One Thousand to One Million Impact

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Imagine Jakarta...

At Present

- 63rd PISA Rank
- 16th GDP Rank

After 10 Years

- 4th Industrial Revolution
- GDP Rated in Top 10

Challenges

- Disparity in Curriculum
- Conventional Learning
- Obsolete Pedagogy
- Math Fear
- Adoption Issues

Idea

A Math program designed to overcome the fear of mathematics by using gamification and adaptive learning to boost STEM in Jakarta.

Approach

Accelerated Programs

Eliminate the achievement gap between at-risk and mainstream students.

Adaptive Learning

Customized resources and learning activities to address the unique need of each learner.

Gamification Technology

Motivate students to learn by using game design and elements.

Numeracy Skills

Develop logical thinking and reasoning strategies in their everyday activities.

Network of Orchestrators

Create a network of coaches in which participants interact and share in the value creation.

Defining the Problem:

Today when we look at all the developed countries and societies of the world, an element of commonality that can be observed is their firm standing in scientific and engineering ground. Development in science and technology has, from the very start of human civilization, been altering the way people live, communicate, and transact. We use countless off-shoot technologies in our everyday life, all thanks to cutting edge STEM research, for example; Internet, GPS, etc.

With a population of about 271 million people[i], Indonesia generates a GDP of 1042.17 billion USD[iii] which is relatively low as compared to countries like Japan or Singapore which generate a GDP of 4970.92 billion USD[iii] and 364.16 billion USD[iii] with a population of 126.8 million and 5.8 million people respectively. The two latter countries generate relatively higher GDPs as compared to their populations. Approximately 27% of Indonesia's total population is under the age of 15 which shows that Indonesia has a lot of youth potential, but unfortunately, the percentage of Indonesians over the age of 25 that had attained at least a bachelor's degree in 2016 was just under 9 percent, the lowest of all the member states of the Association of Southeast Asian Nations (ASEAN)[x]. This shows that the youth are not growing up to pursue education. An analysis by the World Bank also showed that 55 percent of Indonesians who complete school are functionally illiterate[x]. Clearly, these statistics tell that Indonesia's education system has great room for improvement.

Defining the Approach:

According to Dr. F. K. A. Allotey, in his research paper titled "science, technology and development", it is now accepted world-wide that the role of science and technology is more essential for wealth creation of nations than either capital or land.[vi]

On deeper analysis towards the skills needed to excel in science and engineering, research shows that there are two types of skills essential for a child to improve his/her learning capacity, namely, **Language** & **Numeracy Skills**. Though both of these skills are highly crucial for an individual, however, our project proposal revolves around scientific and engineering skills for which numeracy skills are the basic necessity of any student in order to foster a strong STEM mindset. That being said, a strong conceptual ground in said concepts can only be established if numeracy skills are cultivated in students from their foundation years.

Therefore, we define our primary approach as: **"Establishing a firm ground in numeracy skills within the foundation years of the students."**

Although Mathematics has a key role in cultivating numeracy skills in students, research has found that the subject causes anxiety and fear in students. To explore Math

anxiety, researchers from the faculty of education and the center for neuroscience in education at Cambridge University interviewed primary and secondary students in the UK and Italy. Dr. Ros McLellan, who led the interview research, said: “Math Anxiety is very much an emotional reaction. Younger kids won’t want to go to school when they have Math classes; they get tearful and upset.”[viii]

Therefore, we define our secondary approach as: **“Making Mathematics more engaging by making it interesting and fun for students to understand.”**

Hypothesis:

“Equip **One Thousand teachers** with the tools, techniques, and curriculum that involve adaptive learning algorithms, accelerated learning, and gamification techniques in order to change education at the core ***by 2030***.”

Solution Overview:

We concentrated on exploring why students face math anxiety in their foundation years of education, specifically looking at how the current education system in Jakarta teaches its children, and how can we develop a solution to overcome their fear of the subject.

Research Methods:

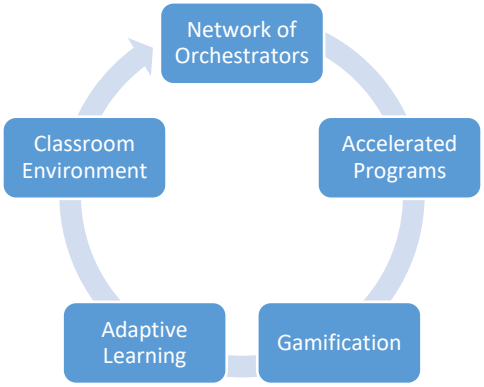
Text-Based Research

Our primary articles were sourced from a variety of databases and credible sources like Cambridge University, Columbia University, Carnegie Mellon University and a number of other sources (see references).

Outreach-Based Research

To maintain the relevance of our solution, we referred to professional organizations, revolutionizing modern education via *STEM & teachers’ training programs*, for their opinions and feedback on our research and idea.

One Thousand to One Million:



Network of Orchestrators:

Expanding on our slogan which stands for training one thousand coaches which in turn will coach one million students in a time period of ten years. Our solution is to create an online platform for teachers which will equip them with curriculum, video lectures, gamification technology centered on mathematics to create a better learning environment for the students, keeping in mind the above mentioned challenges in Indonesia. In our program, teachers will be termed as coaches.

Accelerated Programs:

Our solution will contain certain accelerated programs on math to suit the individual needs of each student. Furthermore, our curriculum will feature the National Curriculum of Indonesia which is designed on the foundation of *Pancasila* (Philosophical foundation of Indonesian Republic)[x] which has undergone multiple changes according to the needs of the society. The reason for implementing the national curriculum is to ensure the same standard of content throughout the schools. Secondly, it is on the open hand which means that the changes in curriculum will be welcomed by a panel of specialized educationalists.

Video Lectures:

The accelerated programs will also entails making lecture videos of the top 10 teachers/coaches throughout Indonesia on every topic of the mathematics curriculum and also make lecture units, and then upload these resources on the online platform for teachers to learn and take help from. These videos will be in native language so that both the teachers and students can understand them

better. Moreover, these lecture videos will develop the practice of online learning / self learning in the students which will be beneficial for them in the future as the mode of education will have shifted towards self learning.

Gamification:

Intuition suggests that gamification may be able to motivate students to learn better and to care more about school. Schools already have a number of game-like elements like points for completing assignments and assessments correctly, more commonly called “marks” and these marks collectively translate into grades. However, something about this “ultimate gamified experience” lacks in engaging students whereas virtual worlds and video games excel at it.[ix]

Our task is to engage students through gamification so that it supports their learning. Educational gamification proposes three major areas in which gamification techniques are effective when deployed: cognitive, emotional, and social.[ix]

Realizing the immense importance of gamification in studies, our platform will equip the teacher with games and simulations needed to properly clarify all the problematic concepts in mathematics to the students. The platform will also have leaderboards, which will create a sense of heathy competition among the students in the city.

Adaptive Learning:

Adaptive learning is a method in education through which specific teaching devices or instruments are employed in an effort to meet the specific learning needs of individuals. In other words, adaptive learning is personalized learning. Adaptive learning merges learning styles and cognitive styles with the availability of educational technology, and data/learning analytics.[iv]

We plan to use adaptive learning through two strategies; first one is through tablets, by creating such software which analyze the student’s cognitive status and then evaluate each student based on their level of understanding. Second strategy is that the teacher determines the cognitive level of each student in the classroom using a test which would also be provided by the platform and then assess each student accordingly with their respective level. So, basically, through both these strategies we will be implementing personalized learning for our students.

Classroom Environment:

Learning environments play an essential role in students' success. Our solution contains two possible versions of the classroom environment, depending upon economic constraints, first contains having tablets for all the students in the classroom on which most of the assessments will be taken along with games / simulations to assist in their learning, and the second prefers the text-book approach in which students will study using text-books but there will also be an LED on which lectures videos would be played along with games and simulations.

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