Republic of the Philippines
Department of Education
NATIONAL CAPITAL REGION

REGIONAL MEMORANDUM
ORD-2024-133

TO : **SCHOOLS DIVISION SUPERINTENDENTS**

FROM : **JOCELYN DR ANDAYA**
Director IV

SUBJECT : **REQUEST FOR THE CONDUCT OF A STUDY ENTITLED "PROEJCT SYLLABI: SYNTHESIS OF LOGICAL AND LEARNING ALGORITHM-BASED INFORMATION USING ARTIFICIAL INTELLIGENCE AND DATA ANALYSIS FOR FLEXIBLE LEARNING EDUCATION**

DATE : February 19, 2024

1. This has reference to the attached Memorandum No. OUA-OUT-020124-P4-1 dated February 1, 2024, from Undersecretary Nolasco A. Mempin, Administration, relative to the conduct of the above-captioned activity, contents of which are self-explanatory.

2. In view thereof, Schools Division Offices are requested to facilitate the conduct of the said study. Particular attention is invited to the attached annexes and detailed project proposal, for reference.

3. Immediate dissemination of this Memorandum is desired.

Republic of the Philippines

Department of Education

OFFICE OF THE UNDERSECRETARY FOR ADMINISTRATION

OUA-OUT-020124-P4-1

MEMORANDUM

TO : **All Regional Directors**

FROM : **NOLASCO A. MEMPIN**
Undersecretary for Administration

SUBJECT : **Request for the Conduct of a Study entitled "Project SYLLABI: Synthesis of Logical and Learning Algorithm-Based Information using Artificial Intelligence and Data Analysis for Flexible Learning Education"**

DATE : 01 February 2024

This has reference to the request of Dr. Jhoanne C. Orillo, a faculty from De La Salle University (DLSU), to conduct their National Research Council of the Philippines (NRCP)-funded research titled **"Project SYLLABI: Synthesis of Logical and Learning Algorithm-Based Information using Artificial Intelligence and Data Analysis for Flexible Learning Education"**. The study aims to develop a pilot scale Educational Management Information System that would serve as a platform to gather necessary information and data on important educational performance indicators. The study also aims to determine the impact and effectiveness of online learning in terms of knowledge and skill-based assessment in the Philippines.

In this regard, a series of research endeavors will be undertaken, including the administration of online surveys and conduct of focus group discussions (FGDs). The target participants for the surveys and FGDs will be students from Junior High School and Senior High School, as well as teachers from these grade levels, excluding schools that participated in the pilot testing phase, as listed in Annex 1. The survey will be administered online, and the respective links and QR codes for access are provided in Annex 2. Subsequently, the FGDs will be conducted remotely via Zoom, following the retrieval of survey responses. Within the online survey form, there is an inquiry regarding the willingness of volunteer teachers and students to engage in the FGD. Based on their responses, the researchers will select at least two teachers and two students from each region to participate in the Focus Group Discussion. Templates for assent and consent forms are available in Annex 3. Further, researchers require information regarding the number of students who have received academic awards from 2017 up to present.

In this regard, Regional Offices (ROs) are requested to:

- Coordinate with School Division Offices (SDOs) and schools to support the research team in the dissemination of the online survey among Junior High School and Senior High School students and teachers;
- Coordinate with School Division Offices (SDOs) to gather data on the number of students who have received academic awards from 2017 up to present.
- For the conduct of focus group discussion (FGD), the DLSU research team will laterally coordinate its details and schedule to selected participants from field offices. This will be conducted through an online platform; and
- Submit feedback on the actual conduct of the study as a result of monitoring to the Policy Research and Development Division - Planning Service (PRD-PS) at email address: ps.prd@deped.gov.ph (*See Annex 4 for the template of monitoring report*).

Kindly note that participation is voluntary. Particularly, participants have the right to refuse to participate or discontinue in accomplishing the survey at any time.

For further inquiries, kindly contact the PS-PRD at email address ps.prd@deped.gov.ph . For lateral coordination, contact Dr. Jhoanne C. Orillo, Associate Professor Lecturer of Department of Physics De La Salle University (DLSU), Department of Physics, 7th Floor William Hall, De La Salle University, 2401 Taft Avenue, Manila through mobile number, 09179720670 and email address, jhoanne.orillo@dlsu.edu.ph.

For consideration and appropriate action. Thank you.

Annex 1: List of Excluded Schools for the Survey (Schools participated in the Pilot Testing)

No.	Region	School name
1	CALABARZON	Bacoor National High School
2	Region III	Subic National High School
3	NCR	De La Salle Integrated School
4	Region III	Ilwas National High School
5	NCR	Ramon Magsaysay High School

Annex 2: Links for the Surveys

Intended Respondents	Survey Link	QR Code
Teachers	https://bit.ly/TEACHERS-survey	bit.ly/TEACHERS-survey
Students	https://bit.ly/STUDENTS-survey	QR Code

De La Salle University
Taft Avenue, Manila

ASSENT TO PARTICIPATE IN A RESEARCH STUDY

"Teachers' and Students' Experiences and Challenges in Learning: Pre, During and Post Pandemic"

We, the Project SYLLABI team, are faculty members of De La Salle University and are conducting a research study entitled, "Project SYLLABI: SYnthesis of Logical and Learning Algorithm-Based Information using Artificial Intelligence and Data Analytics for Flexible Learning Education". This is a three-year project of the Department of Science and Technology and the National Research Council of the Philippines. As part of the research process, we need to gather data from both the teachers' and students' lived experiences, challenges, and problems encountered in the last five years to determine the effectiveness of distance learning. With that, you are being invited to take part in this research because we feel that your experience as a teacher/student can contribute much to our understanding and knowledge of flexible learning in the country. The survey is divided into 7 sections and could be accomplished in 5-10 minutes through Google forms or pen-and-paper, whichever is more convenient.

Section 1 - Teachers' or students' personal information
Section 2 - Mode of teaching/learning
Section 3 - Teachers' or students' experiences in distance teaching/learning
Section 4 - Challenges Encountered in distance learning
Section 5 - Teachers' or Students' Level of Satisfaction in distance teaching/learning
Section 6 - Teachers' or Student's experiences in a face-to-face set-up
Section 7 - Perspective in a hybrid learning set-up.

Participation in this study is voluntary and will not earn any merit or sanction. Likewise, the participant has the right to corroborate data and the researcher's interpretation. He/she may ask to revisit the analysis if he/she thinks there are any misinterpretations in the analysis.

If the participant agrees to participate in the study and is a minor (17 years old and below), please accomplish the parental/ guardian consent and send it to your teacher as soon as possible. If the participant has AGREED and wishes to drop out of the study, please send us an email to remove the data from our analysis. If the participant does not accomplish the activity, he/she will be asked to proceed to the assigned task by the professor.

Rest assured that the data gathered will be treated with utmost confidentiality. Personal information will NEVER be shared with the public and will be analyzed only by the researchers involved. Final analysis, conclusions, and recommendations are planned to be presented in conferences and or journal publications to contribute to scientific knowledge.

If you have any questions or concerns, please contact me at jhoanne.orillo@dlsu.edu.ph
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CERTIFICATE OF CONSENT

By signing this form, I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

_____

Students' Name and Signature/ Date

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that he/she will answer the survey questions thru google forms or pen-and-paper, whichever is more convenient.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

If you decide to participate, and your parents agree, we'll give you a copy of this form for future reference.

_____

Investigator's Name and Signature /Date

****

ASSENT OF ADOLESCENT (17 years old and below)

By signing this form, I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study

_____ _____

Students' Name and Signature/ Date Parent/Guardian's Name and Signature / Date

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that he/she will answer the survey questions thru google forms or pen-and-paper, whichever is more convenient.

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

If you decide to participate, and your parents agree, we'll give you a copy of this form for future reference.

_____

Investigator's Name and Signature /Date

Annex 4: Template for Monitoring Report

Governance level (RO/SDO)	Date of Data Gathering	Research Activities Conducted	Reported Feedback
		(Indicative research activities conducted such as KII and FGD and the number of participants)	*(Discuss feedback of participants regarding the conduct of research activities, and challenges and difficulties encountered in facilitating the activity)*

De La Salle University
Taft Avenue, Manila

January 25, 2024

To: **NOEL T. BALUYAN**
Assistant Secretary of Administration
Officer-in-Charge, Planning Service

Attn: **KARLA S. SIO**
Chief, Policy Research and Development Division

Dear Sir Baluyan,

Greetings!

I am writing to respectfully request your endorsement of our research to allow our team to collect data from the DepEd teachers and students for our National Research Council of the Philippines (NRCP)-funded research project, "Project SYLLABI: SYnthesis of Logical and Learning Algorithm-Based Information using Artificial Intelligence and Data Analytics for Flexible Learning Education." The project's primary objective is to develop a pilot-scale Educational Management Information System (EMIS) that would serve as a platform to gather necessary information and data on important educational performance indicators. The platform would perform immediate feedback and analytics

on the effectiveness of the conduct of flexible learning concerning student performance. Likewise, we respectfully request the acquisition of pertinent data and standardized examination results of the students from pre-pandemic to the present. These data allow us to expand our data analysis and provide more meaningful results and conclusions. Through this endeavor, the project's results can be utilized to draft policies and recommendations for improving the delivery of flexible learning education to students, teachers, and other education stakeholders.

If approval is granted, volunteer DepEd teachers and students will complete a pen-and-paper questionnaire for pilot testing and an online survey for the final questionnaire through Google Forms in 10 - 15 minutes. Informed consent will be embedded in Google Forms to briefly discuss the purpose of the study and how the researchers will manage the data. Likewise, parental consent will be given and accomplished for students below 18.

Additionally, if approval is granted, we would like to request a copy of the following data (from SY 2017-2018 to SY 2024-2025) that are essential for data analysis and would significantly contribute to determining the effectiveness of flexible learning in the country.

1. National Achievement Test Results
2. Standardized Aptitude Test Results
3. List or number of students who were/are accepted, enrolled, graduated, promoted, dropped out, failed, retained
4. List or number of students with honors/ academic achievements
5. Policies implemented from 2017 to present (e.g., No Fail Policy)
6. National Career Assessment Examination (NCAE) Results
7. Table of Specifications (TOS)

Rest assured that the data will be consolidated with care, and individual results will remain confidential and anonymous. Likewise, any publications resulting from this study will only include consolidated results.

As our way of reciprocating the efforts of the teacher participants, we will tap experts and offer various teacher training/webinars that could help them improve their research and teaching skills.

I highly believe that you support research undertakings like this to improve teaching and learning in the country and approve our request. Should you have any questions, please do not hesitate to contact me at any contact details below.

I am hoping for your kind consideration and positive response on this matter.

Respectfully,

Jhoanne E. Orillo, Ph.D
Project Development Officer, Project SYLLABI
Associate Member, NRCP Division I
Associate Professor Lecturer, Department of Physics, De La Salle University
jhoanne.orillo@dlsu.edu.ph| 0917-972-0670

Noted by:

Jayne Lois San Juan, Ph.D
Project Leader, Project SYLLABI
Regular Member, NRCP Division VII
Associate Professor, Department of Indu]strial & Systems Engineering, De La Salle University

DOST Form 2 (for Basic/Applied Research)

DETAILED RESEARCH & DEVELOPMENT PROJECT PROPOSAL

(1) PROJECT PROFILE

Program Title:

Project Title: **Project SYLLABI: SYnthesis of Logical and Learning Algorithm-Based Information using Artificial Intelligence and Data Analytics for Flexible Learning Education**

Project Leader/Sex: Engr. Jayne Lois G. San Juan / Female

Program Duration (number of months): 36 months

Program Start Date: December 1, 2022

Program End Date: November 30, 2025

Implementing Agency (Name of University-College-Institute, Department/Organization or Company): De La Salle University

Address/Telephone/Fax/Email (Barangay, Municipality, District, Province, Region): 2401 Taft Ave., Malate, Manila, 1004, Metro Manila, NCR, Philippines

(2) COOPERATING AGENCY/IES (Name/s and Address/es)

Department of Education

(3) SITE(S) OF IMPLEMENTATION

IMPLEMENTATION SITES NO.	COUNTRY	REGION	PROVINCE	DISTRICT	MUNICIPALITY	BARANGAY
1.	Philippines	All	All	All	All	

(4) TYPE OF RESEARCH

_____ Basic

__/__ Applied

(5) R&D PRIORITY AREA & PROGRAM (based on HNRDA 2017-2022)

_____ Agriculture, Aquatic and Natural Resources
Commodity: _____

_____ Health
Priority Topic: _____

_____ Industry, Energy and Emerging Technology
Sector: _____

_____ Disaster Risk Reduction and Climate Change Adaptation

_____ Basic Research
Sector: _____

__/__ Other: **NRCP NIBRA-K-TOP Program**

Sustainable Development Goal (SDG) Addressed

Goal 4: *Quality Education*, and
Goal 9: *Industry, Innovation, and Infrastructure*

(6) EXECUTIVE SUMMARY (not to exceed 200 words)

Heeding to NRCP's call for research initiatives dealing with the social dimensions of the pandemic, De La Salle University (DLSU) directed its attention towards the conduct of distance learning education. In accordance with the government's safety guidelines against the ongoing health crisis (COVID-19), face-to-face classes are considered restricted and educational administrators are forced to shift the delivery of educational content through distance learning. However, it was observed that there is lack of feedback mechanism that will cite different area for improvement towards the effective delivery of distance learning education. Thus, there is a need for a platform that can determine the impact and effectiveness of distance learning in terms of knowledge and skill-based assessment and online connectivity.

Project SYLLABI aims to ultimately develop a pilot scale Educational Management Information System that would serve as a platform to gather necessary information and data on important educational performance indicators. The results of the project will be utilized to draft policies and recommendations towards the improvement of the delivery of distance learning education towards the students, teachers, and other education stakeholders.

(7) INTRODUCTION

(7.1) RATIONALE/SIGNIFICANCE (not to exceed 300 words)

Need

- A platform that can determine the impact and effectiveness of online learning in terms of knowledge and skill-based assessment

Solution

- To provide an evidence based solution by developing a pilot-scale Educational Management Information System capable of immediate feedback and analytics regarding effectiveness of online learning delivery on students' knowledge and skill-based assessment performances

Differentiation

- Many institutions are utilizing cloud-based databases and learning management systems (LMS) for file (i.e. program descriptions, learning materials, syllabi) storage and sharing, student assessment. However, these platforms only facilitate learning and decision making on a classroom level.

Benefit

- Faster data acquisition of student performance on curriculum and skill application assessments, which may be partitioned/aggregated on a national, regional, and school level
- Provides descriptive, predictive, and prescriptive analytics of online learning effectiveness based on student assessments
- Decision-support tool to provide decision makers for the planning of online learning delivery on a school level (teachers, administrators), and for the educational roadmap on the national level (DepEd, CHED)
- Availability of immediate feedback would allow potential problems to be identified and intervention programs or adjustments to be implemented efficiently
- The proposed tool may be used and will be useful in any educational set up as its goal is to promote continuous improvement through assessing the current status and effectiveness of the existing educational systems.

Although the project will be conducted during the time and context of remote learning, the output of the project (Educational Management Information System) is more applicable to a flexible learning perspective, which means that it may be used regardless of whether learning is offline, online, or blended. The EMIS may be used to analyze the effectiveness of any educational set up and to gather relevant and immediate feedback and insights to support decision making.

(7.2) SCIENTIFIC BASIS/THEORETICAL FRAMEWORK

Education Management Information System

An Educational Management Information System (EMIS) is defined as a system for collecting, integrating, processing, maintaining, and disseminating data and information to support decision-making, policy analysis and formulation, planning, monitoring, and management for all levels of an education system. It provides stakeholders with a comprehensive and integrated relevant, reliable, and timely data and information to support them in the completion of their respective responsibilities (UNESCO, 2008).

An EMIS may also be defined as a centralized system that monitors the performance of education programs offered by various institutes and manages the distribution and allocation of educational resources. It supports the management, planning, and strategizing the implementation of the various work processes to make an education system run smoothly (Korde, 2020).

The management information system must be designed considering the data insights needed and the administrative decisions that it will inform. For instance, educators and administrators can get a detailed analysis of student academics, identify weak areas and accordingly adjust delivery methods that would improve learning outcomes. Year-on-year student performances may also be gathered and compared, to benchmark and recommend best practices in teaching styles and materials, as well as assessment methods (Korde, 2020).

The EMIS may be utilized by government education policy makers to assess policy areas of relevance, and the status of the education system as a whole, as well as the learning outcomes targeted in the country. The purpose of EMIS systems is to aid governments design and implement policies. However, currently, the absence of timely, reliable, and usable data is hindering the ability of countries to conduct data-driven decision making in education policy. Additionally, in most countries, information systems do not exist, or the indicators and other educational goals are not being tracked systematically and consistently. The primary purpose of an EMIS is to support policy design that would improve and refine the quality of education, and as an effect also stimulate a country's economic growth (Abdul-Hamid, 2014).

Intelligent Decision Support System

An Intelligent Decision Support System (IDSS) add artificial intelligence (AI) functions to traditional DSS with the aim of guiding users through some of the decision making phases and tasks or supplying new capabilities. This notion has been applied in various ways. For example, Linger and Burstein (1997) provided two layers in their framework for IDSS, a pragmatic layer associated with the actual performance of the task, and the conceptual layer associated with the processes and structure of the task. Using Linger and Burstein's (1997), and other, concepts, we can develop the IDSS architecture shown in Fig. 1 (Forgionne et al., 2005).

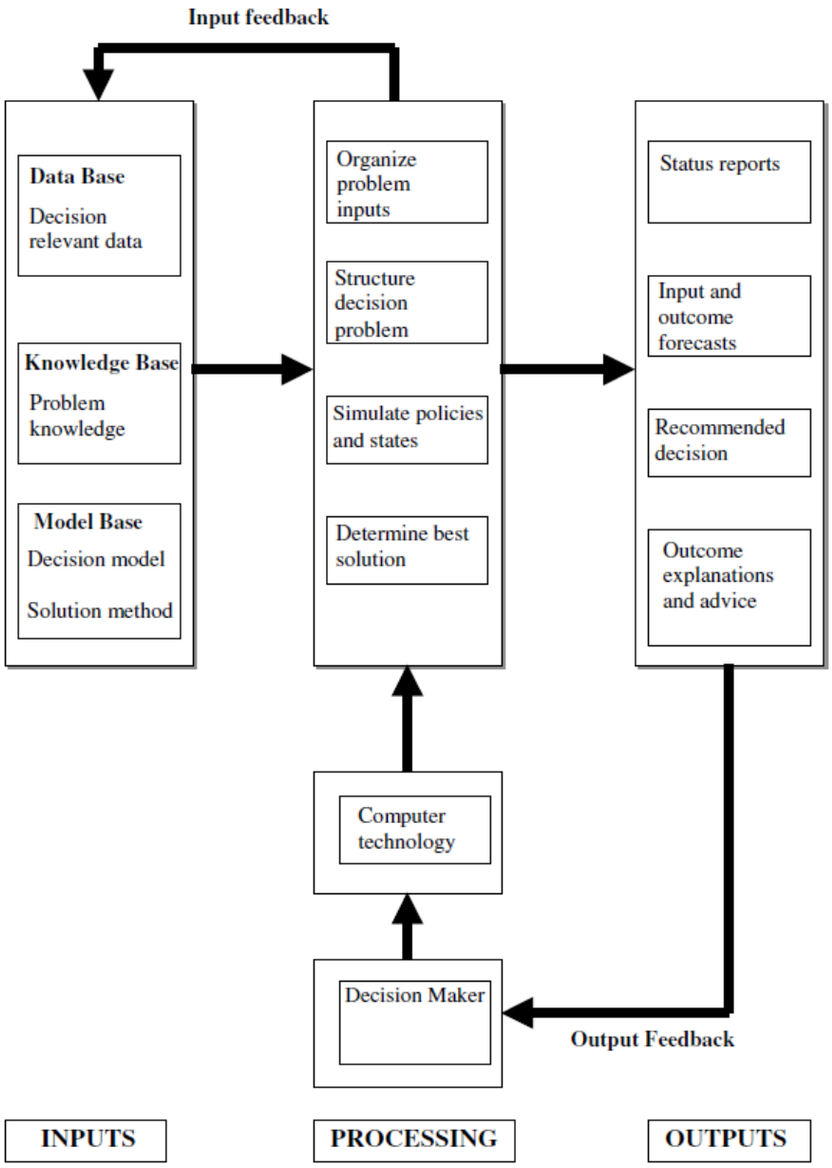

Figure 1. Intelligent Decision Support System (IDSS) Structure

As Fig. 1 illustrates, an IDSS has a database, knowledge base, and model base, some or all of which will utilize AI methods. The database contains the data directly relevant to the decision problem, including the values for the states of nature, courses of action, and measures of performance. The knowledge base holds problem knowledge, such as guidance for selecting decision alternatives or advice in interpreting possible outcomes. The model base is a repository for the formal models of the decision problem and the approaches (algorithms and methodologies) for developing outcomes from the formal models. Decision-makers utilize computer and information technology to process the inputs into problem-relevant outputs.

Processing will involve:
(a) organizing problem inputs;
(b) structuring the decision problem decision model;
(c) using the decision model to simulate policies and events;
(d) finding the best problem solution.

The IDSS can use knowledge drawn from the knowledge base to assist users in performing these processing tasks. Processing will generate status reports, forecasts, recommendations, and explanations. The status reports will identify relevant states, courses of action, and measures of performance and show the current values for these problem elements. Forecasts will report the states and actions specified in the simulations and the resulting projected values for the measures of performance. The recommendations will suggest the values for the actions that best meet the measures of performance. Explanations will justify the recommendations and offer advice on further decision making. Such advice may include suggestions on interpreting the output and guidance for examining additional problem scenarios.

Input feedback from the processing provides additional data, knowledge, and models that may be useful for future decision making. This feedback is provided dynamically to update the models and inputs in real time without external intervention. Output feedback is used to extend or revise the original analyses and evaluations.

(7.3) OBJECTIVES

General:

- The project's primary objective is to develop a pilot scale Educational Management Information System that would serve as a platform to gather necessary information and data on important educational performance indicators. The platform would perform immediate feedback and analytics on the effectiveness of the conduct of flexible distance learning with respect to student performance.

Specific:

- Collect data on knowledge and skill-based assessment results to determine the effectiveness of flexible learning including the emergency remote teaching
- Develop a web application/online website that would serve as the platform to collect these data and perform necessary data analytics
- Utilize artificial intelligence techniques to optimize the performance of the pilot-tested educational management information system

(8) REVIEW OF LITERATURE

COVID-19 Pandemic and Flexible Learning Education

In response to the challenges posed by the COVID-19 public health emergency, education systems worldwide had to adapt rapidly to ensure the continuity of learning while prioritizing the safety of students, teachers, and the entire school community. In an effort to minimize the transmission of COVID-19, most governments, including the Philippine government, have accepted the importance of social distancing; thus, community lockdown protocols have been imposed which included the closure of schools and other educational institutions (Joaquin et al., 2020). As a result, more than a billion students have been affected globally (Li and Lalani, 2020), including over 28 million Filipino students across all academic levels (Joaquin et al., 2020).

The Philippines, like many other nations, likely implemented policies and guidelines to address the disruptions caused by the pandemic. The country implemented the DO#12 series 2020 or Adoption of the Basic Education Learning Continuity Plan for School Year 2020-2021 in light of the COVID-19 public health emergency (DepEd, 2020a) .The adoption of a Learning Continuity Plan would have involved strategies to facilitate remote and flexible learning, taking advantage of technology and alternative teaching methods. This could include the use of online platforms, television, radio broadcasts, and printed materials to ensure that students could continue their education despite physical school closures. The plan would have likely considered the varying access to technology and resources among students and aimed to bridge any gaps to promote inclusivity. Moreover, the Learning Continuity Plan would have incorporated measures to support the well-being and mental health of students and educators during these challenging times. It might have included guidelines for assessment and evaluation, recognizing the unique circumstances presented by the pandemic.Likewise the DepEd had implemented the Deped order #18 s.2020 or Policy Guidelines for the Provision of Learning Resources in the implementation of the basic education plan.The provision of learning resources is essential for fostering a conducive learning environment, whether in traditional classrooms or through remote and blended learning modalities (DepEd, 2020b). The guidelines would likely have addressed the development, distribution, and utilization of various resources, including textbooks, supplementary materials, digital content, and other educational tools. Emphasis may have been placed on ensuring the quality, relevance, and accessibility of these resources to cater to the diverse needs of students across different regions and socio-economic backgrounds. Furthermore, the guidelines might have outlined strategies for collaboration between the education sector, communities, and stakeholders to optimize the use of available resources. This could involve partnerships with private entities, NGOs, and technology providers to enhance the reach and effectiveness of the educational materials. Lastly, DepEd orders often serve as critical directives that guide the Philippine education system, and guidelines like DepEd Order #31 series 2020 would likely have been instrumental in adapting assessment and grading practices to the unique challenges presented by the pandemic (DepEd, 2000c). The implementation of these guidelines would have aimed to ensure fairness, flexibility, and a comprehensive evaluation of students' academic performance. The Interim Guidelines would likely have addressed various aspects of assessment, taking into account the shift to alternative modes of learning, including online classes, modular learning, and other flexible approaches. These guidelines may have provided recommendations on how teachers could effectively evaluate students' understanding and mastery of the curriculum under these varied circumstances.Given the diverse contexts and resources available to students during the pandemic, the guidelines may have encouraged inclusive assessment practices, considering the different learning environments, access to technology, and socio-economic factors. They might have also addressed concerns related to the mental well-being of students, recognizing the additional stressors brought about by the public health crisis. The

Interim Guidelines may have also outlined the grading systems and criteria to ensure consistency and transparency in the evaluation process. Strategies for feedback, communication with parents or guardians, and support for students who may be struggling could have been integral components of the implementation plan.

The concept of e-learning or online learning is not new, there has been existing high growth and adoption of educational technology, such as language apps, virtual tutoring, video conferencing platforms, and online learning software, even before the COVID-19 pandemic hit. Flexible learning encompasses the use of digital and non-digital technology, or a combination of both, and may be implemented exclusively online, offline, or blended (a combination of online and offline). Flexible learning applies to any educational learning environment or mode, in terms of how, what, where, and when learning occurs. Thus can also cover the conduct of physical, face-to-face classes. Nonetheless, this global crisis necessitated a rapid and significant shift from classroom learning to distance learning, particularly to online environments (Li and Lalani, 2020).

The impact of this sudden move to online learning is still unknown, especially given the consideration that both teachers and students had little to minimal training, preparation, insufficient bandwidth and access to the necessary gadgets. In fact, 45% of Filipino citizens and 74% of public schools do not have access to the internet (Jones, 2019). For those with the proper equipment and have access to the internet, the next issue becomes the stability of the Internet access provided by existing service providers (Chakravorti et al., 2020). The Philippines' average internet speed ranks 103rd in the Speedtest Global Index which represents only around 15.06Mbps, relative to the global average of 26.12 Mbps (Ordinario, 2017). Furthermore, it has also been reported that the majority of internet subscribers only rely on 2G and 3G networks, while just 1% have access to 4G or LTE (Jennings, 2016). Another challenge was the conducive learning environment (Barrot, Llenares, & del Rosario, 2021) and household responsibilities of both the students and the teachers. This highlights a 'digital divide' between students, highlighted by their location and socio-economic background.

Despite these limitations, online learning does have its strengths such as the ease and convenience of communicating through chat groups and video meetings, document sharing, polls, and online assessments. For students who have proper tools and infrastructure for digital learning, there is some evidence on the effectiveness of learning online. Some research revealed that material retention is 25-60% higher online relative to only 8-10% in a physical classroom. It also showed that learning online is faster by 40-60% because students can learn at their own pace, going back, repeating, skipping, or accelerating through lessons as they choose. However, these benefits vary in age groups, as younger students (e.g. learners in primary and secondary level) require a more structured environment as they can get easily distracted (Li and Lalani, 2020).

Because of the sudden need to adapt, the focus of educators has been placed on quickly designing distance learning experiences, and schools have been forced to adopt BE-LCP under D0#12 s.2020, follow the policy guidelines of learning resources under DO #18 s.2020 and use the interim guidelines for assessment of DO #31 s. 2020. Likewise some private schools were forced to develop their own policies, in the absence of a national standardized approach at the earlier part of the pandemic (Joaquin et al., 2020). To provide insights and assess the mode of teaching and learning pre, during and post pandemic,, the SYLLABI project intends to develop an web platform Educational Management Information System which would be capable of collecting and consolidating data on students' knowledge and skill-based assessment results to determine the on-going impact and effectiveness of flexible distance learning in secondary level students (JHS and SHS) in public schools to support efficient and effective decision making of stakeholders on a national and school/university level.

Online Learning

Online learning is a type of flexible learning or education, which has long played a growing role in several educational systems and has taken up the largest market of distance learning in recent years (Nguyen, 2015). Online learning may be formally defined as the use of the internet and related technologies to develop materials for education proposes, such as instructional delivery. Furthermore, there are two types of online learning, particularly these include asynchronous and synchronous learning activities, each of which have their own strengths and limitations that need to be properly understood by instructors to ensure that online learning remains effective and efficient (Adedoyin and Soykan, 2020).

To facilitate this, schools and universities have adopted a wide range of virtual learning tools and software, such as virtual tutoring platforms, and learning management systems. One such example is Google Classroom which became one of the more popular choices because it is a free application that can work as an all-in-one learning platform, with features that include video conferencing, virtual classrooms, and shared drives (Murphy, 2020).

Research has revealed the strengths of online learning. It shows that students can learn more online than with traditional courses, having reported a higher retention of information at around 25 to 60%, and can reduce time investment by 40-60% (Li and Lalani, 2020). These statistics may be attributed to the fact that online learning is self-paced (e.g. students can speed through parts they are comfortable with, while slow down for parts they find challenging), it gives students access to quality education anytime and anywhere, multimedia technologies (e.g. videos, podcasts, PDFs, PowerPoints) are utilized allowing the different learning styles to be addressed efficiently (Gautam, 2020).

However, online learning is touted for its versatility. There are many challenges that need to be overcome. One main challenge is unequal access to the internet and relevant technologies needed for online learning. These inequalities are apparent across countries and within countries with people coming from different socio-economic backgrounds. This results in several students and even faculty struggling to participate in the new educational system (Murphy, 2020). Moreover, the online setting is more appropriate for courses which focus on white-collar skills, but is less suitable for practical professions which were originally taught in laboratories and workshops. In the latter, access to more advanced technologies such as robotics, virtual reality or augmented reality might be needed to deliver the same level of experience and hands-on learning to students. Additionally, another challenge of online learning is that students may easily be distracted by social media and other sites, decreasing focus on the online classes, and affecting their mental health (Ignacio, 2021). This is more apparent for students in younger years, requiring teachers to continuously innovate how to keep their classes crisp, engaging, and interactive (Gautam, 2020). Aside from these, both students and facilitators require a certain minimum level of computer or IT literacy in order to function effectively and successfully on an online environment (University of Illinois Springfield, 2021); and again, this might be a larger hurdle to address for younger students, who might need the support of an adult to navigate their online classrooms.

Despite the rich discussion on the strengths and weaknesses of online learning, there is little said about whether online learning can be a complete substitute for physical classes, and yet still be able to maintain educational standards and achieve the necessary learning outcomes for each course/subject.

IDSS Integrated Design and Evaluation Framework

The design and evaluation complexity of IDSS increases the requirement to justify the additional economic, human and computational efforts required when compared to traditional DSS (Messina et al., 2001). The Artificial Intelligence (AI) field, which is the main generator of design theories for intelligent systems, faces a similar problem of determining an adequate set of criteria, measures/metrics and an underlying structure/framework to assess the overall value of an IDSS (Finkelstein, 2000). The AI evaluation approach has been traditionally focused on technical and computational performance issues (Cohen, 1991). A high human-like activity level is also recognized in the AI field as the long-term ideal characteristic for any intelligent system (Turing, 1950; French, 2000), but it is difficult to assess and offers no guidance for practical implementation. According to Simon (1987) and colleagues (Simon et al., 1987), the emergence of IDSS demands interdisciplinary research between DSS/OR and AI disciplines. In this way, valuable knowledge and wisdom concerning principles, architectures, tools, methodologies and techniques generated from both streams can be accumulated.

To integrate DSS/OR and AI evaluation criteria, our proposed evaluation schema combines several required levels of organizational (e.g. organization and user worldviews) and technical criteria (e.g. designer and builder worldviews). The framework is an alternative to previous models that were focused only on organizational effectiveness or performance system criteria for providing a complete and integrated IDSS evaluation. It is based on seminal AI research conducted by Newell and Simon (1972, 1976), Newell (1981) and Chandrasekaran (1986, 1990, 1992). The first theoretical basis is the Physical Symbol Systems (PSS) Hypothesis (Newell and Simon, 1972, 1976) that establishes that any system exhibiting intelligent actions is necessarily a PSS, and if a PSS of an adequate size and quality is developed, then it will exhibit behaviour that can be evaluated as intelligent. The second theoretical foundation is Newell (1981) enhancement to the PSS hypothesis where a third architectural level is introduced as mandatory for any AI-based architecture for intelligent systems.

The initial Symbol/Program and Logic-Circuit levels are augmented with the Knowledge Level. According to Newell (1981, p. 15) this extended framework makes a ‘‘sharp distinction between the knowledge required to solve a problem (i.e. the knowledge level) and the processing required to bring that knowledge to bear in real time and real space (i.e. the Symbol/Program Level)”. Finally, the third theoretical support for the framework is the design theory of intelligent systems based on the notions of generic tasks (Chandrasekaran, 1986) and their refinement as a task structure model (Chandrasekaran, 1990, 1992). This design theory postulates a more refined PSS that decomposes actions recursively into a set of problem-solving methods until specific knowledge on the lowest tasks is available to be executed (Chandrasekaran, 1990, 1992). The IDSS hypothesis (Mora et al., 2005) discussed in the Introduction is refined from the PSS Newell (1981) and Chandrasekaran’s (1990, 1992) hypotheses. The result is a framework that links the upper level perspective between the impacts on decision outcomes and process (Forgionne, 1999, 2000; Phillips-Wren et al., 2004) with the AI-based lower technical view (Mora et al.,

2005). This framework provides generic multiple criteria to comprehensively evaluate systems in an integrated and holistic manner. Fig. 2 (adapted from Mora et al., 2005) exhibits the four levels that link the decision-making phases and steps with the decisional services/tasks, architectural capabilities, and computational symbol/program mechanisms.

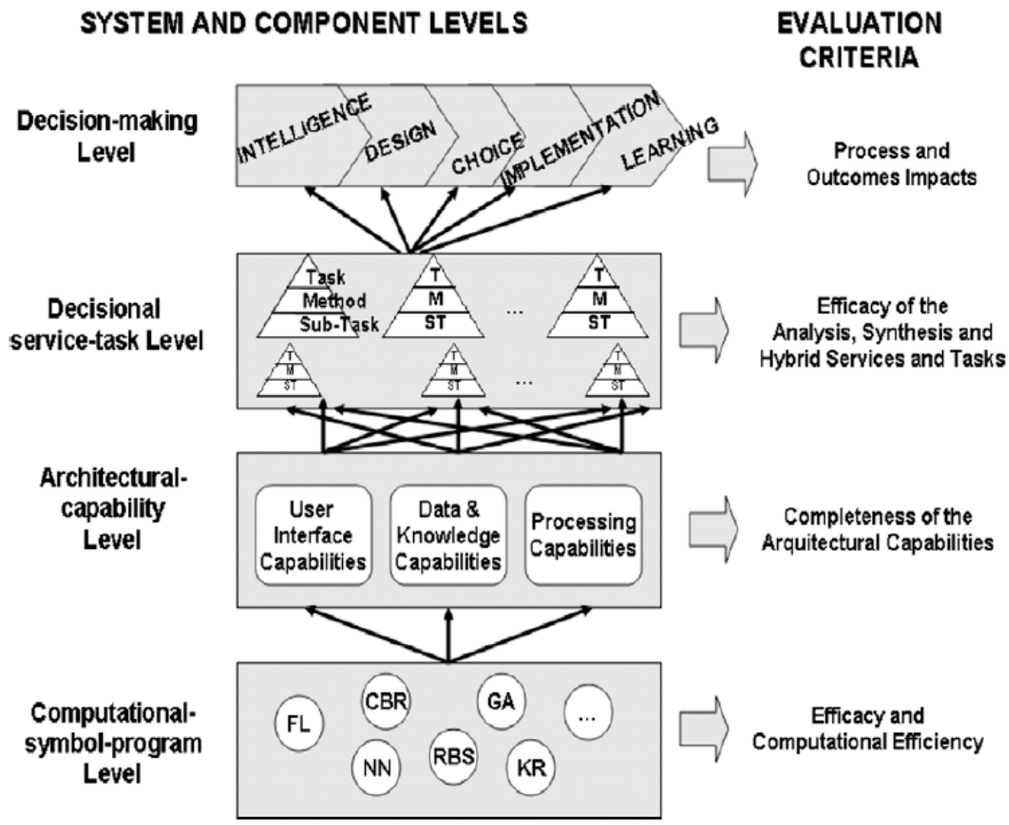

Figure 2. Framework for Design and Evaluation of IDSS

At the top Decision-making Level (organization and user worldviews), the main evaluation criteria are impacts on the process of decision making and impacts on the outcomes from using the IDSS (Forgionne, 1999). The decision process is composed of Simon's (1960) phases of intelligence, design, and choice together with implementation and learning phases.

Decisional service-task level is the next layer (user and designer worldviews), and it includes support for analysis, synthesis and hybrid service-tasks provided by the IDSS. Analysis service-tasks are classification, monitoring, interpretation and prediction. Synthesis service-tasks are configuration, scheduling, formulation and planning. Finally, hybrid service-tasks are explanation, recommendation, modification, controlling, and learning.

The third level, the Architectural-capability Level (user, designer and builder worldviews), includes the user interface (UI), the data and knowledge (D&K) component, and the processing (P) component of the IDSS architecture (Mora et al., 2005; Phillips-Wren et al., 2006b). Evaluation criteria measure the completeness of the UI, DIK and P capabilities provided respectively by the three components. The scale of completeness of the UI, DIK and P capabilities is divided into several categories (Mora et al., 2005). For instance, the UI completeness can be: (i) structured input commands and text outputs, (ii) graphics-user interface enhanced with multimedia issues, and (iii) natural language and virtual reality based user interface.

Finally, the fourth level, the Computational/program/symbol Level (designer and builder worldviews), accounts for the specific AI computational mechanisms implemented in the IDSS architectural components. Evaluation criteria are the efficacy that these mechanisms provide to the next level, e.g. the percentage of real duties done regarding the expected duties, as well as the computational efficiency of such mechanisms, e.g. the time and space complexity measures to evaluate the algorithms.

The proposed framework provides an alternative integrated evaluation view of the predictive or causal linkage between the impacts generated, the decision-making phases and steps, and the technical and functional properties owned by the different layers of an IDSS. These issues are relevant for the organization, users, designers and builders of an IDSS.

(9) METHODOLOGY

Overview of Project SYLLABI

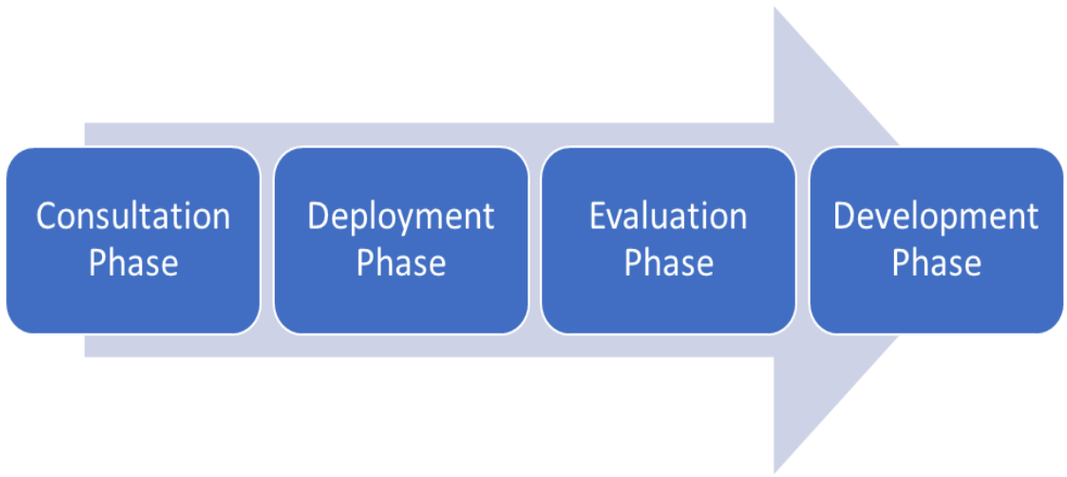

Figure 3. Overview of Project SYLLABI Phases

Phase 1: Consultation

The research team will consult with the co-implementing agency/ies, Department of Education (DepEd), regarding key performance indicators, learning outcomes, and standards of the national education system and the factors and models that contribute to these metrics. These consultations are necessary to acquire relevant knowledge to aid the team in constructing the data collection platform and research instruments. The following data will be requested from the Department of Education for SY 2017-2018 to SY 2024-2025.

i. National Achievement Test Results
ii. Standardized Aptitude Tests Results
iii. List or number of students who were/are accepted, enrolled, graduated, promoted, dropped out, failed, retained
iv. List or number of students with honors/ academic achievements
v. Policies implemented (e.g. No Fail Policy)
vi. NCAE Results
vii. TOS

Phase 2: Deployment/Data Collection

The research team will be deploying the research instruments/survey materials to collect data on student performance based on the necessary learning outcomes and standards. Data will be collected in the form of test scores, survey of student perceptions, and a focus group discussion to validate the quantitative data.

The respondents will include volunteer DepEd Junior High School and Senior High School Teachers and Students from all strands from schools across NCR and all regions.

Phase 3: Evaluation

The research team will utilize computing techniques such as artificial neural networks to determine the effectiveness of online learning with respect to the knowledge and skill of students based on the data collected from the consultation and data collection phases. Several artificial intelligence and mathematical modelling techniques will be explored to identify the best machine learning model for estimating learning effectiveness and psychological well-being.

One known evaluation strategy is called AHP. The analytic hierarchy process (AHP) is a multi-criteria method that can incorporate both qualitative and quantitative criteria into a single metric (Saaty, 1977, 1994). Multicriteria decision making implies that a decision maker needs to identify the best course of action while considering a conflicting set of criteria. Complexity in decision making situations involves quantitative and qualitative criteria, multiple scales, and multiple comparisons. The ability to assign a preference rank for general decision making situations is needed as well as simplicity of methods (Saaty, 1986). The AHP is a plausible method that provides a logical and scientific basis for such multi-criteria decision- making (Harker, 1988) and has been widely applied to both individual and group decision making scenarios from the early 1980s (Wind and Saaty, 1980; Saaty and Vargas, 1994).

According to Saaty (1986), the AHP was founded on three design principles: (i) decomposition of the goal-value structure where a hierarchy of criteria, subcriteria, and alternatives is developed, with the number of levels determined by the problem characteristics; (ii) comparative judgements of the criteria on single pairwise comparisons of such criteria with respect to an upper criteria; and (iii) linear-based synthesis of priorities where alternatives are evaluated in pairs with respect to the criteria on the next level of the hierarchy, and criteria can be given a priority (e.g. preference) expressed as a weight in the AHP matrix. An advantage of the AHP for our evaluation of IDSS is that the contribution of the AI methods used in the system to individual criteria can be determined. For example, it is possible to discern if system benefits from implementing an AI method derives more from process than outcome, or if an AI method contributes to a specific phase of decision making. Such information assists the system developer as well as the user to understand the precise contributions of the components of the IDSS to the overall decision value.

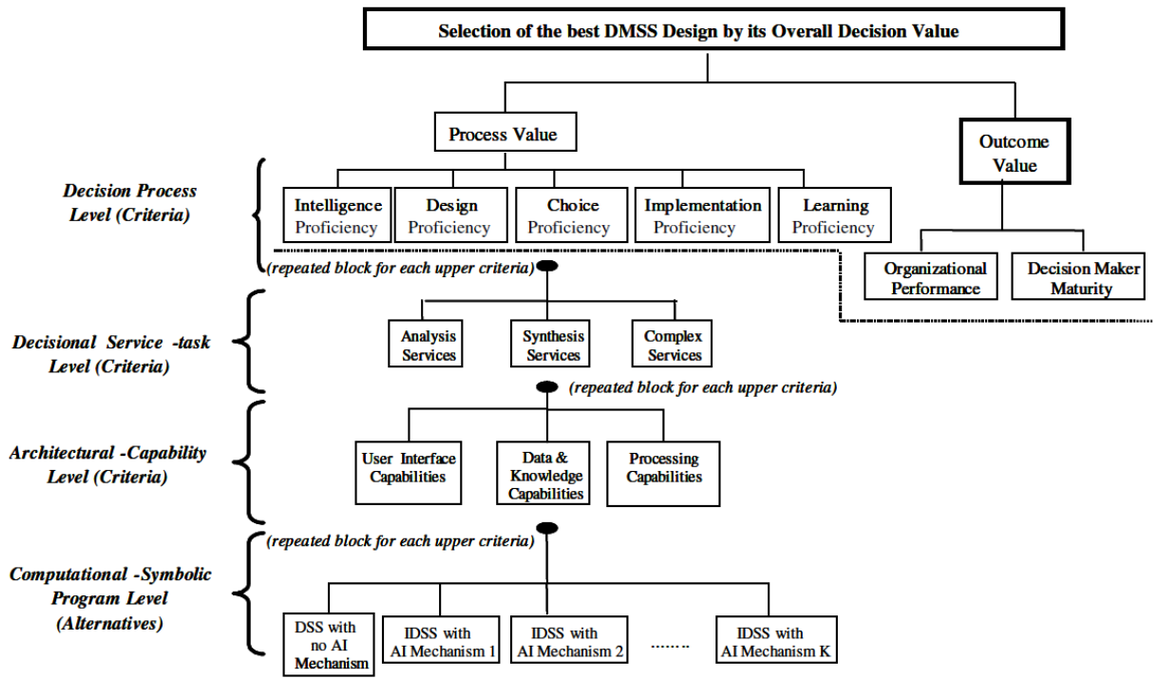

Figure 4. AHP for IDSS evaluation

We have implemented the AHP previously to compare DSS and to determine their effect on the process of, and outcome from, decision making (Forgionne, 1999, 2000; Forgionne and Kohli, 2001; Phillips-Wren et al., 2004, 2006a,b). In this research we extend our previous evaluation to IDSS by using the proposed architecture in Fig. 2 to specifically determine the contribution of implemented AI methods to an IDSS. Fig. 4 illustrates an AHP model for IDSS evaluation.

Phase 4: Development

The research team will develop a web application for estimating the learning effectiveness of students during distance learning as influenced by the curriculum, learning management system, activities performed, and other contributing parameters. A pilot run will be performed at a cooperating university/school as recommended by DepED, which will also be the basis for drafting a recommendation plan for policy making. The proponents will subject the developed application to patenting/copyrighting to protect the intellectual property formed during the course of the project. Improvements for the application, such as beta-tasting and extension to other platforms/environments, can be explored in future phases of the research project.

(10) TECHNOLOGY ROADMAP (if applicable) (use the attached sheet)

(11) EXPECTED OUTPUTS (6Ps)

PUBLICATION*

- Publish at least two (2) SCOPUS journals
- Publish at least five (5) SCOPUS-indexed conference papers

PATENT/INTELLECTUAL PROPERTY*

- Draft patent for SYLLABI Education Management Information System platform

PRODUCT*

- SYNERGY Education Management Information System platform

PEOPLE SERVICE*
- Involve at least two (2) PhD students in the project
- Involve at least five (5) MS students in the project
- Train (2) DEPED personnel to operate SYLLABI Education Management Information System platform
- Train (5) teachers/instructors to operate SYLLABI Education Management Information System platform

PLACE AND PARTNERSHIP*
- Perform testing in prescribed schools recommended by DepEd

POLICY*
- Draft policies regulating the use of education management information system
- Local and national policy of using SYLLABI as part of the Philippine education curriculum

(12) POTENTIAL OUTCOMES

- A novel technology platform for education management
- A working database of information relating to the status of distance learning for cooperating schools/universities

(13) POTENTIAL IMPACTS (2Is)

SOCIAL IMPACT*
- Promote awareness on the importance and features of a National Education Management System
- Improve the conduct of national education/learning, particularly distance learning, through informed and data-supported decision making
- Identify the psychological well-being/distress of stakeholders during the conduct of distance learning, which may support the development of an intervention program
- Benefits of education, aside from income, career advancement, and skill development, may also include economic stability, good citizenship, civic involvement, crime reduction

ECONOMIC IMPACT*
- Create training and employment opportunities for new skill sets in handling SYLLABI.
- Informed management of the Philippine educational system could lead to:
    - Cost and waste reductions
    - Globally competitive graduates

(14) TARGET BENEFICIARIES

The target beneficiaries of this project are the Department of Education (DepEd), School/University Administrators, Teachers, and Students. DepEd, Administrators, and Educators may use the platform to understand real time student performance, the effectiveness of the educational system to support effective and immediate decision making. Students will benefit as customers of the educational system, improvements to the educational systems will be realized by students through improved learning experiences.

(15) SUSTAINABILITY PLAN

- Conduct knowledge transfer and capacity building workshops for the Department of Education (DepEd), School/University Administrators, Teachers, and Students. DepEd, Administrators, and Educators
- Technology licensing agreement to be coordinated with DLSU Innovation and Technology Office (DITO).
- Operations and maintenance to be transferred to startup or a spin-off company.
- Coordination with Animo Labs Technology Business Incubator.
- Conduct validation of initial market research.

Part of the sustainability plan includes the knowledge transfer for relevant stakeholders. The collected data and applications can be shared with the shareholders. Additionally, the project team can file intellectual property to start the process of technology licensing. A spin-off company can be created to commercialize and operationalize the system.

(16) GENDER AND DEVELOPMENT (GAD) SCORE (refer to the attached GAD checklist) **10.99**

The project solicits comments and feedback from stakeholders in a gender-neutral way. The project team will also be composed of a balanced group of male/female researchers. Additionally, the output of the project will be gender-neutral and gender-sensitive.

(17) LIMITATIONS OF THE PROJECT

- The study is limited to volunteer DepEd JHS and SHS teachers and students.
- Cooperating schools and academic levels are predefined, as recommended by DepEd
- Availability of infrastructure and technology of students and faculty will be based on survey and interviews

(18) LIST OF RISKS AND ASSUMPTIONS RISK MANAGEMENT PLAN (List possible risks and assumptions in attaining target outputs or objectives.)

- Due to COVID-19 pandemic crisis, there are still some restrictions in people movement.
- Delays in procurement of hardware and software may impede the project.
- It it possible for the web server to malfunction and lose data
- Since the web application will be hosted publicly, this could attract potential hackers and malicious users who will disrupt the operation of the website
- Possible bugs in the software
- Times of no internet or weak internet connection on the side of the user

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(20) PERSONNEL REQUIREMENT

Position	Percent Time Devoted to the Project	Responsibilities
One (1) Project Assistant I	**100%**	[] Monitor expenses and procurement process

		[] Coordinate with and update the project leader regarding research output and presentation of results [] Facilitates communications and other project deliverables [] Encodes and monitor the record of the purchase of equipment, materials, and supplies [] Assist the group in preparing documents needed for completion of research, travel, and training
One (1) Computer Programmer I	**100%**	[] Serves as the technical specialist of the project responsible for the development of the SYLLABI technology platform [] Reports directly to the project leader [] Sets goals for performance and deadlines in ways that comply with the project's plans and vision [] Organize workflow and ensure that proponents understand their duties or delegated task [] Provide constructive feedback and coaching to proponents
One (1) Project Development Officer I	**100%**	[] Serves as the administrative supervisor and technical supervisor of the project responsible for the development of the SYLLABI technology platform [] Reports directly to the project leader [] Sets goals for performance and deadlines in ways that comply with the project's plans and vision [] Organize workflow and ensure that proponents understand their duties or delegated task [] Provide constructive feedback and coaching to proponents
One (1) Program Leader	**100%**	[] Set the direction and lead the research program [] Provide technical support to the researchers and programmers. [] Develop journal articles out of the research program. [] Organize training and seminars in line with the research program [] Supervise all contents of the research projects and coordinate with project members to meet the goal. [] Review the contents and deliverables of the MOA and other necessary details are completely specified. [] Discuss the contents of the MOA to all co-investigators and all persons that are part of the program. [] Discuss the division of work and expected program milestones and output. [] Divide the group into each of the objectives and determine (and/or expound) specific methods and performance metrics to using in order to quantify the different results. [] Acquisition of the material and equipment. [] Determine the needs of the stakeholders and the end-user in general, in order to analyze and visualize the program.
Four (4) Project Staff Level II and Two (2) S&T Consultant **(1 of the Consultant should have background in Educational Management/Psychology)**	**50%**	[] Provide support on all the ongoing research related to the research project [] Conduct necessary protocols and methods to be used in the completion of the design and development of the open source ventilator system [] Maintain data integrity by accurately recording all research results in a network storage [] Assist the group in preparing documents needed for completion of research, travel, and training [] Analyze and validate data collected from experiments [] Interpret data and set the direction of the project

		[] Provide solutions and alternative methods and troubleshoot issues arising [] Help develop journal articles out of the research project [] Attend meetings and present in seminars and conferences, especially those under the project

(21) BUDGET BY IMPLEMENTING AGENCY

IMPLEMENTING AGENCY	PS	MOOE	EO	Total
Year 1	1,694,486.40	390,000.00	750,000.00	2,834,486.40
Year 2	1,694,486.40	390,000.00	0.00	2,084,486.40
Year 3	1,694,486.40	390,000.00	0.00	2,084,486.40
TOTAL	5,083,459.20	1,170,000.00	750,000.00	7,003,459.20

(22) OTHER ONGOING PROJECTS BEING HANDLED BY THE PROJECT LEADER: _____ (number)

Title of the Project	Funding Agency	Involvement in the Project

(23) OTHER SUPPORTING DOCUMENTS (Please refer to page 2 for the additional necessary documents.)

I hereby certify the truth of the foregoing and have no pending financial and/or technical obligations from the DOST and its attached Agencies. I further certify that the programs/projects being handled is within the prescribed number as stipulated in the DOST-GIA Guidelines. Any willful omission/false statement shall be a basis of disapproval and cancellation of the project.

	SUBMITTED BY (Project Leader)	ENDORSED BY (Head of the Agency)
Signature		
Printed Name	**Engr. Jayne Lois G. San Juan**	**Dr. Raymond Girard R. Tan**
Designation/Title	**Assistant Professor, DLSU**	**Vice Chancellor for Research and Innovation, DLSU**
Date	**July 15, 2021**	**July 15, 2021**

Note: See guidelines/definitions at the back.

DOST Form 2 (for Basic/Applied Research)
DETAILED R & D PROJECT PROPOSAL

I. General Instruction: Submit through the DOST Project Management Information System (DPMIS), http://dpmis.dost.gov.ph, the detailed R&D proposal for the component project together with the detailed proposal of the whole Program, project workplan, line-item budget (LIB), 1-page curriculum vitae of the Project Leader, and Certificate of Incorporation or DTI Registration (if applicable) and other applicable supporting documents required under item II.23 below. Also, submit four (4) copies of the proposal together with its supporting documents. Use Arial font, 11 font size.

II. Operational Definition of Terms:

1. Title- the identification of the Program and the component projects.

Project- refers to the basic unit in the investigation of specific S&T problem/s with predetermined objective/s to be accomplished within a specific time frame.

Project Leader- refers to a project's principal researcher/implementer.

Project Duration- refers to the grant period or timeframe that covers the approved start and completion dates of the project, and the number of months the project will be implemented.

Implementing Agency- the primary organization involved in the execution of a program/project which can be a public or private entity

2. Cooperating Agency/ies- refers to the agency/ies that support/s the project by participating in its implementation as collaborator, co-grantor, committed adopter of resulting technology, or potential investor in technology development or through other similar means.

3. Site/s of Implementation- location/s where the project will be conducted. Indicate the barangay, municipality, district, province, region, and country.

4. Type of Research- indicates whether the project is basic or applied.
Basic research- is an experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular or specific application or use in view.
Applied research- is an investigation undertaken in order to utilize data/information gathered from fundamental/basic researches or to acquire new knowledge directed primarily towards a specific practical aim or objective with direct benefit to society.

5. R&D Priority Area and Program- based on the Harmonized National R&D Agenda 2017-2022, indicates which R&D agenda the project can be categorized in: Agriculture, Aquaculture and Natural Resources; Health; Industry, Energy, and Emerging Technology; Disaster Risk Reduction and Climate Change Adaptation; and Basic Research. Indicate also the specific Commodity/Sector, whether crops, livestock, forestry, agricultural resources or socio-economics; fisheries or aquatic resources; biotechnical, pharmaceutical, or health services; biotechnology, information technology, material science, photonics or space technology; industry, energy, utilities or infrastructure.

Sustainable Development Goal (SDG) Addressed- indicates which among the 17 SDGs adopted by the United Nations Members States are addressed by the project

6. Executive Summary- briefly discusses what the whole proposal is about

7. Introduction- a formally written declaration of the project and its idea and context to explain the goals and objectives to be reached and other relevant information that explains the need for the project and aims to describe the amount of work planned for implementation; refers to a simple explanation or depiction of the project that can be used as communication material.

7.1. Rationale- brief analysis of the problems identified related to the project
Significance- refers to the alignment to national S&T priorities, strategic relevance to national development and sensitivity to Philippine political context, culture, tradition and gender and development.

7.2. Scientific Basis- other scientific findings, conclusions or assumptions used as justification for the research
Theoretical Framework- the structure that summarizes concepts and theories that serve as basis for the data analysis and interpretation of the research data.

7.3. Objectives- statements of the general and specific purposes to address the problem areas of the project.

8. Review of Literature- refers to the following: (a) related researches that have been conducted, state-of-the-art or current technologies from which the project will take off; (b) scientific/technical merit; (c) results of related research conducted by the same Project Leader, if any; (d) Prior Art Search, and; (e) other relevant materials.

9. Methodology- discusses the following: (a) variables or parameters to be measured and evaluated or analyzed; (b) treatments to be used and their layout; (c) experimental procedures and design; (d) statistical analysis; (e) evaluation method and observations to be made, strategies for implementation (Conceptual/Analytical framework).

10. Technology Roadmap (if applicable)**-** a visual document that communicates the plan for technology. It is a flexible planning technique to support strategic and long-range planning by matching short- and long-term goals to specific technology solutions.

11. Expected Outputs (6Ps)- deliverables of the project based on the 6Ps metrics (Publication, Patent/Intellectual Property, Product, People Service, Place and Partnership, and Policy).

Publication- published aspect of the research, or the whole of it, in a scientific journal or conference proceeding for peer review, or in a popular form.
Patent/Intellectual Property- proprietary invention or scientific process for potential future profit.
Product- invention with a potential for commercialization.
People Service- people or groups of people, who receive technical knowledge and training.
Place and Partnership- linkage forged because of the study.
Policy- science-based policy crafted and adopted by the government or academe as a result of the study.

12. Potential Outcomes- refer to the result that the proponent hopes to deliver three (3) years after the successful completion of the project.

13. Potential Impacts

Social Impact- refers to the effect or influence of the project to the reinforcement of social ties and building of local communities.
Economic Impact- refers to the effect or influence of the project to the commercialization of its products and services, improvement of the competitiveness of the private sector, and local, regional, and national economic development.

14. Target Beneficiaries- refers to groups/persons who will be positively affected by the conduct of the project.

15. Sustainability plan- refers to the continuity of the project or how it shall be operated amidst financial, social, and environmental risks.

16. Gender and Development (GAD) Score- refers to the result of accomplishing GAD checklists (for project monitoring and evaluation/project management and implementation) to highlight the contribution of the project in the achievement of the objectives of Republic Act 7192, “Women in Development and Nation Building Act,” interpreted as gender-responsive, gender-sensitive, has promising GAD concepts, or GAD is invisible.

17. Limitations of the Project- refer to restrictions or constraints in the conduct of the project.

18. Risk- refers to an uncertain event or condition that its occurrence has a negative effect on the project.
Assumption- refers to an event or circumstance that its occurrence will lead to the success of the project.

19. Literature Cited- an alphabetical list of reference materials (books, journals and others) reviewed. Use standard system for citation.

20. Personnel Requirement- details on the position of personnel to be involved in the project, percent time devoted to the project, and responsibilities.

21. Budget By Implementing Agency- personnel services (PS), maintenance and other operating expenses (MOOE), and equipment outlay (EO) requirement of the project by implementing agency for Year 1 and for the whole duration of the project. Please refer to the DOST-GIA Guidelines for the details (Section IX.B of DOST Administrative Order (A.O.) 011, s. 2020).

a. **PS**- total requirement for wages, salaries, honoraria, additional hire and other personnel benefits.

b. **MOOE**- total requirement for supplies and materials, travel expenses, communication, and other services.

c. **EO**- total requirement for facilities and equipment needed by the Program.

22. Other Ongoing Projects Being Handled By the Project Leader- list of ongoing projects being handled by the Project Leader funded by the DOST-GIA Program and other sources, and the accompanying responsibilities relevant to the project.

23. Other supporting documents required- as stated in Section VII of DOST A.O. No. 011, Series of 2020 – Revised Guidelines for the Grants-in-Aid Program:

a. Detailed breakdown of the required fund assistance to indicate the counterpart of the proponent and other fund sources including letter/s of commitment from the implementing, collaborating and coordinating agency/entity/ies;[1]
b. A counterpart fund, in kind and/or in cash, shall be required from the implementing agency/entity as one of the application requirements. All projects must have a minimum of 15% counterpart contribution except for projects involving public good;[1]
c. Curriculum Vitae or Personal Data Sheet (PDS) of Project Leader and other co-researchers/implementers. The service record may be requested if needed;[1]
d. Clearance from the DOST or the Funding Agency (e.g., DOST Councils) on previously funded completed projects handled by the Project Leader;[1]
e. Approval from the institution's ethics review board for research involving human subjects or in the case of animal subjects, approval from the Bureau of Animal Industry (BAI) (for PCAARRD- and PCHRD-monitored projects);
f. Clearance from the DOST Biosafety Committee (DOST-BC) shall be required for research proposals involving the use of GMOs under contained use (i.e., experiments done in laboratories, screen house, green house). For projects other than contained use, they shall be referred to the appropriate agency. The DOST Sectoral Councils, after determination as to whether or not the proposal has biosafety implications, shall endorse the same to the DOST-BC in accordance with the prescribed format under Annex 3 of the Philippine Biosafety Guidelines for Contained Use of Genetically Modified Organisms (series of 2014) (if applicable); and
g. For the private non-profit/non-government/people's organizations and startups:
    i. Up-to-date Securities and Exchange Commission (SEC) registration, or Department of Trade and Industry (DTI) registration, or Cooperative Development Authority (CDA) registration certificate, or other authenticated copy of latest Articles of Cooperation and other related legal documents;
    ii. Co-signers Statement (if applicable);
    iii. Copy of latest Income Tax Return;
    iv. Mayor's permit where the business is located;
    v. Audited Financial Statements for the past three (3) years preceding the date of project implementation or in case of those with operation of less than 3 years, for the years in operation and proof of previous implementation of similar projects (or in the case of startups, at least for one (1) year);
    vi. Document showing that NGO/PO has equity to 20 percent of the total project cost, which shall be in the form of labor, land for the project site, facilities, equipment and the like, to be used in the project;
    vii. Disclosure of other related business, if any;
    viii. List and/or photographs of similar projects previously completed, if any, indicating the source of funds for implementation;
    ix. Sworn affidavit of secretary of the NGO/PO that none of its incorporators, organizers, directors or officers is an agent of or related by consanguinity or affinity up to the fourth civil degree to the official of the agency authorized to process and/or approved the proposed MOA, and release of funds;
h. For CSOs, compliance to regulations as required by the General Appropriations Act (GAA) pertaining to fund transfers to Civil Society Organizations (CSOs); and
i. For foundations, DOST certification as accredited by the Science and Technology Foundation Unit

[1] *required of all proposals*

III. Criteria for Evaluation:

A. **Criteria for Evaluating Proposals**

Criterion	Definition
Relevance or Significance	Aligned to national S&T priorities, strategic relevance to national development and sensitivity to Philippine political context, culture, tradition and gender and development
Technical / Scientific Merit	Sound scientific basis to generate new knowledge or apply existing knowledge in an innovative manner
Budget Appropriateness	The proposed budget is commensurate to the proposed work plan and deliverables.
Competence of Proponent	Proponent's expertise is relevant to the proposal and with proven competence to implement, manage and complete R&D programs/projects within the approved duration and budget.

B. **Governing Council / Board and EXECOM's Evaluation Criteria**

Criteria	Indicators	Raw Score
A. Soundness of Proposal (20%)	R&D addresses relevant sectoral need (applicable to pressing concern)	5
	Solution provided is most effective (compared to other proposed solutions)	5
	Proposed budget is reasonable (project is not expensive vis-a-vis output)	5
	Work plan is doable in a given timeframe	5
B. Suitability of Output (30%)	R&D output is cost-effective (cost is competitive in relation to new or existing products or process)	5
	Has identified partners to adopt the technology (with letter of support from the head of the company)	5
	Output can be commercialized (through an existing manufacturer, spin-off or start-up company)	5
	R&D utilization is timely (output should not be overtaken by other solutions)	5
C. Significance of Outcome (30%)	Economic: increase in productivity, increase in income, new jobs generated, high return of investment (ROI)	5
	Social: working partnerships established, training opportunities provided, policies adopted, increased access to basic services (i.e., food, health, education); political, cultural, gender sensitivity and inclusivity	5
	Environment: enhanced environmental health standards, no adverse effect to the environment	5
	Sustainability: sustainability mechanisms established in terms of institutional, financial and human resources capability (submission of a new proposal to sustain a completed or ongoing proposal does not constitute sustainability of the project)	5
D. Competence of Proponent (20%)	Proponent's expertise aligned with the proposal	5
	Collaboration with relevant agencies and/or industry partners	5
	Thorough understanding of the proposal's deliverables	5
	DOST has good experience with the proponent	5

C. **Additional Criteria on Gender and Development (GAD)**