

## PROJECT PROPOSAL 2021 DOST-GIA FUNDING

### I. PROJECT PROFILE

<b>(1) Project Title: Scaling-Up Science Education and Research in Public High Schools in Occidental Mindoro through Robotics</b>				
<b>(2) Project Leader/Sex:</b> Lynn G. Mendoza / Female <b>Agency:</b> Department of Education Occidental Mindoro Division Office <b>Address/Telephone/Fax/Email:</b> Brgy. Payompon, Mamburao, Occidental Mindoro / 0906-550-1840 / occidental.mindoro@deped.gov.ph				
<b>(3) Cooperating Agency/ies:</b> Department of Education Occidental Mindoro Division Office				
<b>(4) Site/s of Implementation:</b> Province-wide / MIMAROPA Region <b>Base Station:</b> Mamburao, Occidental Mindoro <b>Other Implementation Site (s):</b> N/A				
<b>(5) Project Duration:</b> Two (2) Years				
<b>(6) Total Project Cost:</b> (indicate Counterpart Funds; use Form A for the Line-Item Budget)				
Source of Fund / Site(s) of Implementation	PS	MOOE	EO	Total
A. DOST		222,700.00	580,500.00	803,200.00
B. DepEd Occ. Mindoro		130,000.00		130,000.00
<b>TOTAL</b>		<b>352,700.00</b>		<b>933,200.00</b>

### II. PROJECT SUMMARY

#### (7) Rationale

The current era is amid a significant transformation regarding the way products are produced thanks to the automation and digitization of manufacturing. From the first industrial revolution (mechanized production through steam engines) to the mass production and assembly lines using electricity in the second and computers and automation adopted in the third, the Industry 4.0 will further enhance our lives through technologies including smart connectivity, cloud computing, big data, machine learning and artificial intelligence. The society of Industry 4.0 is a world where intelligent robot arms will potentially be used in every aspect of our lives, including education, industry, business and daily life. Every revolution in industry will result in the revolution of education.

The Philippines ranks 50th among one hundred thirty one (131) economies in the Global Innovation Index 2020 (GII 2020). The Global Innovation Index ranks world economies according to their innovation capabilities. The report provides an annual ranking of the innovation capabilities and performance of different economies around the world. The global innovation index had been positively correlated with economic output. According to the GI 2020 report, the Philippines stood out in the areas of innovativeness of its business sector and the innovation outcomes produced by its investments, with the levels of outcomes that even surpassed some high-income economies. The country's innovation profile shows top 25 rankings for other indicators like market capitalization, research talent in business enterprises, and high-technology manufacturing. Compared to other economies in Southeast Asia, East Asia, and Oceania, the Philippines performed above average in the pillars of Business sophistication and Knowledge and technology. This overall performance earned the Philippines rank 11<sup>th</sup> among the 17 economies in the said region.

Occidental Mindoro's S&T ecosystem should ride this wave of educational technology. In the school setting, robots encourage problem-solving, creative thinking, and a healthy sense of competition that drives innovation from students.

But unfortunately, education seems to still lag behind and not nurture the kind of talents capable of solving the real and practical problems the industry is facing or will potentially deal with. The challenge in the future could not be the lack of employment, but the shortage of skilled talents that the new jobs will demand. It's time for education to keep up with the speed of technology development and take the responsibility to lay a solid foundation for tomorrow's workforce needed in Industry 4.0 and AI era.

So how can K-12 classrooms benefit from robotics? New pedagogies require new tools, and robots are turning out to be the engagement tool teachers have been looking for. Classrooms are dynamically impacted by the dual forces of technological evolution and student expectation. This is especially critical in K-12 environments as millennial age out of the school system and are replaced by Generation Z. Student engagement is changing, driven by digital natives looking to combine organic social interaction with science, technology, engineering and math discovery. Cracking the K-12 connection code requires a new approach, one that combines active-learning pedagogy with robotics in the classroom to deliver an interactive, immersive learning experience. Stand-and-deliver discourse won't do it for Gen Z students. Access to social technologies combined with an increasing recognition of the need for unstructured play and flexible learning environments has prompted pedagogical shifts that help students engage, rather than simply observe. In practice, robots help bridge pedagogy and technology, offering physical manifestations of key educational concepts. To do this, the STEM teachers need to be capacitated first.

Educators on all levels — teachers, principals, and superintendents — know the value of learning science, technology, engineering and math (STEM) and focusing on technology in education. Robotics takes education technology to a new level, creating the next evolution in teaching. That's because introducing robotics to schools means making STEM skills and knowledge hands-on and fun, to prepare students for the future in a way that feels more like creativity and less like homework. Robotics requires all of the subjects of STEM, so it's a well-rounded approach to educational technology and learning.

This project is an initiative to enhance the teaching-learning environment in STEM, particularly on the practical and experiential side of science, technology, and engineering.

The schools identified by DepEd has the following number of students under the STEM strand per school who will benefit from the project: San Jose National High School (385 students), Sablayan National Comprehensive High School (225 students), Occidental Mindoro National High School (329 students), Magsaysay National High School (193 students), Sta. Cruz National High School (195 students), Rizal National High School (131 students). Thus, the number of students who will benefit from the project totaled to one thousand four hundred and fifty-eight (1,458) students.

#### **(8) Project Description**

This project will be conducted in partnership with the Department of Education - Occidental Mindoro Division Office and will involve the provision of robotic kits to public junior and senior high schools. These educational robots will enable students, especially students from the STEM strand, to become familiar with and deepen their knowledge of robotics and programming, while at the same time learning other cognitive skills.

Students are active learners whose multimodal interactions learn by intentional and meaningful interactions with educational robots. These robots can foster affirmative emotional states and social relations that promote the creation of positive learning attitudes and environments which improves the quality and depth of a student learning experience.

The recipient schools identified by DepEd shall be provided with robot kits. These kits will allow students to learn robot related institutions, electronics and programming related knowledge, and may even be ready to compete in robot competitions. DepEd Occidental Mindoro Division Office identified the following public Senior High Schools offering STEM strand to be the beneficiaries of three (3) sets of robot kits:

- San Jose National High School
- Sablayan National Comprehensive High School
- Occidental Mindoro National High School
- Magsaysay National High School
- Sta. Cruz National High School
- Rizal National High School

Furthermore, DepEd will be encouraged to establish a robotics learning corner in each nominated schools. Schools may advocate a collaborative, authentic and goal-oriented learning environment with respect to the demand of Industrial Revolution 4.0.

### **OBJECTIVES** (General and Specific)

General Objective:

The project aims to scale-up science education and research in public high schools in Occidental Mindoro through robotics.

Specific Objectives:

- To capacitate educators to teach robotics and basic programming
- To provide each recipient schools with learning kits and instructional materials
- To stimulate and entice the students to pursue STEM related courses
- To help address the shortage of skilled talents needed in Industry 4.0 and AI era

### **METHODOLOGY**

Provision of robotic kits is needed to enable students, especially students from the STEM strand, to become familiar with and deepen their knowledge of robotics and programming, while at the same time learning other cognitive skills.

Science, Technology, Engineering, and Mathematics (STEM) are intertwining disciplines when applied in the real world. The difference of the STEM curriculum with the other strands and tracks is the focus on advanced concepts and topics. Under the track, a graduate can become a pilot, an architect, an astrophysicist, a biologist, a chemist, an engineer, a dentist, a nutritionist, a nurse, a doctor, and a lot more. This is basis of the selection of STEM students to be the beneficiaries of the project. The robot kits will greatly help them in their studies because educational robotics provides students with a learning environment that has the potential to successfully integrate concepts within science, technology, engineering, and mathematics (STEM) into K12 learning environments in class, after school, or for robotics competitions. The students are anticipated to use science and technology innovations to address problems being encountered by people in the countryside.

As soon as the project is approved and funds are released, DOST-MIMAROPA, through the PSTC-Occidental Mindoro, in coordination with the proponent/beneficiaries, would facilitate the procurement of the equipment. The robotic kits will be awarded to DepEd Occidental Mindoro Division Office. The kits will then be deployed to the schools identified by DepEd. They will also designate focal person in each school who will be responsible for the robotic kits. Technical training and support regarding the operation of the device will be provided by DOST to DepEd Occidental Mindoro Division Office and to all the

recipient schools. Each school will identify six (6) of their STEM teachers to undergo training(s) on robotics. The teachers will be provided with orientation and training with knowledge and skill in robotics hardware and software. Adaptation to the K-12 curriculum is recommended to be implemented. The “in-class testing” must be replicated to more schools in different school conditions in the province. Aside from cognitive learning, affective and skills learning will also be incorporated.

A staff from PTSC will oversee the implementation of the project, monitoring and evaluation as well as provide technical assistance for the project’s improvement. There will be two (2) trainings before the actual classroom deployment of the equipment. The impact of the project would be assessed based on its objectives and would be reported after the second year to the respective agencies.

A post-project assessment will also be conducted by Project Monitoring Team (PMT) for students and teachers as participants to reflect the number of students that go into Industry 4.0-related profession/careers/employment. This will be done in the last phase of the project.

The PSTC, through the hired staff, will orchestrate all efforts towards the attainment of the stated objectives.

### **EXPECTED OUTCOMES**

The project is expected to have the following outcomes:

- Two (2) trainings for STEM teachers
- Six (6) schools provided with three (3) sets of robotic kits
- Six (6) entries in the Provincial Science Investigatory Project (SIP) competition, each school with at least one (1) entry.
- Six (6) schools with robotics learning corner

### **PERCEIVED IMPACT**

The socio-economic impact of the project cannot be measured immediately since the effect will be very much on a long term basis. The impact will be on graduates with solid background and skill in the emerging technologies necessary for tomorrow's workforce needed in Industry 4.0 and AI era.

Teaching robotics at the secondary school level, according to Fabiyi, Abdulmalik, and Tiamiu (2016), is capable of: creating job opportunities, increasing interest in engineering and computer science among prospective university candidates, enhancing students’ academic performance, and proffering solution to the problem of digital divide. Education is the foundation of any national development and the best legacy any government could bestow upon the people. If any society is going to experience any meaningful socio-economic growth and national development, the people thereof must be educated in order to acquire necessary technical capacities.

### **SUSTAINABILITY PLAN**

The following strategies will be adopted to sustain the operation and growth of the program:

- a. Engagement of the private sector, like the organization Pinoy Robot Games, especially those with CSR activities related to education. They can be requested to provide additional robotic kits and/or trainings to prepare students for local and international competitions.
- b. Ensure that the online teaching-learning network for STEM will be supported.
- c. Continuous channel of communication between all parties to address issues and concerns related to upgrading of teaching of robotics and programming.

**(9) Workplan** (See Form B)**(10) Project Management**

The project would be implemented by DepEd Occidental Mindoro Division Office with supervision of DOST-MIMAROPA through DOST PSTC Occidental Mindoro. The PSTC would coordinate with the regional office on the purchase of equipment and support other aspects of project implementation. A project staff from each agency will compose the Project Monitoring Team (PMT) to review, evaluate, and recommend improvements in the program, to include in scope, content of the learning module-kit, budgeting, and other operational issues. The PMT shall oversee the implementation of the project.

**III. ATTACHMENTS** (Please refer to the DOST-GIA Guidelines for the necessary documents.)

Prepared by:

Noted by:

  
**ROSALIE G. PABLO**  
 Project Assistant I

  
**MARIA ETHELWILDA G. CORONACION**  
 Provincial Science and Technology Director

Certified Funds Available:

Approved by:

  
**JEFFREY D. VARELA**  
 Accountant III

  
**DR. MA. JOSEFINA P. ABILAY**  
 Regional Director

**DOST Form B**  
**PROJECT WORKPLAN**

**(1) Program Title:** Grants-In-Aid Program

**(2) Project Title:** Scaling-Up Science Education and Research in Public High Schools in Occidental Mindoro through Robotics

**(3) Total Duration (in months):** Twenty four (24) months

(4) Planned Start Date: August 2022 (5) Planned End Date: July 2024

[illegible]

## DOST Form A

## DEPARTMENT OF SCIENCE AND TECHNOLOGY

## Project Line-Item Budget

CY 2021

Program Title : Grants-In-Aid (GIA) Program  
 Project Title : Scaling-Up Science Education and Research in Public High Schools in Occidental Mindoro through Robotics  
 Implementing Agency : Department of Education Occidental Mindoro Division Office  
 Total Duration : 2022 - 2024  
 Current Duration : 2 Years  
 Cooperating Agency : Department of Education Occidental Mindoro Division Office  
 Program Leader : Dr. MA.JOSEFINA P. ABILAY  
 Project Leader : MARIA ETHELWILDA G. CORONACION  
 Monitoring Agency : PSTC OCCIDENTAL MINDORO

	Counterpart Funding	
	DepEd Occ. Mindoro	DOST
<b>I. Personal Services</b>	P	P
<u>Direct Cost</u>		
Salaries		
Honoraria		
<u>Indirect Cost</u>		
<i>(Implementing Agency)</i>		
Salaries		
Honoraria		
<i>(Monitoring Agency)</i>		
Salaries		
Honoraria		
<b>Sub-total for PS</b>	P -	P -
<b>II. Maintenance and Other Operating Expenses</b>		
Traveling Expenses - local	100,000.00	100,000.00
Training Expenses		
Traveling Expenses - local		40,000.00
Supplies and Materials Expenses		2,000.00
Fuel, Oil and Lubricants Expenses		
Other Professional Services		
Printing and Publication Expenses		
Representation expenses	20,000.00	43,000.00
Meals		
Rents-Motor Vehicles		
Supplies and Materials		
Office supplies	10,000.00	18,000.00
Medical, Dental and Laboratory Supplies Expenses		
Semi-Expendable-Machinery Expenses		
Semi-Expendable-Equipment Expenses		
Fuel, Oil and Lubricants Expenses		5,000.00
Other Supplies and Materials Expenses		
Utility Expenses		
Water Expenses		
Electricity Expenses		
Communication Expenses		
Postage and Courier Expenses		
Telephone Expenses - Mobile		5,850.00
Internet Subscription Expenses		8,850.00
Awards/Rewards Expenses		
Other Professional Services		
Other General Services		
Repairs and Maintenance		
Taxes, Insurance Premiums and Other Fees		
Taxes, Duties and Licenses		
Insurance Expenses		

Electricity Expenses  
 Printing and Publication Expenses  
 Representation Expenses  
 Transportation and Delivery Expenses  
 Rent/Lease Expenses  
 Other Maintenance and Operating Expenses  
 Auditing Services  
 Advertising Expenses

Indirect Cost

**(Implementing Agency)**

Utilities

Supplies and Materials Expenses (shall be itemized based on GAM)

Office Supplies Expenses, Gasoline, Oil and Lubricants Expenses

Agricultural Supplies Expenses, etc.

Printing and Binding Expenses

**(Monitoring Agency)**

Communication Expenses

Transportation and Delivery Services

Traveling Expenses

Utilities

Supplies and Materials Expenses (shall be itemized based on GAM)

Office Supplies Expenses, Gasoline, Oil and Lubricants Expenses

Agricultural Supplies Expenses, etc.

Representation Expenses

Professional Services

Legal Services, Auditing Services, Consultancy Services,

Other Professional Services etc.

**Sub-Total for MOOE**

P 130,000.00

P 222,700.00

**III. Equipment Outlay**

**Robot Kit ( 18 kits @ P32,250 each kit)**

580,500.00

Specifications:

Motherboard:

ELF • Microchip: ATmega 328P • Port: 1 x MCU port (ATmega 328p, ATmega2560, ESP32) • 4 x RJ11 (connect to RJ11 sensor and modules) • 2 x DC motor port • 6 x pin conversion port (4 of which can be stepper/encoder/dc motor port) • 1 x USB port • 1 x Communication port (Bluetooth 2.4G) • Electronics: 1 x Buzzer, 1 x On-board button, 1 x On-board RGB LED

Sensors and Motors:

1 x RGB ultrasonic sensor V1.0, 1 x Double-way line-following sensor V1.0, 1 x Gyroscope sensor, 1 x limit switch module, 1 x Light sensor, 1 x Sound sensor, 1 x IR receiver, 1 x RGB LED -8( pins ), 2 x Encoder/DC motor driver, 1 x IR remote control, 1 x Bluetooth 4.1 module, 1 x Bluetooth Dongle module, 2 x Encoder DC Motor-25 9V188RPM, 1 x DC Motor-25 (50RPM), 1 x N20 DC motor (in robot

Indirect Cost

**(Monitoring Agency)**

P

P

**Sub-Total for EO**

P

P 580,500.00

**GRAND TOTAL**

P

130,000.00

P

933,200.00



Prepared By:

*Raquel P. Girao*  
**DR. RAQUEL P. GIRAO**  
Chief, Curriculum Implementation Division  
DepEd Occ. Mindoro

*Lynn G. Mendoza*  
**LYNN G. MENDOZA**  
OIC-Schools Division Superintendent  
DepEd Occ. Mindoro

*Plus School have fund  
More CRRP-Like loan*  
**Certified Funds Available:**

*Miles P. De la Torre*  
**MILESON P. DELA TORRE**  
Budget Officer, Finance Services  
DepEd Occ. Mindoro

*Merry Ann T. Ramirez*  
**MERRY ANN T. RAMIREZ**  
Accountant III  
DepEd Occ. Mindoro

*Jeffrey D. Varela*  
**JEFFREY D. VARELA**  
Accountant III  
DOST-MIMAROPA

*Dr. Ma. Josefina P. Abilay*  
**DR. MA. JOSEFINA P. ABILAY**  
Regional Director  
DOST-MIMAROPA