

# Digital Education and Mixed learning in the Context of the COVID-19 Pandemic

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## ABSTRACT

This article analyzes a study aimed at comparing the methodology of the "Flipped Lecture" with traditional methods of conducting lectures on the discipline "Physiology" for 1st-year students of the specialty "General Medicine". Flipped Learning is a learning technology, during the implementation of which the tutor provides students with a set of audio, video, text and other materials for self-study at home, and during classroom classes-full-time (or remote, online) lectures, the teacher and students analyze the most difficult questions of the topic formulated by the students themselves. The evaluation was carried out according to the following criteria: motivation to study the material of the disci-

pline, the student's self-assessment of involvement in the scientific and educational process, the teacher's self-assessment of his role in preparing for the lesson, the role of the formative assessment of knowledge in preparing for the final exam.

**Key words:** Distance education, COVID-19, Flipped lecture, Medical education, Student motivation, Assessment

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## INTRODUCTION

The COVID-19 pandemic has had a significant impact on all aspects of human life, including education. This has never happened before in the history of civilization. The world was divided into two periods: pre-and post-pandemic. No one was really prepared for the radical changes and challenges associated with the spread of the coronavirus and the need for people to distance themselves from each other.

The COVID-19 pandemic has suddenly forced medical institutions, as well as medical universities, to find new ways for interacting, teaching, and learning. These processes should have been as fast as the sudden and rapid increase in the incidence of coronavirus infection in people. It is no accident that this period was called by us and other members of the medical education community "emergency communications" or, as it is called, Hodges C *et al.* "emergency distance learning" (Hodges C, *et al.*, 2020).

Such a lightning-fast transition to total "digitalization" allowed us to see what potential we have in the digital education and training system. Before the COVID-19 pandemic, there were already very positive developments in digital learning. In numerous fundamental studies, data were presented that testified to the advantages and high efficiency of using digital educational technologies in the educational process (Liu Q, *et al.*, 2016; Stegmann K and Fischer F, 2016; Vaona A, *et al.*, 2018; Kyaw BM, *et al.*, 2019; Fontaine G, *et al.*, 2019).

New educational technologies and teaching methods, as well as modern models of e-learning, were further developed and represented important tools for the process of mastering skills and competencies (Salmon G, 2013; Chi MT and Wylie R, 2014; Hege I, *et al.*, 2020). In particular, mixed learning concepts, such as the flipped class model, as well as the use of virtual patients (Isaza-Restrepo A, *et al.*, 2018; Edström DW, *et al.*, 2020; Kiesewetter J, *et al.*, 2020; Al Jamil N, *et al.*, 2019) and simulation, were increasingly used (Cook DA, *et al.*, 2011; Tolks D, *et al.*, 2016; Kononowicz AA, *et al.*, 2019; Chen F, *et al.*, 2017).

In Medical education of Kazakhstan, we have begun to widely implement methods that are quite common in Western coun-

tries and are based on digital technologies: electronic clinical cases with multiple choice of the way of examination and treatment of the patient - "branched cases" (PBL-branched cases), Virtual Patient (VP), Training Based On Medical Errors (TAME) and others (Khamchiyev KM, *et al.*, 2020; Khamchiyev KM and Ostanin AA, 2017; Khamchiyev KM, *et al.*, 2018). At the same time, completely new, modern methods were developed and implemented that would meet the conditions of distance learning and contribute to the optimization of the educational process and the assimilation of the necessary competencies by students in the current difficult situation with COVID-19 (Haag M, *et al.*, 2021).

In particular, our colleagues from other countries and we increasingly used mixed learning concepts, such as the inverted classroom model, Flipped Lecture, modeling of physiological processes, creating anatomical and physiological models and videos that reflect the process of their production and demonstrate the principle of operation (Khamchiyev KM, *et al.*, 2020; Khamchiyev KM and Ostanin AA, 2017; Khamchiyev KM, *et al.*, 2018; Haag M, *et al.*, 2021).

Mixed forms of education, along with other innovative educational methods, require a lot of time and significant efforts of the teacher, aimed at forming the student's learning culture. In the course of classroom classes, the main efforts and time are spent on the formation of educational competencies and the study of basic issues of the discipline, with mixed training, the main emphasis is on the formation of independent work skills of the student, the ability to analyze the literature on the topic and formulate questions for study, the ability to team work and mutual assistance based on the creation of verbal and non-verbal communications (Müller C, *et al.*, 2018; Tolks D, *et al.*, 2020; Benning NH, *et al.*, 2020; Kuhn S, *et al.*, 2018).

One of the models of mixed learning that has been successfully applied by some educational organizations over the past decade is "inverted learning, inverted classroom, Flipped Lecture". Like any other technology, this form of training has its advantages and disadvantages (Wang R and Liu C, 2019; Quöß M, *et al.*, 2017; Salehi B, *et al.*, 2010; Schneider A, *et al.*, 2019; Zioga I, *et al.*, 2020).

The aim of the research was to study the effectiveness of the Flipped Lecture (FL) in the process of teaching medical students, as well as to compare the use of this methodology with traditional forms of conducting lecture classes.

### MATERIALS AND METHODS

The responses of 160 1st-year students of the NAO "Astana Medical University" were analyzed. Students of the 1st stream (n=78) were given five lectures on the FL method; similar lectures were held for students of the 2nd stream (n=82) according to the traditional method. The next 5 lectures were delivered for the 1st stream traditionally, and for the 2nd-in the FL format. The analysis of the questionnaires was carried out using the following indicators: the student's desire to study the theoretical and practical aspects of the discipline, the student's assessment of their own involvement in the scientific and educational processes, the teacher's assessment of the student's role in preparing for the lesson, the role of formative and summative assessment of knowledge in preparing for the current, intermediate and final exam.

For the analysis of student reviews, a questionnaire was developed in which the answers were ranked on the Likert scale from 0-completely disagree to 4-completely agree.

### RESULTS AND DISCUSSION

Flipped Learning is a learning technology, during the implementation of which the tutor provides students with a set of audio, video, text and other materials for self-study at home, and during classroom classes-full-time (or remote, online) lectures, the teacher and students analyze the most difficult questions of the topic formulated by the students themselves (Fontaine G, *et al.*, 2019; Khamchiyev KM and Ostanin AA, 2017; Khamchiyev KM, *et al.*, 2018; Haag M, *et al.*, 2021). For inverted learning, we have developed and used podcasts, podcasts, text files, 3D animations, and 3D presifiles on all topics.

Here, given the novelty of the method and the terms used, it is necessary to decipher them.

Podcasts are audio files (audio lectures) recorded in advance by lecturers of the Department of Normal Physiology, which are previously (in a few days) sent to students on the Moodle and Microsoft Themes platforms. Students can save the provided content to their electronic devices, stationary or mobile, and listen to them online or offline at any convenient time

A vodcast is a video file of a lecture prepared and recorded by the lecturer. All video lectures use colorful drawings, diagrams, graphs and tables for a better perception of the material. A text file is the text of a lecture, also prepared by a tutor and containing control questions and tasks that students must answer on their own, and discuss with the group during an Flipped Lecture. A 3D presentation file is an animated presentation of the lecture content using 3D technology in the Prezi Next program. 3D animations are 3D-animated processes occurring in the body.

All materials provided to students are the authors' own developments.

The FL technology we offer is a technique in which the preparation for a lecture consists of several stages: familiarization with the text of the lecture; listening to the lecture; watching video lectures, animations and presentations; solving entry-level tests that reflect knowledge of the basic questions of the topic.

Full-time or remote work with the lecturer (during the lecture according to the schedule) is devoted to the consideration of complex, problematic sections of the theoretical part and questions that students have encountered during the preparation for the Flipped Lecture. Also during the lecture, students under the guidance of the lecturer analyze

clinical cases and perform educational and research tasks. At the end of the lecture, there is a reflection on the understanding and consolidation of the topic covered in the lecture.

The transition to the technology of the Flipped Lecture is a transition from the leadership of the lecturer (teacher) to the leadership of the student. It is the student who becomes the key element of the educational process, which fully corresponds to the implementation of the student-centered approach in medical education.

The results obtained in the course of analyzing the students' responses showed that 86% of students prefer "Flipped Lectures" compared to traditional teaching methods, the remaining 14% said that they would prefer the combination of new technologies with traditional lectures, which may reflect the individual student's ability to learn and perceive information. The student survey also shows that in the traditional learning model, the student relies more on the teacher as the main source of knowledge, and the assessment of his involvement in the learning process was 2.1 points compared to 4.6 when studying in the "Flipped Lecture", which reflects more independent work in preparing for the lesson. The motivation of the student was largely determined by the presence of feedback and represents, in the words of the students, a "two-way process". The methodology of the "Flipped Lecture" requires a more clear and structured approach from the lecturer, active use of digital technologies, and more time spent on preparing for the lesson. The average exam score for students of the 1st stream was 87.2 points, for students of the 2nd stream-88.2 points (Table 1).

**Table 1: Effect of flipped lecture on students**

Students		Average score
1st stream	n=78	87.2 points
2nd stream	n=82	88.2 points
Traditional learning model was 2.1 points compared to 4.6 when studying in the "Flipped Lecture"		

The students noted that the Flipped Lecture technique allows them to feel at the lecture not as passive listeners who perceive information unfamiliar to them, but as active and equal participants in the educational process, along with the lecturer. The lecturers also claim that the lecture in the "inverted" format is more interesting, productive, and allows you to analyze the material more deeply and in a larger volume.

### CONCLUSION

Thus, given that medicine is one of those areas of knowledge where problem methods based on the active role of students in the learning process can be most useful, and due to the peculiarities of medical education, the technology of "Flipped Lecture" will be effective in those areas of knowledge where cognitive activity, the constant expansion of theoretical and practical layers of knowledge, as well as the speed of problem solving, self-confidence and independence are important. The technology of the "Flipped Lecture" allows you to form and consolidate the skills of obtaining knowledge, the forms of achieving consensus, the ability to navigate in information fields, to find an objectively correct solution in multidisciplinary situations. At the same time, the use of this model involves the development of the following skills by students, such as: working in a team, leading a group to develop leadership skills, the ability to listen and actively participate in discussions, independent and purposeful study and use of resources, communication skills for interaction in solving complex clinical problems and exchanging information, independence in judgment, defending one's point of view, responsibility for learning.

The achievements of recent years in the field of medical and pharmaceutical education have had a significant impact on the learning process of the younger generation, contributing to their greatest partici-

pation in the latest achievements of medical science. Tutors of higher medical and pharmaceutical education need to improve innovative pedagogical technologies in order to prepare future specialists for new challenges, one of which is currently a dangerous pandemic of coronavirus infection. Inverted learning or inverted class, inverted lecture is one of these innovative tools that can help students develop critical thinking skills and master the methods of memorizing and reproducing a large amount of information, involving students in an active learning process.

Based on the above, the technology of "Flipped Lecture" can be successfully used in any branch of education, especially in the context of distance learning.

### CONTRIBUTION DETAILS

Khamchiyev K.M.-concept, design, definition of intellectual content, manuscript preparation, manuscript editing and manuscript review; Suleimenova F.M., Sagimova G.K.-literature search, preparation of questionnaire questions; Shandaulov A.Kh. - experimental studies, data acquisition; Sabit A.E., Askarova N.B.-data analysis, statistical analysis. All the authors made a significant contribution to the research and preparation of the article, read and approved the final version before publication.

Khamchiyev K.M. is responsible for the integrity of the work as a whole from inception to published article and should be designated as 'guarantor'.

### DECLARATION

The authors don't have any financial [Financial competing interests include (but are not limited to): Receiving reimbursements, fees, funding, or salary from an organization that may in any way gain or lose financially from the publication of the article, either now or in the future, holding stocks or shares in an organization that may in any way gain or lose financially from the publication of the article, either now or in the future, holding, or currently applying for, patents relating to the content of the manuscript, receiving reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript] or nonfinancial [include (but are not limited to) political, personal, religious, ideological, academic, and intellectual competing interests], competing interests.

### CONFLICT OF INTEREST

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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