Research Article

Motivational Indicators and Academic Success in Students: The Impact of Fragmented Thinking

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Background

A potential remedy for this situation is to integrate advancements in information technology with traditional methods of working with academic texts, using gadgets exclusively as supplementary sources of scientific knowledge.

Objective

The aim of the research is to develop an understanding of fragmented thinking in universities in Russia and Kazakhstan by surveying teachers and identifying optimal methods for influencing the reduction of students' inclination toward fragmented thinking.

Methods

The study employed a population of 137 teachers and a random sample of 384 students from the 1st – 5th years. The research was conducted using surveys among faculty members and analysis of student performance indicators at the Institute of Foreign Languages of the Russian University of Friendship of Peoples and the Abai Kazakh National Pedagogical University (Almaty). The study included: (i) An analysis of the impact of motivational strategies on the tendency toward fragmented thinking, (ii) a correlation analysis between academic performance and the tendency for fragmented connections, and (iii) a theoretical and survey-based analysis of the positive and negative aspects of this type of thinking.

Results

The results demonstrate significant differences in the role of each motivational strategy in relation to fragmented thinking.

Conclusion

This study can enhance the understanding of the interaction between students and educators, mobile technologies, and social networks.

1. INTRODUCTION

Today, society is in a new stage of development – the informational era. This shift is driven by the increasing significance of information in people's lives. A new mode of communication and information dissemination, referred to as "screen culture,"[1] is emerging. The information society impacts social structures, education, and management processes, altering our thinking and giving rise to new concepts in the academic literature, such as "screenman," "fragmented thinking," and "fragmented consciousness."[2]

The concept of "fragmented thinking," also known as "clip-based thinking," was articulated well before the widespread availability of information sources.[3] Fragmented perception and understanding of the world were not directly linked to the constant presence of smartphones but rather to the proliferation of mass media, particularly television, which distorts natural perception and worldviews.[4]

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Individuals from the "pre-television" era placed greater value on direct personal experience and the worlds shaped by their imagination through reading.

"Fragmented thinking" is a response to the increasing volume of information.[5] The deepening of fragmented thinking and its transformation into clip art should be associated with the emergence and development of the all-encompassing informational realm of the Internet.[6] The trend, initially rooted in the advent of television, has intensified. Modern technologies now enable vivid perceptions not only of the lives of television celebrities but also of ordinary individuals, through blogs, social media posts, photos, videos, and live broadcasts. In this context, the virtual world sometimes appears more real than the actual world, as more people devote their time to immersing themselves in social networks.[7] A key moment in the development of this trend was the proliferation of compact internet-access devices, such as tablets and smartphones. Unlike television, which implied a "point of entry" into the informational field – where one could only engage with content while at home and resting from work – the smartphone has eliminated the very notion of a "point of entry" into the virtual world. People are now almost continuously immersed in the informational realm, constantly shifting from one type of information to another.[8,9]

Under the influence of the vast flow of diverse information that contemporary youth attempt to process by constantly switching between digital applications, consciousness becomes fragmented, capturing isolated, vivid fragments from the surrounding world that are not connected to each other. This results in an eclectic, shallow, and fragmented worldview.[10] The characteristics of clip-based thinking are reflected in television, cinema, and animation: Whereas scenes in films and TV shows produced before the widespread dissemination of the internet could last 5 – 10 min, modern films frequently switch between scenes, and in television programs, individual shots are displayed for no longer than 10 – 20 s.[4]

The development of fragmented thinking has impacted other forms of information and altered the presentation of material in the educational process.[11] Consequently, the traditional educational principle of visual clarity is now transitioning to the widespread incorporation of multimedia tools into the teaching process (projectors, interactive whiteboards primarily used as projection screens, and lecture presentations).[12] It remains unclear whether the increase in "fragmented thinking" actually facilitates material retention, and whether the drive toward enhanced visual presentation is genuinely a result of the use of modern educational tools or merely a "last resort" for students with unstable attention and underdeveloped conceptual thinking.[13] Thus, the education industry both adapts to the needs of the contemporary student and, paradoxically, exacerbates their fragmented thinking, further advancing them along this path.[4] This phenomenon contributes to the decline in interest in classical literature, as most teenagers and students prefer brief summaries or are willing to engage with classical works in a visual format, such as short films.[14]

With the informatization of education, there is a risk of losing the creative capacity to foster culture. The older generation retains skills in processing information, such as comprehension, comparison, analysis, and critique, while the younger generation tends to prefer dynamic thinking, favoring visual reception, processing, and information creation.[6] In contrast, the educational process still struggles with transformative risks, maintaining a traditional approach to educating the new generation raised on the byproduct of fragmented thinking (primarily video materials, such as those found on TikTok).[15,16] This issue is particularly relevant in post-Soviet countries, especially Russia and Kazakhstan, where adaptation strategies in the context of digitalization are progressing at a slow pace, primarily due to a lack of resources and an innovative educational infrastructure.[17] Moreover, the primary indicator of educational effectiveness in such countries, as in most developed higher education institutions, remains academic performance. Therefore, the shift toward fragmented thinking cannot be allowed to undermine the perception of information.[18]

All this highlights the fact that, at the present stage of experimental research, the study of motivational indicators of academic performance and the evaluation of future prospects for examining the impact of fragmented thinking – considering both its advantages and disadvantages for the educational environment, educators, and students – is highly relevant. This relevance is further emphasized by the extensive discussions in the media and among secondary and higher education faculty about the negative consequences of modern technologies. However, there remains a lack of scientific research on this phenomenon. As a result, three null hypotheses (H_0) are formulated in this study:

(i) H_{01}: The use of specific motivational strategies does not influence the manifestations of fragmented thinking in students.
(ii) H_{02}: Manifestations of fragmented thinking in students have no impact on their academic performance.
(iii) H_{03}: Fragmented thinking is exclusively defined as a negative phenomenon for the learning process.

These hypotheses will allow us to determine the prospects for implementing different types of strategies, to form potential ways to combat the negative manifestations of fragmented thinking, and to achieve the necessary adaptive behavior to modern conditions on the part of education. In addition, future work will focus on the side effects of the phenomenon of fragmented thinking on an important determinant of education, in particular, academic success, to find out whether they have a certain connection. This is necessary to strengthen the understanding of the attention to fragmented thinking in the field of digitalization. Finally, this study will help to answer the question of the possible advantages of such an evolutionary basis of memory, determine the view of educators, and shed light on the insufficiently studied scientific area of clip thinking.

2. LITERATURE REVIEW

Instructors working with contemporary students face a catastrophic decline in attention span, which in higher education is attributed not to physiological factors but to habitual distraction by external stimuli.[6] The constant possibility of remaining connected and addressing work-related issues while engaging in other activities provides students and even schoolchildren with the opportunity to earn extra income, but it also represents an additional distraction during learning. The boundaries of the concept of labor as a productive activity are increasingly blurred, as many professions require close interaction with the virtual environment, and if a teacher sets rules regarding smartphone usage during lessons, they risk negative reactions from students who insist that smartphones are not merely entertainment tools but their work instruments.[3]

Social-cognitive theory posits that learning is an active, constructive process where individuals deliberately seek and process information.[19] From this perspective, learning involves the interaction of cognitive, motivational, and emotional processes within the educational context.[20] These processes during learning are not confined to individual students. Students typically learn within a social context that includes interactions with peers, teachers, and even parents.[21] They are responsible not only for their own knowledge, motivation, and emotions but also collectively for the thoughts, feelings, and actions of others.[22] Furthermore, students act as active agents in social and technological environments, interacting with their teachers, peers, various technologies, and numerous available artifacts, often within a collaborative learning environment.[23] Thus, the quality of education depends on the complex interplay between cognitive, motivational, and emotional processes and external sources surrounding students, such as teachers, peers, and technological tools.[24] The complexity and interrelation of learning processes and social factors during education present a significant challenge for educational sciences in their efforts to understand these processes and develop effective strategies to facilitate successful learning.

In recent years, the primary mode of instruction has gradually shifted from the traditional teacher-centered approach to a student-centered model, where instead of passively receiving knowledge, students are encouraged to actively engage with what they are learning and to think more deeply.[12] The characteristic feature of traditional instruction is that the teacher imparts information and knowledge that are already available and well-established. The emergence of "post-textual" thinking is linked to the advancement of electronic communications.[25]

The formation and active development of fragmented thinking are intricately connected with the electronic representation of text. This mode of presentation contributes to the specific cognitive patterns of individuals who spend significant time online.[14] Since a student's perception of information is shaped by their interaction with the informational field, which is unavoidable in contemporary settings, educators will need to expand their interaction formats with this field. The recommended strategies include engaging in project work utilizing internet content and access to informational resources, switching between different types of activities during learning – similar to "scene changes" in movies and television programs – actively involving students in content creation as opposed to passive consumption, and considering that while the modern format of information presentation allows for the retrieval of any data, it does not permit artificial intelligence to draw its own conclusions.[3]

The introduction of the term "fragmented thinking" has led to a number of stereotypes that could be questioned and problematized in our research. To establish the transformation of cognitive processes under the influence of information technologies, a group of contemporary researchers proposes the use of the concepts of "network thinking" or "fragmented thinking."[26,27] The term "clip thinking" is often applied to the cognitive processes of adolescents and young people, with this type of thinking frequently perceived negatively.[28] Another scholarly perspective on the importance of motivational factors and student success, particularly under the influence of fragmented thinking, is presented in the work of an American scholar. This study focuses on educational success, analyzing learning success in terms of the student's state, the learning process, the result, and its

necessity. Academic success is defined as the student's personal aspiration to acquire knowledge, which reflects their own motivation and interest in the subject.[1] Success is an integral assessment of the effectiveness of personal efforts, recognized by others, and elicits emotions in the student that reflect a positive personal attitude toward learning, thereby contributing to a sense of satisfaction.[3]

First, fragmented thinking is often analyzed exclusively as a characteristic of younger generations, including children, adolescents, and students. Second, it is frequently perceived as a negative phenomenon that needs to be eradicated.[29,30] In the United States, pharmacological treatments are used to address students' distractibility,[12] while in Russia, there are recommendations to encourage reading among children.[20] Fragmented thinking is identified as a contributing factor to the decline in student education, with suggestions to undergo training to improve concentration on a single task.[1] Under the influence of information overload, thinking ceases to be systematic, and immersion in the internet industry may lead to the degradation of cognitive processes.[31,32]

2.1. PROBLEM STATEMENT

Fragmented thinking, both among students and teachers, has become a relatively widespread phenomenon in contemporary settings. An analysis of existing scholarly publications indicates that the issue of the impact of fragmented thinking on students' academic success remains highly relevant. The lack of specific or even complementary methods in university teaching practices contributes to the proliferation of this phenomenon in an increasingly digitized era. At present, there is limited research on this topic in the scientific literature, primarily due to the insufficient study of this phenomenon. The relevance of the issue is driven by the rapid integration of digital technologies into education, which has, in turn, facilitated a more attentive recognition of the manifestations of fragmented thinking among youth.

The primary motivation of this article is to outline the fundamentals of fragmented thinking and analyze the most accessible methods for minimizing its effects on students' academic activities. The aim of the article is to analyze the role of "fragmented thinking" in higher education in Russia and Kazakhstan, as well as to investigate its impact on students' success in the educational process of higher educational institutions. In general, three objectives were set for the present study: (i) Testing available methods for mitigating the manifestations of fragmented thinking, (ii) analyzing the correlation between fragmented thinking and academic success among students, and (iii) identifying the positive and negative aspects of fragmented thinking based on a literature review and teacher surveys.

3. RESEARCH METHOD

The study was conducted using a survey method among faculty members and an analysis of student performance indicators at the Institute of Foreign Languages of the Russian University of Friendship of Peoples and the Abai Kazakh National Pedagogical University (Almaty), which provides both full-time and part-time education. The research involved a two-stage approach to examining the influence of fragmented thinking. The teacher survey was based on a random sample and communication through a questionnaire and semi-structured interviews. Subsequently,

students were tested to assess the systematization of their thinking before and after the intervention. The intervention refers to the implementation of specific methods in small student groups aimed at reducing fragmented thinking within the educational process. The study also sought to determine the relationship between fragmented thinking and the academic performance of the respondents. A quantitative method was used for collecting and analyzing the interpretations and responses to the survey in this research.

3.1. PARTICIPANTS

The study involved two groups of samples. The first group consisted of the entire faculty department from the two universities involved in this study. Teachers were selected regardless of age, gender, and other characteristics. A total of 137 teachers participated in the study: 67% female and 33% male. The average age was 48.234 years (standard deviation [SD] = 3.389), and the average teaching experience was 6.622 years (SD = 1.018). The faculty members represented various disciplines, including "Energy," "Cultural Linguistics and Intercultural Communication," "Russian Language and Literature," "Journalism," and "Philology."

The second group comprised students from both universities. Random samples were selected using a randomizer. In total, 384 students from the 1st to the 5th year were included in the study. A more detailed description of the sample can be found in Table 1.

3.2. STUDY DESIGN

The first task of the study is to test available methods for mitigating the manifestations of fragmented thinking. At the outset of the study, certain strategies for potential improvements in students' thinking in the context of fragmentation were analyzed. The principle of accessibility was used as the foundation, as teachers were expected to integrate these strategies independently (without additional funding from the educational institution or other resources). Based on the literature review, six groups of methods were identified and

Table 1. Characteristics of the student sample

Characteristics	Percentage
Gender	
Female	38
Male	62
Age (years)	
17 – 19	32
19 – 21	55
21 – 23	13
Specialty	
Pedagogical	10
Foreign languages	63
Economics	27
Number of higher education institutions	
Institute of Foreign Languages of the Russian University of Friendship of People	97
Abai Kazakh National Pedagogical University (Almaty)	1
Beijing Institute of Technology	2
Nationality	
Russian	56
Kazakh	42
Other (Chinese, Korean, English, or Australian)	2

evaluated for their effectiveness in addressing fragmented thinking (Table 2).

Using the same procedure, participants were randomly divided into 6 equal groups (64 participants in each). The division of participants into groups did not influence the educational process in any way. Within each group, the instructor applied a specific method during each class session. The technique was applied for 3 months. It was established that a specific method for a group had to be applied at least once during each class. The methods were coordinated with the authors for each lesson and could not be mixed.

Before and after the intervention, students underwent diagnostics to assess their fragmented thinking. A modified version of Litvinov's "Clip Type Thinking Test" was used for the study. The questionnaire included two answer options: Option A and Option B, with a total of 30 questions. One point was awarded for selecting answer A on question 1, 2, 5, 7, 8, 11, 13, 17, 18, 20, 22, 24, 27, 29, and 30, while one point was awarded for selecting answer B on question 3, 4, 6, 9, 10, 12, 14, 15, 16, 19, 21, 23, 25, 26, and 28.

Thus, the score range that a student could achieve was from 0 to 30 points. A higher score indicated a greater tendency toward clip-like perception. Each question was checked for relevance to the target audience. The Cronbach's alpha test demonstrated the reliability of this instrument (0.8862).

The second task of this study is the analysis of the correlation between fragmented thinking and academic success. The identified values regarding the tendency toward fragmented thinking were also examined for their

Table 2. Principles of applying components of motivational strategies for each group

Method	Essence
Non-judgmental approach	Throughout the course, students did not receive any grades for their work (lectures, practicals, labs, or homework). The final grade was assigned at the end of the semester, taking into account the entire body of work.
Communication culture	Teachers adopted a more informal tone in their communication. There was a form of address using the familiar "you" between lecturers and students, and academic discussions were allowed outside the university setting, including communication through social networks, etc.
Unconventional teaching methods	The methods used were at the discretion of the teachers and could vary from session to session. These included activities outside the university classroom, physical exercises during lessons, and more.
Teacher's sense of humor	The teachers incorporated humor into lectures and practical sessions. The materials were explained in the format of stand-up shows, with entertaining tasks and stories from life on humorous topics.
Continuous analysis of life situations	The approach presented educational content based on life situations. Each topic was initially addressed from a practical, life-oriented perspective.
Creation of problem-based scenarios	The materials were designed in a way that each class was structured as a quest, aimed at solving a specific problem using newly acquired knowledge.

correlation with academic success. To this end, grades at the end of the second semester of the academic year were used as indicators.

The third task of the study is the identification of positive and negative aspects of fragmented thinking based on the literature review and teacher surveys. Each educator analyzed the impact of fragmented thinking on the educational process and identified its advantages and disadvantages through a survey (Appendix 1). The survey was developed by the authors and included a questionnaire with open-ended questions. Responses of up to 150 words were allowed. Afterward, responses were refined in accordance with the author's requirements. The questions were formulated based on the measures taken to assess the impact of fragmented thinking and were specifically related to the present design of the experiment. Teachers were given up to 1 h to answer the survey questions. Responses were analyzed by grouping similar answers, with the option to conduct additional semi-structured interviews if necessary. The identified findings were compared with the relevant academic literature. In particular, the works of Azevedo *et al.*,[5] Dror,[33] Mellamphy,[34] and Ross[35] were extensively reviewed.

3.3. ETHICAL CONSIDERATIONS

The research was conducted with the approval of the administration of the selected institutions. Ethical principles were established in advance. Confidentiality and respect for the privacy of participants were strictly adhered to. Initial official approval was obtained from the institutions, after which informed consent was obtained from each participant. The relationship between the participants and the researcher was crucial in creating a trust-based environment that allowed participants to freely share their experiences. Subsequently, interviews with each educator were scheduled at mutually convenient dates and times. To facilitate the discussion, a semi-structured questionnaire (Appendix 1) was used. The interviews continued until no new patterns or themes emerged from the data collection.

3.4. RESEARCH LIMITATIONS

One of the main limitations was the developed questionnaire. Among the principles was the accuracy of the questionnaire items. The questions were formulated in a way to obtain objective responses and minimize the influence of subjective factors. A key limitation of the survey was the prohibition on using the collected information for purposes other than research, as well as the narrow focus of the questionnaire. The study encompassed research from two educational institutions in two countries, Russia and Kazakhstan. Despite this, the results of the work can be generalized and tested for other target groups, with prior adaptation based on age, language, and other specific characteristics. Only certain motivational methods were considered, with the primary criterion being their feasibility for implementation without additional resources.

3.5. DATA ANALYSIS

Elements of descriptive statistics, *t*-statistics, Cohen's *d* coefficient, etc., were used for the analysis. A number of online information tools were used to test hypotheses. The study was conducted using Microsoft Excel (version 2018, Microsoft, United States of America [USA]) and the Statistical Package for the Social Sciences (SPSS version 19.0, IBM, USA) software.

4. RESULTS

4.1. THE IMPACT OF MOTIVATIONAL STRATEGIES ON FRAGMENTED THINKING

In presenting the key provisions of this section of the experimental block, it is important to note certain disparities in the shifts observed across different research groups. Table 3 provides data on the predisposition toward fragmented thinking and the changes observed before and after the implementation of integrated motivational strategies. The results demonstrate significant differences in the role of each motivational strategy within the context of fragmented thinking.

Overall, the most pronounced effect in terms of influencing aspects of fragmented thinking was observed in the context of unconventional teaching methods (p=0.004; Cohen's $d = 0.716$) and the creation of problem-based scenarios (p=0.003; Cohen's $d = 0.762$). The least impact was observed with the non-evaluative approach (p=0.043; Cohen's $d = 0.209$). In this case, the tendency toward fragmented thinking was within the smallest range. Compared to the aforementioned indicators, there was only a 2-percentage point difference. It is worth noting that the significance values from the *t*-test and Cohen's *d* indicate a consistent direction of influence, even considering that the tendency toward fragmented thinking was reduced across all groups without exception.

4.2. CORRELATION BETWEEN FRAGMENTED THINKING AND ACADEMIC SUCCESS OF STUDENTS

Regarding the relationship between the scores obtained for the studied type of thinking and the academic performance of students from Russia and Kazakhstan, it should be noted that the correlation coefficient is in the moderate range (Table 4). This indicates a trend: as the students' average score increases, their tendency toward fragmented thinking decreases. This relationship can be characterized as having a moderate strength.

4.3. POSITIVE AND NEGATIVE ASPECTS OF FRAGMENTED LEARNING

As shown in Table 5, a survey was conducted among teachers, and both the positive and negative aspects of fragmented thinking were identified based on the analysis of contemporary literature. Given that the questionnaire had a semi-structured format; it was possible to observe certain characteristics in the responses of the participants. Specifically, it is worth noting that the overwhelming majority of teachers (68%) acknowledged the importance of working with fragmented thinking, considering it a clear phenomenon of our era. This is evidenced by their responses to questions 8 and 9 in the questionnaire. Moreover, when discussing these questions, it is important to highlight the differences in attitudes toward fragmented thinking and clip-based thinking, which were not perceived as identical by the respondents. Despite the fact that only 9% of teachers distinguished these as separate concepts, clip-based thinking was defined as being directly related to digitalization,

Table 3. Difference in means and effect of motivational strategies on students' tendency toward fragmented thinking

Parameter	Mean (before)	Mean (after)	t	p-value	Cohen's d
Non-judgmental approach	27.94	25.67	−1.61	0.043	0.209
Communication culture	28.72	22.96	−2.743	0.011	0.458
Unconventional teaching methods	22.66	15.92	−3.931	0.004	0.716
Teacher's sense of humor	21.57	19.34	−3.126	0.029	0.498
Continuous analysis of life situations	28.01	18.88	−3.632	0.013	0.603
Creation of problem-based scenarios	24.33	13.51	−4.006	0.003	0.762

Table 4. Correlation between the tendency toward fragmented thinking and the academic success of students

Parameter	Tendency toward fragmented thinking	
Academic performance	Correlation, R	−0.427
	Significance (2-tailed)	0.000
	Sample size, N	384

Table 5. Positive and negative aspects of fragmented thinking and its impact on the educational process according to faculty members

Positive aspects	Negative aspects
The "fragmented" approach to information processing adds dynamism to cognitive activities in learning and helps students manage and complete required tasks when dealing with large volumes of educational material.	The environment for students becomes a mosaic of fragmented facts and pieces of information that are loosely connected. Students become accustomed to frequently changing activities and seek new stimuli, such as new music, chat interactions, being constantly "online," editing photos, watching videos, and playing online games with new people.
"Clip-based" behavior enables recognition of the multidimensionality, variability, and ambiguity of approaches to problem analysis or the resolution of specific questions and tasks.	The loss of the ability to analyze and construct logical sequences results in information absorption akin to consuming fast food.
"Fragmented thinking" serves as a psychological defense mechanism against information overload, allowing students to better comprehend and adapt to the evolving social reality.	Students with fragmented thinking struggle with situational analysis because information does not persist in their consciousness and is easily replaced by new inputs. This leads to a decline in academic performance and a reduced level of knowledge retention.
Fragmented behavior is the key to creativity in the modern world. The ability to identify the fundamentals without analyzing the essence contributes to time efficiency, multitasking, and the search for unconventional ways of interpreting information.	Fragmented thinking shifts students into a teacher's role. This approach to problem analysis forces them to fill in the gaps left by the absence of a cohesive educational system. They draw their own conclusions without additional relevant sources.
	Fragmented thinking accelerates the learning process, fostering inequality among students. This also pertains to inclusivity.

particularly the short content on social media and the information overload in the online space.

In addition, teachers emphasized the presence of significant risks to the educational system associated with the proliferation of fragmented thinking. To examine this, responses to questions 6 and 7 were analyzed. In particular, 89% of teachers believe that the progression of fragmented thinking can significantly impact not only academic performance but also future professionalism in the field. Notably, responses from teachers in the "Energy" discipline, which represented the most technical group of respondents, revealed that 45% of them expressed concern about this issue. At the same time, 72% of the surveyed teachers remain convinced of the effectiveness of integrating motivational strategies, with a special focus on project-based learning, which received 69%. Despite these results, teachers provided responses to questions 4 and 5 that differed from the statistical differences observed in the t-test results. Teachers were more focused on improving communication culture (55%) and creating problem scenarios (49%).

5. DISCUSSION

The results of our study align with those of other research that describe both the positive and negative characteristics of fragmented thinking. When analyzing the context of the present findings, it is important to focus on the transfer of this type of thinking from the academic world to the real world. For example, in the context of literature, there is a noticeable mosaic and fragmented perception of the surrounding world, as well as a reluctance among students to engage with lengthy linear texts (e.g., War and Peace by Leo Tolstoy).[36] This indicates that students with a tendency toward fragmented thinking already face certain limitations within traditional educational curricula. The absence of necessary references for analyzing large texts and big data hinders their further application in certain professional fields. Despite this, such an approach is largely compensated for by advancing digitalization.[37] It is expected that working with large data sets, analyzing them, and synthesizing conclusions will be delegated to artificial intelligence and other technologies.[38,39] In this way, there is an argument

for mitigating the negative consequences of fragmented thinking. As our results show, teachers are prepared to work with this modern form of cognition, and the proven motivational strategies yielded measurable results in addressing fragmented thinking, not to minimize it, but to balance it. A positive aspect is that fragmented thinking is considered

a protective psychological reaction to cognitive overload, which facilitates better adaptation and acceptance of the constantly changing social reality.[39]

Despite the differences in the advantages and disadvantages of fragmented thinking, there is a clear similarity between the results of this study and other research on the topic, all of which were identified through various research strategies. The most negative quality of clip-based thinking, as evidenced by this and other studies, is the loss of the ability to analyze and construct logical chains, which leads to a mosaic and fragmented perception of the surrounding world.[36] It is important to agree with these statements and specify them in the context of the educational process. Even the construction of methodological topics throughout the semester, which is designed for a systematic analysis of all prior knowledge, ultimately leads to the formation of a holistic understanding of the solution to a problem, the theme of a work, or the particular physiological process. In scientific practice, it is often insufficient for a student to be competent in just one or a few topics; a comprehensive understanding of the functioning mechanism of an entire section is also essential, for example.[40] Other authors also note that fragmented thinking is a protective response to information overload.[15,16] We consider this an interesting area for further research, which allows us to view fragmented thinking not only as an effect of digitalization but also as an indicator of the significant need to reform the educational system.

Analyzing the research of scholars from the USA, India, and the United Kingdom, it becomes evident that one of the key components of successful learning is the student's ability to perceive themselves as an active subject in the learning process.[19] In this context, the driving force behind the learning process is personal motivation, which triggers positive emotions toward educational activities and contributes to the realization of an individual's right to educational and intellectual development. A researcher from the USA notes that contemporary youth often demonstrate the principle of cognitive economy, whereby actions are initially performed, and reflection on them occurs only subsequently, if necessary.[6] The inability to logically and coherently formulate thoughts, as well as to understand and express the essence of a scientific text or problem without relying on gadgets, negatively affects students' comprehension of learning materials.[6] Another study, which examined the impact of fragmented thinking on academic success, used a survey consisting of 30 varied questions with binary answers, one of which was correct regarding identifying tendencies toward clip-based thinking. Data analysis not only assessed the impact of fragmented thinking but also identified cognitive profiles associated with the use of such thinking among different research groups. The results showed that 14% of respondents scored an average of 14.36 correct answers, 53% scored below this average, and 33% exceeded it. These results indicate positive trends in the evolutionary development of the ability to engage in fragmented thinking.[2] This study demonstrates that fragmented thinking can enhance learning if students are appropriately motivated, rather than hindered by it; indeed, improvements in academic success were observed only after the application of various motivational strategies.

Thus, the theoretical significance of this article lies in the significant expansion of the field of defining fragmented thinking in the education of Kazakhstan and Russia. Given the comparative context in the literature, this topic is gaining momentum among researchers as a deep and ongoing debate between the inevitable digitalization and a holistic approach to teaching information within the framework of the traditional academic system. The practical significance lies in presenting the most independent motivational strategies that are a complement to the traditional format of learning.

6. CONCLUSION

The results obtained reject all three null hypotheses proposed at the outset of the study. Specifically, it was demonstrated that interventions utilizing different motivational strategies have varying effects on manifestations of fragmented thinking. Overall, the most effective strategies include non-traditional practices (such as extracurricular lectures, physical exercises, and unconventional assignments) and academic lessons based on problem-based scenarios. However, these approaches did not eliminate this type of thinking entirely.

At the same time, regarding the second hypothesis, the following trend was observed: as a student's average grade increases, their propensity for fragmented thinking decreases. This relationship can be characterized as moderately strong. Scientific and practical analysis confirms that avoiding fragmented thinking in the activities of modern students is impossible. Furthermore, such avoidance is unnecessary, as some distinctive features of fragmented thinking yield positive outcomes, and educators are willing to integrate various methods to balance this phenomenon.

Based on educators' perspectives and scientific analysis, the third null hypothesis must also be rejected, as fragmented thinking is not viewed as an exclusively negative phenomenon. Emphasizing dynamism, creativity, and multitasking fosters the development of autonomous and intellectually capable youth. However, the prevailing barriers in education raise greater concerns about the uncontrolled spread of fragmented thinking, as evidenced by specific statements from educators.

Future researchers should approach the interpretation of fragmented thinking in the education of various specializations with careful consideration. It is essential to examine this phenomenon in terms of its potential to enhance learning conditions for students and adapt to the modern dynamics of information perception shaped by social media, influencers, and external advertising, all of which emphasize and reinforce fragmented memory in contemporary contexts.

Equally important is the investigation of the motivational strategies described in this study, with an emphasis on diversifying sample populations. It would be interesting to explore whether such approaches are effective within an international and large-scale target audience or in specific fields of activity and specializations.

In studying fragmented thinking, building correlations with various competencies critical for academic subjects will be valuable. Notably, the present understanding of interventions in fragmented thinking and their impact on competencies such as attentiveness, critical thinking, creative thinking, analytical reasoning, persuasion skills, and most importantly, the ability for long-term retention of educational materials and practical application remains unclear. These areas warrant further exploration to provide meaningful insights into their implications for modern education.

CONFLICT OF INTEREST

Authors declare that they have no competing interests.

AUTHOR CONTRIBUTIONS

Conceptualization: ZuoYuan Liu and Lilya Sabirova
Formal analysis: ZuoYuan Liu
Funding acquisition: Lilya Sabirova
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Supervision: ZuoYuan Liu

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was conducted in accordance with the ethical principles approved by the Ethics Committee of the Beijing Institute of Technology (Protocol № 5 of 21.04.2023). Participants provided consent to participate verbal.

CONSENT FOR PUBLICATION

All participants gave their written informed consent.

DATA AVAILABILITY STATEMENT

All data generated or analyzed during this study are included in this published article.

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Appendix

Appendix 1. Participant questionnaire

Age

Specialty

1. Describe the positive aspects of "fragmented thinking" and explain why:

_____
_____
_____
_____

2. Describe the negative aspects of "fragmented thinking" and explain why:

_____
_____
_____
_____

3. What motivational strategies do you employ in student education?

_____
_____
_____
_____

4. Which of the motivational strategies we proposed did you find most effective and why?

_____
_____
_____
_____

5. Which of the proposed motivational strategies do you believe was most favored by students, and why?

_____
_____
_____
_____

6. Describe the impact of "fragmented thinking" on student success:

_____
_____
_____
_____

7. What obstacles have you identified arising from the use of fragmented thinking during teaching? How can these be addressed?

_____
_____
_____
_____

8. Describe the role of "fragmented thinking" in the educational process:

_____
_____
_____
_____

9. What, in your opinion, are the consequences of "clip-based thinking"?

_____

_____

_____

_____

10.   What do you consider to be the decisive factor in students' academic success?

_____

_____

_____

_____