



**E = MD²: Excellence in Maths Education through (e-)Debate and
Diversity
Project No. 2021-1-ES01-KA220-SCH-000024455**

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Introduction

Carl Friedrich Gauss, one of the greatest mathematicians, is said to have claimed: "Mathematics is the queen of the sciences and number theory is the queen of mathematics. " We couldn't agree more.

But, to understand its greatness, we must be aware of its ubiquity in everyday life, the presence of mathematics that is on an unconscious level a part of all of us human beings, whether scientific or not. And that is something that we aim to accomplish with our students.

Our project named $E = MD^2$: Excellence in Maths education in inclusive classroom through e-Debate and Diversity is a project inspired by the Einstein equation $E = MD^2$, but the variables in the equation have an educational context.

The idea is to increase the level of mathematics knowledge by raising the motivation for learning. We will achieve this idea by democratising the learning process and involving students in the process of choosing ways they want to learn maths. We believe that students should be asked where the problems are, in accessing and understanding the mathematical content - we expect students to be partners in the process of realisation of the teaching activities, changing maths curriculum and to hear their voice. Because mathematical concepts are related to everyday life activities.

Our project will have three project results and the first of them is an analysis of this survey we conducted. With it we will have a starting point for developing a positive attitude toward mathematics and methods for better understanding, teaching and learning mathematics, especially in an inclusive classroom, with students who are experiencing all kinds of different challenges in learning.

Being at school is the most important educational period when students create learning mechanisms, construct knowledge, and develop basic skills and acquisition methods. Many academic papers and global reports, such as the "Mathematics Education in Europe: "Common Challenges and National Policies" from the Eurydice network point out the importance of the learner's motivation and engagement. Considering those two points, it is therefore essential to work on a way to improve the level of European pupils on mathematics and make their learning experience less passive.

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students should be asked where the problems are, in accessing and understanding the mathematical content - we expect students to be partners in the process of realisation of the teaching activities, changing maths curriculum and to hear their voice. Because mathematical concepts are related to everyday life activities, it is expected to find interesting mathematical issues/contents/challenges that would be processed in the STEAM context. Modification and modernization of the method of Mathematical Debate as one of the methods that simultaneously achieves five of the basic 8 key competencies defined in the EU documents will be made.

The main objectives of the E=MD2 project are:

1. Searching excellence in maths education through increasing motivation for learning in an inclusive classroom.
2. Increasing the level of achievements in maths for students with maths disabilities (dyscalculia, dysgraphia, mathematics anxiety...)
3. Strengthening the profile of the maths teachers, by sharing knowledge, exchanging experience and developing new educational products to contribute to the issue of searching excellence in maths education in an inclusive classroom.

Necessary attention in achieving the project goal and objectives will be addressed to the students who have certain mild mental disabilities, and who walk together with their peers in the inclusive classroom. Dyspraxia is a hidden handicap that affects around 6% of European students. It impacts on 4 major activities in schools: reading, writing, arithmetic and organisation.

The general awareness of public authorities and the educational world is getting better since a few years but access to adapted resources, interoperable and connected to the scholarship curriculum, is still a critical need for the concerned individuals. This motivated us bringing together- schools, university, associations - to make this project proposal about new methodology and create innovative ways of teaching and learning Mathematics using modern technologies, and this also satisfies the European priority to "support the professional development of teachers as mediators of creativity and innovation; promote the incorporation of creativity and innovation at all levels of education and training".

For teachers we expect to gain better competence. They will look at the teaching process from the point of view of the students and have a better understanding of it. This is the way they are going to upgrade their teaching skills. Strengthening the profile of the teaching professions, including teachers, school leaders and teacher educators, through actions with the following objectives: enhancing teachers' professional development; supporting teachers in dealing with diversity in the classroom; supporting teachers in adopting collaborative and innovative practices.



This Project result report contains Elaboration of survey reports based on-line surveys in each partner country along with the identified elements from the collection of good practices. Realisation of Survey targeting experienced school teachers in inclusive classrooms, parents and students. This activity refers to the implementation of a survey targeting school teachers/leaders, parents and students. It is planned that at least 20 school teachers, 20 parents and 50 students will participate in the Questionnaire based on-line survey in each partner city. We also gathered good practice examples to implement in our inclusive classrooms.

Results and feedback

Methodology:

- Questionnaire was administered via Google Forms and answered in an online form.
- Target groups were teachers, students and parents in partner schools in Spain, North Macedonia, Romania and Croatia.
- Only difficulties we were having during the data collection process were deadlines for participants to fill the questionnaire.

Survey for teachers

- In our survey 177 teachers participated. They were from 4 European countries – Spain (25), North Macedonia (23), Romania (27) and Croatia (102).
- Majority of 177 teachers who participated in survey have 15 or more years of experience in teaching (28% in Spain, 56.5% in North Macedonia, 88.9% in Romania and 46.1% in Croatia – overall 51.42%)
- Most of the teachers have students aged 11 – 14 years (63.25%)

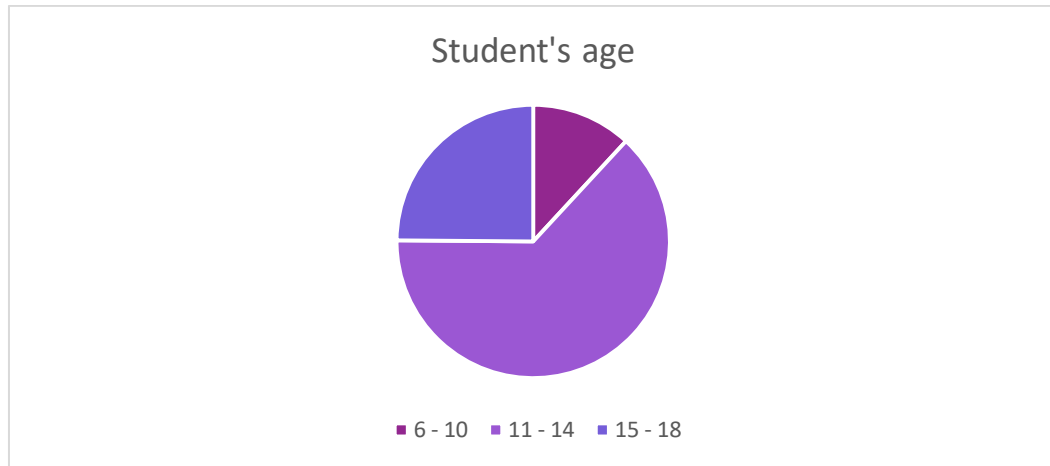


Image 1. Students age groups (International)

1. I have freedom in deciding what teaching methods will I use

Most of the teachers answered that they have freedom deciding what methods they can use (72.88% of the teachers completely agree and 22.03% partially agree).

2. I am satisfied with the current mathematics curriculum

Most of the teachers are satisfied with the current mathematics curriculum (64.73%), but there is a relatively big percentage of teachers who partially disagree or disagree (35.21%).

3. There is too much content in the curriculum

Three quarters of teachers find that there is too much content in the curriculum (32.77% agree and 43.50% partially agree).

4. There is too little content in the curriculum

As it is expected, three quarters of teachers disagree or partially disagree that there is too little content in the curriculum (28.25% partially disagree and 48.59% disagree).

5. I can decide on the evaluation criteria by myself

Almost all teachers agree that they can decide on the evaluation criteria by themselves (81.92%).

6. I have plenty of time to dedicate to gifted students

Teachers disagree on having plenty, or even enough time to dedicate to gifted students (69.49%; disagree 41.81% and partially disagree 27.68%).

7. I have enough time to devote to students with learning disabilities

As it is for gifted students, it is for students with learning disabilities – only 31.07% of teachers agree to have enough time to devote to those students (3.39% agree and 27.68% partially agree).

8. I feel competent to teach maths to students with learning disabilities

Only about half of the teachers participating in the survey feel competent to teach maths to students with learning disabilities (12.43% feel competent and 40.68% partially agree to feel competent).

9. A student with some disability can be an excellent mathematician

The majority of teachers agree that a student with some disability can be an excellent mathematician (81.35% - 42.37% agree and 38.98% partially agree).

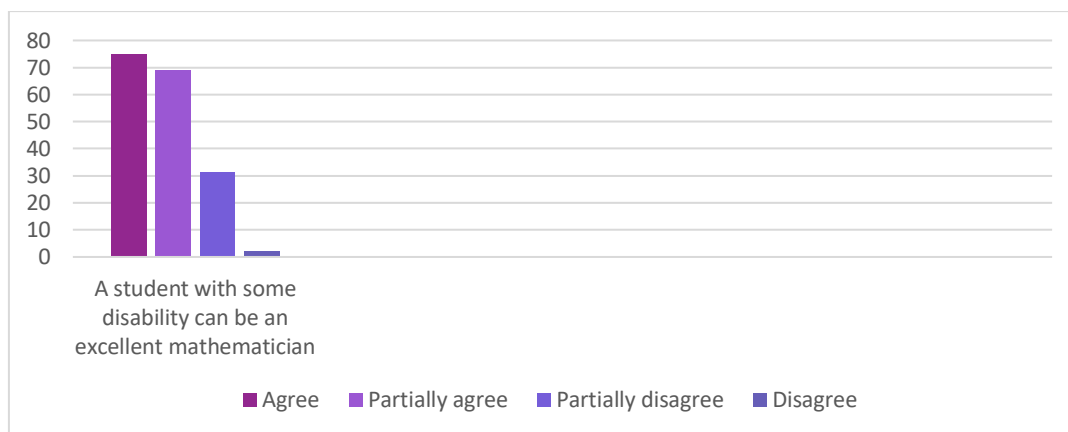


Image 2. Opinions about students with disabilities (International)

10. I think that peer to peer help is useful for students who help and for students who are helped

Almost all of the teachers (98.03%) think that peer-to-peer help is useful for both the students who help and for students who are helped.

11. Teaching is a great way to learn

All teachers agree that teaching is a great way to learn (96.61%).

12. There is only one way to explain and teach mathematics

Only 13.56% of teachers believe that there is only one way to teach mathematics and 86.44% that there isn't only one way.

13. I find it necessary to have more maths classes per week

The majority of teachers (79.66%) agree that there should be more Maths classes per week.

14. Experience is the best way to learn

As expected, almost all of the teachers (91.52%) believe that experience is the best way to learn.



Image 3. Experience as the best way to learn - Opinions

15. I connect the teaching contents with everyday life

All teachers connect teaching contents with everyday life (92.09% - 60.45% agree and 31.64% partially agree on this statement).

16. Maths is difficult for students

Three quarters of all teachers in our survey agree or partially agree that Maths is difficult for students (76.84%)

17. Students do not see the purpose of mathematics

71.19% of teachers find that students do not see the purpose of Maths.



Main conclusions

From this survey we can see that teachers are aware of problems regarding teaching Maths, now more than ever. Issues, as shown, are very similar no matter what country. Although teachers connect teaching contents with everyday life, it seems as if the students do not see the purpose and importance of Maths.

Most teachers feel that they have freedom in deciding about teaching methods and evaluation criteria, but are not as much satisfied with the current curriculum.

Another problem that is visible are gifted students and students with learning disabilities because teachers do not feel competent enough and do not feel that they have enough time to dedicate to those students.



Survey for students

In our survey there were 274 participants, 81 from Croatia, 43 from North Macedonia, 78 from Spain and 72 from Romania.

1. How do you feel at school?

Most of the participating students feel good at school, but some of them feel bored or in some cases bad.

2. Maths as a subject:

Surprisingly, most of the students declared that they love or like Maths (23.72% love Maths and 48.9% like), and only 10.58% students don't like Maths at all.

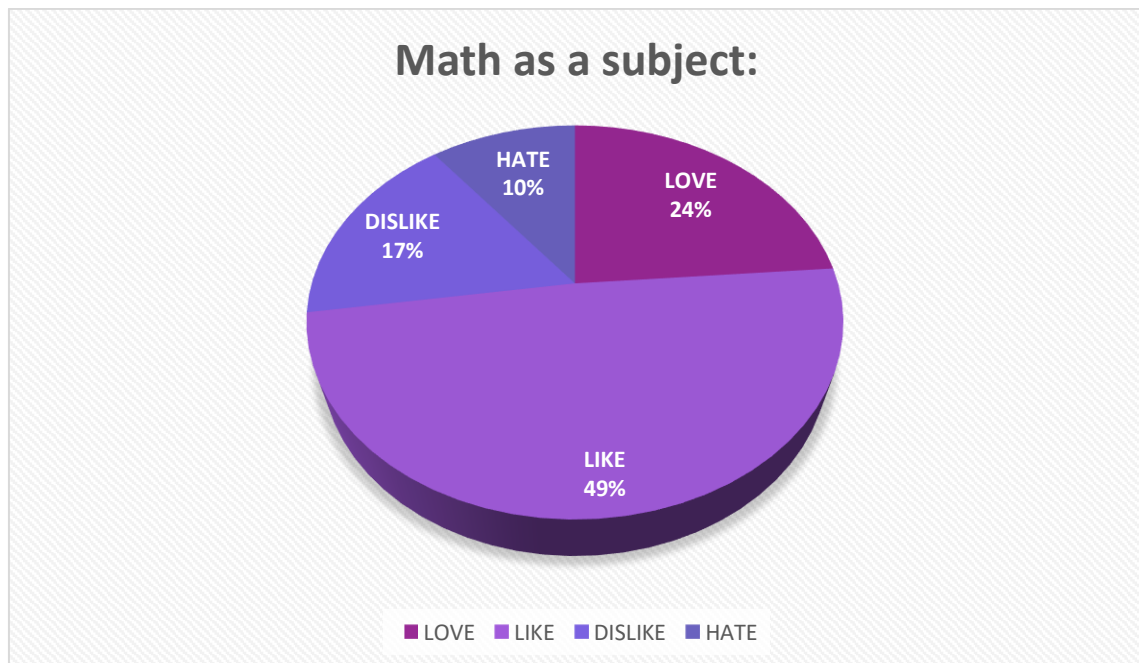


Image 4. General student's opinion about Maths

Check the following statements

1. I'm glad we have maths at school.

To the assertion "I'm glad we have maths at school", 49.27% (135 of 274) of the students surveyed answered "YES". They believe that it is good to have maths at school. As for the rest of the students, 43% answered "Sometimes" and 8.76% (24 people) "NO". This is, particularly for the last ones, that they do not agree with the assertion.



2. If I have to explain something in maths class, I'm always afraid I'll say something wrong.

Majority of students on this question answered sometimes (41,37%) and about the same amount of those who answered YES and NO to this question (around 29%)

3. It would be nice if there weren't maths classes.

Students do not agree that it would be better to not have Maths classes (58.42%), only 17.82% think it would be nice to not have Maths.

4. Most of what one has to learn in mathematics in one's life is not necessary at all.

42.35 % of students feel like they only sometimes learn in Maths something useful for their lives, and 21.7 % are convinced that what they learn is useless.

5. There is very little that interests me in mathematics.

Around 50% of students agree or at least sometimes agree that there is very little that interests them in Maths. 46 % of all students disagree with this statement.

6. We sometimes work in maths class so that I have a good time in class.

Majority of students, around 79% agree or sometimes agree with this statement (44.84% agree and 34.16% sometimes agree), and only 21 % of participating students do not agree.

7. After the written exam, I have a feeling that I made a lot of mistakes even in the tasks I knew.

A lot of students feel like they have made a lot of mistakes in their written exams, 43.37%, and 33.69% feel like that sometimes. 22.94% do not agree and feel like they didn't make lots of mistakes.

8. The teacher of mathematics evaluates fairly, the evaluation depends only on the work and knowledge of the students.

Only 8 % feel like the Maths teacher doesn't evaluate fairly, and 74.56% feel that evaluation is fair.

9. The subject is interesting to me.

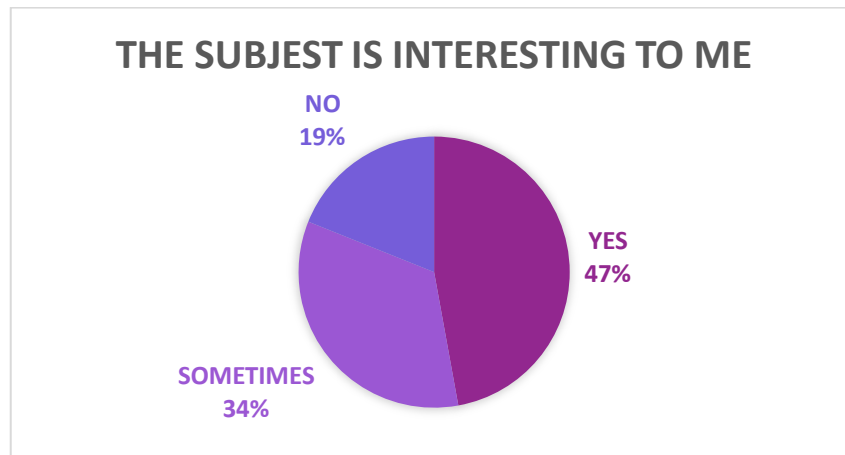


Image 5. General student's opinion about the subject Maths

10. The way of interpreting the material is interesting and motivating.

Around one fifth of students do not agree that the way of interpreting the material is interesting, 34.86 % sometimes agree and 44.72% agree and think that the way of interpreting the material is interesting.

11. In the classroom we have a relaxed and working atmosphere. and

12. Discipline in the class allows good work.

The results of both questions are shown in the following chart. As we can see, between 40 % and 50 % of all students think that they have a relaxed working-atmosphere and that discipline is the main reason for that.

Only about 15 % of students do not feel relaxed in the working atmosphere and discipline in class.

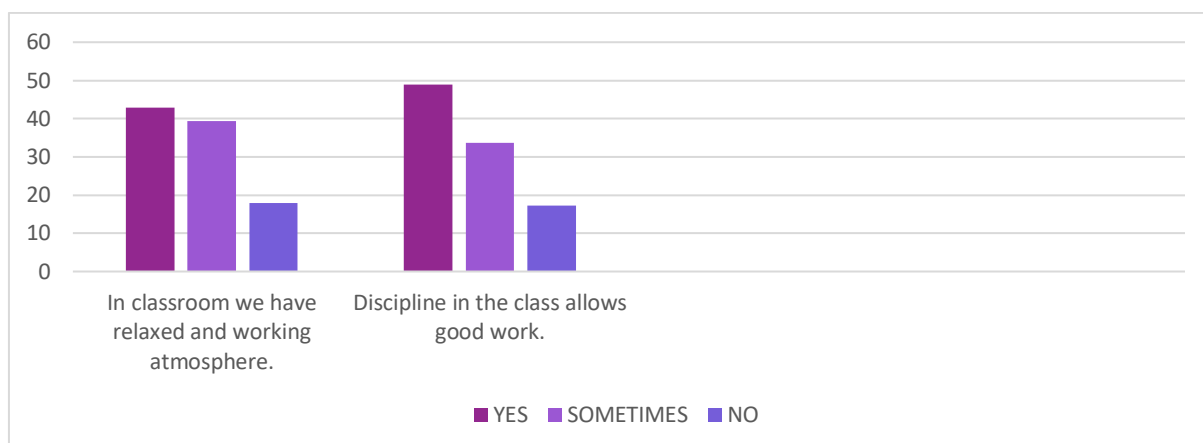


Image 6. General student's opinion about discipline in the classroom

13. Classes are mostly dynamic and well used.

More than 50 percent of students agree that classes are mostly well used and dynamic (56.5%), and another 31.5% think that sometimes they are well used. Only 11.9% disagree with the statement.

14. The teacher will be happy to explain any ambiguity with the interpretation.

It is very well known that students agree that their teachers are happy to explain any ambiguity with the interpretation (73,38%), and only 6.47% disagree. The rest agree sometimes. Nevertheless, it is very good that students feel free to ask knowing and trusting their teachers to answer any questions regarding subject matter.

15. Students are mostly actively involved in the work through conversation, assignments, practical work and student presentations.

Even though most of the students are only sometimes actively involved (almost half of them, 47.2%), there is more than one third of them actively involved in the work and assignments. 14% of students are not actively involved, unfortunately.

16. If you watch your class at home, you shouldn't study too much.

The majority of students agree or sometimes agree that if they are paying attention in class, they shouldn't study too much at home (44.48% agree and 31.32% sometimes agree) and 24.2% disagree.

17. The lectures show the purpose of learning the subject and its connection with life.
Even though Maths is hard, students mostly agree that sometimes (if not always) lectures show the purpose of learning Maths (43.6% agree and 40.4% sometimes agree).

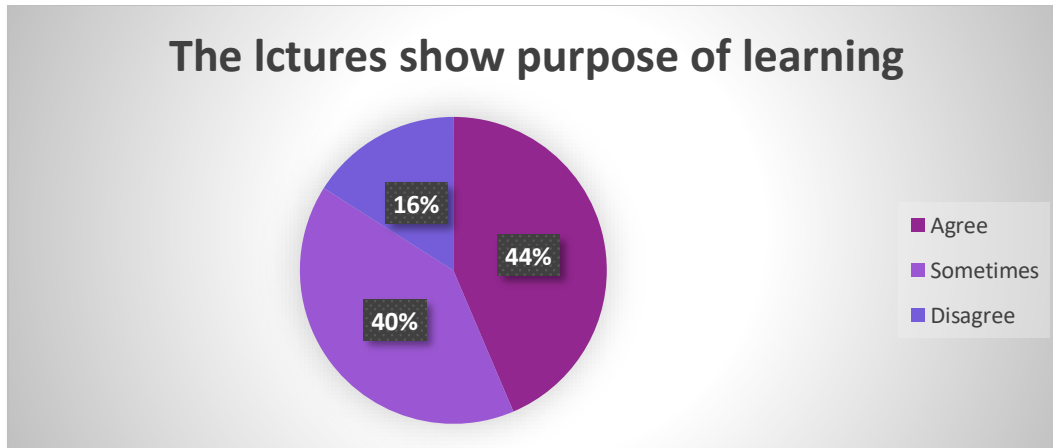


Image 7. General opinion of students on the connection of Maths problems in class with real life problems.

18. I love when my peers explain tasks to me, so I learn better.

Surprisingly, there is almost equal distribution of those students who do not like and those who like when their peers explain subject matter to them (37.46% agree with the statement, and 28.97% disagree).

19. I like to explain maths problems to my peers, so I learn better.

Students who like to explain Maths problems to their peers are in majority (45% like and 27.14% sometimes) and they think it helps them to learn better.

20. I write my homework regularly.



Image 8. Claims of students for writing their homework regularly

21. Maths makes me nervous and confused

Only 21.79% agree with this statement. Other 36.43% agree that they are nervous and confused only sometimes or disagree 41.78% (in all 78.21%).

22. I don't understand what I have to do in assignments

It is good to know that only a small percentage of our students do not know what is expected of them to do in certain tasks (15.82%), 43.53% sometimes have trouble understanding, and 40.65% always understand the task.

23. I will need maths for the rest of my life

More than half participating students agree that they will need Maths for the rest of their lives (53.85%), 30.77% think that they will need it sometimes and 15.38% think that they will never need maths in their lives.

24. I need knowledge of mathematics to learn other subjects

Students are aware that they need maths to learn and understand other subjects (46.59% agree with the statement and 40.86% sometimes agree), yet there are 15.38% that disagree and think that they do not need maths knowledge for other subjects.

25. I need maths to enrol in a college I would like

26. I need maths to get the job I want

27. I would love to do a maths related job (as shown in graph)

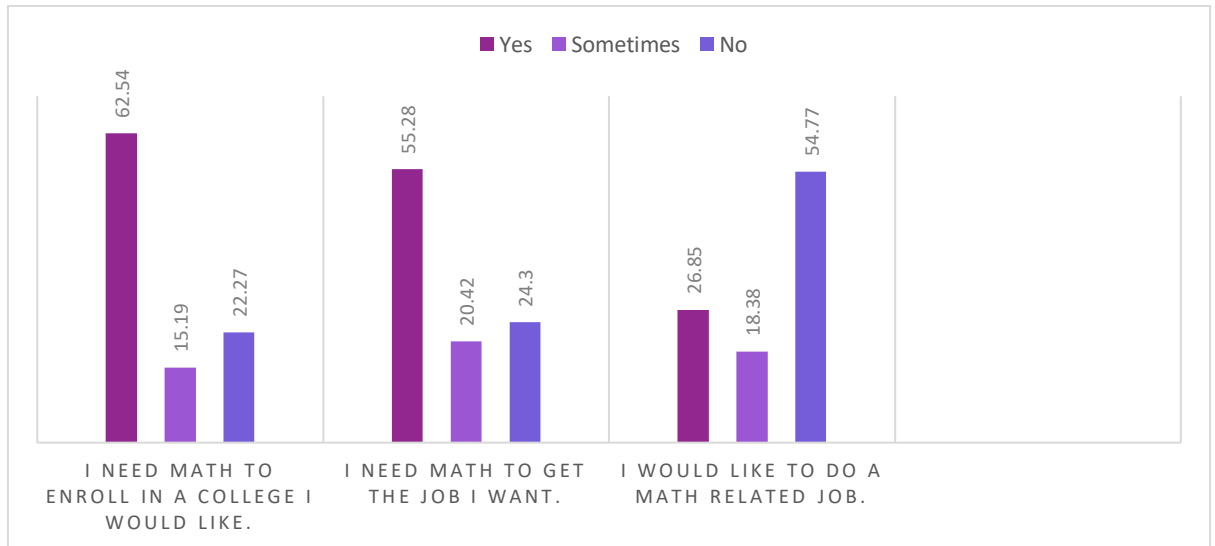


Image 9. General opinion of students on the need for Maths in later life

Main conclusions

Even though most of the students find Maths difficult and challenging, they are aware that Maths is very important in everyday life. They, as it is expected, learn better through discussions, solving real life problems, connecting subject matter to life itself, projects, through their involvement in the teaching process.

Also, we mustn't neglect teachers' role in Math classes. They have shown that it's crucial that teachers are fair in evaluation, in obtaining working atmosphere and discipline, in moderating discussions and finding a good and interesting way of teaching and getting the subject matter as near as possible to students and problems they can connect with.

Survey for parents

1. Does your child have problems with maths at school?

The majority of parents (61.57 %, 65 people out of 169) admitted that their child (children) do not have any problems with Maths. The remaining 38.46 % answered the contrary. See figure below:

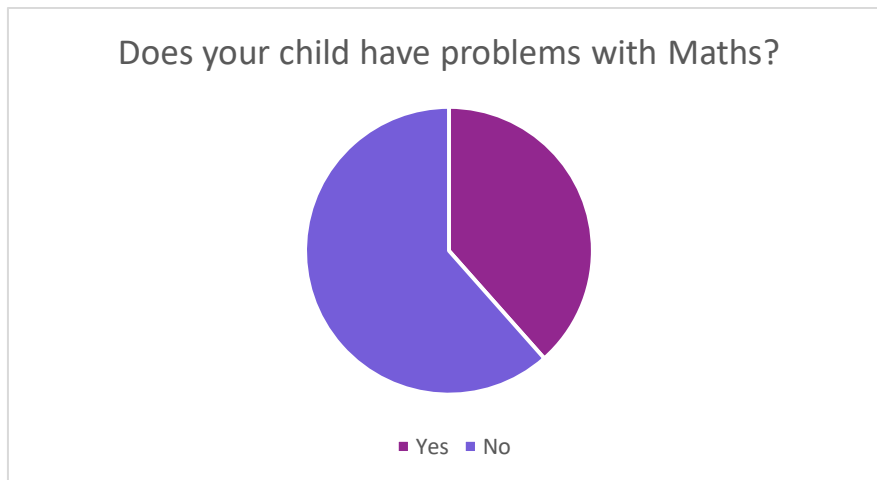


Image 10. Number of parents claiming their children have problems with Maths

2. If the answer is YES, what kind of problems?

Most of the parents claim that their child/children have problems with motivation and lack of understanding the subject (almost 31 % do not understand the subject and almost 40 % are not motivated). Around 16 % of parents think that the problem is that Maths does not have a connection with real life and the rest of them say that their children do not understand why they need to study Maths.

3. What is your personal attitude towards maths?

Almost 52 % of parents claim that they either love or like maths and around 30 % neither like or dislike Maths. Only 18 % dislike or hate Maths (just 1 % hate Maths).

4. Indicate with a tick to what extent you "totally DISAGREE" (1) or "totally AGREE" (5) with the following statements

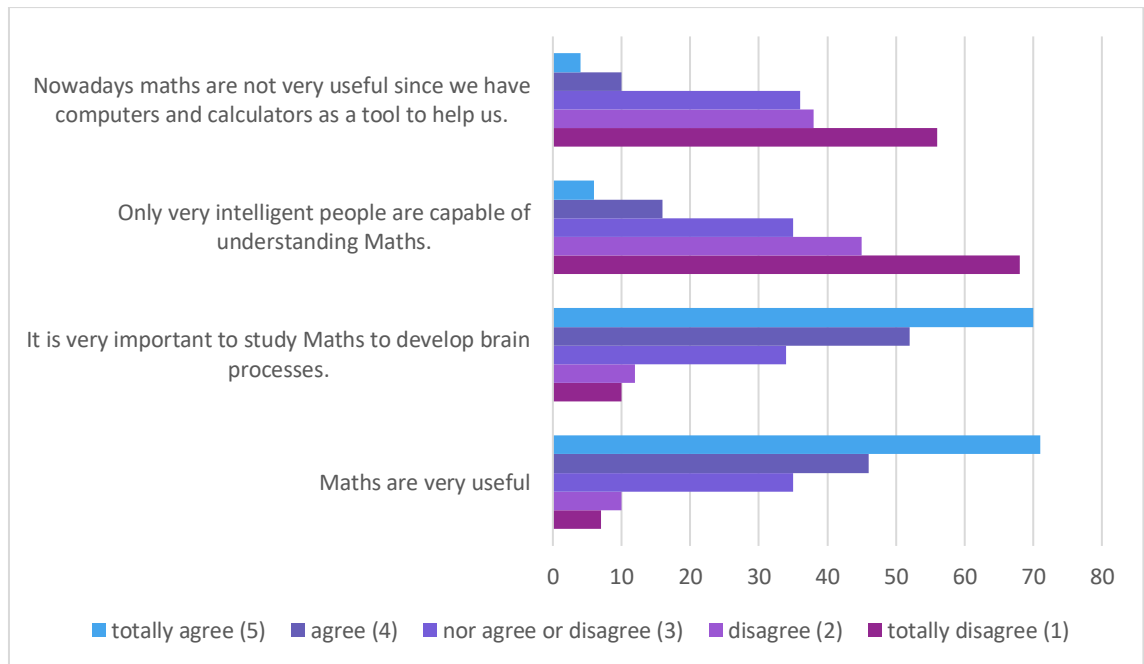


Image 11. Number of parents claiming their children have problems with Maths

5. Do you think that your attitude towards maths can influence your child's attitude

Opinions are almost 50:50 divided here – apparently, half of the parents believe that their attitude influences their child’s attitude towards Maths, and as much of them believe that it doesn’t. Here I must say that Croatian parents made the difference because the majority of them do not believe in their influence and Romanian, Macedonian and Spanish parents think that they do influence their child’s attitude.

6. If your answer was YES, please explain. To what extent do you think your attitude influences your child's? Is this influence positive or negative?

Since this was an open type question, most of the parents answered that they are aware that their attitude influences their child’s attitude and they believe it is in a positive way.



7. How do you think you could help your child be more motivated to learn maths?

There are many answers to this question, but basically, all parents are saying that Maths should be more interesting, that there should be more gamification in Maths, that it is important for students that they see connection with everyday life and need for maths.

Some of them emphasise that it is important that they have a positive attitude towards Maths and that they help their children in learning.

Main conclusions

Most of the parents recognize lack of motivation and connection between Math classes and everyday life the biggest problems with learning and gaining interest in Math subjects. It is a general opinion that Maths is difficult and that students are not motivated enough.



Comparative analysis

Comparing our survey groups we came to this conclusion:

- **Interest/Lack thereof** - Recognising the importance of maths with regards to its application to real life.

Lack of interest is recognized as the biggest problem in learning Maths mostly because students do not see the connection between real life and Maths, especially content they learn in school.

- **Professors' performance**- Teachers are mostly satisfied with curriculum and their autonomy to teach and evaluate with their own criteria. However, there is enough space to improve subject content and above all methods that we use to teach.

- **Motivation-Lack thereof** – The second biggest problem is lack of motivation, again due to lack of connection with real life. Lack of motivation is recognized in all three survey groups as something that needs to be worked on.

- **Anxiety** - distress or uneasiness caused by fear of underperforming or failing at maths is rarely associated as the cause for students to underperform. But, there is a very strong connection among professors' performance, methods and attitude towards students and their motivation and interest in the subject.

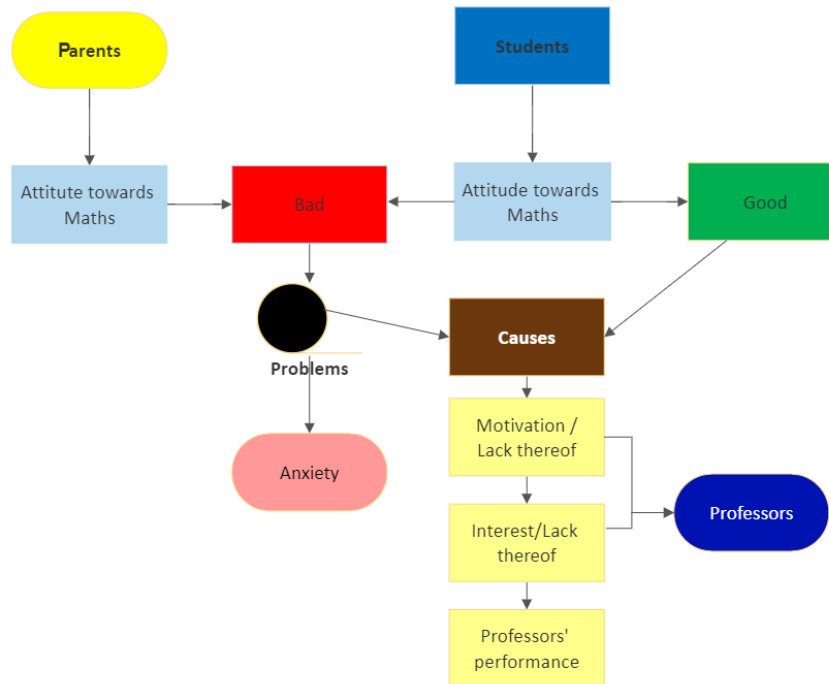


Image 12. Schematic of the predictions for data results

-Analyse/Compare the opinions in relation to "problems with maths" and its possible causes:

- **Interest/Lack thereof**
 - PARENTS 70 % of them claim that their children have problems with Maths due to lack of interest and not understanding the subject's connection to life.
 - STUDENTS also agree with parents. The main problem is lack of interest in the subject because they have a hard time finding Maths useful in everyday life.
 - PROFESSORS know that Maths is often found difficult to understand and therefore is lack of interest.

- **Professors' performance**
 - PARENTS find professors' performance and methods important for understanding the subject



- STUDENTS are likely to love Math and not have problems with it if they have confidence in their teachers' performance, evaluation criteria, willingness to help them and answer all their questions.
- PROFESSORS are mainly satisfied with curriculum and autonomy to teach and evaluate with their own criteria. They understand the importance of their performance and their various methods of teaching as well for the gifted and for students with some disabilities.
- **Motivation/Lack thereof:**
 - Both, PARENTS and STUDENTS find it very important to have the right motivation due to be successful in any part of education and life. Therefore, they recognize the lack of motivation as a big problem and think that students could be motivated with other creative teaching methods and involve them more in practical ways of learning, combining subject to everyday life situations and connecting matter to relatable issues.
- **Anxiety:**
 - Although some students find Maths difficult and challenging and Maths do engage some anxiety problems, this is not as common as we initially expected.