GLOBAL MARS: THE MARTIAN OUTREACH PROJECT IN SRI LANKA. H. C. Senarath Dassanayake1,  
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Introduction: Global Mars is an educational outreach project designed to utilize a planetary science passion-based curriculum to find out what it can contribute to lessen the cycle of poverty in disadvantaged places in the world. The project hopes to diffuse the knowledge of planetary science to communities that do not have access to this information. Global Mars believes education is the key to breaking the cycle of poverty [1]. Over decades, research shows that poor children face educational challenges [2], [3]. In the summer of 2017 the Global Mars team conducted Pilot Project 1 (PP1) in Matara, Sri Lanka, to diffuse knowledge to disadvantaged students. By helping students identify their own passion and looking at science from a new perspective, the hope was to benefit students by helping them to identify problems in their own community and come up with long term solutions. Passion based learning includes the concept of important ideas, connecting them to real world problems and projects with student driven learning for enrichment and connection [4].

PP1 Concept: Global Mars consist of a passion-based planetary science curriculum with a focus on filling knowledge gaps in textbooks. Visits to local government schools are an integral part of the project. The audience for this study was a government girl’s school. The Global Mars curriculum is developmental and focused in this instance on twelve (12) English medium seventh grade students with 2 mentors. As an example of challenges faced during PP1 preparation, flooding badly affected Matara district in May 2017, closed the school for a week, and pushed back the program from July to August: “Severe flooding brought on by monsoon rains across southwestern portions of Sri Lanka has resulted in the deaths of at least 169 people, according to the country’s Ministry of Disaster Management” [5]. A potential weakness of the PP1 includes the interactive education plans such as fieldwork, may require adjustments according to the weather. However, with the adaptability and the expertise of the team, the Global Mars experience was very useful and valuable for the students.

PP1 goals: The goals of PP1 include introducing and encouraging interdisciplinary learning. STEM, scientific method, scientific research and exam preparation, passion based learning, encouraging the learning of science through mentoring to fill knowledge gaps in the local curriculum. Global Mars focuses on achieving the above goals utilizing the dynamic, spark-based planetary science curriculum. Ultimately, the long term goal is to lessen the cycle of poverty through increased knowledge, critical thinking, and confidence, gained through the Global Mars curriculum. A long-term goal is to introduce Global Mars in other developing countries as well.

Specific elements of the curriculum: The curriculum focuses on learning about astronomy, geology, biology, habitability in the solar system and field work. It also describes the planet formation. Specifically, focus is placed on how a planet forms when smaller particles are combined together leading to accretion. As the body grows gravity increases, attracting more dust. To understand this phenomenon the Global Mars team gave students a snack activity in which students took a loose snack mixture, mixed it with other ingredients and then squashed it together to make "aggala" (a planet snack).

Figure 1: Students performing the scientific method using a coin experiment to understand the concept of “refraction” of waves.

As another example, the local textbook explains the three types of tectonic plate movement with diagrams, but it does not mention the distinctive names or give examples of the types of tectonic plates. The Global Mars curriculum gives real life examples for divergent, convergent and transform plate boundaries. It also asks and answers the question, “if there is tectonics on Earth, are there tectonics on other planets and moons?” This is done while answering questions from the textbook and exam questions from previous years.

Global Mars also focuses on life on Earth and adaptations in animals to environments, which later helps the students understand why animals and plants live on some planets (example: Earth) and not on at least some other planets. The Global Mars curriculum narrates the "Goldilocks" story [6] to explain the habitable zone and factors that make a planet habitable. The concept
of habitability ties together with a subsequent field component where students examine soil samples to learn about relative particle sizes (sand, silt, clay) while filling a knowledge gap in the textbook by learning about gravel as the text book does not mention about gravel.

Passion based learning (passion project): Passionate teaching provides students inspiration to learn, model engagement with ideas, strategies and techniques to do so. This practice is known as passion based learning [4]. Passion based learning empowers students to conduct research and to create and communicate their deep interests while moving towards a student-centered and controlled approach [4]. The Global Mars curriculum consists of a passion project. During PP1 the Global Mars team asked students to conduct research about local Sri Lankan scientists who interest them and about whom they are passionate to learn. This led them to their "Passion Project" where students were encouraged to create a scientist biography and present it to the class as an autobiography (student as the scientist). This is accompanied with activities and delivered with costumes.

There is also a science communication component to the passion project, where students pretending to be scientists meet at a conference and get to know each other. The students are given a hand-out with questions to help them interview and write about the scientist they had just met. Learning about other people’s research could benefit the student in return to improve their own research skills.

Method: A planetary science-passion based curriculum was created for the Global Mars PP1 and a statistically valid survey was conducted to find out if the project achieved its goals. The survey included a background questionnaire to understand the academic and personal background of the students, a content survey, an activity/project analysis, and a program evaluation was conducted during the program. The program evaluation survey was conducted in both Sinhala and English languages to help ascertain whether language was a problem for students in understanding and learning about the program and to check if the mentors communicated effectively during the program. A team report was written by the mentors at the end of each day during the program, to help delineate which teaching tactics worked best, what the challenges were, and so on. A follow up survey, 4 months after the program was conducted to find out how the program affected the students’ academic progress, where 100% students agreed the program better prepared them for the final school exam and what was taught during the program showed up in the exam.

Summary: Assessment of the efficacy of PP1 is ongoing. Preliminary assessment includes identifying what parts of the curriculum worked well and what parts required improvements. Data collected during program surveys is being analyzed.

Future: PP1 focused on identifying a student’s research and learning passion. This initial study was conducted in only one school district (Matara), but it is anticipated that future studies include both a revisit to Matara district and multiple visits to a government school in Colombo. The goals of future projects are to: improve the curriculum, help students identify problems in their own community; use their passion to solve those problems; and get a statistically valid study group starting spring 2018. Ultimately, the goal is to integrate Global Mars lessons into standard curricula in Sri Lanka.

References:

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