

A Concept Note

On Project

BUILD A SCIENCE CLUB IN YOUR SCHOOL

**A Program to promote and encourage
study of Science in Rural Bengal**

**A Pilot Project to be initiated with
5 Schools of Ramakrishna Mission**

“BUILD A SCIENCE CLUB IN YOUR SCHOOL”

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SUMMARY

GRABUU (Gram Bangla Unnayan Udyog), a nonprofit foundation registered in the United States, has developed an extracurricular hands-on Science learning program called “BUILD A SCIENCE CLUB IN YOUR SCHOOL” for school students of grade VI to IX in West Bengal. It plans to build Science Clubs in selected school campus in West Bengal, (there are more than 14,000 secondary and higher secondary schools in the State.) particularly in the suburban, small towns and rural areas in collaboration with two other organizations: Science Club Coordinators and the School Authorities who want to get the Science Clubs installed in their campus. It is

a huge undertaking. The task and the activities that each of the parties need to perform, are stated in details in this article. A memorandum of understanding (MOU), a nonbinding agreement between the three parties outlining the terms and details of the understanding, including each parties' duties and responsibilities, has been prepared. All three parties are required to sign the MOU.

The objective of the program is to motivate, inspire and excite the students to do science projects. While working on such projects over the school years the students will have the opportunity to construct for themselves a mental framework focused on analytical and creative thinking, problem solving and project management skill. The article also emphasizes that the school students of this generation need to acquire such skill set because the 21st employers demand that each of their employees to be STEM (Science, Technology, Engineering and Mathematics) – educated problem solver trained to think analytically and creatively.

The article describes how a Science Club would be equipped with Science project kits where the students would be engaged in hand-on project activities under the guidance of the Science teachers of the school. The students will also participate in intra-school and inter-school Science quiz competitions, annual Science Fair competitions and other Science-study related activities.

GRABUU will fund all major tasks and activities of the program.

GRABUU recognizes the major challenges ahead: how to reach the School Authorities willing to join the program, how to find the Science Club Coordinators in the different parts of the country; how to have access to the large amount of human and financial resources needed to implement this massive program. GRABUU is in the process of developing a number of plans and strategies to address these issues.

The article ends with the optimistic note: “If we (GRABUU), three of us work together hand in hand, we believe, we will be able to start a new state-wide movement for science education in secondary schools in west Bengal and actualize our objectives to train a new generation of students to acquire science-based skills to explore the 21st century employment opportunities where employers want each of their employees to be smart professional, creative thinkers and problem solvers.”

INTRODUCTION

The California Science Teachers Association, an educational foundation in the US, says: "SCIENCE PROJECTS PREPARE STUDENTS FOR LIFE".

When the students get engaged in Science projects based on STEM subjects and participate in hands-on science project activities during the school years, working in an exciting environment with the classmates inspired by a spirit of competition and entrepreneurship, consulting with the science teachers, mentors and listening to the critical appreciation of the judges about their projects and presenting those to the Science Fair visitors, the students gain highly valuable experience in analytical and creative thinking, problem solving, time management, responsibility, organization, team work, collaboration, communication and project management.

This skill set is a powerful tool. Its impact on a student's life is profound and goes a long way in shaping his/her career and it lasts for life. These skills are critical for success not only in Science and technology, but also in other businesses and industries like, the financial services, healthcare, transportation, public service, etc.

Science and technology in the 21st century are transforming people's life and work in an unprecedented way. The employers now want each of their employees to be STEM-educated problem solvers. A business consulting company writes: *"Businesses expect employees at all levels to identify problems, think through solutions and alternatives, and explore new options if their approaches do not pan out"*.

The secondary and higher secondary schools in both developed and developing countries in the world including India are incorporating STEM syllabus in their curriculum. The vision of the India Stem Foundation is: "To create a world where the young people are encouraged to celebrate fun and excitement of science and technology and inspire them to take science and technology-based career path to become tomorrow's much needed technology leaders."

Our aim, therefore, is to prepare new generation of students who would develop into smart and committed professionals, innovators, managers, business owners and educationists, science and technology leaders.

To do science projects is a fun. When asked about the impact of science projects on his studies and his life a California school student writes, *“Science projects are invaluable experiences --- It’s like being a detective and it is fun because the entire project is yours – not some homework assignment ---- There is nothing predictable about it and it is a completely new experience from sitting and learning in a classroom ---”*

Keeping the above thoughts in mind we, **GRABUU** (Gram Bangla Unnayan Udyog), a nonprofit foundation registered in the United States, has developed an extracurricular hands-on Science learning program called “BUILD A SCIENCE CLUB IN YOUR SCHOOL” (referred later as “Club”) for school students of grade VI to IX in West Bengal. We have planned to build Science Clubs in selected schools in West Bengal, particularly in the suburban, small towns and rural areas in collaboration with two other organizations: Science Club Coordinators and the School Authorities who want to get the science Club installed in their campus. It will be a collaborative enterprise.

MISSION:

GRABUU wants to start a State-wide movement for the study of Science in secondary schools in West Bengal to prepare students for the 21st century job market.

OBJECTIVES:

The principle objective of the program is to motivate, inspire and excite the students to do science projects. By doing projects with their own hands over the school years the students will have the opportunity to construct for themselves a mental framework focused on analytical and creative thinking, problem solving and project management.

GOALS

GRABUU’s goal is to install Science Clubs in at least 100 schools in 3 years in the State of West Bengal.

ORGANIZATION

In order to achieve the above goals and objectives the following three organizations must come together and work hand in hand. It would be a collaborative effort:

1. **GRABUU** – developer and the sponsor of the program, “BUILD A SCIENCE CLUB IN YOUR SCHOOL”.
2. **School Authority** – Individual School authority that wants to get the Science Club installed in their campus
3. **Science Club Coordinators**(SCC) Groups of voluntary science teachers, educators and retired scientists who are currently engaged in a group or individually in the Science Fairs, Science projects and science education for school children that are sponsored by State or Central government. .

GRABUU's first order of business would be to reach the individual School Authority and explain to them the enormous benefits their students would get out of the extracurricular activity-based Science study program called, “Build A SCIENCE CLUB IN YOUR SCHOOL”, sponsored by GRABUU. They will have the opportunity to motivate and train a new generation of students to acquire a set of skills that would be required to explore the job opportunities in the 21st century's job market. GRABUU would urge the School Authority to participate in this program and would make the offer to build the Science Club Lab equipped with science kits for students of class VI to IX at the school campus, free of charge. Also, the schools will be provided with highly valuable resources in the form of expert services of the Science Club Coordinators who would be actively engaged in and facilitating and coordinating the running of the program at the school and help the School Authority in all matters pertaining to the Science Club activities.

GRABUU will fund all major tasks and activities of the program.

GRABUU's next step would be to search and find competent and enthusiastic volunteer Science Club Coordinators who would be willing to join this program and train a new generation of students to acquire a set of

skills that would be required to explore the job opportunities in the 21st century's job market.

Each Science Club Coordinator would receive an honorarium from GRABUU for their service.

In order to finalize the 3-party working relationship GRABUU will prepare a memorandum of understanding (MOU), a nonbinding agreement between our three parties outlining the terms and details of the understanding, including each parties' requirements and responsibilities. This will express the convergence of the will indicating an intended common line of action. All three parties will sign the agreement

ABOUT SCIENCE CLUB

A Science Club is a concept that forms the core of our endeavor and is defined by a number of features as stated follow:

- It will have a room or a space, may be a class room or a part of the existing science lab of the school where the students would do experiments, tinker with new ideas, build models and prototypes under the guidance of the science teachers. This space would be provided by the individual School Authority in their school campus which would be called Science Club Lab.
- This space would be furnished with work benches, cabinets, hand tools and accessory, as needed.
- The Science project kits for students of class VI to IX would be stored in the Club room. These kits are designed to make models to explain scientific theories. We looked at some of them available in the market and found them to be very innovative, exciting and educative. The students, by putting the parts and pieces together will build physical models of the concept, theories and hypotheses they have studied in the class room. They would also be tasked to build models with the parts of the kits without any help from the teacher, may be only a hint

or a clue. We believe this will excite the students, ignite their curiosity, pose new questions, challenge their imagination and thinking. They will be required to think analytically and creatively to solve the problem on hand. This is where the active learning of Science starts. At this point, learning Science by cramming is thrown out the window. This will help the students build a strong foundation of the fundamental scientific concepts and understanding of the application of the concepts. We have come to know a few non-profit organizations in Kolkata that promote the study of science and technology, make and market such kits. They also provide the necessary training to the science teachers of the recipient schools. The kits suppliers have an important part to play here. The introduction of the kits and the acceptance by the science teachers and the students should be seamless. GRABUU in consultation with the Science Club Coordinators and Science teachers of the schools would select high quality kits.

- We recommend that four Science Quiz competitions be held in a year. Two of them would be organized by the Science Club Coordinators and two, by the students themselves. The students would divide themselves into several groups and develop their own quiz questions studying books on Science Quiz available in the school library, Internet or other sources and challenge each other. Initially the quiz competitions can start within each school and later it can be organized as an inter school competition.
- We recommend that the schools be registered with Science Olympiad Foundation (SOF) that conducts yearly competitive test for school students called National Science Olympiad (NSO). The objective of the NSO is to build an aptitude for Science in young learners and encourage building a strong foundation of the fundamental scientific concepts and understanding of the application of the concepts. The NSO tests many skills of the learners, such as, "observing, identifying, comparing, classifying, inferring, predicting, quantitative reasoning, problem solving, analytical thinking, listening, speaking, reading,

writing and more.”We in the Science Club also are motivating and guiding the students to acquire the same set of skill. However, the Science Olympiad tests are more difficult.They say it requires “Higher Order Thinking Skill”. The students must pick up this challenge when the science teachers think they are ready. The School library should have a good selection of the books that are designed to prepare the students to participate in quiz competitions as well as NSO.

- The game of chess promotes critical thinking and strategic planning that are very much needed in the science project work. We would strongly recommend that School Authority organize and motivate the students to play the game of chess that can be turned into intra-school and later as inter-school chess competition.
- Many innovative and educative Science Posters are available in the Science book publishing market as well as on the Internet. We would ask the school authorities to display such posters, may be 8 to 10 in number in the school campus.They may be replaced with new posters every year.
- Google in their worldwide online science competition (www.google-science-fair.com) has proposed the following 6-step problem solving process. Google treat each Science project as a problem-solving opportunity:
 1. Find a problem worth solving
 2. Think up ideas & select the best one
 3. Explore your ideas & develop a solution
 4. Experiment & test out your solution
 5. Collect and communicate your results
 6. Wrap up your findings & draw a conclusion

We suggest that several posters should be made showing the six steps of problem solving and posted in the Science Club lab and other class rooms, specially where science subjects are taught.

- We recommend that the school authorities with the help of the Science Club Coordinators arrange at least two popular science lectures / seminars by the scientists and scholars from the local university, if any or national laboratories in which school teachers, students, parents and local dignitaries who are interested in science, may participate. The subject chosen may be of current interest like environmental protection, Information Technology, Space exploration, etc.
- With the help of the Science Club Coordinator school authorities may consider one or two one-day educational trip per year to attend State / National Science Fair, planetarium, National Laboratory, etc.
- The students of each class must make one special model that will be exhibited in the annual School Science Fair that the School Authority would organize in their campus. Students should be encouraged to participate in the inter-school Science Fair competitions at the State and National levels.
- GRABUU believes that community involvement in this program is important. We recommend that the school authorities organize two “Science Club Socials” per year – the first one, early in the year on the day of announcement of the date of the annual Science Fair of the school and this is also the start date of the Science Fair project activities. A short description of each of these projects and the names of the participating students may also be announced; that way student’s participation in the Science Fair would be recognized in the community gathering. The second “Science Club Social” would be held towards the end of the year on the closing day of the Fair when the outstanding student exhibitors would be recognized and awards, prizes and certificates would be distributed. The parents of the students whose involvement and encouragement are highly critical for the success of the program, teachers, school board members, neighbors and the science club coordinators should all be invited. Local community leaders and businessmen have also an

important part to play in this endeavor. They may be asked to support and sponsor “Science Club Socials” and annual Science Fair. We expect that it would be a festive occasion where foods and drinks would be served.

Two of the four Quiz competition mentioned above may be included in the program of the two “Science Club Socials”.

ROLES AND RESPONSIBILITIES

The roles and responsibilities of the each of the three groups are discussed below:

1. GRABUU :

GRABUU is the developer and sponsor of this program called “BUILD A SCIENCE CLUB IN YOUR SCHOOL”. It is a massive undertaking. There are more than 14,000 secondary and higher secondary schools in West Bengal. Our goal is to install Science Clubs in 100 schools in the first 3 years. It requires a huge amount of human and capital resources. The main challenges are how to search and find the School Authorities in the suburban, small town and rural areas of the State who are willing to get a Science Club installed in their campus. Similarly, how to find sufficient number of Science Club Coordinators ready to take the responsibility of managing the implementation of the program coordinating various tasks and activities articulated in this article. GRABUU has the following action plan:

- ❖ GRABUU will design and develop an informative and attractive website stating its mission, goals and objectives of the program. The website would serve as a virtual spokesperson that would communicate to the outside world: the public in general and particularly the students, parents, teachers, school authority,

community leaders, educationists, universities, corporations, charitable foundations - domestic and international, State and Government agencies that are planning and executing a variety of educational program, etc. The website must articulate the enormous educational, social and economic benefits the program can bring to the State and appeal for the participation and support of all stakeholders in the form of donations and sponsorships.

- GRABUU would seek the support and sponsorship of the media like newspaper, TV network, etc.
 - Seek support of the Science teachers' associations of the State
 - Direct mail to the parents of the school-going children particularly in the areas not covered by Internet highlighting the benefit their children may get if they participate in Science Club activities.
 - Direct contact with various educational foundation – national and international for grants.
 - Developing an active fund-raising mechanism.
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- GRABUU would be responsible for funding all major tasks and activities of the program. It will start by installing a small number of Science Clubs, may be 20 to 30 in the first year. Three or more schools will be clustered in a small geographical area under the supervision of one Science Club Coordinator for reasons of better logistics and management. GRABUU in consultation with the SCC's will select the area and the schools where the Science Clubs would be installed. Presently, GRABUU is in negotiation with a small number of School Authorities and SCC's to start the program in about three months.
 - In order to evaluate the productivity and efficiency of the program GRABUU would seek the help of the SCC and the School Authorities to select a set of criteria to measure the performance of each school.

2.SCIENCE CLUB COORDINATORS :

The first and the most critical task of the Science Club Coordinators would be to help GRABUU to develop the MOU bringing all the three parties together.

In general, The Science Club Coordinators will provide their expert knowledge to facilitate, supervise and evaluate the Science Club activities and maintain liaison between GRABUU and the School Authorities. Specifically, here are some of the activities SCC would perform:

- Helping the School Authorities to prepare a budget to equip the Science Club lab with work benches, cabinets, hand tools and accessories needed for science projects work and submitting it to GRABUU for funding.
- SCC in consultation with GRABUU and the School Authorities, would get quotes from the Science Kits suppliers and select high quality Kits for students of class VI to IX.
- Organize four Science Quiz competitions per year.
- Help School authorities to register with Science Olympiad Foundation (SOF) and guide students prepare for the annual National Science Olympiad (NSO).
- Selecting suitable books for the school library for the students to prepare for the Science Quiz competition as well as for the annual NSO.
- Help School authorities organize two lectures / seminars by invited scientists.

- SCC will pay visit to each of the schools for a few hours per months to inspect the activities of the club and address the operational issues, if any and make sure the program is being run efficiently and productively.
- SCC would provide quarterly report for GRABUU.
- SCC's may sometimes find few gifted students with uncommon scientific curiosity and want to pursue a career in science. GRABUU would encourage SCC's to be a mentor of such students and counsel and help to realize his / her hopes and aspirations. GRABUU will provide the resources in such cases, if needed.

3.SCHOOL AUTHORITIES:

The School Authorities would sign the 3-Party MOU confirming that they agree to install the Science Club in their campus and perform the following tasks and activities:

- Provide a space (a room, may be a part of an existing lab, etc.) in the school campus to build the Science Club lab equipped with work benches, cabinets, hand tools and accessory.
- After the installation of the Science Club Lab and the receipt of the Science Kits, School Authorities need to develop an action plan to implement the program. The first thing they need to do is to prepare a schedule for Science Club activities. This may be a little difficult; however, they need to consider the following factors in doing so:

- Since it is an extracurricular activity, will the project work be done after the school hours or weekends? In that case, will the science teachers of the school be available?
 - Can the activity be carried on during the regular Science class hours that may be extended?
 - Can activity class and regular class in a week be held like, two days of regular class followed by two days of activity class. In that case building a Science Club Lab wouldn't be necessary.
- School Authorities will have the help and cooperation from SCC's regarding setting up of the Science Club and running the program at the school campus. School Authorities may seek their advice on all matters related to Science Club, particularly on the following:
- Equipping the Science Club Lab
 - Selecting Science Project Kits
 - Selecting suitable books for school library for Science Quiz competition as well as for National Science Olympiad (NSO).
 - Getting the school registered with the National Science Foundation (NSF) so that the students of the school can participate in the annual NSO.
 - Organizing four Quiz competitions in a year
 - Organizing two "Science Club Socials" in a year
 - Selecting posters for the school campus
 - Annual Science Fair of the school
 - Organizing Science seminars.
- School Authorities may encourage the students to participate in such extracurricular activities as, playing the game of chess, reading books on the life and work of famous scientists and inventors, watching science programs on the TV, etc.

FUNDING BY GRABUU

GRABUU would be responsible for the funding of the following three major items for each school:

One: Buying the necessary work benches, cabinets, tools and accessory to equip the Science Club in the school campus.

Two: Buying Science Project Kits for all classes from VI to IX.

Three: Honorarium: Honorarium for the services each Science Club Coordinator would render to facilitate the starting of the program and keep it running, monitoring and evaluating it on a timely basis with the quarterly report to GRABUU.

GRABUU would also be willing to share the cost of doing the following tasks and activities with the School Authorities:

- Buying books on Science quiz for the school library
- Buying the posters to be displayed in the School campus
- Fees for registering with the Science Olympiad Foundation (SOF)
- Organizing the annual Science Fair in the school campus
- Organizing two annual “Science Club Socials”

School Authorities may consider raising funds / seeking sponsorship from the following stakeholders of the community, such as, parents, School Alumni Association, local businessmen, etc.

CONCLUSIONS

In this article we have set up a plan to organize and run the program, “BUILD A SCIENCE CLUB IN YOUR SCHOOL” listing many task and activities by the three parties involved. It may not be possible for all of us to implement all of them all the time; these exceptions are to be discussed and negotiated. However, we need to set up the minimum

number of tasks and activities we must perform to start the program. These are:

- ❖ A space or a room equipped with work benches, hand tools and accessory where the students can carry on their science project activities.
- ❖ Science project kits appropriate for each of the four classes, VI to IX.
- ❖ Availability of the science teachers of the school to guide the students.
- ❖ Organizing four Science Quiz competitions in a year.
- ❖ Organizing annual Science Fair on the school campus.
- ❖ Organizing two annual “Science Club Socials”

In closing we would say it is an enormous task to reach hundreds of schools in West Bengal; there are many challenges in front of us. It requires commitment, dedication and hard work to address these issues. We believe if we, three of us work together hand in hand we will be able to start a new state-wide movement for science education in secondary schools in west Bengal and actualize our objectives to train a new generation of students to acquire science-based skills to explore the 21st century employment opportunities where employers want each of their employees to be smart professionals, creative thinkers and problem solvers.

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