

Academic Motivation of University Students and the Factors that Influence it in an E-Learning Environment

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Abstract: One of the most important factors in successful e-learning is the motivation of the student. This article examines the very essence of student motivation in the context of e-learning and identifies the factors that influence it. The investigation involved 123 five-year students of the Elabuga Institute of Kazan Federal University and the I.M. Sechenov First Moscow State Medical University aged from 21 to 23 ($M = 22.6$ $SD = 0.03$). Determination of specific factors affecting students' motivation was performed by means of a specially designed questionnaire. Motivation analysis was done by using the Academic Motivation Scale (AMS) adapted for Russian students. The link between the reviewed factors of influence and academic motivation was established by using correlation analysis. In general, the results of the experiment indicate the absence of statistically significant variations in motivation levels across experimental (studying online) and control (studying traditionally) group participants ($t = 0.721$, $p > 0.05$). The significance of this research stems from the fact that it provides an idea of how to increase student engagement in e-learning and limit the effect of determinants reducing student motivation. That aside, they may be taken advantage of when planning and carrying out future research on the influence of e-learning on student motivation.

Keywords: amotivation; e-learning; extrinsic motivation; intrinsic motivation; motivation factors

1. Introduction

The modern world has become a witness to numerous destructive events resulting from the coronavirus disease outbreak (Covid-19). The policy of restricting social interactions has had a significant impact on various areas of our life causing an especially notable effect on the sector of education. As a consequence, many students find it difficult today to grasp these changes (Bovermann and Bastiaens, 2020). The tools of e-learning have become particularly useful under the current pandemic conditions. Almost every university has implemented e-learning methods as far as they propose numerous capabilities to manage, plan, deliver, and track the educational process. Given that most of these systems are cost-free, they can surely provide continuous learning during the pandemic (Almaiah, Al-Khasawneh and Althunibat, 2020).

Online-based education is widely accepted as just as valuable as in-class experience. For this particular reason, it is increasingly applied in educational institutions of various profiles. The system of higher medical education can hardly be deemed an exception in terms of the possibilities for e-learning. The informational part of its courses can also be implemented using an online-based approach, presenting both theoretical (recorded webinars, video lectures, conferences, etc.) and practical material (recorded video elements demonstrating manipulations, the ways of delivering different types of medical care, or surgical techniques) (Ibili, 2020). The confirmation of this may be the Kazan Federal University, which is already benefiting from e-learning by providing its students with original electronic educational resources for disciplines placed in Moodle. By registering a personal account, students acquired the opportunity to sign up for a specific online course, gain access to electronic lectures, practical materials, online and offline consultations, as well as obtain additional points for passing tests and completing tasks and research projects (Maslova, Burdina and Krapotkina, 2020).

Provided that digital technologies afford new opportunities that faculty can apply to make education more attractive, it seems important to be aware of the specific aspects of student motivation within the e-learning process. Hence, the purpose of this study was to analyze the motivation of students during e-learning. According to this goal, the following research questions were set:

1. Discover if there are any differences in the academic motivation of students trained traditionally (in class) and remotely (via e-learning);
2. Determine and analyze the factors of students' motivation (lack of communication, time management, support from instructors, equipment and technical issues) influenced by e-learning.

1.1 Literature review

In recent years, online education has become the subject of numerous academic research publications. E-learning is usually referred to as a technology that enables students to learn digitally, both online and offline, anytime and anywhere, making them more independent in material acquisition (Mayer, 2017). To date, there is a great deal of evidence that effective use of e-learning tools can increase student motivation and attendance (Keller and Suzuki, 2004; Luo, Zhang, Y. and Zhang, M., 2019). In a similar vein, there are enough proofs that e-learning is an educational breakthrough applied to students to learn digitally using software and hardware technologies presented in an engaging and interactive way (Man, Azhan and Hamzah, 2019). E-learning format can include various theoretical materials, videos, tests, simulations, and many other elements (Bovermann and Bastiaens, 2020). Research on the matter has shown that self-efficacy in using a computer and Internet resources is an important factor influencing student satisfaction during e-learning (Kumar Basak, Wotto and Belanger, 2018). Digital education is, by nature, a part of the e-learning concept (Kew et al., 2018). Thus, all materials created and distributed digitally can be integrated into the e-learning platform (Moodle) in the form of text, images, animation, or video (Kim, Hong and Song, 2019; Vaona et al., 2018).

1.2 E-learning and motivation

Motivation is one of the most important psychological concepts in education that encourages students to learn (Faridah et al., 2020). Cognitive motivation (motivation for conscious action) plays a major role in e-learning. It is about when a student does the work not because of fear and not to stand out from the rest or receive a reward, but in order to gain knowledge and skills, become smarter, expand personal horizons, and rise in personal development (Samsudeen and Mohamed, 2019). Motivation is an important factor in maintaining student satisfaction in the e-learning environment. Lack of motivation can be a serious obstacle preventing learners from concentrating on instruction (Jaemu, Kim and Lee, 2008). Research in medical and non-medical fields consistently demonstrates that students are mostly satisfied with the proposed e-learning approaches. Compared to traditional education modes, students' satisfaction in e-learning increases greatly along with perceived ease of access, navigation, interactivity, and interface use (De Leeuw et al., 2019). As a rule, e-learning is externally regulated, which implies that many students are more likely to complete such assignments with largely extrinsic motivation brought into play. Without educators' support for e-learning values, there is a chance that the motivation of many students would deteriorate towards amotivation since their online learning will not be motivationally regulated (Fryer and Bovee, 2016). By and large, there are several factors that can affect students' satisfaction from learning and, correspondingly, motivation to achieve better results. These embrace feedback, progress, and internal reward. Students may perceive their satisfaction differently based on previous experience, technology awareness, and individual preferences (Faridah et al., 2020). In addition, experienced e-learners are more inclined to feel comfortable and calm when using e-learning technologies than those with less practice in it. As a result, high levels of anxiety can negatively affect satisfaction with online-based education (Bolliger, Supanakorn and Boggs, 2010; Ferrer et al., 2020).

Self-determination theory (SDT) models motivation through the regulatory continuum. According to SDT, motivation should be viewed from a multidimensional perspective (Howard et al., 2021). In the context of this theory, motivation indicators can be influenced by the use of modern digital technologies that increase students' interest and motivation in online learning through their interactive format (Chiu, 2021). Thus, it can be divided into intrinsic motivation, extrinsic motivation, and amotivation (Fryer and Bovee, 2016). In order to increase academic motivation, it is necessary to improve the quality of the training content, as well as find out the reasons that affect its level in students. A thorough analysis of research papers on the matter, primarily in the context of computer-based and distance education, allowed elaborating a theoretical framework for influences on the learner's motivation in independent e-learning. These factors can be divided into three main categories of motivational influence: internal, external, and personal (Dubey and Pirooska, 2019; Kim and Frick, 2011). Internal factors are related to the features of the course itself. For example, representative internal motivators are personal goals, qualities, desire to create or learn something new, etc. External factors refer to aspects of the learning environment. For example, representative external factors are the influence of the teacher, parents, social circumstances, environmental and psychological factors. Personal factors are connected with motivational influences caused by the learner (Jalal and Mahmood, 2019). Another study on motivation in e-learning proposes

ten techniques for attracting and retaining students' attention: incentives from educators, excitement, mismatches, specificity, variability, humor, questioning, participation, breaks and stimulants, and storytelling (Keller, Hrastinski and Carlsson, 2007). At the same time, other research works posit that learner's satisfaction with and motivation for e-learning can be affected dramatically by the social presence (Abou El-Seoud et al., 2014).

2. Methods and materials

2.1 Research design and sample

This study involved four groups of five-year students of two educational institutions – the Elabuga Institute of Kazan Federal University and the I.M. Sechenov First Moscow State Medical University (two groups from each). Their age ranged from 21 to 23 years ($M = 22.6$ $SD = 0.03$), while the gender composition was 64 women and 59 men.

To achieve the study goal, the research process presupposed the total respondents' cohort to be divided into two groups. The first one, experimental (EG), comprised 62 individuals engaged in e-learning, whereas the second, control (CG), was supposed 61 students enrolled to undertake traditional in-class preparation without e-learning techniques used. These two groups were equivalent in all demographic characteristics as well as the first group was from the Elabuga Institute of Kazan Federal University and the second group from the I.M. Sechenov First Moscow State Medical University. Overall, the experiment lasted for 12 academic weeks (1 module). Under e-learning, the study authors defined online classes using additional digital resources (Figure 1).

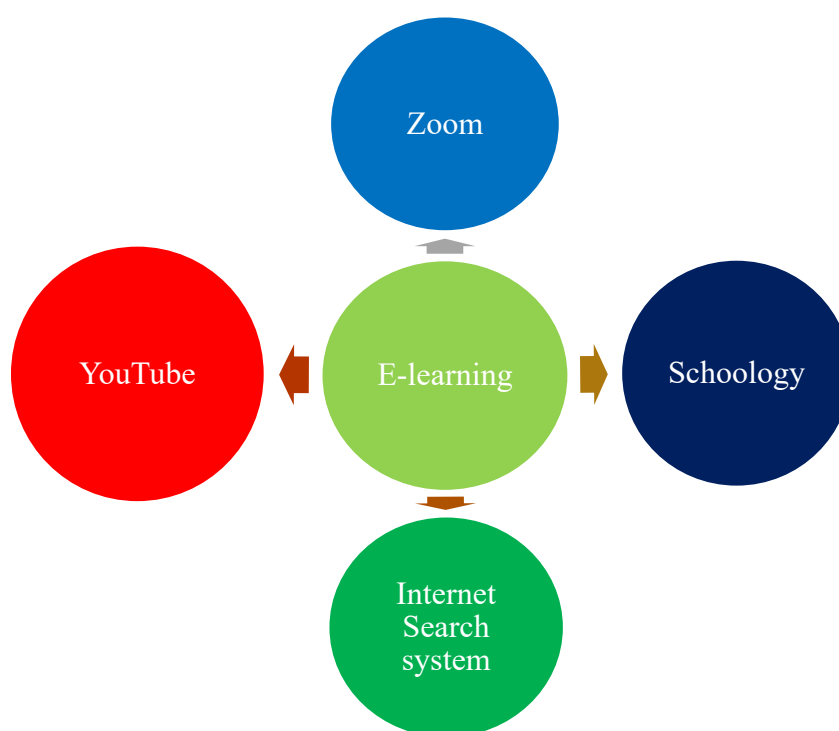


Figure 1: Additional digital resources used by online e-learning classes

The training schedule and materials (notes, lectures, homework links) were posted in the Schoology system. Schoology.com is a free teaching tool that helps educators to manage classroom information. It is a collaborative platform for instructors, students, and parents directed at connecting the school community in the technology-supported classroom for improving students' learning (Biswas, 2013). In such a manner, each student was provided with their own online cabinet, where all data on received grades and attendance were displayed. Within the course of the experiment, all necessary lectures for EG participants were presented in the format of video recordings on the YouTube platform, while practical activities were held in Zoom-conference mode. As for the CG students, all of their classes were university-based. The entire learning process took place in face-to-face mode, without the use of additional technological solutions. For the sake of comparison, before and after the end of the module, all students were surveyed to determine their motivation levels by means of the Academic Motivation Scale (AMS) adapted to Russian realities (Gordeeva, Sychev and Osin, 2014; Vallerand et al., 1992).

An additional survey was also conducted for EG participants to determine the possible factors influencing their motivation.

2.2 Data collection and coding

As it was previously noted, the academic motivation of degree-seeking students was measured through the adapted AMS (Gordeeva, Sychev and Osin, 2014; Vallerand et al., 1992). AMS incorporates 16 statements representing the answers to the question: “Why are you currently attending classes at the university?” The degree of agreement was assessed on a 6-point Likert scale (0 – “Does not correspond at all,” 5 – “Corresponds exactly”). The statements were grouped into four sections. Table 1 provides a description of the goals and statements of each subscale.

Table 1: AMS: short description

Sections	Description	Statements
Intrinsic motivation towards knowledge (IMK)	Characterizes interest, joy, and pleasure in the learning process	<ul style="list-style-type: none"> - Because I experience pleasure and satisfaction while learning new things - For the pleasure I experience when I discover new things never seen before - For the pleasure that I experience in broadening my knowledge about subjects which appeal to me - For the pleasure that I experience when I read interesting authors
Intrinsic motivation towards achievement (IMA)	Describes the feeling of personal significance and meaningfulness of the performed educational activity	<ul style="list-style-type: none"> - For the pleasure I experience while surpassing myself in my studies - For the satisfaction I feel when I am in the process of accomplishing difficult academic activities - To prove to myself that I am capable of completing my college degree - For the pleasure that I experience while I am surpassing myself in one of my personal accomplishments
Extrinsic motivation (EM)	Describes learning as the process triggered by the need to fulfill the obligations taken and a sense of guilt	<ul style="list-style-type: none"> - Because I think that a college education will help me better prepare for the career I have chosen - In order to obtain a more prestigious job later on - Because eventually, it will enable me to enter the job market in a field that I like - Because I believe that a few additional years of education will improve my competence as a worker
Amotivation (A)	Describes the lack of a sense of meaningfulness and interest in current learning activities	<ul style="list-style-type: none"> - Honestly, I don’t know; I really feel that I am wasting my time at university - I once had good reasons for going to college; however, now I wonder whether I should continue - I can’t see why I go to college and frankly, I couldn’t care less - I don’t know; I can’t understand what I am doing in school

All sections had acceptable reliability ($0.71 < \alpha < 0.91$) (Gordeeva, Sychev and Osin, 2014; Vallerand et al., 1992). In order to assess the factors affecting students’ motivation, a special questionnaire was developed. Its scale referred to the motivation to learn and was compiled grounding on the literature analysis. The first draft of the questionnaire was reviewed by six experts who further made relevant amendments to it. Preliminary testing of its consistency was made by calculating Cronbach’s alpha ($\alpha=0.932$). The degree of agreement with the factor (Table 2, column 2) was assessed on a 6-point Likert scale from 0 – “Does not correspond at all” to 5 – “Corresponds exactly.” More detailed data on the questionnaire are presented below.

Table 2: Factors affecting learning motivation

Statement	Factor
1. I experience a lack of live communication with fellows	Lack of communication
2. Sparing a while for self-study is rather difficult for me	Time management
3. I find educators' support very important	Support from instructors
4. The use of e-learning technologies encouraged me to study more	Equipment
5. I had technical difficulties (poor Internet access, the program crashed, etc.), which made me somehow disappointed	Technical issues

2.3 Data analysis

In order to reach the ultimate study goal, the data analysis was aimed at the following:

1. Investigate the outcomes of the survey on academic motivation conducted amongst two groups of students through the independent samples t-test based on the mean and standard deviation values;
2. Compare the levels of motivation outlined in the CG and EG respondents via pre- and post-testing;
3. Determine the correlation between motivation and the factors that influence it by using Pearson's correlation analysis.

For the results' interpretation, cross-sectional descriptive and comparative statistical analysis methods were chosen. Statistical data processing was performed in the Statsoft Statistica V.6.0. The significance of differences was measured using Fisher's t-test (significant at $p \leq 0.05$). To estimate the parameters of the mediating variable, the analysis was performed at a 95% confidence interval.

2.4 Ethical issues

All participants enrolled gave informed consent to participate and were completely anonymous. Their personal data was neither collected nor stored or used during the study. The research process did not affect respondents' academic performance or personal development.

3. Results

The results of the evaluation of the motivation under different learning strategies are presented in Table 3.

Table 3: Statistical evaluation of the general academic motivation (between groups)

Group	N	Mean (SD)	t-value
Pre-test			
CG	61	3.21 (0.435)	0.721
EG	62	3.29 (0.425)	
Post-test			
CG	61	3.13 (0.429)	0.687
EG	62	2.95 (0.421)	

The above data indicate that the results of the two groups in the pre-test did not reach the level of significance ($t = 0.721, p > 0.05$). Thus, their academic motivation before the experiment did not differ. Additionally, it should be noted that, even though EG's indicators in the post-test are lower than those of the CG, they are far from reaching the level of statistical significance between groups ($t = 0.687, p > 0.05$).

The results of the analysis of learning motivation for each study group in pre- and post-testing are presented in Table 4.

Table 4: Statistical evaluation of the general academic motivation (for pre- and post-testing)

	Mean (SD)	t-value
CG (N=61)		
Pre-test	3.21 (0.435)	0.717
Post-test	3.13 (0.429)	
EG (N=62)		
Pre-test	3.29 (0.425)	0.657
Post-test	2.95 (0.421)	

According to the performed calculations, academic motivation in the post-test decreased for both groups: by 0.08 in the CG and by 0.38 in the EG. Correspondingly, the value obtained by CG is statically insignificant ($t = 0.717, p > 0.05$), whereas the result shown by the EG just barely reaches the statistical significance threshold ($t = 0.657, p < 0.05$). This allows one to conclude with confidence that the motivation in the CG remained practically the same after the experiment, while in EG students, it decreased more radically. In the meantime, it is important to remark that the results of pre- and post-experimental assessment of the academic motivation of students in both groups correspond to the average level (their values range from 3 to 4).

The results of post-testing on motivation according to the intrinsic motivation towards knowledge, intrinsic motivation towards achievement, extrinsic motivation, and amotivation sections are presented in Table 5.

Table 5: Post-test motivation results by subscales

Subscale	CG (N=61)	EG (N=62)	t-value
	Mean (SD)	Mean (SD)	
IMK	2.65 (0.392)	3.11 (0.421)	0.651
IMA	2.87 (0.402)	2.79 (0.391)	0.771
EM	4.21(0.478)	4.02 (0.461)	0.769
A	1.01 (0.351)	1.06 (0.352)	0.783

As evidenced in the table, the intrinsic motivation towards knowledge section values statistically differ across two groups of respondents. In the EG, this indicator is 0.46 higher as compared to the CG ($t = 0.651, p < 0.05$). Rather reversed is the state of affairs with extrinsic motivation – its CG value comes to the fore exceeding that of EG by 0.19. The difference in the resulting values collected for the intrinsic motivation towards achievement section e is statistically insignificant ($p > 0.05$), which suggests the average level of this motivation type in both groups. As concerns amotivation, its value is higher among EG students by 0.05. However, this result is statistically insignificant and indicates a low level of amotivation among the persons enrolled in the experiment. The results of the statistical evaluation of factors influencing motivation are presented in Table 6.

Table 6: Statistical evaluation of factors affecting students' motivation

Factor	Mean (SD)
Lack of communication	4.49 (0.498)
Time management	3.81 (0.487)
Support from instructors	4.21 (0.456)
Equipment	3.97 (0.489)
Technical issues	3.02 (0.451)

The table above reports that the most rated factors influencing motivation are *insufficient communication* ($M = 4.49$), *time management* ($M = 3.81$), *support from instructors* ($M = 4.21$), and *equipment* ($M = 3.97$). This implies that students regard communication with fellows and the quality of content and educational programs using online technologies as important, experience difficulties in time management, and often need additional support from educators. On the other hand, average indicators for the *technical issues* factor ($M = 3.02$) indicate that students are likely to respond calmly to technical problems.

The relationship between factors affecting motivation and motivation types is presented in Table 7.

Table 7: Relationship between aging, gender and creativity types

	IMK	IMA	EM	AM
18 years old	- 0.01*	-0.34*	- 0.89*	0.78**
20 years old	-0.07*	- 0.31**	-0.13*	0.21*
22 yerrs old	0.41**	0.47**	0.81**	-0.55**
women	0.43**	0.17*	0.56**	-0.42**
Men	-0.21*	-0.05*	- 0.11*	0.44*

* No correlation $r = 0$

** Correlation is significant at $r > 0.3$

The link between the reviewed factors of influence and academic motivation was established by using correlation analysis. The collected data explicate a moderate positive relationship between intrinsic motivation towards knowledge and *support from instructors* and *equipment* factors ($r > 0.3$). In the meantime, this motivation type

correlates very weakly and negatively with the factors designating the *lack of communication*, *time management*, and *technical issues* ($r < -0.3$). As regards the intrinsic motivation towards achievement, it positively correlates with the factor denominating the *support from instructors* (0.41). At the same time, there is a weak negative relationship between this motivation type and the *lack of communication* and *time management* ($r < -0.3$), as well as a very weak positive link with the *equipment* ($r = 0.17$). Data for extrinsic motivation show a strong negative relationship with the *lack of communication* ($r > -0.8$) and a strong positive bond with the *support from instructors* ($r > 0.8$). What is more, there is a positive correlation between extrinsic motivation and *equipment* ($r = 0.56$) and a weak negative link between this motivation type and the *time management* factor ($r < -0.3$). The amotivation indicator strongly and positively correlates with the *lack of communication* ($r = 0.78$) and has a moderate negative relationship with the *support from instructors* ($r = -0.55$) and *equipment* ($r = -0.42$). Of particular notice is also the fact that the *technical issues* factor correlates weakly and negatively with all academic motivation types ($r < -0.3$), except for amotivation ($r = 0.44$).

4. Discussion

Provided that the results of post-testing of the EG and CG registered the absence of statistically significant differences in the level of motivation ($t = 0.721$, $p > 0.05$), one can infer with certainty that the academic motivation of students is practically independent of the study mode. A general decrease in motivation among EG participants ($p < 0.5$) may be provoked by poor extracurricular activity and a lack of student-engaging events in the university environment. Another reason for such an outcome can be the limited communication with fellows and the inability to plan and organize independent study during e-learning, which was actually proved by the relatively high values obtained for the *lack of communication* ($M = 4.49$) and *time management* ($M = 3.82$) factors. In a similar fashion, the study showed that the *lack of communication* is the main factor directly related to amotivation ($r = 0.78$), whereas the *support from instructors* is still regarded as very important ($M = 4.21$). Failure to contact the teacher in “live” and rather weak self-organization abilities make it difficult to awaken positive emotions in the online-based educational environment. Analysis of the survey answers provided the possibility to conclude that interaction with educators and mentors stimulates extrinsic motivation and reduces amotivation. Students expect recognition, receiving a positive assessment of their efforts, and are persistent in striving to achieve the intended goal regardless of the study mode. However, in this day and age, the role of an educator in e-learning has somewhat shifted from its traditional sense. Instead of being just a knowledge evaluator, today, such a person acts as a coordinator of the educational process, whose functions are to organize, adjust, interact (both in synchronous and asynchronous modes), and monitor the academic progress (Daumiller, Stupnisky and Janke, 2020). The correlation analysis explicated no relationship between academic motivation and *technical issues* ($r < 0.3$). Given that this factor is positively associated only with amotivation ($r = 0.47$), one can argue that such technical problems as poor Internet connection, for instance, can facilitate a decrease in the level of student learning motivation as well. For this particular reason, it is important for learners to receive an optimal amount of high-quality information for self-study as they may express mounting concerns and anxiety about the large volume of educational material for being covered by themselves alone (Logan et al., 2017). A higher level of intrinsic motivation towards knowledge in remotely-trained individuals ($t = 0.651$, $p < 0.05$) and its unrelatedness to the *lack of communication* and *time management* ($r < 0.1$) could arise from the fact that the use of advanced online-based technologies in e-learning encourages the improvement of students’ cognitive processes and focus on the knowledge necessary for a future career.

Although numerous academic works claim that e-learning can enhance the overall desire to learn (Elfaki, Abdulraheem and Abdulrahim, 2019; Makhambetova, Zhiyenbayeva, and Ergesheva, 2021) and that the motivation for studying via the Internet is higher than when using a whiteboard and a projector in the class (Hoerunnisa, Suryani and Efendi, 2019), the outcomes of this study do not appear to corroborate this position. The same applies to those researchers analyzing e-learning in the field of medicine from the quantitative and qualitative perspectives and indicating raised student satisfaction as well as improved knowledge, self-awareness, understanding of the major concepts, and achievement of course objectives within the online-based preparation (Venkatesh et al., 2020). Some academic world representatives claim that the convenience and flexibility of e-learning have a direct impact on motivating individuals to study online. On the contrary, others, after reviewing student motivation in the context of continuing medical education, declare that flexibility, convenience, and control (that is, the freedom to work at one’s own pace) are the main factors influencing students’ success in distance learning (Tossy, 2017). Many also conjecture that controlling the pace and timing of learning is more important for individuals choosing online preparation format, while interaction with the instructor and peers is paramount to those preferring the traditional learning mode (Dubey and Pirooska, 2019).

4.1 Research limitations

It is plausible that a number of limitations might influence the results obtained among which are limitations in determining the level of student motivation, a small sample presented by students of two universities in one country without taking into account other countries. They were equally important in the results' interpretation and in considering future research directions. In this respect, it should be noted that while this study took into account already acquired competencies and the observed outcomes of the e-learning course, modeling of overall results was based mainly on data provided by research participants themselves. This could have influenced the external validity of this study to some degree. Even though the conducted investigation did not consider students' specialization and created as equal conditions for respondents as possible, carrying out more works of this kind will provide meaningful comparisons.

5. Conclusions

The evidence from this study points towards the idea that students' academic motivation does not depend on the learning strategy ($t = 0.687$, $p > 0.05$). The assessment of learning motivation revealed its post-test decrease for both groups involved in the experiment: by 0.08 in the CG ($p > 0.5$) and by 0.38 in the EG ($p < 0.5$). The central factors leading to such events were the limitation of the ability to communicate with fellow students ($M = 4.49$) and the lack of skills in sparing time for self-study ($M = 3.98$). In turn, the support from instructors was defined to favorably affect extrinsic motivation ($r = 0.81$), while technical issues and insufficient communication were positively correlated with amotivation ($r > 0.3$). In sum, this suggests that for the development of motivation in the context of e-learning, it is important for educators to provide active feedback on students' activity and report on the success of study assignments' completion. Poor motivation and self-discipline are other problems of e-learning requiring increased attention from the academic community. Their elimination is advised to be done via careful selection of educational materials and organization of video conferences in Zoom at a high technical level. The matter of self-discipline deserves special focus as it is crucial not only for mastering the studied material after classes but also in the process of learning at home. Considering the positive and negative aspects of e-learning and analyzing the factors affecting motivation, the authors of this article came to the judgment that e-learning cannot completely replace the standard form of education but can be beneficial in ensuring a high level of education accessibility while maintaining its quality. So, it would definitely be fascinating to utilize e-learning as a standard tool in higher education. The significance of this research stems from the fact that it provides an idea of how to increase student engagement in e-learning and limit the effect of determinants reducing student motivation. Future research directions of the study are the possibility of applying in practice the presented methodology in order to study the motivational factors of students from universities in different countries. Also promising is the study of motivational factors of students of different specialties in the comparative aspect.

Declarations

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