tool improving learning outcomes.

The ICT is seen as a means arousing students’ interest, appealing to the emotional sphere being strong motives in any activity, including educational. Interest and positive emotions aroused by effective educational tools in the modern day classroom have a beneficial influence on learning outcomes. Motivated students strive for success by getting solid knowledge, taking initiative and seeking responsibilities in solving problems.

The purpose of information and communications technology is to make the teaching process more intensive and flexible. With the widespread use of the media the transmission of information is carried out both in writing and oral forms. The need to teach a foreign language more people, i.e. to speak and understand it, has also increased with the growth of international political, economic, and cultural ties. The ICT tools are
particularly important in teaching languages due to the shift in emphasis on language acquisition as a means of communication.

# Visualization Lecture in the Digital Educational Process at the University (On the Example of the Discipline «Russian Language and Speech Culture»)

It is known, «… in the course of training it is necessary to form such competences those will make the future graduate competitive in the labour market» [11].

As professor O.A. Frolova writes, «it is possible to make remarkable curricula, to develop strategic tasks but if there is absence of desire to change approaches to digitalization of educational process – nothing will turn out» [12, p. 328].

Everywhere Smart education develops. It means:

S - Self-Directed (self-governed and self-checked);
M - Motivated (motivated);
A - Adaptive (adaptive, flexible);
R - Resource-enriched (enriched with various resources);
T - Technological.

The concept of Smart education is the flexibility assuming existence of a huge number of sources, different types of multimedia, ability to be adjusted quickly and easily.

Besides, the mixed training (blended learning) is the model of joint educational activity of a teacher and a student or a group on preparation and carrying out educational process providing the most effective achievement of stated purposes is used.

Students gain knowledge on classes and independently online. They prepare cards, presentations, booklets of video.

The results of poll which are carried out to GBOU VO «Nizhny Novgorod State Engineering and Economic University» showed that students would like to see at our university:

– «total rejection of printing editions;
– maximum computerization: online consultations, use of electronic textbooks …»
– the model of joint educational activity of a teacher and a student or a group on preparation and carrying out educational process providing the most effective achievement of stated purposes.

During teaching the discipline «Russian Language and Speech Culture» information technologies are actively used:

1. electronic textbooks;
2. monitoring procedure with attraction of IT technologies and resources of the Internet;
3. information search for reports;
4. watching educational videos;
5. preparation of the presentations;
6. work with video lectures;
7. organizing webinars of professional orientation value;
8. organizing lectures and practical lessons in the form of webinars (students can make record of lessons and once again look through them in out-of-class time, download training material, presentations and to work with them independently in free time);
9. carrying out consultations in the form of webinars (individual and and in groups before examinations);
10. organizing seminars for staff.

Students gain knowledge in classrooms and independently online at home. They prepare cards, presentations, booklets, videos.

The purpose of the research is to analyze visualization lecture as an effective form of learning in the digital educational process. The scientific and practical significance of the article is to review the techniques of visualization in Humanities cycle with the use of remote technologies and techniques on the subject «Russian Language and Speech Culture».

The work is devoted to the study of modern visual methods in the digital educational process. The research describes visualization as an educational method, describes visualization techniques, their practical application during the lecture and analyzes the effectiveness of using visualization lecture as a form of conducting classes confirmed by the results of testing students’ knowledge using questionnaires. They say: «It is better to see once than hear a hundred times». Indeed, most of information from the world around us is obtained through vision, that is why the visual channel of perception should be maximally involved in learning. Even in the 20th century, visual teaching methods were widely used, providing for the display of visual AIDS in the classroom to facilitate understanding, memorizing the material and applying it in practice [13–15]. Visual in Latin means «visually perceived». There were significant changes in visual teaching methods due to the growth of information, the development of digital technologies and their application in the educational space in recent decades. Students get more information that is easier to understand and remember visually when presenting structured information [16].

Visualization is widely used in the educational process at all levels, including in higher education. With the development of digitalization visibility has received a new idea: the old posters, maps, visual AIDS have been replaced by computer technologies those allow you to use not only illustration and demonstration, but also multimedia. The teacher relies on the contingent, chooses the optimal form of presentation of the material using computer technology: for example, an interactive table will be effective for one group, a cluster for another group, and so on. While preparing for the lesson, it is necessary to study the material in terms.

Economist Jon Schwabish has formulated 4 principles of data visualization: data clarity; visual noise; graph and text – a single whole; pre-attentive processing [17]. In our opinion, visualization as a teaching method also has a set of principles that contribute to the successful application of the method in the educational process. Among them, it is worth to think about:
• clarity of the material (visual representation of specific information that should be clear to students);
• consistency (compliance with the laws of logic, ways of thinking);
• simplicity (ease of perception);
• optimality (optimal amount of information).

Visualization is a tool for activating students’ mental activity, and also has an interactive component: not only the teacher gives ready-made images for visual perception, but also the students themselves are involved in the process of creating «visible» and understandable information that passes into the category of their own knowledge obtained by heuristic means. In the works of a number of researchers, it is said about visual thinking that can create new images that are endowed with a semantic load making information visible [18–20].

It is particularly worth noting that the use of the visualization method in Humanities classes has its own nuances associated with the presence of a large volume of mostly textual information. Students of technical specialties who study Humanities within the framework of educational programs have difficulties in working with text material, so it is necessary to use visibility during teaching.

In our opinion, cluster, infographics, intelligence map, word cloud, time tape (chronograph) are effective visualization techniques in Humanities classes. A cluster is a figurative scheme that explains the essence of a key concept through its associative reproducible elements. The cluster can be based on a picture with cause-and-effect relationships. Another technique that is close to a cluster is the intelligence map. An intelligence map is a way of displaying information in the form of a tree diagram that reflects interrelated ideas and concepts (branches of a tree) coming from the Central one (trunk). Infographics is a visualization technique that reflects information through graphic images, including tables, diagrams, charts, graphs and drawings. Time tape, or chronograph, is a visualization technique that reflects a sequence of events.

These techniques can be used in the course of both lectures and practical classes in Humanities effectively. In the context of the pandemic, all universities were forced to resort to distance learning.

Students need to perceive the teacher through a computer monitor, where the presentation of the lecture material comes to the fore now. The teacher’s word is a sound background. Visualization in such conditions is in the first place. Teachers need to convey new material through clear, memorable images, as well as teach students to visualize the material they are working with.

Visualization lecture as an interactive form of conducting classes allows you to use various visualization techniques through digital technologies in the educational process. Visualization lecture helps to transform oral and written information into visual images by folding a large text into a concise visual element, as well as the process of speech development through «deployment»: explaining visual images with complete oral monologues. This type of lecture implements the principle of material availability.

As an example, we will give a methodological development of a class on the subject «Russian language and speech culture» on the topic «Communicative qualities of speech: richness, diversity, expressiveness of speech». The purpose of the lesson is to study the richness and expressiveness of speech as communicative qualities. The main tool of the
teacher in the distance learning format is a presentation containing visual images those help to reveal the content of a new topic, as well as tasks those address the independent creation of visual images by students on the topic.

At the beginning of the lesson, the already studied material is systematized by analyzing clusters, infographics, for example, Figure 1 presented below.

This cluster reflects elements that do not meet the standards of the literary language and clog it. Students formulate the concept of «correctness of speech».

The interactive table «Language norms» is aimed at repeating the language norms and their compliance with the rules, and draws a parallel with the sections of linguistics. Students must fill in the gaps in the table in the columns of language norms or rules themselves.

![Fig. 1. The correctness of speech](image)

The study of new material begins with analysis of supply artificially created by the linguist L. V. Shcherba: «Glokaya kuzdra shteko budlanula bokra and kudryachit bokryenka». Students are invited to make an illustration of the proposal in a graphic editor or on a piece of paper, take a photo and post it for discussion. We can conclude that even unfamiliar words make it possible to imagine what is being said, to assume the partial belonging of words.

Speaking about the semantic richness of words, the teacher suggests students to work with word clouds, where synonymous series are presented. Students determine the shades of meaning by noting positive or negative connotations, determining the presence or absence of expression in words.

When analyzing the richness and expressiveness of the grammatical structure of the language, students are invited to work with the table (infographic): to compare the verbs «to have read» and «to have been reading».
Students are asked to create a cluster that reflects the concepts those are part of the named communicative quality to formulate the definition of speech expressiveness. The teacher creates a cluster online, adding students’ responses to it. In the course of the work, the cluster is proposed to be transformed into an intelligence map, adding the visual image with conditions that affect the expressiveness of a person’s speech, as well as recommendations for improving their speech expressiveness.

Repetition of visual and expressive means can be submitted via an infographic (table or diagram) or an intelligence map of students’ choice. Thus, a fairly large amount of information is visually presented not only from the position of the teacher, but also from the position of students.

3 Results

We conducted a study on the use of visualization and its significance for the development of digital education. For this purpose, 2 groups were selected: the first of them continued to study according to the usual program, and the second became experimental. In the latter, visualization lectures were held during the semester, i.e. using presentations, tables, graphs, clusters, video lectures, and other materials both from the teacher and prepared by students.

At the end of the semester, students were offered a knowledge test, which showed higher results of the second subgroup—79% of correct answers. In the first subgroup, this percentage was much lower – 57%.

To evaluate the results, the same questionnaire was conducted in both groups. It included the following questions:

1. Did you like the lessons on discipline «Russian language and speech culture»?
   a) Yes
   b) No
   c) Not really

2. Do you remember them?
   a) Yes
   b) No
   c) Not really

3. Will you remember them long?
   a) Yes
   b) No
   c) Not really
4. Would you like to return to these classes?

a) Yes
b) No
c) Not really

The answers to each of the questions were the same, which simplified the assessment system. Based on the responses provided, a comparative table was compiled below (Tables 1 and 2).

**Table 1. Knowledge test of the 1st group**

| The question                                                                 | The answer «yes», % | The answer «no», % | The answer «not really», % |
|------------------------------------------------------------------------------|---------------------|--------------------|---------------------------|
| 1. Did you like the lessons on discipline «Russian language and speech culture»? | 56                  | 7                  | 37                        |
| 2. Do you remember them?                                                      | 49                  | 1                  | 50                        |
| 3. Will you remember them long?                                               | 47                  | 2                  | 51                        |
| 4. Would you like to return to these classes?                                 | 59                  | 3                  | 38                        |

**Table 2. Knowledge test of the 2nd group**

| The question                                                                 | The answer «yes», % | The answer «no», % | The answer «not really», % |
|------------------------------------------------------------------------------|---------------------|--------------------|---------------------------|
| 1. Did you like the lessons on discipline «Russian language and speech culture»? | 76                  | 6                  | 18                        |
| 2. Do you remember them?                                                      | 81                  | 1                  | 18                        |
| 3. Will you remember them long?                                               | 79                  | 2                  | 19                        |
| 4. Would you like to return to these classes?                                 | 72                  | 2                  | 26                        |

Moreover, after finishing the questionnaire the students of the second group were invited to answer the question "Do you think lectures full of presentations, graphs,
diagrams, clusters and tables are more effective than regular so to say «dictation» lectures taught with chalk / a marker at the board? Answer «yes»/«no» and say why? We need detailed answers». It is necessary to give a small survey.

The students commented their attitude to the new form of the lecture, i.e. visualization lecture, in the oral form. 3 students of the group said that it was always individual.

One of them underlined: «I understand more when I write under dictation and with a blackboard. It’s easier for me. I don’t know what’s best for the others». The second one commented that «it depends on the material. I better remember graphs and tables, but I think that there will be no special difference». The other student offered to combine classical lecture with the visualization one.

There was one who understood the belonging of visualization lecture more to the distance learning and commented it: «If you talk about distance and full-time learning, then my personal opinion is that full-time is of course better, and the combination of lectures at the blackboard with chalk and also saturated with presentations when you sit at a desk is better. There is a combination of old and new type of learning».

There was a student who said: «I think that visualization lecture is more effective. The information is easier to remember, lessons are more interesting, and generally speaking, the information in color is remembered better and faster than written with chalk or a marker on the board».

Two students underlined the necessity of video materials at the lessons. One of them said «Yes, yes and yes again! Classical lectures are good, but for a good mark of a teacher it would be better, if there were more video materials. And it would be possible for a teacher to get an «Oscar» for the lesson».

The second one decided to characterize the teacher of the discipline «Russian language and speech culture»: «You are a good teacher, you explain everything and help with tasks. But you can add more videos to your presentations and other materials».

There were also some other opinion: «Lectures with presentations and graphs are easier to understand than writing them as it were a dictation. But sometimes you still need optional lectures with a blackboard. At it you can ask certain things on which you have questions during the study and get a high-quality answer. Mostly it is easier with presentations, but you need the blackboard to ask questions and get the answers at a certain time of the lesson. This student even had a desire to offer one decision as if he were a teacher: «That is better to conduct a certain number of classes with presentations and at the end of the last of them to explain the remained questions at the blackboard».

The answers of the students help the teacher again to understand that education is a bilateral process and some so to say «grains» of it we can get not only from the books, but also from our students who can be both the object and the subject of the education.

4 Conclusion

Students of the second group noted the simplicity of presentation of the material and ease of memorization. As you know, the majority of people are visual artists, so it is easier for them to perceive the material systematically, visually, taught in the form of diagrams, tables, presentations, clusters, and video lectures. The students said that they began to understand the discipline more and its importance for the overall development.
Even teachers of other disciplines began to use visualization after student’s offer: to draw up diagrams and tables at specialized lectures, as well as to structure knowledge in this way. As well as the teachers of the discipline «Russian language and culture of speech» noted the increase in students’ motivation, as well as their colleagues borrowed the experience of conducting visualization lectures.

Appendix

Plan of the lecture visualization

Lesson topic: Communicative qualities of speech: richness and diversity, expressiveness. Methodological goal: to activate the work of students in the classroom through the use of interactive forms and methods of teaching. The purpose of the lesson: to continue studying the communicative qualities of speech, to consider the expressiveness of speech. Tasks: Educational: to repeat the studied communicative qualities of speech, to study the richness and expressiveness as communicative qualities of speech. Developing: to develop analytical thinking, competent oral and written speech, the ability to use the communicative qualities of speech. Educational: to form the ability to work in a team, to develop aesthetic feelings in relation to a language and speech.

Lesson progress

1. Organizational moment: greeting, attendance check (2 min).
2. Entrance control (repetition of the studied material, terms, diagrams, table) (10–12 min).
3. Content of the training material (lecture). Visualization lecture «Communicative qualities of speech: richness and diversity of speech, expressive speech» (work with diagrams, fixing the definitions, work with texts, discussion) (60–65 min). The richness of speech: the identity of the Russian language; the richness of its vocabulary; semantic richness (polysemy of words, synonyms, idioms); expression; grammatical structure of the language. Expressiveness of speech: features of speech structure; conditions of expressiveness; visual and expressive means.
4. Output control (working with the table 5–7 min)
5. Summing up, reflection (2 min).
6. Homework (1 min).
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