FLIPPED LEARNING: ANALYSIS OF DIFFICULTY AND INTENSITY

INTRODUCTION

One of the promising educational technologies that works well in an advanced information society is the technology of flipped learning. Flipped classroom technology, based on the principle of flipping the traditional way of the training session, is widely used in the blended and hybrid learning models. Changing the sequence of actions during learning and drilling makes it possible to organize the learning process more efficiently, plan students’ independent work much better, and find more time to consolidate, discuss gained knowledge and put it into practice (ARBAUGH et al., 2010; BIGGS, TANG, 2011; SAMS, BERGMANN, 2013). The technology of flipped learning works well to the needs and interests of the younger generation (so-called generation Z), such as the desire to express individuality and independence, the ability to learn continuously, in any convenient place and at any convenient time, the desire to choose content independently and receive personal guidance.

The technology of flipped learning has a significant potential for professional training and higher education, as it allows students to increase their independence and responsibility for learning outcomes, individualize the learning process, spend more time on group work, and use new ways to organize training sessions (ANTONOVA, MERENKOV, 2018).

At the same time, the prospect of spreading flipped learning as a new educational form is limited by the insufficiently complete development of classroom management within this technology, the lack of readiness of students and teachers to use it, as well as lack of practical testing of this technology (BAEPLER, WALKER, DRIESSEN, 2014). Therefore, the research problem is the contradiction between the great need for educational practice to use new educational models and technologies that can make learning more effective in the information society, and the lack of research related to the use of flipped learning technology. The purpose of the study is to present the results and the analysis of complexity and intensity of flipped learning in comparison with traditional learning from the students’ position. The study objectives are:

- systematize the information of using flipped learning technology in professional training;
- describe the experimental work carried out on teaching students using the flipped classroom technology;
- describe and interpret the students’ results (doing bachelor’s and master’s degrees), assessment of the complexity and intensity of flipped learning;
- compare flipped learning with traditional learning in terms of complexity and intensity and draw conclusions about the potential and limitations of flipped classroom technology in professional training.
Initially, flipped learning was described in the work of American teachers D. Bergmann and A. Sams (2012), then the practice of flipped learning began to spread, which was reflected in the works of foreign authors (KIM at al., 2014; MCNALLY et al. 2017). In Russian educational practice, the technology of flipped learning is presented in the works of O. F. Bryksina (2015), N. L. Antonova, A.V. Merenkov (2018), E. A. Vorob'yev, A. K. Murzayeva (2018), A.V. Loginova (2015), M. V. Yurina, Yu.B. Lopukhova (2017) and others.

The flipped classroom technology is a model for organizing a learning process, in which classroom work is preceded by independent learning by the student. Flipped learning, being a special model of learning activity, works well for the so-called “nonlinear” learning environment, in which the student is supposed to have some freedom in choosing both the course content and the way of learning (BAEPLER, WALKER, DRIESSEN, 2014). Extensive opportunities for flipped learning are associated with the availability of learning resources, most often in the electronic environment, which give students a great opportunity to get ready for discussion in advance and to master skills (ENFIELD, 2013; STRAYER, 2013). A flipped lesson is often described as part of the blended learning practice, which combines self-learning, time, method and pace of learning chosen by the student, combined with online learning and teacher’s guidance (BISHOP, VERLEGER, 2013; ROEHL, REDDY, SHANNON, 2013). The advantages of the flipped learning model, which determine its high potential, are:

- students are highly active and involved in the learning process (KIZILOVA; FADEEV; VOLKOV, 2018);
- well-organized independent work (BULGANINA et al., 2017);
- high responsibility for learning outcomes associated with increased attention to each student during classroom sessions;
- ability to control the pace, depth, and order of learning (LE ROUX, NAGEL, 2018);
- intense interaction between students and the teacher during the training session, due to better pre-training of students (ABEYSEKERA, DAWSON, 2015).

The authors associate potential issues of the flipped learning model with the need for significant methodological processing of current training courses, and a large amount of time spent on teaching students independent learning before classes (GRANEY, 2013; HUNG, 2015). Analyzing the possibilities of flipped training, we have formulated the possibilities of improving the quality of professional training related to:

- development of information operating skills (selection, systematization, transformation of information) (BRYKSINA, 2015; LOGINOVA, 2015);
- developing skills to assess the need for information and its relevance;
- development of skills for forming and expressing conclusions and viewpoints on the studied issues (ARKHIPOVA et al., 2018);
- development of interaction and communication skills (VOROB’YEV, MURZAYEVA, 2018; YURINA, LOPUKHOVA, 2017).

The analysis of the Russian practice of using the "flipped classroom" technology in higher education institutions shows that there is not enough research, analysis and evaluation of the practice (GRUZDEVA, TUKENOVA, 2019; NAGAYEVA, 2016; VAGANOVA et al., 2019). This fact refers to the previously unsolved part of the problem. Due to the fact that “flipped classroom” technology can be used in every university with electronic educational environment, the study is relevant and has practical significance.

**RESEARCH METHODOLOGY AND DESIGN**

Two groups of students took part in the study: undergraduates and master’s degree students. The characteristics of participants in the experimental work (gender, age, and degree) are shown in Table 1.
Table 1. Characteristics of respondents

| Characteristics          | Undergraduates | Master’s degree students |
|--------------------------|----------------|--------------------------|
|                         | n=39           | n=21                     |
| Sex                      |                |                          |
| Male                     | 18             | 7                        |
| Female                   | 21             | 14                       |
| Year                     |                |                          |
| 1 year (freshmen)        | -              | 11                       |
| 2 year (sopthmores)      | -              | 10                       |
| 3 year (juniors)         | 22             | -                        |
| 4 year (seniors)         | 17             | -                        |

Source: Search data.

During the experiment, students studied the subjects according to their curriculum. The subjects in all groups were the same in terms of intensity (3 credits), the duration of all courses was 6 weeks.

1. At the first stage of the experimental work, guidance materials were developed for flipped learning. All materials for the study were presented in the electronic educational environment of the university (SAMERHANOVA, 2019; GRUZDEVA, TUKENOVA, 2019), on the platform Moodle (EOS Moodle).

2. At the second stage of the experiment, the students had classes according to the academic schedule. To implement the flipped classroom technology, the following pattern was used: introduction to the topic of the lesson and recollection of the information – discussion based on the material studied during students’ independent work, explanation of the theory and ways to do the practical task, practice itself, questions and answers session.

3. At the third stage of the experimental work, a survey was conducted in Google forms, aimed at comparing flipped learning with the traditional one according to the criteria of complexity and intensity. The survey results were processed using mathematical statistics methods. The ability of students to study independently and the frequency of tutorials in the learning process were also taken into consideration. All the questions asked in any form to the teacher were considered as guidance tutorials: on the forum, in Viber, in a chat, in person.

4. Final test is an exam at which the student could get 30 points (max).

Moreover, during the experimental work, we practiced covert participant observation in the experimental group to clarify questions related to students’ interest in this technology, their assessment of preliminary independent work.

RESULTS

The first issue of our study was to assess the complexity of flipped learning compared to traditional one, for this reason students assessed the complexity of learning activities. The difficulty was assessed on a scale from one to ten, according to which 10 is the maximum difficulty, and 1 is the minimum difficulty. Average difficulty ratings are shown in Table 2.

Table 2. Traditional and flipped learning comparison by degree of complexity (average respondents' ratings)

| Learning activities     | Undergraduates | Master’s degree students |
|-------------------------|----------------|--------------------------|
|                         | Traditional learning | Flipped learning | Traditional learning | Flipped learning |
| Information search      | 3.6             | 6.2                      | 4.2             | 6.4 |
| Learning                | 4.8             | 5.2                      | 5.2             | 6.2 |
| Information processing  | 6.2             | 6.9                      | 6.8             | 7.5 |
| Progress tutorials      | 2.6             | 3.4                      | 2.9             | 3.2 |
| Discussions             | 2.3             | 4.8                      | 1.9             | 4.2 |
| Practice                | 6.3             | 6.9                      | 4.2             | 4.7 |

Source: Search data.
The survey results showed that flipped learning made the work with information quite difficult for students, search for relevant information, study and process it. This is natural for flipped learning and is explained by a shift to independent work, freedom to choose sources, methods of processing and information presentation. Difficulties in working with information also affected the need for tutorials, (the need increased for undergraduates on average by 0.8 points, for students of master’s degree programs - by 0.3 points), and became more regular.

Flipped learning led to a change of classroom time management: most of the time was spent on discussion and practice. This had an impact on the complexity assessment of these types of activities: for undergraduates, the flipped learning complexity was 2.5 points higher than for traditional training, for master’s degree students - 2.3 points. As for the practice part, the difference in average rating for undergraduates was 0.6 points, for master’s degree students - 0.5 points. Next, we compared traditional and flipped learning in terms of time spent (table 3). A similar nine-point scale was used.

**Table 3. Comparison of traditional and flipped learning by time spent (average respondents' ratings)**

| Learning activities       | Undergraduates | Master's degree students |
|---------------------------|----------------|--------------------------|
|                           | Traditional   | Flipped                  | Traditional   | Flipped   |
|                           | learning      | learning                 | learning      | learning  |
| Information search        | 2.6           | 2.8                      | 1.8           | 2.05      |
| Learning                  | 3.8           | 6.2                      | 4.1           | 7.4       |
| Information processing    | 6.5           | 7.6                      | 7.1           | 8         |
| Progress tutorials        | 3             | 4.8                      | 3.6           | 5.2       |
| Discussions               | 6.8           | 5.4                      | 5.1           | 5         |
| Practice                  | 5.6           | 6.4                      | 4.1           | 5.8       |

*Source: Search data.*

According to the survey results, despite the fact that students spend more time searching for information during flipped learning, the difference with traditional training is insignificant. This is due to the high availability of information and wide access to it.

There is also a reduction in the time spent on discussing information compared to traditional training. In our opinion, during flipped training, undergraduates and master’s degree students are better prepared since they have questions to discuss in advance. In addition, the classroom discussion is influenced by the fact that during flipped learning, students realize that they cannot avoid participating in a group discussion, thus, they prepare for the lesson more carefully.

While other types of educational activity during the flipped learning undergraduates and master’s degree students considered as more time consuming - it concerns the time to study and process the information and practice. These data allow us to draw a conclusion that undergraduates and master’s degree students work more intensively during flipped learning. Special attention should be paid to the fact that students spend more time on practice (the difference with traditional training for undergraduates is 0.8 points, for master’s degree students - 1.7 points). This also confirms the wide potential of the flipped lesson to master professional skills. Comparing the deviations of traditional and flipped learning grades allowed us to clearly demonstrate that in general, flipped learning is more complex and time-consuming for both undergraduates and master’s students (Figure 1 and Figure 2).
Moreover, as part of our work, we also compared the number of requests for tutorials by undergraduates and master's degree students during the course. This allowed us to determine the need for guidance in the form of flipped learning (Figure 3).
Figure 3. Frequency of students’ requests for guidance instructions during flipped training

Source: Search data.

These data clearly reflect the reduction in the need for guidance and tutorial instructions as the course is developed in the form of a flipped lesson. This suggests that despite a fairly high assessment of the complexity and time spent on flipped training, students (both undergraduates and master’s students) have generally got used to the peculiarities of the educational process and are less likely to face problems.

CONCLUSION
The main conclusions of the study are as follows:

1. Flipped learning is more time-consuming and complex compared to traditional training for both undergraduates and master’s degree students. It can be stated that there was no difference in the grades of flipped classroom learning between students in bachelor’s and master’s programs. Analyzing the survey results, it can be claimed that students spend significantly more time on studying, processing information, and practice compared to traditional training. This proves the high value of independent learning of students during flipped learning. In addition, we assume that in traditional training, the student’s responsibility for learning outcomes is lower, since only a small proportion of the training session is devoted to discussion. During flipped learning, students know that they will actively participate in the discussion and they prepare better. All this leads to a higher complexity and intensity of the flipped learning format.

2. The practical evaluation of flipped classroom learning allowed us to present and confirm the advantages of this format, such as:
   - Students’ active independent work before classroom training sessions (students spent more time searching, systematizing and processing information);
   - Time change during the training session (discussion of the training session compared to traditional training has become longer);
   - Intensive guidance instructions were required only at the beginning of the training, then the number of requests for guidance significantly decreased (i.e., students got used to the “flipped” mode of work, independent work skills were mastered).

3. A significant difference between undergraduates and master’s students is observed in the assessment of the prospects of flipped education. Master’s degree students evaluate the prospects of flipped learning much more optimistically, which is explained by more developed skills of independent work, as well as the ability to cover the educational material through their own professional experience.
4. When training design with the use of the “flipped classroom” technology, it is necessary to give clear instructions for independent work and to assess the practicability and the amount of presented information (the used information sources should be accessible, and the tasks should be feasible for students);

**Contributions of this research, limitations and future recommendations**

In general, it can be claimed that flipped training is a promising educational format for the professional training system, and its opportunities and potential increase with the level of education (this format is more appropriate for master’s degree students than for undergraduates). By means of flipped learning, one can more effectively organize independent work, make classroom learning better, and activate the educational process as a whole.

The contribution of the research to the pedagogical science is to clarify the features, advantages and disadvantages of flipped learning from the students’ perspective. The assessment of complexity level and time spent on different types of educational activities allowed us to identify the most difficult types of activities for undergraduates and master’s degree students. The study shows the difficulties that a student can face. The study also suggests that flipped education is more suitable for students in master’s programs, since it allows them to use their professional experience to do the tasks. The prospect of the research is a more thorough analysis of the difficulties that students face during flipped learning. In addition, it is of practical interest to compare flipped learning with various methods of implementation of creative components when using this technology.

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Resumo
O artigo analisa a avaliação média de tipos de atividades como pesquisa, estudo e transformação de informações de aprendizagem, discussões e aplicação de conhecimento e tutoriais. Há algumas informações sobre a frequência de instruções de orientação. A análise de dados ajudou a provar que a tecnologia da sala de aula invertida é geralmente mais complexa e demorada para os alunos, independentemente do curso de graduação. Evidencia-se que o processamento independente de informações e sua apresentação na forma exigida pelo professor são as principais dificuldades para os alunos. O estudo também avaliou os benefícios da aprendizagem invertida como uma tecnologia educacional na perspectiva dos alunos. Os resultados mostram que o treinamento invertido é mais adequado para os alunos que fazem mestrado, que possuem habilidades mais desenvolvidas de trabalho independente e têm a oportunidade de apresentar o material estudado através da experiência profissional. Como resultado, foram consideradas as conclusões sobre as perspectivas da aprendizagem invertida para a formação profissional, as condições para tornar a aprendizagem invertida mais eficaz para os alunos.

Palavras-chave: Sala de aula invertida. Treinamento profissional. Desempenho acadêmico. Bacharel. Mestrado.

Abstract
The article analyzes the average assessment of such activity types as research, study and transformation of learning information, discussion and knowledge application, and tutorials. There is some information on the frequency of guidance instructions. Data analysis helped to prove that the technology of flipped classroom is generally more complex and time-consuming for students, regardless of the degree program. It was proved that independent information processing and its presentation in the form required by the teacher are the major difficulties for students. The study has also assessed the benefits of flipped learning as an educational technology from the students' perspective. The results have shown that the flipped training is more suitable for students doing master's degree, who have more developed skills of independent work and have an opportunity to present the studied material through the professional experience. As a result, the conclusions about the prospects of the flipped learning for professional training were made, the conditions to make flipped learning more effective for students were considered.

Keywords: Flipped classroom. Professional training. Academic performance. Bachelor's degree. Master's degree.

Resumen
El artículo analiza la evaluación promedio de tipos de actividades tales como investigación, estudio y transformación de información de aprendizaje, discusión y aplicación de conocimientos, y tutoriales. El análisis de datos ayudó a demostrar que la tecnología del aula invertida es generalmente más compleja y consume más tiempo para los estudiantes, independientemente del programa de grado. Se demostró que el procesamiento independiente de la información y su presentación en la forma requerida por el profesor son las principales dificultades para los estudiantes. El estudio también ha evaluado los beneficios del aprendizaje invertido como tecnología educativa desde la perspectiva de los estudiantes. Los resultados han demostrado que la formación invertida es más adecuada para los estudiantes que realizan másteres, que tienen habilidades más desarrolladas de trabajo independiente y tienen la oportunidad de presentar el material estudiado a través de la experiencia profesional. Como resultado, se sacaron las conclusiones sobre las perspectivas del aprendizaje invertido para la formación profesional, se consideraron las condiciones para hacer que el aprendizaje invertido fuera más efectivo para los estudiantes.

Palabras-clave: Aula invertida. Formación profesional. Rendimiento académico. Título de grado. Grado de maestría.