Encouraging students of Kazakhstan to learn mathematics
How to encourage students of Kazakhstan to study mathematics?

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3100 words

Authenticity Declaration

I declare that the work in this research project is my own and is authentic. All resources and sources are acknowledged and cited, where sources and resources of other people have been used.

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Acknowledgment

I would like to thank my supervisor Bauyrzhan Kaziyev for his support throughout the project work by giving recommendations, and my classmate Zhaksylyk Kamila for giving peer-review and answering for numerous questions about the project work.

Abstract: *This article discusses the impact of lack of motivation to learn math on student and efficient ways to encourage students of Kazakhstan to study mathematics. The article notes that lack of motivation to learn math may negatively influence on academic performance of the student and may lead to forgetting received knowledge. The main findings include that performing creative tasks, combining games with education and joint work of students can be the reasons that encourages students to study mathematics.*

Бұл мақалада математиканы оқуға деген ынта-ықыластың жетіспеушілігінін оқушыларға әсері мен Қазақстандық оқушыларды математиканы оқуға ынталандырудың тиімді әдістері туралы айтылады. Мақалада математиканы оқуға деген ынта-ықыластың болмауы оқушының оқу үлгеріміне кері әсер етіп, алған білімін жоғалтуға әкелуі мүмкін екендігі көрсетілген. Зерттеу жұмысының нәтижелері шығармашылық тапсырмаларды орындау, ойынды оқумен ұштастыру және жұмысты бірлесіп орындау оқушыларды математиканы оқуға ынталандыра алатынын көрсеткен.

В этой статье обсуждается влияние нехватки мотивации к изучению математики на учащихся и эффективных способах мотивации студентов Казахстана к изучению математики. В статье отмечается, что отсутствие мотивации к изучению математики может негативно сказаться на успеваемости студента и привести к потере полученных знаний. Основные выводы включают в себя то, что выполнение творческих заданий, совмещение игр с обучением и совместная работа студентов могут быть причинами, побуждающими студентов изучать математику.

Keywords: *Mathematics, Lack of motivation, Student, Influence, Encourage*

Introduction

Mathematics is one of the important and difficult subjects, that students commonly do not want to study due to misunderstanding, absence of desire and other personal reasons. However, the main reason remains a lack of motivation. Motivation is the driving force of human actions. People frequently use this word to describe why a person does something. A lack of this driving force can lead to negative influence on student learning. Because, students' success in learning mathematics often depends on their motivation to study the subject. That is, without motivation, learning math gets harder. Problems related to motivation in mathematics have been reported in extant literature (Harkness, D'ambrosio, & Morrone, 2007; Walter & Hart, 2009; Nguyen & Goodin, 2016).

For a long time, mathematics is considered as fundamental subject in school, since arithmetic and logical reasoning are the bases of science and technology (Yeh et al., 2019). Realizing this, some students continue ignoring this subject or they study it, but without enjoyment. Because they have not got the motivation to learn it. This can lead to a lack of knowledge or emotional exhaustion. Nevertheless, a lack of motivation can affect student's exam results, which in turn may negatively influence the child's future.

Due to the pandemic which had begun in 2019, the problem of a lack of motivation to study became relevant in Kazakhstan. After the quarantine was placed in march 2020, more than 3 million students have moved to distance learning (Tukliev, 2020). With placing online education, the motivation of students to learn mathematics began to decline. Thus, the risk of deterioration in the quality of education increases. This makes the government and schools of Kazakhstan be focused on the improvement of education quality and searching for new methods of teaching.
The purposes of this project work are to identify the main factors influences the lack of motivation and find the most efficient ways to encourage students of Kazakhstan to study mathematics.
Therefore, following main research questions have been revealed:

1. What are the main reasons for the lack of motivation to study math among students of Kazakhstan?
2. What consequences can lack of motivation bring?
3. How can this issue be prevented?

The outcomes of the research project will find the main reasons of the current problem and the effective ways to motivate students to study mathematics.

I noticed that desire of some of my acquaintances to study declined after a few weeks of online learning. They stopped trying to understand topics and solve problems in mathematics. Initially, I thought that the reason is the new educational system. But then, I understood that the main reason is the absence of motivation. In addition, I want to know how to motivate people to learn. If I face this problem, this knowledge will help me to tackle it in a small period. I do not believe that there is a perfect solution to this problem. But, I decided to find the most efficient ways of motivating students to study math.

Context

Mathematics has long been an academic subject that many students of Kazakhstan do not want to study. In most cases, absence of desire to learn is conditioned by lack of motivation. Paas et al. (2005) argued that meaningful learning starts off only if it is combined with motivation. In addition, the nature of this motivation can be different. In research of Butler (2016), "motivation is discussed in the context of three theories" (p.16). However, in this research will be used only

Self-determination Theory (SDT) as developed by Ryan and Deci (2000). According to Nguyen and Goodin (2016), "Self-Determination Theory is the theoretical basis for understanding how students were motivated to learn mathematics. SDT distinguishes motivation based on different goals: intrinsic and extrinsic motivation." (p. 50).

Intrinsic and extrinsic motivation

To start with, intrinsic motivation is identified as the completing of an activity for its inherent pleasures (Ryan & Deci, 2000). Similarly, Nguyen and Goodin (2016) claimed that an intrinsically encouraged pupil in a mathematics course would be motivated by the "enjoyment of learning", gaining self-gratification from solving problems and personal satisfaction from success in acquiring experience and skill. Opposing to intrinsically motivated student in a math course, an extrinsically motivated student in the same course might be motivated equally, however, for other reasons (Nguyen & Goodin, 2016). For example, parents said for their child that they will buy him a new telephone, if he passes math exam. Thus, child will try hard to pass exam, since he will receive a gift for this. Also, extrinsic rewards usually more tangible and numerous than the intrinsic. That is why, extrinsic rewards often supplant intrinsic rewards. Despite this fact, intrinsic motivation results in a high quality of learning and creativity (Nguyen & Goodin, 2016).

Ways to motivate students of Kazakhstan to learn math

There are a lot of ways to motivate student for learning mathematics. However, not all of them can be efficient. To begin with, Kazakhstan is developing country with advanced technologies and modern infrastructure. It gives opportunity to motivate students and improve their learning skills by using technologies. For example, creating educational games that will give enjoyable experience and improve learning performance of the student. On the other hand, residents of the country with modern infrastructure live in different conditions. It is connected with social status and salary of people, which can impact on child's motivation to study and academic performance.

Using technologies for motivating students

Many countries practice in mixing games and learning mathematics. This practice might influence on students of Kazakhstan in favourable way. Because, many researches have shown that educational-based games for learning mathematics could facilitate mathematics performance, enjoyment, and self-efficacy (Ku et al., 2014; McLaren et al., 2017). Similarly, Yeh et al. (2019) suggested, that some of scholars found that learning based on games may facilitate students' learning in terms of motivation and learning effects. To show influence of game-based learning McLaren et al. (2017) provided pupils with prompts to correct their mistakes about decimals. Study was conducted with the game adopted instead of seven lessons of regular mathematics classes. Results of the study showed that the educational game could promote better academic performance and enjoyment than a traditional teaching approach. However, Moos and Marroquin (2010) noted that the results of researches about effectiveness of technology as a motivational instrument are mixed. They added, that results might be unsatisfactory if technology is used as a "secret sauce" to automatically increase students' engagement, rather than applied in a principled way to help an individual to find a strong sense of confidence in math and science capability. If technology is used in teaching math properly, results will be positively. Otherwise, technologies will influence on learning performance of students negatively and students will lose their motivation to study.

Family background as motivation to study

Kazakhstan is one of that countries where each person has different family background. In other words, students of Kazakhstan might be from both advantaged and disadvantaged families. Most studies show that family background plays an important role in student's academic performance. It impacts on student's participation in school activities, number of resources available for student's education, school environment, and the support children get to complete school demands (Liu & Chiang, 2019). Research shows that class-based differences reflects in pupils' motivation to learn, such that wealthy families can instill high stages of learning motivation in

their children by providing high levels of social-emotional support as well as opportunities and resources at home (Liu & Chiang, 2019). Furthermore, family background might motivate student to learn math more than other motivational sources. For instance, some researchers emphasize family background by showing its greater effect on learning motivations than the teacher-student relationships (Liu & Chiang, 2019). On the other hand, children from disadvantaged families do not have this opportunity. Therefore, interest of children to study will not be so strong. However, Liu and Chiang (2019) stated, that numerous researches strongly suggest that student motivations to learn at school is substantially coupled to family background, while some scholars suggest that motivations for academic learning are individual-based and not closely connected with class background. For instance, students from comparable family backgrounds. Some of them more interested in academic excellence, while others are strongly motivated to pursue non-academic activities (Liu & Chiang, 2019). It shows that students intrinsically motivated to develop that skills, which they want.

Methods

In order to reduce the amount of inaccuracy, mixed methods has been used to collect data. This research method is defined as the class of research during which the researcher mixes or combines quantitative and qualitative research methods, approaches, concepts or language into one study (Johnson & Onwuegbuzie, 2004). This method uses advantages of both qualitative and quantitative methods, allowing researchers to explore different viewpoints and uncover relationships between the complex layers of research questions (Shorten & Smith, 2017). The mixed methods approach has its own benefits and drawbacks which derive from the properties and limitations of quantitative or qualitative approaches (Chatterji, 2010). On the one hand, mixed methods requires more time and resources compared to other methods. On the other hand, mixed methods gives better understanding of research topic and yield more complete evidence. Furthermore, by using this research method researcher develop his search skills, which is particularly important for those at an early stage of their career. That is why, it is an effective way to collect data.

Quantitative research is a research strategy that emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through different techniques, and it focuses on gathering numerical data and describing, predicting, or controlling variables of interest. In this project work, survey was chosen as a quantitative research method to collect data which consists opinion of society and statistical data. Because, survey is capable to collect data from a large number of respondents in less time and it makes possible to reduce or prevent geographic dependence. However, respondents may not feel encouraged to provide accurate, honest answers and closed-ended questions may have a lower validity rate than other question types. To tackle these problems, besides closed-ended questions, open-ended questions were added to the survey. To provide accurate and honest answers, questions for the survey have carefully organized. Overall, the survey consisted of 9 questions, including multiple choice, rating scales, dichotomous and open-ended questions. These types are included to fully review the topic and try to get reliable information about problem of lack of motivation to learn math. In the beginning, it was planned to take survey from at least 100 people to get generalized statistics. However, only 53 people completed the survey. The questionnaire was sent by different platforms such as Outlook, Instagram and WhatsApp. The survey was taken not only from students of Nazarbayev Intellectual school in Aktobe, but also from students of other schools and higher education institutions in order to provide reliable and not biased answers.

Qualitative research is the process of collecting, analyzing, and interpreting non-numerical data to gain an understanding of reasons, concepts, opinions, or experiences of the person. In addition, it gives opportunity to dive deeper into the problem. An interview was chosen as a type of qualitative research method in this project work, because interviews can help to collect fresh, relevant and primary information. Moreover, any misunderstanding or mistake can be easily

corrected during the interview. However, the interview is not without its drawbacks. If interviewee faces the interviewer's question which is not related to the field, she or he may feel disappointed. In addition, conducting and replicating an interview may be time-consuming process. To avoid disappointment of the interviewee, questions on topic were carefully organized and constructed. The interviews were conducted in quiet locations or online to save the interviewer's and interviewee's time. The interview consists of 6 open-ended questions on the research topic. Interviews were conducted from teacher of math and students of different age categories who faced the problem of lack of motivation to study mathematics. The conversations were recorded by interviewees' approvement.

Results

The study included responses of 53 people over 11 years old (21 men, 30 women and 2 others) (Appendix 2.1). A largest fraction of the total number of respondents are aged between 15 and 18 (Appendix 2.2). Results of the study showed that most participants (71,7%) have encountered the problem of lack of motivation (Appendix 2.3). Moreover, more than 41,5% think that this problem is relevant in Kazakhstan, however, 5,7% of people who took this survey have different opinion about it. In majority of survey takers' (52,8%) opinion, problem of lack of motivation to learn math is maybe relevant in mentioned country (Appendix 2.4). It proves that this problem is relevant in Kazakhstan. First of all, it is important to know about the factors that have influence on motivation of students to learn math. In most cases, respondents think that reasons of this problem are misunderstanding of the subject (60,4%) and teacher's approach to the lesson (50,9%), however 24,5% of them have chosen "No necessary conditions to study" option. In addition, participants could add their own option. Two participants think that amount of motivation to learn math depends on the students themselves. (Figure 1).

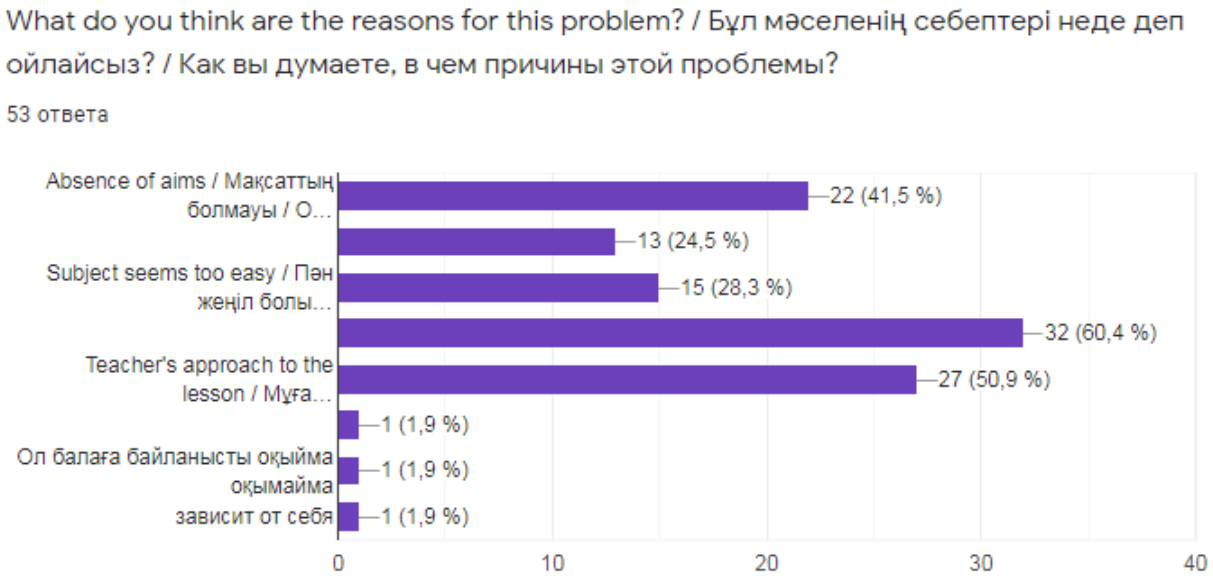

Figure 1. Causes of lack of motivation to learn math

In order to understand about factors which can encourage student to study, the following question was asked to the participants. Results showed that 84,9% of students can be motivated by goal, while money can encourage 34% of participants to learn math. Additionally, 18 respondents prefer to be motivated by gift. In this question survey takers could add their own option. 3 of them wrote PlayStation 5, IPhone and laptop as things that can motivate them. As they can be appreciated as gift, they were added to this option. (Figure 2).

Figure 2. Reasons to learn math

The next question can make participants think, because they had to choose the most effective way to tackle problem of lack of motivation or they can add their own option. Performing creative tasks in opinion of 41,5% is the most effective way of motivating, whereas, 32,1% think that it is combining games with education and a percentage of those, who chose "Giving a present for good results" is equal to 22,6%. 2 participants did not choose any of proposed answers and think that explaining importance of math is the best method. (Figure 3).

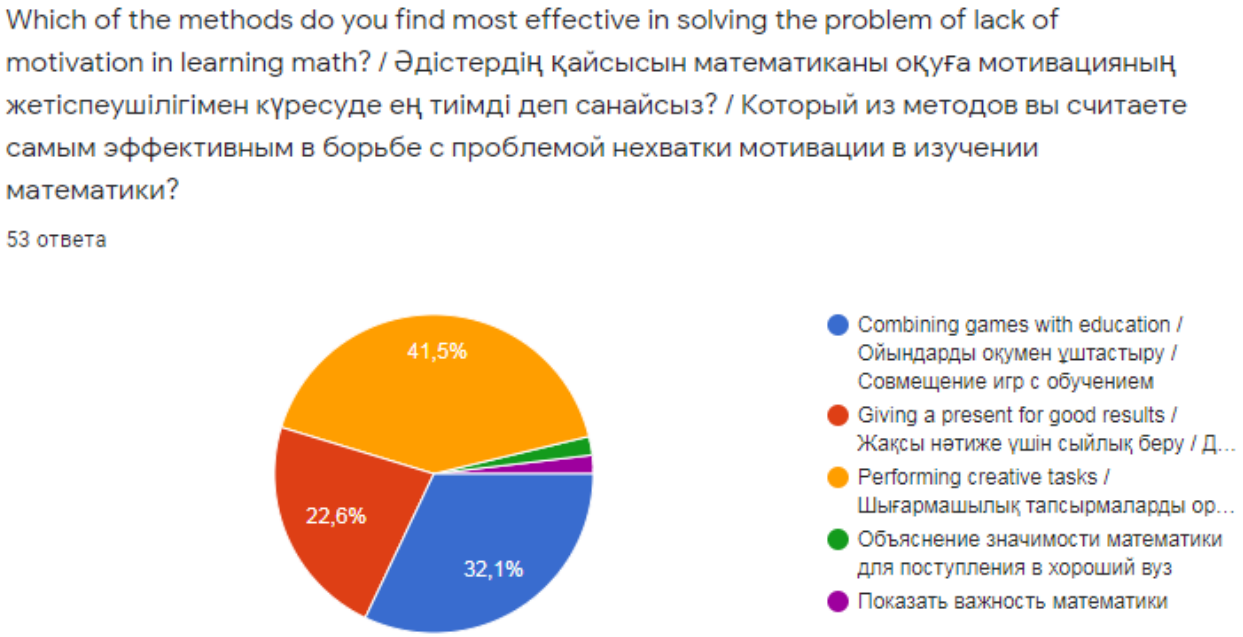

Figure 3. Solutions to the problem

The last question contained recommendations of participants to solve this problem (Appendix 2.5). This question received a lot of different answers, because it was open-ended and contains opinion of each answered participant. This question was not compulsory, that is why overall number of answers were 41. In other words, 12 participants chose not to answer this question. Also, 22% have not got recommendations. The most popular answer among participants was changing teacher's approach to the lesson. In general, questionnaire received 13 different opinions on this question.

The interviews were taken to collect qualitative data for research work. The interviews were taken from five people who had a connection to the current problem. First interviewee is a teacher of math. Since she taught math, she shared with the examples from her personal experience and gave some recommendations about solving this problem. Other four interviewees were students of different age categories who had suffered or suffer from this problem. They answered for 6-7 questions and similarities were noted in their answer. All of interviewees think that problem of lack of motivation to learn math is relevant in Kazakhstan. In addition, all of interviewed students consider misunderstanding of subject as a reason of current problem. However, math teacher has not mention it as a cause of lack of motivation. In her opinion, motivation to learn math depends on student's self-regulation skill. To tackle this problem without help of others, interviewees suggest to watch videos about unclear topic, reading notes, doing an in-depth reading and extracurricular activities. Also, to solve this problem, teachers can help to overcome the weaknesses of students and conduct joint work of students, or give desired gift for reaching the set goal.

Conclusion

The research indicated that there are several reasons for the lack of motivation to study math among students of Kazakhstan. According to answers of respondents, misunderstanding of the subject and teacher's approach to the lesson are the most common reasons for not being involved in learning math. Additionally, biased opinion about subject and absence or lack of self-regulation skill may also become a reasons of this issue.

The second thing that was noticed is the consequences that can be bring by lack of motivation to learn math. This problem affects student's academic performance, that necessary in assessing human knowledge, admission to university and searching a job. In addition, lack of motivation may lead to forgetting knowledge, and therefore to inability to use it in future. Furthermore, according to answers of interviewees, lack of motivation to learn math may worsen relationships between parents and child.

The ways of solving this problem were suggested by the respondents of survey and interview as a result of the research. Results of the questionnaire showed that the most effective ways to tackle this problem are performing creative tasks and combining games with education. In addition, most of participants connect this problem with teacher's approach to the lesson. In other words, changing teacher's approach to the lesson can lead to solving this problem, because the teacher plays a big role in the learning process of the student. However, there was detected another unusual method of prevention the problem of lack of involvement in learning mathematics. This unusual method is joint work of students which holds on explaining and helping to understand the subject to each other. This method gives opportunity for students to use and consolidate knowledge gained from the teacher in practice. Moreover, explaining knowledge to others can help to remember it very well.

Despite the strengths of the research project work, there were some limitations. For example, only one teacher has been chosen as an expert in math field to conduct an interview. For further research project, the scope of the study should cover all population of Kazakhstan and number of interviewees should be increased. In addition, it might be better, if more experts in this field have been involved to research. Moreover, questions for interview should be constructed properly in order to avoid misunderstanding of them.

Taking all data and information which was mentioned before into account, the problem of lack of motivation to learn math should be addressed in a consistent effort to provide better future for the younger generation.

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Appendixes

Appendix 1. Survey questions:

1. Your age: ***11-14 / 15-18 / 19-25 / 25+***
2. Gender: ***Male / Female / Other***
3. Assess your desire to learn math.: ***High / Medium / Low***
4. How do you think, does motivation affect math performance? : ***Yes / No / I don't know***
5. Have you encountered the problem of lack of motivation to learn math? : ***Yes / No***
6. Is this problem relevant in Kazakhstan? : ***Yes / No / Maybe***
7. What do you think are the reasons for this problem? : ***Absence of aims / No necessary conditions to study / Subject seems too easy / Subject is difficult to understand / Teacher's approach to the lesson / Other***
8. How does the teacher's approach to the lesson can affect your motivation to learn mathematics?: ***1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10***
9. What can motivate you to learn math? : ***Gift / Money / Goal***
10. Which of the methods do you find most effective in solving the problem of lack of motivation in learning math? : ***Combining games with education / Giving a present for good results / Performing creative tasks / Other***
11. What suggestions you have to motivate students of Kazakhstan to learn mathematics? :

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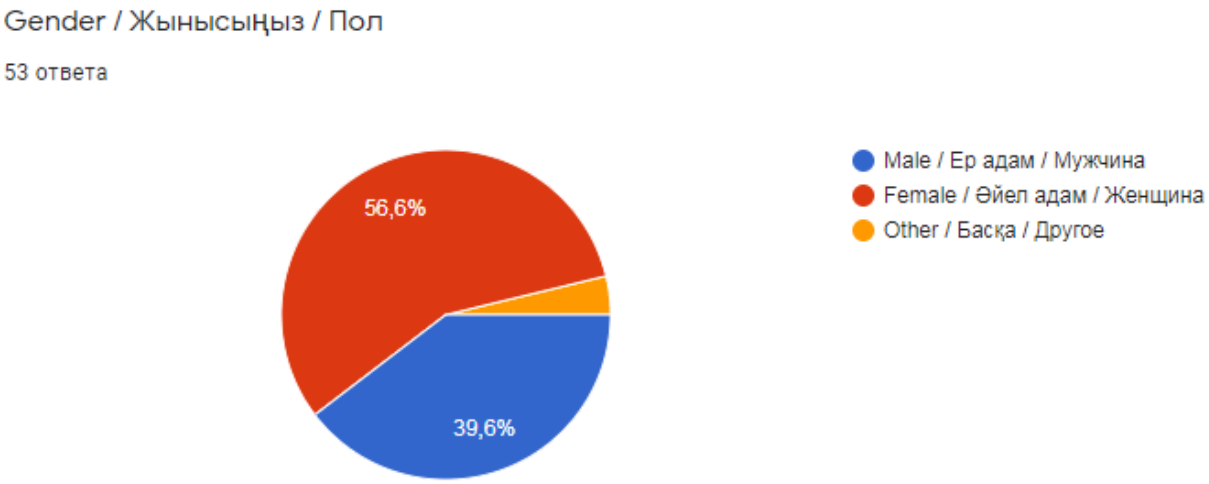
Appendix 2. Survey Results Diagrams

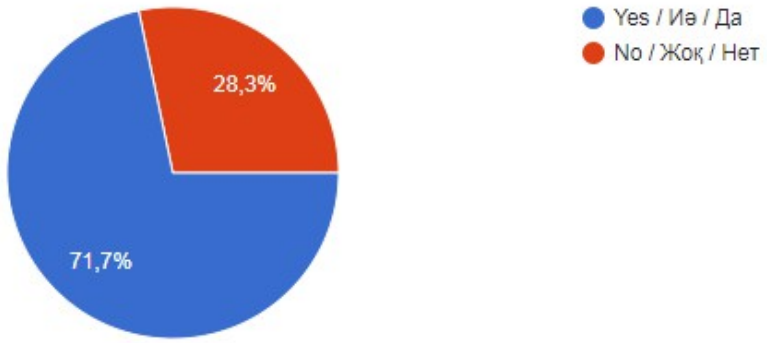
Appendix 2.1. The age of the respondents.



Appendix 2.2. The gender of the respondents.

Have you encountered the problem of lack of motivation to learn math? / Сіз математиканы оқуға деген мотивацияның жетіспеушілігіне тап болдыңыз ба? / Сталкивались ли вы с проблемой нехватки мотивации к изучению математики?

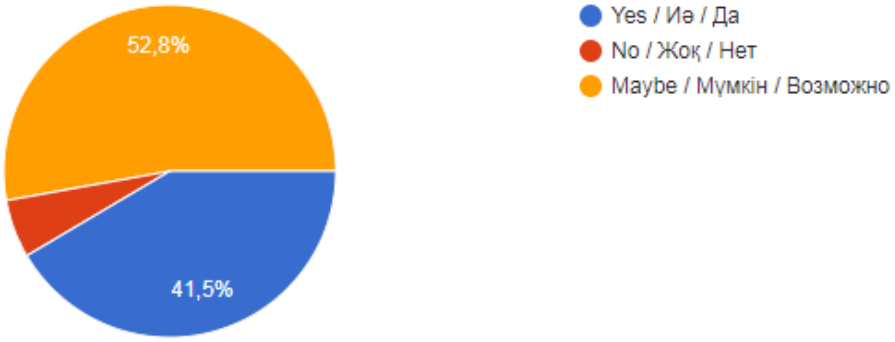
53 ответа



Appendix 2.3. The number of people who encountered this problem.

Is this problem relevant in Kazakhstan? / Бұл мәселе Қазақстанда өзекті ме? / Актуальна ли эта проблема в Казахстане?

53 ответа



Appendix 2.4. Relevance of the problem in Kazakhstan.

What suggestions you have to motivate students of Kazakhstan to learn mathematics? / Қазақстандық оқушыларыды математиканы оқуға ынталандыру үшін қандай ұсыныстарыңыз бар? / Какие у вас есть предложения для мотивирования казахстанских студентов к изучению математики?

41 ответ

-

Не нагружать сильно

,

Не знаю

Цель?

Топта қызық тапсырмаларды орындау

показать фильмы про математиков в школах

Обучать с помощью игр

Мұғаліммен оқушы арасындағы қарым-қатынасты дұрысттау

Использовать возможности инновационных технологий в разработке методов мотивации

Предмет учитель должен вести интересно с творческим подходом.

--

Ұсынысым жоқ

Это зависит от студента

Сделал предмет более практичным, допустим решать прикладные задачи или применять полученные знания на практике

Maybe to use graphics since we are prone to accept visual data better

Интерактивные занятие с примерами из реальной жизни

Игры

Вести уроки интереснее и относиться ко всем одинаково:)

устраивать разные конкурсы

Я думаю нужно объяснить важность данного предмета

Увеличение стипендии для учеников с высоким уровнем знаний математики

Мақсат қою

Улучшить популярность предмета

Нужно показать ее важность если давать что-то взамен за выполнение заданий человек может к этому привыкнуть

It is impossible

Совмещать хорошее с полезным(уроки с развлечениями)

Я не знаю

Создать игру про математику которая сможет стать популярной

На это может повлиять много разных факторов, как обстоятельства в семье или просто не надобность предмета в будущем. И чтобы побудить кого-то учиться к каждому нужен индивидуальный подход в зависимости от того, что побудило отсутствие мотивации

Креативные задания не только способствует как увелеечнию мотивации, так и развитию критического мышления

нет

Я что надо не то чтобы мотивировать, а просто пробудить интерес к этому уроку, ведь во многих школах математика, казалось бы самым важный предмет, проходит на уровне заучиваний формул, и последующих решений задач. Но в таком случае ученики никогда не заинтересуются в изучении математики, особенно наше и поколение по младше, ведь насколько я заметил и знаю, мы являемся более творческими людьми, и если уж нам что-то понравится, мы это обязательно досконально изучим и узнаем всё об этом.

Незнаю

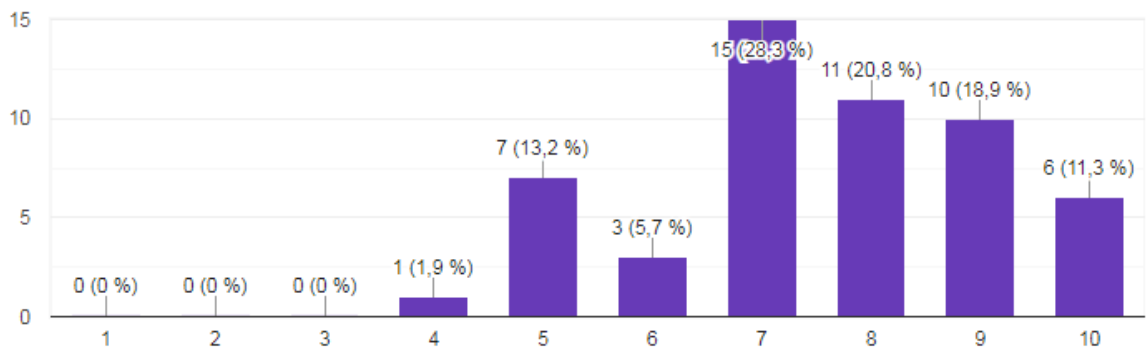
Изменить отношение учителей к ученикам

Конкурсы

Appendix 2.5. Recommendations of respondents.

How does the teacher's approach to the lesson can affect your motivation to learn mathematics? / Мұғалімнің сабаққа көзқарасы сіздің оқуға деген құштарлығыңызға қаншалықты әсер ете алады? / Насколько может повлиять подход учителя к уроку на вашу мотивацию учиться?

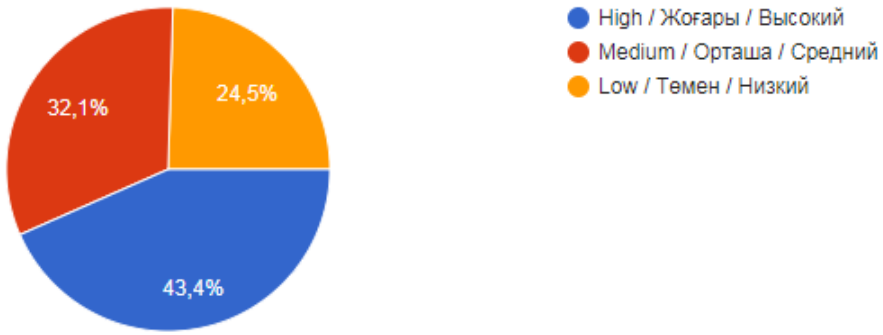
53 ответа



Appendix 2.6. Impact of teacher’s approach to the lesson.

Assess your desire to learn math. / Математиканы оқуға құштарлығыңызды бағалаңыз. / Оцените свое желание изучать математику.

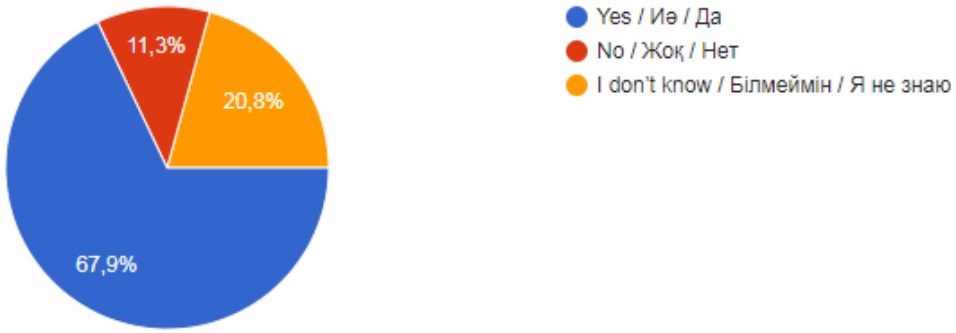
53 ответа



Appendix 2.7. Desire of respondents to learn math.

How do you think does motivation affect math performance? / Мотивация математикадан оқу үлгеріміне әсер етеді деп ойлайсыз ба? / Как вы думаете, влияет ли мотивация на успеваемость по математике?

53 ответа



Appendix 2.8. Influence on math performance.

Appendix 3. Interview questions:

1. What do you know about the problem of lack of motivation to learn mathematics? / Математиканы оқуға деген мотивацияның болмау мәселесі жайында не білесіз?
2. Is this problem relevant in Kazakhstan? / Бұл мәселе Қазақстанда өзекті ме?
3. What can cause this problem? / Бұл мәселені не тудыруы мүмкін??
4. What are the consequences of this problem?
5. What methods of dealing with this problem have you used? / What methods do you use or have used to motivate your students to learn math?
6. Which of them do you consider the most effective? Why?