

CAT 4 RESOURCE DEVELOPMENT

Quick Maths

Shawn Lim Kai 3o2 (19)

Fang Ziyu 3o2 (5)

Marcus Yim Khai Wern 3o2 (15)

Zhao Tiancheng 3p3 (19)

ABSTRACT

Quick Maths is an integrated, intuitive and user-friendly online platform aimed at addressing the issue of Secondary one students struggling to adapt to the jump in difficulty from Primary to Secondary school mathematics. We took advantage of the ubiquity of digital technology such as smartphones and computers to develop our online resource.

The resource consists of a Wix website, which hosts our content and videos. Our resource is infused with modern methods of learning which encourages independent and self-learning, allowing the student to not only understand the topic, but develop a passion for learning in the process. We have separate portions on our website for three mathematics topics which we have identified as the most challenging among Secondary One students through a needs analysis, namely being Algebra, Geometry and Number Patterns, which portray the key concepts required using visual and pictorial methods such as images and diagrams, in contrast to chunky paragraphs, allowing students to immerse and understand every topic one by one. Aside from that, we have produced videos for our covered topics, ranging from beginner, intermediate, to advanced difficulty, allowing for customisable learning progression for the student. To top it all off, we have printable notes for all 3 topics that provide a concise breakdown of all theories and formulas needed for tests and examinations, to ensure our users ace their tests. All of these combined allow for an efficient and customisable learning experience which is unparalleled among all existing resources.

1 INTRODUCTION

1.1 RATIONALE

Upon entering secondary one, many students often experience a jump in difficulty for many subjects. However, we have noticed that this is especially true for mathematics. Mathematics, as a primary school subject, is limited to word problems and little or no manipulation of the core concepts of addition, subtraction, multiplication and division.

Upon entering secondary school, students are bombarded with different formulas and theories which require extensive manipulation, a world of difference as compared to primary school. This ends up causing the average secondary one student to end up weak in mathematics, causing them to fail to establish the foundations which are required for the coming years in their education journey.

1.2 OBJECTIVES

The objectives of Quick Maths was to

- Bridge the difficulty gap between Primary and Secondary school mathematics
- Provide a customisable learning experience
- Deliver our content efficiently and clearly

1.3 TARGET AUDIENCE

The target audience was Secondary One students.

1.4 RESOURCES

The resources created for this project was an integrated online platform comprising of content on the three topics we are covering, videos and notes. In addition, there is a study tips section to help students incorporate good study habits into their learning of mathematics.

2 REVIEW

While scouting the internet for existing resources, we discovered that there are plenty of calculators which straight up present students with answers for their questions, with little or no explanation. This can be seen from the image below, showing Mathpapa, a popular mathematics learning platform.

Algebra Calculator

What do you want to calculate?

$$(x + 1)(x + 2)$$

CALCULATE IT!

Solve

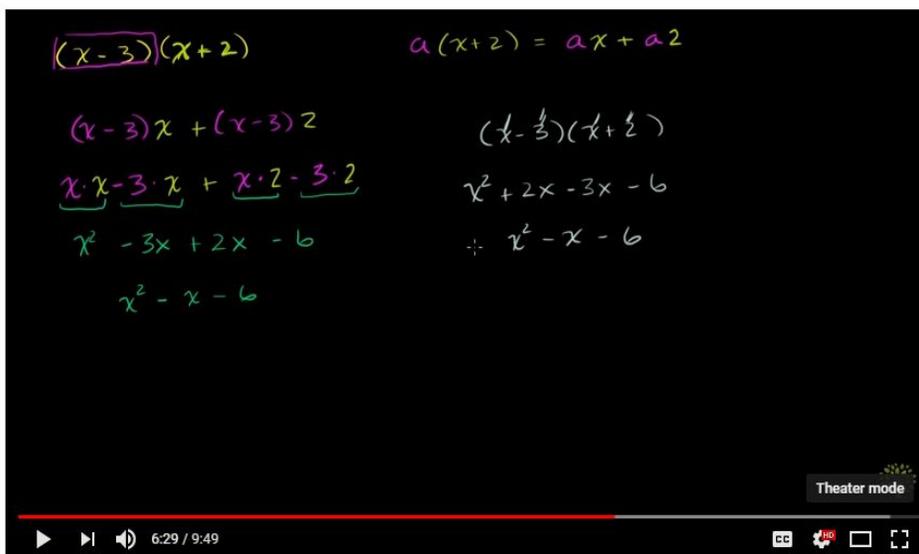
Evaluate

Lesson

Simplify

$$\begin{aligned} &(x + 1)(x + 2) \\ &= (x + 1)(x + 2) \\ &= (x)(x) + (x)(2) + (1)(x) + (1)(2) \\ &= x^2 + 2x + x + 2 \\ &= x^2 + 3x + 2 \end{aligned}$$

In addition, we analysed another popular mathematics learning platform, Khan Academy, which specialises in visual learning in the form of videos. However, as seen below, their videos are often messy and unorganised, causing unnecessary confusion among users.



$(x-3)(x+2)$

$(x-3)x + (x-3)2$

$x \cdot x - 3 \cdot x + x \cdot 2 - 3 \cdot 2$

$x^2 - 3x + 2x - 6$

$x^2 - x - 6$

$a(x+2) = ax + a2$

$(x-3)(x+2)$

$x^2 + 2x - 3x - 6$

$\therefore x^2 - x - 6$

Theater mode

6:29 / 9:49

Multiplying binomials and polynomials | Algebra Basics | Khan Academy

The information can definitely be presented in a clearer and more concise manner.

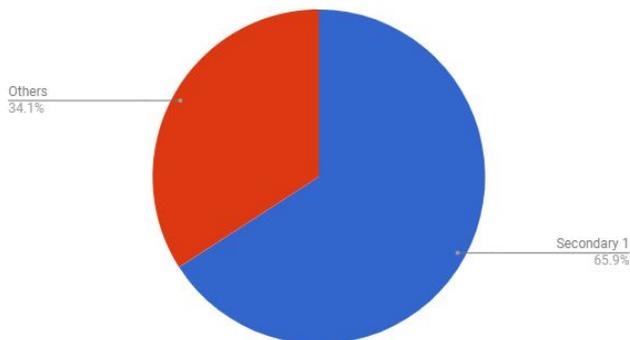
3 METHODOLOGY

3.1 NEEDS ANALYSIS

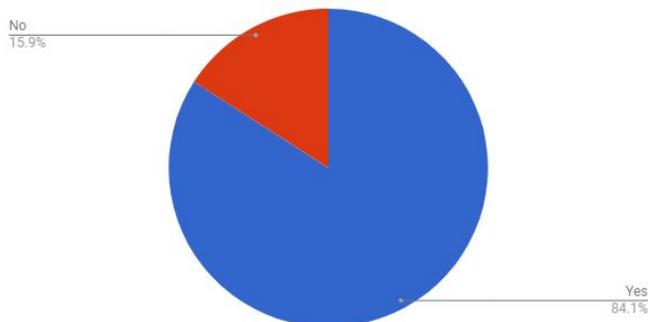
A needs analysis was conducted to ascertain the relevance of such a project. Firstly, We conducted a survey which had 43 respondents, comprising of secondary 1s and seniors who had gone through Secondary One mathematics. This survey allowed us to identify some problem areas among Secondary Ones and what methods we should use in our project. Secondly, we consulted a lower secondary mathematics teacher, Ms Wong Mong Ee, on the feasibility and effectiveness of a project such as ours. She confirmed that the project would allow for a valuable learning experience which would supplement the existing syllabus.

3.2 NEEDS ANALYSIS SURVEY RESULTS

Count of Level?

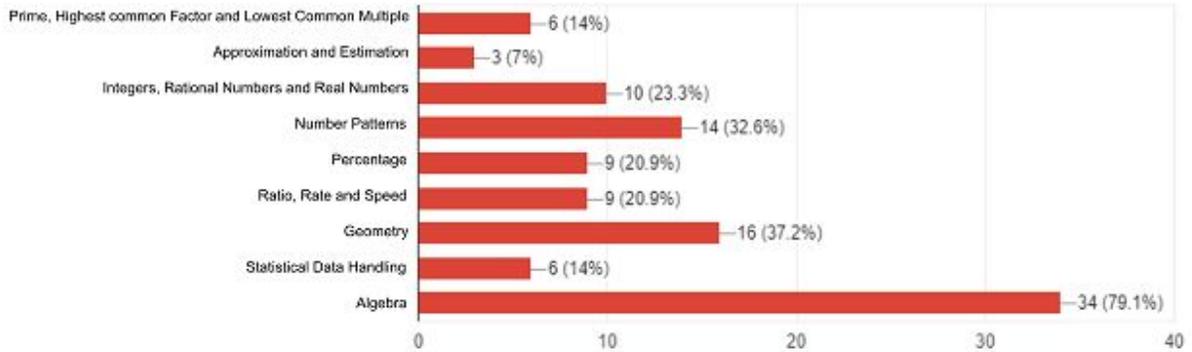


Count of Do you feel that the transition from primary to secondary mathematics is a tough one?



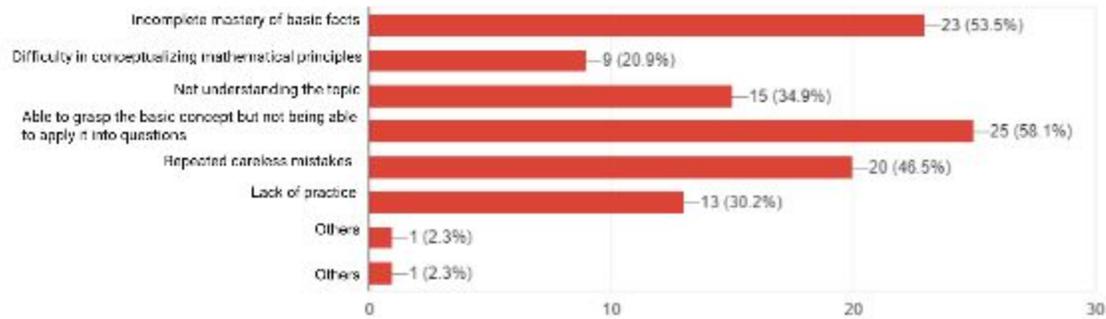
What is/are the topic(s) of lower secondary maths that you have/had trouble dealing with?

43 responses



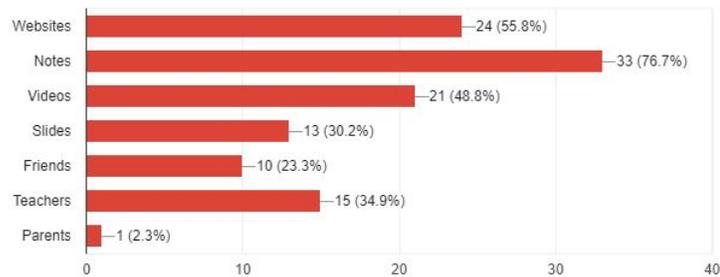
Explain briefly the main reason(s) why you have/had trouble with the topic(s) you mentioned earlier.

43 responses

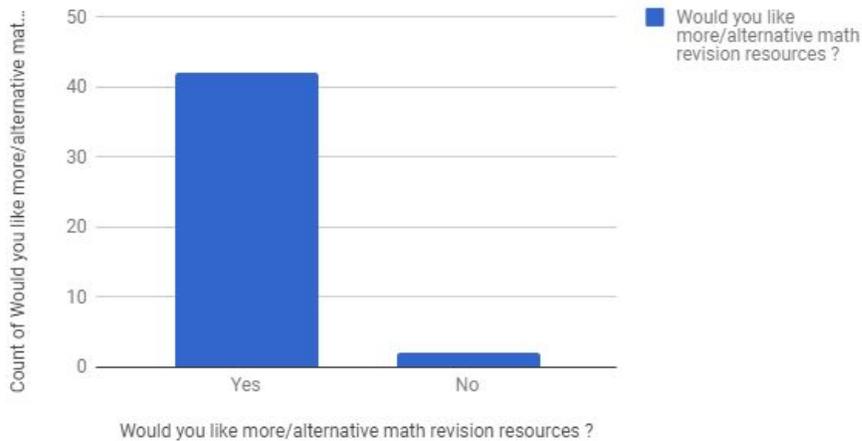


What are your preferred methods to guide you in learning maths?

43 responses



Count of Would you like more/alternative math revision resources ?



3.3 DEVELOPMENT OF RESOURCES

A review was carried out of all the existing mathematics learning resources and was collected from secondary 1 students through our survey. This information was collated and we reviewed the information along with our mentor. By pinpointing problematic areas and preferred learning methods among Secondary Ones, we were able to go ahead and develop our resource.

3.4 PILOT TEST 1

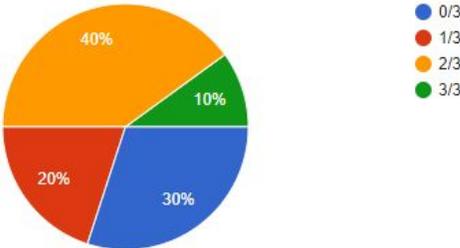
Firstly, we conducted our first pilot test in Term 3 Week 1 with 10 secondary 1 students in HCI to find out the effectiveness of our resource package and how we could improve it. We conducted a survey after the pilot test to collect feedback on our resource.

- Quiz administered
 - 1 before using our resource package and 1 after
 - Each quiz comprises of 3 questions, 1 question from each of the 3 topics we are covering in our resource package
 - Questions all from “intermediate category” of textbook, to ensure that both quizzes are on the same difficulty level in order to obtain a more accurate result

3.5 PILOT TEST 1 SURVEY RESULTS

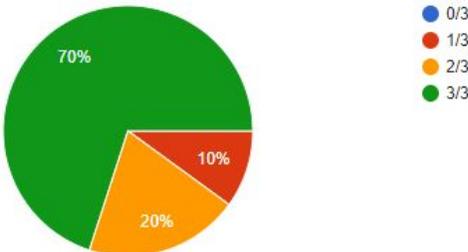
Quiz Score (before using Quick Maths)

10 responses



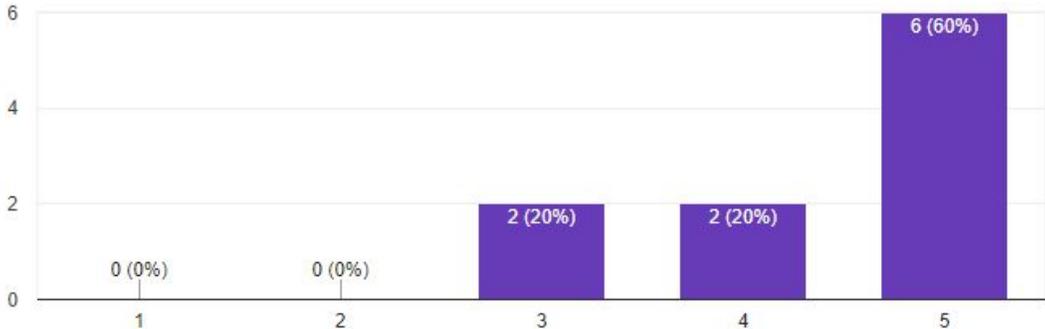
Quiz Score (after using Quick Maths)

10 responses



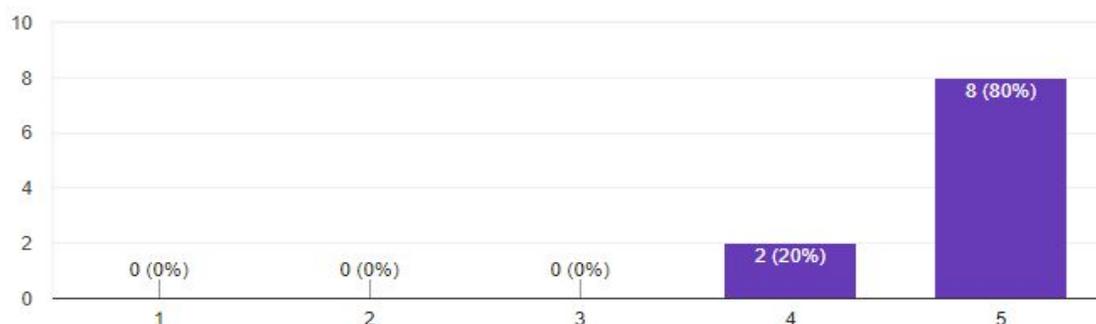
Was it enjoyable?

10 responses



Was it easy to understand?

10 responses



3.6 PILOT TEST 2

Secondly, we conducted another pilot test after the mid-term evaluation with 32 Secondary One students to find out the effectiveness of our project and whether it was ready for the final evaluation. We specifically picked two groups of students, one where they had gotten a B3 or above in their term 2 mathematics, and the other where they had gotten a B4 or below in their term 2 mathematics. We administered two quizzes to them, one before and one after the pilot test, to test their knowledge and the effectiveness of our project.

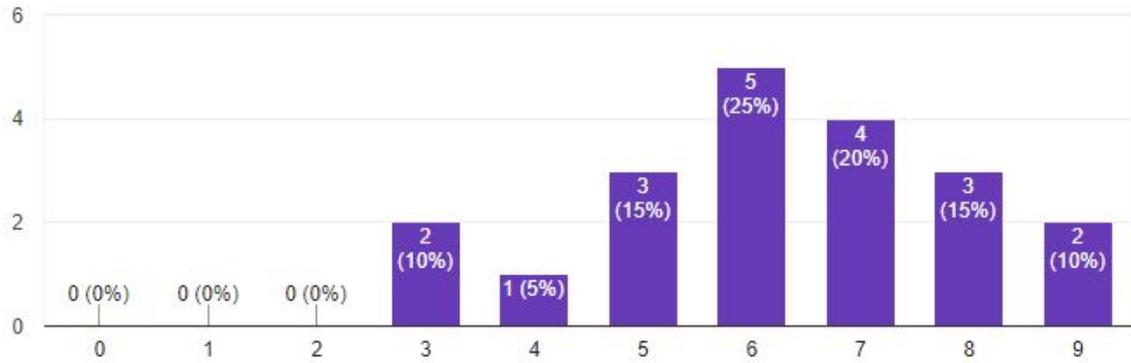
We conducted a survey after the pilot test for each individual group to collect feedback on our resource.

- Quiz administered
 - 1 before using our resource package and 1 after
 - Each quiz comprises of 9 questions, 3 questions (1 beginner, 1 intermediate and 1 advanced) from each of the 3 topics we are covering in our resource package

3.7 PILOT TEST 2 SURVEY RESULTS (A1-B3)

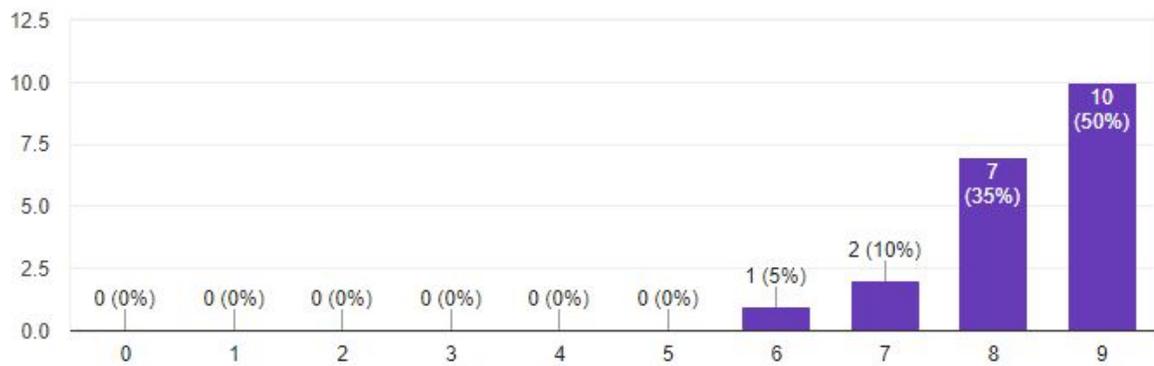
Quiz Score (Before using our resource)

20 responses



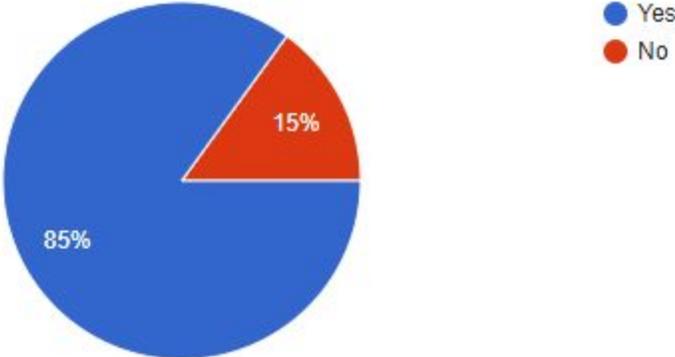
Quiz Score (After using our resource)

20 responses



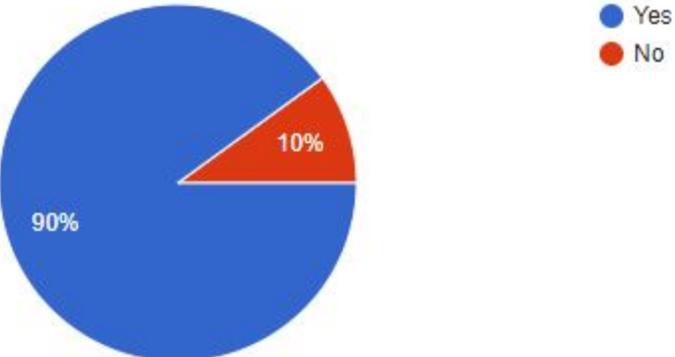
Was our project enjoyable?

20 responses



Was our project useful?

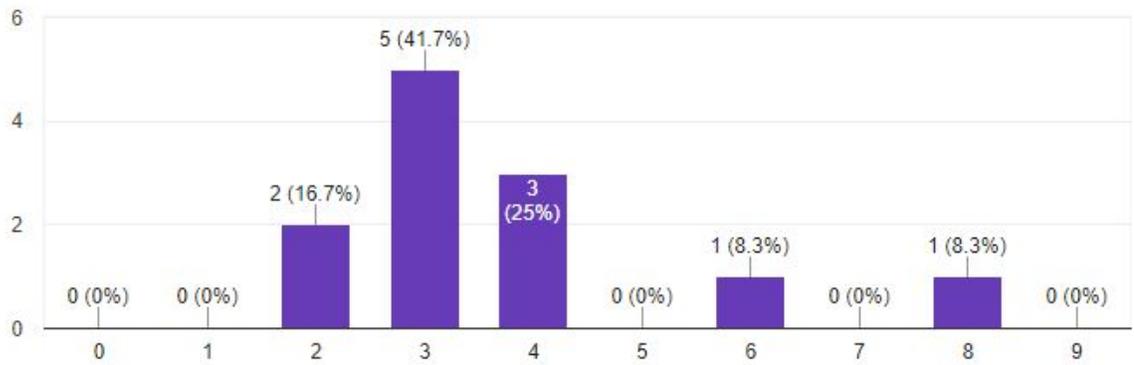
20 responses



3.8 PILOT TEST 2 SURVEY RESULTS(B4 AND BELOW)

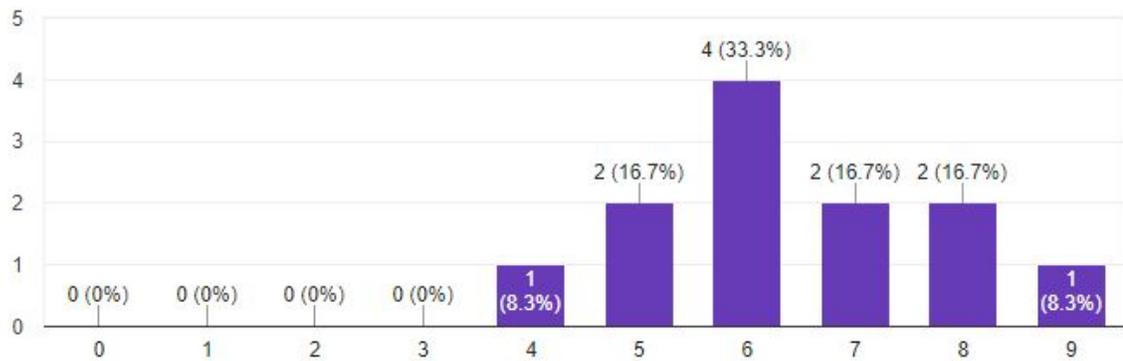
Quiz Score (Before using our resource)

12 responses



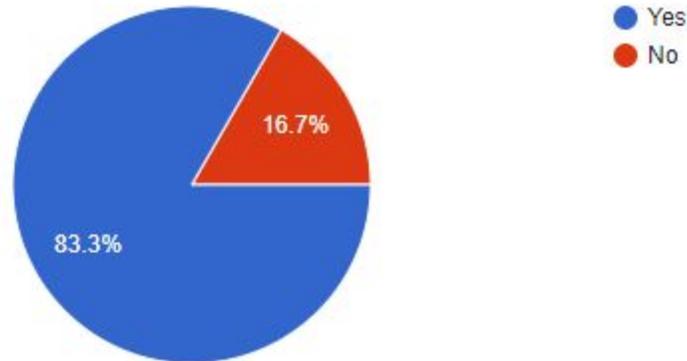
Quiz Score (After using our resource)

12 responses



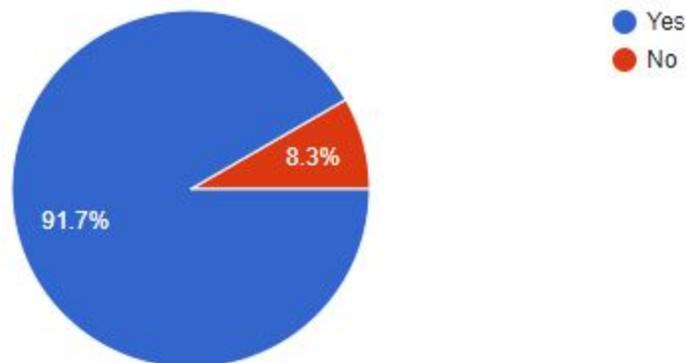
Was our project enjoyable?

12 responses



Was our project useful?

12 responses



4 OUTCOME AND DISCUSSION

The final outcome of our project was an online platform consisting of videos, notes and a base website. However, we initially decided to have a games section, suggested to us that games may not be effective due to our limited coding capabilities. The limitation to this project as it must go hand in hand with a user's own efforts as mathematics requires much practice, which our product does not offer. Further works which can be

accomplished could include practice worksheets so as to overcome the limitation of our project.

5 CONCLUSION

Quick Maths has definitely been a challenging project to undertake as it required many hours of re-studying Secondary One topics, shooting videos, researching and collating information, platform designing etc. The whole project has enabled the group to develop many skills. Critical thinking and creativity were developed while formulating the early stages of the project. Patience was developed in countless hours of re-shooting and editing videos. Observation and analysis skills were developed while comparing our project with existing resources and listening to the judges' and our mentor's comments. Perseverance and determination were the final skills that pushed us to complete and perfect our resource.

6 ACKNOWLEDGMENTS

We would like to acknowledge and extend our deepest gratitude to the following individuals, without whose help the project would never be a success.

Our Mentor for her patience in helping us improve our project

The panel of judges who gave us valuable suggestions to improve our project

Our Secondary One juniors for their input during needs analysis and pilot tests

7 INDIVIDUAL REFLECTIONS

Shawn Lim Kai 302 (19)

- I feel that this project has been a very insightful experience for me. In the development of this project, I have learnt many new things that will stay with me and has helped me to grow as a person. Unconsciously, I have been developing

many new skills in this short duration of a year. Firstly, I feel that I have learnt fundamental people skills. Being an introverted person, it is unlike my nature to step out of my comfort zone and talk to complete strangers. However, during the conduction of our two pilot tests, I found myself going out to talk to our pilot testers and find out more about their needs and what can be done to improve our project. This has stretched me out of my comfort zone but has definitely provided for a very much needed first step. Secondly, I have learnt the virtue of patience. As the team leader, dealing with a team of 4 people can be a much more challenging task than it seems. From rushing last minute deadlines to pushing all my group members, my patience has been tested countless times during this project. However, more than my patience, I have learnt to channel my anger towards someone into a more positive energy, and instead see things from a different and more helpful lens. Thirdly, I have learnt the very important skill of time management. I feel that I am especially weak in this skill due to my tendency to be a procrastinator and rush deadlines at the eleventh hour. However, this project has taught me the hard way that that is a foolproof path to failure. My sense of responsibility towards how I manage my time has definitely matured after this. Lastly, and most importantly, I have learnt the importance of teamwork. This is a project that I could not have accomplished myself, and it is only due to everyone's contribution that this project has reached this stage. Dealing with conflicting opinions, constant accusations and blame-pushing, uncooperative group mates and much more has been no easy task, but in the end of the day we realise that it was only through these ordeals that we have emerged here. More than anything, I have taken more away from this project than what I have given, and I am delighted to say that I have accomplished it with no regrets.

Fang Ziyu 3O2 (05)

- I have learnt several things from this project. First of all, cooperation is key in project work as sometimes when we could not cooperate with each other, we

were not able to finish the task at hand. I also feel that a good relationship is a very important component in a team. It may be the factor that spurs the team to achieve a high-task performance. As when certain group members were discontented with other group members, the group in a whole also did not accomplish a lot. We also could have had managed our workload better. As sometimes some group members would have finished their work some time back while the others would still be rushing their part, leading to uneven cooperation. Lastly, what could be improved is our discipline. There was also quite a lot of time given to us to do this group project so we kind of slacked off at the start of the semester. This potentially led to us sometimes rushing to meet the deadline. However, if I were to be in a group with shorter deadline in the future, I believe that my group would need a better discipline to ensure that everything is carried out on time and properly.

Marcus Yim 3O2 (15)

- Throughout this learning journey, i have learnt a multitude of things that are surely invaluable life lessons for myself. When the group first came together, many of us were not efficient and would constantly not perform up to standard to ensure the success of the project. Instead we would leave everything to last minute, and would not employ effective communication among one another to ensure that things are more efficiently done. This problem continued until the mid term evaluation, as there were still group members who did not take the project seriously, and continued to lack the motivation to contribute more than one is tasked. However, after the mid term evaluation, i could see that we were more bonded as a whole, and would not be afraid to seek out other groupmates when in doubt. Many of us also stepped up and outperformed others expectation, and took this project more seriously. Even though not all bad habits were corrected, and there were still sometimes when we decided to slack off a little, there was a significant improvement nonetheless. On a side note, i feel “teamwork makes the dream work.” At first, to me this seemed like on of those generic quotes that were

only politically correct. However, looking back, i have actually realised that this is actually an invaluable lesson to all. This project would never have been able to be accomplished by one man, but with the invaluable help from my other group mates, we have been able to support each other in times of need, and allow our dreams to be realised. At first, many of us merely did our tasks privately, however as time went on, we learnt the importance of cooperation, and realised this is a major determining factor to the success of the group. However, i felt that the progress of this project has been greatly hampered by our distinct laziness at times. Even though we still managed to finish everything on time, most of the time this was only possible because many of us rushed it the night before, and thus led to sub-par standards of work. However despite all the challenges faced by our group, i still feel that i had a wonderful time being part of this project.

Zhao Tiancheng 3P3 (19)

- I, as a member of our project Quick Maths, have gained many takeaways throughout this year when participating in this project. First of all, I feel that teamwork is key to success. Fortunately, despite our group having a lack of team spirit at the start of the year, we were able to come together and work as a team now. Causes of our lack of teamwork at the start may be that we did not know each other really well, especially me, as I came from a different class from the other three. We were unable to communicate well enough, resulting in inefficiency as well as last minute work done a few days right before the evaluation date. This issue went on all the way until mid-term evaluation, the point of time when we found out what we are lacking. Subsequent issues such as making excuses, pushing blames to others as well as backing off from meetings last minute have also popped up through the development of this project. Despite facing such issues, we are able to realise our wrongdoings, and here we are now, standing together as a team. Now, I can surely say that we are way more bonded together than before. I did not do much on my own, no one did, we did it together as a team.

8 REFERENCES

Using visual methods to help us move from researching on to researching with. (n.d.). Retrieved April 03, 2018, from <https://www.bera.ac.uk/blog/using-visual-methods-to-help-us-move-from-researching-on-to-researching-with>

Stapel, E. (n.d.). Purplemath | Home. Retrieved April 03, 2018, from <http://www.purplemath.com/>

Khan Academy. (n.d.). Retrieved April 03, 2018, from <https://www.khanacademy.org/>

MathPapa. (n.d.). Retrieved from <https://www.mathpapa.com/algebra-calculator.html>

M. (2015, January 13). Retrieved July 11, 2018, from <https://www.youtube.com/watch?v=gddB32IQFnw>

Santos, D. (2016, October 03). How to Study Maths: 7 Tips for Problem Solving. Retrieved from <https://www.goconqr.com/en/examtime/blog/how-to-study-maths/>