

Incentivizing Fifth-Grade Students to Pursue Science Education: A Study on Encouraging Enrollment in STEM-Specialized High Schools

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ABSTRACT

“STEM-Up” is a pioneering endeavor led by Grade 12 students from Philippine Science High School - Caraga Region Campus, designed to address the challenge of low enrollment rates from Buhangin Elementary School into the Philippine Science High School (PSHS). Grounded in the imperative to cultivate future scholars from Brgy. Buhangin, Butuan City, this project aims to introduce innovative strategies to augment enrollment figures and foster academic excellence. Drawing inspiration from pertinent literature on educational outreach and student motivation, STEM-Up is structured to empower fifth-grade students by providing tailored lessons geared towards excelling in the National Competitive Examination (NCE). The project also emphasizes the importance of mentorship and guidance in nurturing young talents towards realizing their potential to contribute meaningfully to national development.

The methodology employed in STEM-Up encompasses a multifaceted approach, beginning with comprehensive engagement with stakeholders, including local authorities, school administrators, and target student cohorts. Initial phases involved the formulation of informed consent procedures, the selection of participants, and the dissemination of project details to the concerned parties. Leveraging insights from educational psychology and pedagogy, the curriculum design prioritized topics aligned with NCE requirements and tailored instructional methodologies to suit the learning needs of the target demographic. Implementation strategies included regular classroom sessions supplemented by interactive workshops and mentoring sessions aimed at instilling confidence and motivation among participants. Continuous assessment and feedback mechanisms were integrated to gauge student progress and adapt instructional strategies accordingly.

Keywords: Incentivizing, Fifth-Grade Students, Science Education, STEM Education

INTRODUCTION

Buhangin Poblacion, also known as Barangay 19, is a vital community within Butuan City, surrounded by several other barangays such as Baan Riverside Poblacion, Golden Ribbon Poblacion, and Agao Poblacion. With a population of 5005 people as of 2020, Brgy. Buhangin is characterized by its predominantly agricultural economy, with farming and sari-sari stores being the primary sources of livelihood. Despite its proximity to Butuan's city center, many residents face challenges in accessing employment opportunities outside the barangay, often resulting in a struggle to make ends meet. Education emerges as a potential catalyst for improving the quality of life in Brgy. Buhangin, aligning

with the notion that education is instrumental in nation-building and personal advancement (Al-Shuaibi, 2014). Notably, the government's emphasis on STEM education, exemplified by initiatives like the Philippine Science High School (PSHS), offers a promising avenue for addressing developmental gaps in the community. However, observations reveal a significant gap between the potential benefits of STEM education and the current enrollment rates from Buhangin Primary School into PSHS-CRC. A simple interview conducted by the proponents of this study uncovered a startling fact: none of the current PSHS-CRC students hail from Brgy. Buhangin. This underscores the need to bridge educational disparities and provide equal access to high-quality secondary education for underrepresented communities. Addressing this issue could pave the way for future leaders and experts in science and technology to emerge from Brgy. Buhangin, contributing to both local and national development agendas.

The literature reviewed provides valuable insights into the objectives of enhancing education and increasing access to STEM programs in underserved communities like Brgy. Buhangin. Al-Shuaibi (2014) emphasizes the critical role of education in driving socio-economic development and national progress, highlighting its potential of STEM education in preparing students for future workforce demands and fostering innovation and economic growth, aligning with the goals of national development. UNESCO (2017) identifies challenges faced by marginalized communities in accessing high-quality education, emphasizing the need for targeted interventions to address disparities and promote inclusive development. Wang and Degol (2017) explore barriers to STEM enrollment and participation, including lack of awareness and socio-economic factors, while Hossain and Robinson (2012) examine the impact of STEM education initiatives on student outcomes, highlighting potential benefits for academic achievement and socio-economic mobility. Integrating these insights can inform the development of interventions to improve educational opportunities and foster inclusive development in communities like Brgy. Buhangin.

Objectives

There are over 1.8 billion people who are expected to be aged 10-24 today, and more than 1.6 billion live in developing countries (United Nations Populations Fund, n.d.). In the Philippines, there are nearly 30 million youth aged 20–24, which makes up about 28 percent of the total population of the country (Young People, 2019). Unfortunately, many of these young people lack a strong basic education.

Out-of-school children and youth (OSCY) are aged 12–15, the average age of a high school student, accounting for 7.7 percent of the 3.8 million OSCY in the country. This is alarming since a lack of education contributes to unemployment or unemployability. Being undereducated or out of school places young people at risk of violence, crime, teenage pregnancy, and sexually transmitted diseases. Moreover, low educational achievement affects not only young people but also their families, since it limits their abilities to achieve higher economic status.

As a developing country, the Philippines does not have enough resources to send all of its children to school. Youth literacy programs are a method for meeting the country's basic education needs. It provides the youth with a first or second opportunity to learn.

The existence of a literacy project like STEM-Up could aid in the promotion of student diversity and give students from underrepresented communities the opportunity to study at the Philippine Science High School (PSHS). By placing an emphasis on increasing the scope of people availing themselves of the privileges and life-changing experiences of being a PSHS scholar, STEM-Up's approach would help future audiences grasp methods to contribute to nation-building and understand the value of the youth.

in achieving the said aim. For this school year, STEM-UP aims to tutor select fifth-grade students so that they may meet the admissions requirement of PSHS, which is the Philippine Science High School-National Comprehensive Examination (PSHS-NCE).

STEM-Up believes in the intellectual capacity of every individual. Economic, social, and other factors may contribute to the challenge of achieving a standard education. By focusing on the student's abilities and helping them improve their skills, we focus on their core values, principles, and potential. Thus, as Pisay scholars, we should give ourselves the opportunity to learn not only for ourselves but also for the people around us, especially those who have so much more to give.

In fact, it was not the researchers who taught them, for the researcher are the ones who learned so much from them.

METHODOLOGY

During the pre-test phase of the literacy project, several key activities took place. These included:

1. Drafted the consent form and selecting the top ten fifth-grade participants.
2. Submitted the project information and proposal to the Office of the City Division (OCD) for approval.
3. Established contact with the target community to inform them about the project.
4. Distributed the informed consent form to the selected top ten fifth-graders and obtaining their consent.
5. Developed the pre-test and post-test assessments to measure students' knowledge and progress.
6. Administered the pre-test to the chosen participants and collecting primary data on their baseline literacy skills.
7. Reviewed and verified the collected data to ensure accuracy and reliability.

DISCUSSION OF RESULTS AND FINDINGS

In a series of lectures, the group was able to share what they knew about abstract reasoning, mathematical skills, scientific skills, and verbal skills. When the group used or changed their methods of teaching, they saw a big difference in how well they understood the different topics.

The researchers quickly put into practice the recommendations made to us by the students' advisers. First off, we noticed that the fifth-grade students were able to understand the topics better if they were given assessments after the lecture. For example, when asked who wants to answer the problem on the board, the students voluntarily agree to answer. This is also a good activity for both groups because the backup group can see which students had trouble with the lesson. If the majority of the students had a hard time with the lesson, we would conduct supplementary lessons to reinforce the idea. Another piece of advice was to take breaks by playing games or singing. This was incredibly helpful since the students were able to relax and have fun before the session began.

STEM-Up gave a pre-test and a post-test to find out if the lecture sessions were actually helpful. It was statistically analyzed. The results of this analysis will follow suit.

Paired Samples T-Test

Test of Normality (Shapiro-Wilk)

			W	p
English Post	-	English Pre	0.953	0.638
Math Pre	-	Math Post	0.926	0.302
Abstract Post	-	Abstract Pre	0.935	0.396
Science Post	-	Science Pre	0.932	0.361

Note. A low p-value suggests a violation of the assumption of normality

Interpretation: For Shapiro-Wilk Tests, the computed significance levels were greater than .05. Therefore, normality can be assumed.

Paired Samples T-Test

			statistic	df	p
English Post	English Pre	Student's t	6.73	12.0	<.001
Math Pre	Math Post	Student's t	-2.16	12.0	0.051
Abstract Post	Abstract Pre	Student's t	7.78	12.0	<.001
Science Post	Science Pre	Student's t	6.47	12.0	<.001

Interpretation:

For English, the p-value is lesser than .001 so there is a significant difference between the pre-test and post-test.

For Abstract Reasoning, the p-value is lesser than .001 so there is a significant difference between the pre-test and post-test.

For Science, the p-value is lesser than .001 so there is a significant difference between the pre-test and post-test. Based on the analysis, the p-value for Mathematics is $0.051 > 0.001$. Thus, it cannot be concluded that there is a significant difference between the pre-test and post-test.

Overall

Paired Samples T-Test

Test of Normality (Shapiro-Wilk)

	W	p
Post Test% - PreTest%	0.973	0.931

Note. A low p-value suggests a violation of the assumption of normality

Paired Samples T-Test

	statistic	df	p
Post Test% - PreTest%	9.94	12.0	<.001

For Shapiro-Wilk Tests, the computed significance level is 0.931>.05. Therefore, normality can be assumed

For the overall scores since the p-value is less than <0.001, there is a significant difference between the pre-test and post-test.

The researchers saw that only the math portion of the exam did not have a significant difference. Although, improvement was seen. The researchers could consider a different approach to the teaching method. There were other factors in place during the exam that may have affected their results since, in the analysis, their overall exam results did improve. Thus, the researchers are forever grateful to the students who gave their time and absorbed the information given to them and to the school staff who allowed this project to take place.

Admittedly, the researchers did encounter some problems during project implementation, which could be summarized into the following: school climate/environment and background knowledge. Brgy. Buhangin was very prone to flooding, and they had to do activities after the flood, such as clearing up the area and/or letting students stay at home for their safety. There were times the group had to cancel their visit due to the aftereffects of the flood. There were also instances where houses nearby would have conversations or the students of the school would be engaged in fights that were rather distracting. Studies have shown that school climate has a considerable impact on students' ability to perform (Karada, 2017). Thus, it is important to not only consider academic intellect but school climate and environment as well. While researchers are unable to change their environment, they tried to make do with the situation. The researchers were in one of the quieter rooms with a limited number of students, so the researchers could immediately communicate with them. If there were other students making a scene, the researchers immediately contacted the advisers and made the students stay in the room in case the situation escalated. These aren't foolproof plans, but making use of the time, the researchers hope to make their situation a little bit better.

As mentioned, another thing that should be noted is that there are gaps between students' background

knowledge and topics that are included in the NCE. Some students have trouble with basic math, spelling, and science. This seems to be because they didn't learn as much during the pandemic (Barrot et al., 2021). Going back to the fundamentals solved this. We asked for help from the advisers on how to teach them in a way that the students could easily digest the information being given. The researchers also ensured that we were being understood by patiently explaining or giving examples to avoid confusion.

Through this project, STEM-Up recognizes the importance of education, especially in a student's foundation years, and it was very important for us to ensure they had a chance to build upon their foundation years and enhance their talents to hopefully enter PSHS.

SUSTAINABILITY

The project aims to give the fifth-grade students of Brgy. Buhangin Elementary School has the chance to enter one of the country's finest secondary schools. This would also serve as a reference project for other schools or researchers who aim to increase the number of students passing PSHS.

This would help spread awareness about the different challenges that the students face and shed light on their difficulties. More than increasing the number of passers, this gives a future to the fifth-grade students to hone their skills in science, technology, engineering, and mathematics since we are in the age of technology. Overall, the project to put fifth-grade students in PSHS is important both to give them a quality education and to provide an amazing future from which students from other walks of life can learn.

Since it is a literacy project, the information and academic resources that the group gathered were put in a Google Drive. This way, more people will be able to access the teaching materials that the group has gathered. Basically, the researchers wanted to make sure that the information we taught the students was easy for them to find and use so that they wouldn't forget and might even teach their other classmates. To do this, the researchers did the following:

1. gave printed copies to the select fifth-grade students at Brgy. Buhangin Elementary School.
2. gave printed copies to Brgy. Buhangin Elementary School.
3. gave printed copies to the local government office, BrgyBuhangin.in.
4. sent digital copies to Brgy. Buhangin Elementary School.
5. sent digital copies to the local government office, BrgyBuhangin.in.

To further the project, preparing a more extensive lesson plan, creating a more flexible time schedule, having other tutors or lecturers, and looking into the different factors that may affect the performance of the students will be extremely beneficial to the long-term goal of the project. Another alternative would be to record video lectures and collect more review material that can be uploaded to the internet so that not only the students of Brgy. Buhangin may access the information but others in the nation as well.

Participants in the STEM-Up program expressed profound transformations in their academic journey and personal growth. One student marveled at their newfound confidence in understanding mathematics, attributing it to the patient guidance and clear explanations provided by tutors. Another student highlighted the program's ability to infuse joy into learning, describing engaging activities that fostered

both academic and personal development. For a third participant, STEM-Up served as a catalyst for career aspirations, igniting a determination to pursue a future in science. These testimonials underscore the program's impact in not only enhancing academic performance but also instilling ambition and broadening horizons for students from underserved communities.

To mitigate environmental and external factors that could disrupt learning, a multifaceted approach is necessary. Firstly, thorough assessments of the learning environment should be conducted to identify potential disruptions such as noise pollution or inadequate lighting. Addressing these issues may involve simple adjustments such as rearranging furniture or installing noise-canceling materials. Additionally, infrastructure improvements should be made to create a conducive learning environment, including renovating classrooms, installing soundproofing materials, and improving accessibility. Technology integration can also provide alternative learning arrangements, such as multimedia tools for interactive learning and access to online resources. Emergency preparedness plans should be developed to address unforeseen disruptions like natural disasters or public health emergencies, including regular drills and communication protocols. Engaging with the community can further support the learning environment through partnerships with local stakeholders and organizations. Professional development for educators is essential to effectively manage disruptions and adapt teaching strategies. Finally, fostering flexibility and adaptability within the educational institution is crucial for responding to changing circumstances and ensuring a resilient learning environment for all students.

SUMMARY/ CONCLUSION

During the project's planning, implementation, wrap-up, and evaluation, the group worked hard to come up with different ways to make sure that both STEM-Up and Brgy. Buhangin Elementary School would benefit. The project is unique in that the target area doesn't yet have any PSHS passers and hasn't had the PSHS-CRC visit them for the RACE or NCE campaign. Because of this, we had to give ourselves a lot of room to change our daily schedule, general time frame, lecture methods, and point person.

Other groups working on projects in Brgy. Buhangin focused on activities that helped the environment, but STEM-Up put a lot of effort into education since elementary students need a good secondary education. In fact, the researchers are very thankful that the project was able to take place in this community. The local government officials, led by Hon. Reynaldo C. Lopez Jr. and Mr. Curada, Kagawad for Education, were very helpful and made it easy for the school to approve our project. We met the school principal and the advisers for the fifth grade, Teachers Noeme Lugo and Susan. Though talking to adults and people of authority was incredibly difficult, the group were able to develop our communication skills and understand the different concepts of the community, which made us appreciate the overall process of our project.

During the project, the researcher saw some of the problems that the students face every day, such as the fact that their school is often flooded and they don't know a lot of general information. One thing the researchers wanted to ensure that they were helping further their education. All of the interactions, all the things they had to go through just to get to the school, all the stories these young minds gave us, and all of these God-given lessons, although not included in the objectives, that we will bring with us even after the project. More than their intellect, the students share a desire to grow academically, discover their talents, and improve their families.

In meeting the fifth-grade students, the researchers were reminded of ourselves. The innocence and hopeful minds, hopeful that with each passing second, that might bring change to the world. For them, education was a way to achieve their goals. For the researchers, this was a gentle reminder that as scholars of Pisay, there was a greater role to fulfill in this nation—to serve always.

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