Rigid class scheduling and its value for online learning in higher education

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Abstract

The spread of coronavirus infection brings changes to all spheres of activity, including education, which is increasingly moving to a distance learning format. The ultimate goal of this study was to investigate the effectiveness of the recommendations for developing a rigid class scheduling method in the framework of online learning using advanced approaches updating traditional learning mechanisms. Overall, this research was conducted among 226 students and 54 teachers representing Moscow Aviation Institute and Kazan Federal University. Research methodology basis was represented by a sociological survey, which allowed identifying the problems of implementation of online learning from the students’ standpoint. The collected outcomes showed that for 35% of students, one of the main problems in distance learning was the lack of self-discipline, which can be further adjusted by a clearly established schedule of classes (37% of respondents) and tests (29% of respondents). At the same time, the collected data showed that the learning process was most efficient in subgroups 1 (0.5), 2 (0.3), and 5 (0.45). Recommendations provided for further distance education improvement, first of all, related to schedule formation issues. More precisely, the paper emphasized the need for time constraints, even distribution of subjects, use of special applications, designation of dates for knowledge checking, and inclusion of additional learning materials. The findings and results of this work are believed to be of scientific value for the methodological departments of educational institutions responsible for curricula preparation as they are expected to significantly contribute to educational process advancement.

Keywords Curriculum · Distance learning · Independent work · Learning materials · Learning process

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1 Introduction

Today’s reality speaks of the transition to online learning, which is directly related to the COVID-19 pandemic. Distance education is a complex educational process associated with the use of various online technologies and is based on mastering the necessary information online without direct student-teacher interaction (Frolova et al., 2020). Online learning is a more independent process because it requires students to concentrate a lot, be psychologically prepared, be interested in the subject, be diligent and smart. Like any other study mode, online learning has both pros and cons. The positive aspects of online education are associated with time-saving, the possibility of individual studies, the use of online technologies, access to online libraries, convenience for people with disabilities, and a number of other similar aspects. Hence, distance learning can be used not only for schoolchildren and students but also for various professionals who seek to improve their professional skills. The core disadvantages of online learning are associated with adaptation difficulty, lack of digital literacy for benefiting from it, periodic technological failures, as well as poor socialization and self-discipline (Odinokaya et al., 2019; Sabitha et al., 2016; Zawilinski et al., 2016). Though, despite the identified shortcomings, online learning is quite flexible and comfortable. In order to properly shape the learning process, it is necessary to establish a rigid framework of class schedules to avoid absenteeism and resulting unsatisfactory outcomes.

The modern world provides a substantial number of technological tools to develop lesson schedules for both offline and online learning. For example, Google Classroom facilitates the composition and distribution of assignments among students. Google Calendar is a good planning tool with proven effectiveness and benefits residing in the possibility to create individual folders, thereby allowing for the exchange of files and information directly with the teacher and other students (Pettersson & Olofsson, 2015). Moodle platform is a world-known tool facilitating the learning process by providing the ability to create one’s own study courses that can be tailored to an individual group of students (Sekendiz, 2018). SoreAr is another helpful platform in the field that has similar functionality to Moodle but, among other things, allows the creation of webinars and lessons based on ready-made templates, as well as enables the analysis of students’ progress (Wang, 2017).

Distance education should not differ in quality from the traditional learning process. For this, there should be well-structured training criteria, a clearly formulated and developed program, qualified educators possessing online learning and teaching skills, and the availability of all the technological tools required (Bazylova et al., 2019; Berikkhanova et al., 2017; Gajendar, 2017). Online education allows lessons to be delivered to a huge number of listeners, avoiding unnecessary noise as during in-class sessions. Since education is the intellectual capital of every country, the learning process must be structured in the right way and meet the requirements of students and teachers (Krylova et al., 2020; Ozaydin Ozkara & Cakir, 2018). Many scholarly papers have been reviewed to identify
methodologies for applying a rigid class schedule to the online learning process. Jia & Zhang (2021) indicated that the development of information technology contributes to the emergence of new resources and teaching methods. The authors presented a hybrid learning model based on Small Private Online Course (SPOC) scheme, which aims to improve students’ abilities. The training was conducted online based on simulation, which contributed to the development of a variety of abilities.

Widiyatmoko (2021) showed the effectiveness of applying Google Classroom in online learning during the COVID-19 pandemic. The paper points out that Google Classroom allows creating and distributing assignments, effectively providing feedback, and sharing files and information, which facilitates the learning process greatly, especially in the field of science. Dios & Charlo (2021) showed students’ attitudes toward online learning. Their results show that it saves a great deal of money, and video presentations are a more effective model of learning.

Another promising application of online learning is for the education of students with hearing impairments who require the use of sign language. In this respect, online learning is able to facilitate the transfer of information through presentations and video materials. Android applications for the hearing impaired also assist in the search for existing libraries and various documents, which allow learning at a convenient time and in comfortable conditions, having access to the internet (Amnur et al., 2021; Race, 2020) presented the challenges of lifelong learning in relation to COVID-19. Hence, the major disruptions in the field were associated with decreased attendance, lack of interaction with peers, and socialization. The researcher also determined that in order to improve the quality of the educational process, it is necessary to provide all the necessary resources for learning and adjust the technical points.

Kim and Margulieux (2020) concentrated upon the example of hybrid learning. The authors claimed that such a learning mode may well contribute to students’ motivation, but for this, it is necessary to have clear goals, control, clear guidance and feedback, as well as provide the necessary technology. Learning English with the help of online technology is shown in the work of Garríguez et al. (2019). The authors justify the advantage of online learning as it saves time, facilitates administrative work, and is easy to use. Sandnes and Eika (2017) present Model-View-Controller, which allows managing a large number of students during online learning. This program includes the ability to solve problems effectively because it allows the creation of plans, lectures, class schedules, and student evaluations. The effectiveness of this program has been confirmed over five years of practical application in several courses and contributes to the simplification of tasks with each academic semester.

The analyzed sources revealed that most research in recent years is related to online learning because of the COVID-19 pandemic. Many studies are aimed at identifying problems faced by students and teachers and focus on only one subject.

The main purpose of the work was to develop recommendations for a method of rigid class scheduling in the process of online learning, which is associated with a possible overcoming of traditional problems of remote education.
The study objectives were as follows:

- identify the challenges students face in online learning, as well as the indicators that contribute to the learning process and student interest;
- develop recommendations to class schedules formation, taking into account the previously obtained sociological survey data related to building a sustainable and effective learning process;
- determine the effectiveness of the stages of implementing a class schedule among teachers who have a direct impact on student interest in online learning;
- confirm the obtained data on the effectiveness of the given recommendations with the help of a sociological survey and the knowledge acquisition efficiency coefficient.

2 Methodology

The method of rigid class scheduling for online learning to overcome traditional problems of distance learning was based on a sociological survey involving 226 students of the Moscow Aviation Institute and Kazan Federal University. The first research stage was directed at identifying the challenges students face in online learning, as well as the indicators contributing to an effective learning process through the sociological survey method (its scheme is described below) (Musselin, 2021). Since the first stage was held in September 2019, this further contributed to the development of scheduling mechanisms that not only affect student discipline but also enable obtaining necessary research data. The second research stage (from September 2019 to January 2020) was focused on developing the elements necessary to form a rigorous schedule of classes in a remote format. In order to implement it, the authors reviewed already available literature on the matter and compared data. The third research stage (June 2020) lay in determining the level of effectiveness of the developed recommendations according to the estimates of the faculty of educational institutions of which the respondents were representatives. Also, this stage sought to determine the level of student interest and degree of need for online learning within the study presented. The last research stage, the fourth, intended to determine learning efficiency among the students of the control and experimental groups. Participants’ distribution into groups contributed to determining the usefulness of the rigid schedule method compared to the results of students who were introduced to the proposed study program but taught under the traditional system, excluding the modern approach to learning. Data for the fourth stage were collected in July 2020.

2.1 Sample

The developed program was set up only for second- and third-year students. Although a total of 272 s-, third-, and fourth-years were supposed to take part in the research process (on the designated schedule), the authors later decided to exclude
all fourth-years (42 people). This decision is explained by the fact that the fourth year is the final for their study. Hence, it is natural that fourth-years have more classes concentrated on writing theses, and their motivation relates not only to the organizational moments but mainly to the successful bachelor’s thesis delivery.

For the study purposes, the overall sample of participants was divided into two groups: control and experimental. While 113 students in the experimental group were directly trained within the developed schedule, control group participants were only familiarized with the schedule but did not adhere to a rigid framework during the organization of the educational process. This distribution was applied in order to determine the effectiveness of the rigid class scheduling method. In doing so, the experimental group participants underwent direct online training as part of a rigid class schedule monitored by the educators. In contrast, control group representatives were only observers familiar with the stages of distance learning within a rigid class schedule but did not take advantage of it for training. The online instruction of the control group students took place following the traditional approaches but with the use of the Zoom platform. The distribution of participants into two groups was made randomly. The main condition of the authors of this article was the belonging of students to the second and third study years since first-years are directly interested in continuing their studies, and the fourth- and sixth-year students are graduates whose level of interest is focused on other points (writing a final work and getting a diploma). The sample of educators comprised 54 people from the Moscow Aviation Institute and Kazan Federal University.

2.2 Research design

The first stage of the study was to identify the problems that students face in the process of online learning using the method of sociological survey. The sociological survey was chosen as the main research method because it allows collecting and processing primary data necessary to confirm or refute the researched facts and makes it possible for a large number of people to be enrolled (Musselin, 2021). The sociological survey was conducted electronically, using messengers. To this end, respondents were sent questions with answers provided (developed by the authors). Answers to the designated questions were to be sent by the experiment participants within a limited time period, namely five hours after receipt. Respondents were required to provide only one answer for each question, having undergone registration previously, in order to avoid receiving unreliable data. In line with this, the survey was anonymous and did not provide data in the public domain.

The resort to the sociological survey revealed the key problems faced by students in online learning, namely, self-discipline, learning process organization, psychological factors, and feedback. Next, indicators that contribute to the effective organization of the learning process among students were identified. They were as follows: planning classes, established schedule, selective control, availability of necessary materials for training. Based on the data obtained, the authors developed the following requirements for the formation of schedules:
– classes throughout the semester should begin at approximately the same time;
– an even distribution of academic subjects;
– use of the iStudiez pro (MadeForiPad, 2020) application for scheduling;
– marking of systematic tests in the academic schedule;
– a schedule should include clear boundaries of free and study time;
– a schedule is to include links to instructional materials.

The rigid class schedule method was based on the systematic application of the designated elements over six months of instruction. Each stage of their application is detailed in the Results section, with strictly marked breaks and students’ leisure and study time. Unlike control group students, experimental group participants were taught according to the designated class schedule system. This means that they were tightly controlled in terms of instruction and study materials and undertook systematic testing. Control group students were only sent study materials via Zoom. Although their teachers also used the information delivered to the experimental group, they could turn off their cameras and make it look like they participated in the learning process. What is more, control group students did the assignments on their own, which did not allow them to get feedback from the educator. Their grades were given only for the assignments as there was no direct student-teachers communication.

After a six-month training following the developed schedule, a sociological survey was conducted among the faculty to determine the effectiveness of this approach. In line with this, a sociological survey was also carried out among students to unveil the level of their interest in online learning and the degree of the need for a rigid schedule among students.

The next stage of the study was to establish knowledge acquisition efficiency among the students of control and experimental groups. The calculation was carried out according to formulas 1 and 2 (Druzhinin, 1995):

\[
T_{ef} = \frac{\sum (N_{a(i)} T_{a(i)})}{N_{gr}}
\]  

(1)

where \(T_{ef}\) – knowledge acquisition efficiency, min.

\(N_{a(i)}\) – the number of students of the i-th group who work within one task;

\(T_{a(i)}\) – the time that was allotted to study the posed question of the i-th group;

\(N_{gr}\) – total number of participants in the group.

To determine the efficiency of the schedule, all study participants were additionally alphabetically divided into five subgroups. The time spent on one task they chose themselves, depending on their abilities. Respondents’ distribution was done to increase the transparency and objectivity of the data. Furthermore, since creating favorable conditions for the participants is integral to the rationality of the experiment, creating small groups was optimal for identifying trends and calculations’ accuracy. The normative time was eight sessions of 50 min each. The efficiency coefficient of the obtained data was determined using formula 2:
$$K_{ef} = \frac{T_{ef}}{T_{total}}$$

(2)

$T_{total}$ – total time allocated for one class.

If the efficiency coefficient exceeds 1, more time was spent on performing the tasks, which testifies to insufficient learning process efficiency.

The data were processed using Microsoft Excel, as it allows entering, storing, and transforming data into tabular and graphical forms. The sociological survey was conducted in accordance with all ethical norms of the International Code on Market, Opinion and Social Research and Data Analytics (ESOMAR, 2016).

3 Results

3.1 Distance learning ins and outs: pre-experiment investigation

To determine the problems faced by students during online learning, a sociological survey was conducted among the students of Moscow Aviation Institute and Kazan Federal University. The obtained data are summarized in Fig. 1.

Figure 1 shows that 35% of students had difficulties with discipline, as there was no strict control from the teachers, and the availability of free time did not always allow one to concentrate on the tasks at hand. Understanding that self-discipline and learning process organization are directly related to psychological aspects was shown by 28% of students. As far as distance education provides a more independent learning process with a lack of direct contact with peers and teachers, there

![Fig. 1 Problems students face in the process of online learning, %](image-url)
were difficulties in perceiving and remembering the necessary information. In line with this, 14% of students claimed that they experienced difficulties due to the lack of feedback from teachers, which is directly related to the evaluation of the data obtained. Identification of the problems students face during their studies is important for the subsequent development of the schedule of classes and the elimination of stress in students after the transition to distance education.

The question “What would contribute to an effective learning process?” was posed among the students (Table 1) before the division into control and experimental groups was carried out.

The results presented in Table 1 make it clear that in order to organize the educational process effectively, first of all, it is necessary to establish a fitting class schedule (37%) because it is at this stage that the curriculum load is distributed and the schedule of each group is formed. Selective control is the second most important criterion – 29% of students believed that it would allow them to keep in tone and study on time since this criterion is spontaneous and it is impossible to prepare for it in advance. Having the necessary study materials for several classes ahead of time allows one to concentrate on the learning process and avoid the anxiety of searching for information. A plan for each lesson helps one manage time and create a study schedule. These data are essential to plan further study steps and develop items that contribute to the formation of a rigid class schedule.

### 3.2 Developing items contributing to a rigid class schedule formation

Based on the data obtained, the authors found that of importance for online learning is a properly planned schedule of classes, which advantages students’ self-organization. Thus, it is recommended to take into account the following elements when composing a class schedule:

1. Classes throughout the semester should start around the same time in order to develop consistency. A clean-cut plan promotes student self-organization and time management capabilities. To this end, the participants of this study were presented with a schedule of classes for a month in advance, so they could get acquainted with it and organize their time properly (the schedule was the same throughout the semester).

2. Even distribution of the number of academic subjects per day contributes to sound academic schedule design. Uniform load facilitates students’ adaptation and the

| Effective indicator                                | Percentage of students, % |
|----------------------------------------------------|---------------------------|
| Class scheduling                                   | 15                        |
| Established class schedule                         | 37                        |
| Randomized control                                 | 29                        |
| Availability of necessary learning materials       | 19                        |
development of a regime that does not differ from traditional offline learning. This indicator is necessary to develop the habit of learning within the allotted time frame and preparing homework with almost identical effort each day. Such an established way of conduct helps prevent student fatigue and form a regimented learning process. As part of the experimental instructional process carried out within the current research, four study subjects were taught every day.

3. As one of the most useful applications that may assist greatly in class planning, the iStudiez pro is recommended. It makes it possible to create a schedule with lessons that are periodically repeated. For better visualization, a specific color to each subject can be assigned, which will allow it to stand out among the others. Also, such an app helps allocate time for preparation for each class and make notes that improve the learning process for each student. Within the limits of the current research, students had two hours to prepare for each class.

4. Systematic tests should be marked in the academic schedule. This promotes greater student concentration and helps to eliminate problems. Earlier marked deadlines are an incentive for effective learning and memorization of the necessary information. Holding tests also affects students’ preparation and helps identify gaps to make changes and focus on a particular study topic. Within the framework of this research, knowledge tests were conducted every two weeks throughout the semester.

5. Unforeseen situations that result in a change of curriculum for a certain period of time must be reflected in the class schedule. Once changes are made to the class schedule, students must be notified to prevent absenteeism. This element is necessary to maintain students’ discipline. In the context of this research, changes in the schedule had to be communicated no later than 15 h before classes.

6. The class schedule should strictly designate breaks and free time, allowing students to be within certain limits and facilitating the learning process that 52 students are worried about (Fig. 1). Each break students had within this experimental study lasted for 20 min.

7. The class schedule should include active links to the material that will be covered in each subject during a specific time period. This would make the material needed for learning available at any convenient time. The authors of this article recommend uploading the material two months in advance so that additional independent preparation is possible. The use of e-books and similar online information sources may help in providing students with data in a specific time frame, which would simplify not only in-class learning but also homework preparation. Having study materials in advance also boosts learning content comprehension and opens the possibility for discussing difficult points with the educator.

8. The class schedule program should include a reminder feature that will notify one of the tests and allow one to track changes in the schedule. This element of the program is also necessary to organize instructional time and keep discipline in order to prepare for midterm exams in a timely manner.

The effectiveness of these recommendations was tested by means of a sociological survey addressed to the faculty of the educational institutions under consideration (Fig. 2). This indicator was mandatory to judge the applicability of the
developed recommendations (which is directly connected with the novelty of this research).

As can be seen from the above, 72% of the teachers indicated a high level of learning process organization efficiency, and 2% indicated that the formation of schedules according to these indicators is ineffective, which is associated with the difficulties of implementing digitalization in the learning process among certain groups of students.

In the framework of the following research step, a sociological survey was conducted to determine the interest in online learning among control and experimental group representatives after six months of training (Table 2). The level of student interest in distance learning according to the developed format is also tightly connected with the applicability of the inferences made and forms the value of this work.

Table 2 explicates clearly that 78% of experimental group students had a high level of interest in online learning, which is associated with the proper learning process organization, a clear plan, and the availability of all the information for students.

Table 2  The level of student interest in online learning

| Student Interest     | Experimental group students, % | Control group students, % |
|----------------------|---------------------------------|---------------------------|
| High level           | 78                              | 27                        |
| Average level        | 18                              | 58                        |
| Low level            | 4                               | 15                        |
learning. The low level was observed in 4% of students only. This could result from the technical aspects of listening to the lectures, as well as class-skipping. Control group participants showed worse results. For example, a high level was observed only in 27% of students, which may well be due to the lack of coordinated actions and time constraints.

### 3.3 Determining relevance and effectiveness of the developed rigid class schedule in the learning process

The next stage of the study was to decide on the need to further introduce a rigid class schedule from the perspective of students. Data on this matter are given in Table 3.

As is clear from the table above, in general, students were satisfied with such a schedule as 86% of experimental group students highly evaluated it. This suggests that a rigid schedule contributes to students’ self-organization, independent work, and other related aspects. At the same time, the proposed schedule turned out to be not suitable for 2% of students, which could be associated with their lack of motivation at the initial stage. Among the control group of respondents, a low level of need for this type of schedule was shown by 28% of students. This is due to the fact that control group participants were only familiar with the schedule, which was posted on the university website but did not apply it directly, so there were problems with the self-organization of the learning process. Determining the extent to which students need a strict schedule shapes their motivation in the learning process and affects the level of knowledge acquired. After determining the degree of necessity of the rigid class schedule method, the results were verified by calculating the knowledge acquisition efficiency. Before this, students in each group were divided into five additional subgroups, which were engaged in answering the questions posed. The efficiency of

| Table 3 | Students’ perceived need for a rigorous study schedule |
|---------|---------------------------------------------------------|
| Perceived need | Experimental group students, % | Control group students, % |
| High level | 86 | 8 |
| Average level | 12 | 64 |
| Low level | 2 | 28 |

| Table 4 | The coefficient of obtained knowledge efficiency |
|---------|--------------------------------------------------|
| Group number | Experimental group | Control group |
| Subgroup No. 1 | 0.5 | 1.3 |
| Subgroup No. 2 | 0.3 | 1.5 |
| Subgroup No. 3 | 0.95 | 0.8 |
| Subgroup No. 4 | 1 | 1.6 |
| Subgroup No. 5 | 0.45 | 0.9 |
knowledge acquisition and assimilation of the necessary information was calculated using formulas 1 and 2. The calculation results are presented in Table 4.

Based on Table 4, one can see that subgroups 1 (0.5), 2 (0.3), and 5 (0.45) had the highest results, which suggests not only efficient learning process organization but also solid students’ motivation. The class preparation time was the same for all subgroups – 8 sessions of 50 min each for one month (after five months of training). The efficiency of information assimilation was rather high, which confirms the necessity of organizing a rigid schedule of classes. The coefficient of obtained knowledge efficiency among the control group participants reached a high level in two subgroups – subgroup 3 (0.8) and subgroup 5 (0.9).

4 Discussion

The identification of approaches for shaping online learning, class schedules, and organizational culture was based on a comparison of various literature sources. Anam et al. (2021) indicated that internet development contributes to the formation of a practical, effective and efficient learning system, as well as facilitates easier process of creating schedules in the university. To this end, they developed the E-SIP program, which included the stages of needs analysis, design, testing, maintenance. For this, the authors studied a sufficient number of literary sources, as well as taking into account the opinions of teachers. The E-SIP program implies a three-level system, where in the first stage only the administrator has the right to enter data, in the second – the person in charge of organizing schedules, the third level is based on the perception of this information. The results of their study showed the effectiveness of the E-SIP, as it provides for simultaneous online management and verification of the submitted data. The current work also emphasizes the use of new technologies; however, instead of the E-SIP program, iStudiez pro was used as it allows for the creation of a colored class schedule for better visualization. Yet, one should take note of the particularity of the samples of the current and analyzed study, as well as the requirement to develop specific competencies for an individual professional. Thus, for visual learners, the formation of a colored schedule is more effective than for those studying healthcare, for instance (Zhiyenbayeva et al., 2021). In this regard, it is quite relevant to consider personalized learning, which has excellent incentives to be taken advantage of in training individual specialties. A good example here may serve the research of Makhambetova et al. (2021) based on three universities in Russia and Kazakhstan. It testifies to the fact that the formation of a personalized learning paradigm is connected with excessive individualization and meeting the needs of only one student.

The factors that influence online learning are presented in the work of Helma & Murni (2021). The authors concluded that learning simple mathematical statements and acquiring critical and creative thinking skills are most effective in a classroom, as students are guided by a teacher, use learning materials, and communicate with peers. After online learning, students performed poorly because they did not adhere to a specific learning schedule, were unsure of problem-solving, and had difficulty
understanding the material independently. In the course of the current study, similar results were found, indicating the need to reconsider the schedule for online learners – 4% of experimental group respondents pointed to a low level of interest in this training format due to inadequate time scheduling.

The level of online learning during the COVID-19 pandemic was assessed by Coffey et al. (2020) among 132 students at the University of California San Diego School of Medicine. The results showed that 73% of students found online classes to be the most appropriate resources. Flexible schedules helped organize free time, but some students confirmed that weekly schedules were more effective because they helped shape their learning mode, although increased access to various resources and interactive remote sessions was observed during online learning. This paper also evaluated data obtained with the help of the efficiency indicator determined by comparing the actual time spent on training with that normatively established.

Nemec et al. (2020) concluded that online education should be similar to traditional learning. They also inferred that distance learning affects the mental and physical state of the students. This is owing not only to the lack of communication but also the fact that students began to devote more time to the learning process. Woodard and Fairbrother (2020) analyzed how distance learning affects students’ self-control. The results of their study showed that the detailed processing of information during the continuous performance of tasks contributes to the development of self-control. In the current research, participants reacted positively to the factors of distance learning with strict rationing of working hours. Therefore, in order to systematize the flow of information in the home atmosphere, the institution may indeed provide the same learning environment.

To reduce the teachers’ workload and increase their efficiency during online learning, Lee et al. (2020) created a dedicated chatbot. Its work is based on the fact that, after educators download the training information and the chatbot can answer all questions about the course materials, create charts, and distribute points to students. Overall, this means was found to be an effective mentor in the learning process and a useful tool for implementation in other systems (Lee et al., 2020). The challenges that teachers and parents have faced in the transition from traditional to online learning are presented by Zigelman (2020). Researcher indicates that educators had to learn how to conduct online conferences and use online tools in a very short period. What is more, they encountered difficulties when explaining instructional material individually, which increased the number of work hours. As for parents, the transition to online learning required much time to be spent with children, which disrupted their work schedules. Students varied in their approach to classes, with some excelling in their learning, some regressing, and some ceasing to attend classes altogether. The current study also actualize time rationing as a factor influencing parents’ work time, outlines the problems students encounter during instruction, and presents mechanisms for dealing with the identified difficulties. Although this work gives no consideration to the problems faced by students during instruction and parental control, it paid a great deal of attention to setting limited time frames for classes, homework preparation, and entertainment.

The experience at hand evidences that distance learning schedule promotes students’ effective independent work, as well as learning process planning. The test
system as part of online learning encourages the assimilation of professional requirements, as well as life cycle changes. A systematic assessment system allows students to respond more quickly to gaps in knowledge, as well as to make changes to the learning schedule (Lapshina et al., 2020). To facilitate the distance learning process, Nigam and Srivastava (2020) developed an interactive online planner that facilitates the development of learning schedules. However, in this article, we turned to iStudiez pro as a springboard for scheduling student work time since this scheduler has proven its effectiveness in a low workload environment and simplifies working with large amounts of information. This study also took advantage of a lesson scheduler, but it was developed directly by the teachers, not by the students.

Jordan et al. (2019) presented the process of training future teachers to work in a distance education environment. Initially, the program was based on interactive learning in community colleges, and then the program expanded to include remote coursework. Cheng and Lee (2018) outlined the factors that affect online learning while learning English. Their study collected quantitative and qualitative factors based on students’ attendance records, which showed that students had significant difficulties in self-study. A rigid study schedule was the main reason for students’ loss of motivation, but constant counselors’ support contributed to students’ persistence.

The analysis of literary sources revealed a huge number of papers related to the forced online learning introduction resulting from the COVID-19 pandemic, for example. This work adds some knowledge to the field by exploring mechanisms that boost the learning process in online settings. These mechanisms aim to develop a rigid schedule of classes, which solves the problems with students’ self-discipline. Confirmation of this was done by calculating the coefficient of knowledge acquisition efficiency among control and experimental group students.

Grounding on the collected data, recommendations on rigid class schedule development, and the analysis of academic sources on the matter, the authors have formed several additional suggestions for such programs’ introduction:

1. Faculty should provide all students with modern learning programs, excluding previously developed traditional learning systems, as innovative curricula benefiting from modern technology can significantly raise students learning efficiency (these data were confirmed in the course of the current study).
2. Adhering to a specific training schedule and developing critical thinking through a greater emphasis on mathematics are critical as student engagement in learning can be enhanced notably through systematic instruction and direct student-teacher communication.
3. Faculty should ensure a systematic discussion between students and educators in order to support communication within distance learning.
4. For better learning results, students’ independence during distance learning, as well as their control by parents, should be ensured.
5 Conclusions

The effectiveness of a strict schedule during online learning is beyond doubt as it helps maintain discipline and learn the necessary subjects, as well as contributes to a good mental attitude towards the learning process. The present study was conducted on the basis of two educational institutions – Moscow Aviation Institute and Kazan Federal University. A total sample of respondents enrolled comprised 226 students who were divided into control and experimental groups, as well as 54 educators. Using the sociological survey method, it was revealed that among the problems faced by students in the process of online learning, self-discipline was important for 35% of respondents, psychological aspects – for 28%, learning process organization – for 23%, and feedback from teachers – for 14%. The analysis of the processed data allowed deducing that the established schedule of classes represents an effective element of learning organization for 37% of students. This figure is a transition from the traditional stage of online learning to a more innovative one.

Based on this, the following recommendations were made and applied to online education. Namely, classes throughout the semester should start approximately at the same time, there should be an even distribution of academic subjects, and iStudiez pro is to be used for scheduling. In line with this, systematic tests should be outlined in a class schedule, clear boundaries for free and study time should be included in the schedule, and links to study materials should be added to the schedule.

As many as 72% of educators from the Moscow Aviation Institute and Kazan Federal University confirmed the effectiveness of the developed scheduling recommendations for second- and third-year students, whereas 2% indicated that there are still difficulties with this approach due to the risk of technical failures. After a sociological survey, 4% of experimental group students showed a low level of interest in this format of training, which is associated with missing classes and in the classroom environment. Among control group students, 15% of people showed low interest, while 28% of control and 2% of experimental group students did not consider a rigid study schedule as effective.

The coefficient of obtained knowledge efficiency was calculated for all participants. Here, experimental subgroups 1 (0.5), 2 (0.3), and 5 (0.45) showed the highest results; only group 4 with coefficient 1 stood out. The collected findings are of scientific value for teachers of various educational institutions engaged in organizing the learning process online.

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Code availability Not applicable.

Declarations

Conflict of interest The authors declare that they have no conflict of interests.

Ethical approval The authors declare that the work is written with due consideration of ethical standards. The study was conducted in accordance with the ethical principles approved by the Human Experiments Ethics Committee of I.M. Sechenov First Moscow State Medical University (Protocol No 1 of 02.09.2020).
Consent to participate  All the participants have given their written informed consent to the participation in the research.

Consent for publication  All the participants have given their consent to the publication of the research results.

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