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Distributing STEM Excellence: Establishing SUC STEM Centers for Professional Development

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Visual Mapping of Science Teachers Participation of BU-RCSMED PD program per province in Bicol Region. This visualization was created by Datawrapper

Quality of education is one of the biggest challenges in the Philippines, as reflected in students' low performance in large-scale international assessments. A recent report by the Second Congressional Commission on Education (EDCOM II) strategically suggests that consistent Teacher Professional Development (TPD) is the key to improving teacher quality, which will directly translate into learners' STEM literacy. Only a few TPD programs in provincial institutions focus on science and mathematics content, and those that do are distant from the training center, creating a hindrance.

Findings further show that attending STEM-focused TPD strongly capacitates teachers in both content and pedagogy. However, nearby teachers from the training center benefited greatly and enjoyed the STEM TPD, while the majority of teachers from distant school divisions that require long travel, such as island cities and provinces, missed the opportunity to attend.

This policy brief therefore recommends that provincial state universities and colleges establish STEM hubs for professional development as part of decentralizing STEM centers. This includes mentoring and coaching with a large university in the region, partnerships with national institutions, connections with international organizations, the private sector, and LGUs, and strong partnerships with DepEd and CHED for sustainability through SUC autonomy post-initial support, fostering a national network of STEM hubs.

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Introduction

EDCOM II reported that Philippine education is in crisis and requires immediate reform of the curriculum and its implementation. Leveraging the Philippine education system is essential to address persistent challenges such as poor learning outcomes, as reflected in the PISA 2016 and 2018 results; skills mismatches with industry needs; and fragmented agency coordination, while driving economic growth and human capital development. Reforms to curriculum revision and implementation, such as the K to 12 Curriculum and the Enhanced Basic Education Act of 2013 (RA 10533), aim to expand access and quality, but systemic issues like inadequate infrastructure, learning materials, and teacher training demand further investment and support systems.

According to Second Congressional Commission on Education (2024) and Chi (2024), 62% of Filipino teachers are teaching outside their specialization which is a misalignment to their bachelor's degree. This specialization is being offered by Teacher Education Institutions (TEIs) which are not align to the needs of basic education. An example of this is the CHED Memorandum Order (CMO) number 74 series of 2017 that imposed the guidelines in offering Bachelor of Elementary Education. The current BEED program is leading to a generalist elementary teachers and not suitable for intermediate grades (Grade 4-6) because major subjects are not intended for content mastery but to teach pedagogy. This scenario is also reflected to the result of Licensure Examination for Teachers (LET) where 56% of the TEI nationwide performed below-average passing rates in the examination since 2010 as reported by Bautista (2023). LET Elementary level results are declining from 2014 to present while the secondary level sustains steady improvement. However, despite of secondary level improvement in LET, both takers still performed below passing rates.

This report on the mismatch of in-service teachers has been proved and verified by Mejia et al. (2025) with high proportion of mismatched teachers which is an indicator of poor planning and resource allocation of the educational system. Mejia et al., 2025 also suggested that in-service teachers may require attending professional development and additional preparation in order to teach outside their field effectively. Some of STEM teachers both from public and science public schools are using emerging technologies (ET) to make their science lessons more meaningful. Yet using of ET becomes challenging because of the lack of equipment, training, integration time, and lack of resources (Ongsotto, 2025).

Teacher Professional Development (TPD) and in-service training (INSET) improve the capacity of teachers if implemented institutionally. Rivera et al. (2025) support the revitalization of TPD and INSET by increasing funding, integrating digital learning tools, and institutionalizing training

frameworks. Through strengthening the TPD and INSET it will develop the community of practices (CoP) of teachers in terms of coaching and mentoring, which will surely produce a high-quality teaching workforce in handling the 21st-century learners that are expected to lead our country.

Aside from institutionalized school-based INSET, a Professional Development (PD) program offered by higher education institutions that focuses on science content is highly commended. In fact, Morales, et al. (2021) suggests that PD program can achieve teacher quality and quality STEAM education in the country may adapt micro-credentialing to fully structuralize the capacity building program in the country. The good example of this is the Science Education Institute (SEI) under Department of Science and Technology (DOST) has a project dubbed as STAR or Science Teacher Academy. Project STAR develops capacity building for science and mathematics educators intended for basic and tertiary education that focuses on different regions in the entire Philippines. STEM teaching approaches is being cascaded from the university faculties to in-service teachers in their respective localities or nearby provinces (Gayya & Valdez, 2023).

Some neighboring countries decentralize STEM teacher training through partnerships. The meriSTEM@NIA, a Singapore-based institution, helps STEM teachers in Thailand in collaboration with the Thai Ministry of Education, SEAMEO STEM-ED, and the Office of the Basic Education Commission (OBEC). The meriSTEM@NIA equips teachers through STEM research, workshops, and the design of integrated STEM lessons that focus on computational skills, engineering design thinking, and emerging technologies used in STEM teaching, such as 3D-printed models and vertical farming. In addition, Thailand has the Institute for the Promotion of Teaching Science and Technology (IPST) under the Ministry of Education, which leads STEM integration into the curriculum by equipping STEM teachers with skills and knowledge through a PD program (Suriyabutr & Williams, 2021).

Meanwhile, India's District Institutes of Education and Training (DIETs) were established in 1989 because government recognized the role of teachers in shaping the future of the next generation. As of now, more than 500 DIETs are available across the country in providing quality training for teachers and other educational personnel. DIETs is an integral part of India's education system that serve as the hub for excellence and professional development both for pre-service and in-service teachers. One of the best practices of DIETs are they work closely to schools in identifying the specific needs of students and develop teaching strategies that cater those needs (Dyer, 2005).

In the context of Bicol Region, one of the partner universities of DOST-SEI's Project STAR is Bicol University in



Legazpi City, Albay. This university has an existing STEM center that offers continuing education program for science and mathematics teachers. This is BU – Regional Center for Science and Mathematics Education Development (BU-RCSMED) established in 2016. It was created to sustain and broaden the mission of the former Regional Science Teaching Center, an initiative of the National Science Development Board (now DOST) dedicated to strengthening science and mathematics teaching and learning in the Bicol Region. The BU-RCSMED continuing education program is paramount to the framework of Philippine Development Plan (PDP) and Bicol Regional Development Plan in improving education and lifelong learning. Training offered is based from the needs of the teachers and nature of the training. This ensured that teachers learned both the content and necessary science experiments across various disciplines. The center prioritized teachers who are non-major (on specific science discipline) in basic education.

The PD program for science teachers of BU-RCSMED has been mapped per province, and the school city division in Bicol region. It provides a holistic picture of the reach of PD training for science teachers in the said region.

Key Issues

Unequal Access to STEM Professional Development. The BU-RCSMED conducted a mapping on science teachers participation on the PD program offered by the center from 2018-2024. The distribution of science teachers and their participation in the PD program offered by the center in Bicol region reveal a significant access gap. As of June 5, 2024, DepEd V has 3,348 secondary science teachers across six provinces and seven cities. However, participation in the training program of the center varies considerably among school divisions. Albay Division recorded 205 participants out of 549 science teachers, while 136 out of 422 for the nearby province of Sorsogon, island of Masbate 122 out of 481, Camarines Sur 110 out of 892, Camarines Norte 32 out of 268, and the island of Catanduanes 16 out of 165. While City Divisions like Legazpi 99 out of 99, Tabaco 91 out of 91, Ligao 37 out of 81, Iriga 13 out of 66, Masbate City 10 out of 49, Sorsogon City 54 out of 102, and Naga City 24 out of 93.

These numbers indicate that access to STEM PD is shaped not only by teachers' professional needs but also by their geographical location. Divisions near BU-RCSMED, particularly Division of Albay, City Divisions of Legazpi, and Tabaco, benefit from convenient physical access and stronger institutional coordination. In contrast, teachers from distant divisions and island areas face substantial travel time, transportation difficulties, weather-related disruptions, and additional costs. Travel from Camarines Norte to Legazpi City

may take five to six hours or even more than, while teachers from Masbate City, Masbate Province, and Catanduanes may need several land and sea transfers to attend onsite trainings. Without travel assistance, accommodation, service credits, and other forms of administrative support, participation remains difficult even when teachers recognize the value of training.

Uneven Institutional Support and Delivery Capacity. The complete participation of science teachers in Legazpi City and Tabaco City demonstrates strong institutional support of schools division. Since 2017, the LGU Tabaco City has partnered with RCSMED and SDO Tabaco City to enhance the capacity of their basic education teachers, resulting in a Content Enhancement Training for Grade 8 Science Teachers. LGU Tabaco City demonstrated a strong commitment to supporting teachers for the sake of quality education, particularly during the early years of the K to 12 Curriculum when resources were limited. SDO Legazpi City benefits from its proximity to RCSMED and coordinated support from the Schools Division facilitated the participation of off all science teachers in training across multiple STEM disciplines. In fact, SDO Legazpi City inked with BU, via RCSMED, for three years to provide teacher training for both elementary and secondary teachers in Science and Mathematics. Masbate Province likewise sustained participation through the guidance of its Science Education Program Supervisor because he's a consistent participant before becoming supervisor.

These experiences show that low participation is not simply an indicator of teacher disengagement. It often reflects an equal distribution of PD opportunities and support mechanisms. SDOs that lack a nearby training provider or sufficient resources for transportation and accommodation are less able to release teachers for centralized programs. Consequently, teachers in remote areas-including teachers assigned to STEM subjects outside their specialization – are more likely to miss opportunities to strengthen their content knowledge in science and classroom practice.

This mapping highlights quality policy realizations. The presence of STEM hub that supports the PD of science teachers is very much needed specially those non-major. PD that focuses on hands-on science experiments and science content are some of the tangible requirements in order to deliver a good science lessons. Looking from the result of mapping on the science TPD held in Bicol region, several policy recommendations were crafted:

Key Findings and Policy Recommendations

Establish Provincial STEM Centers in State Universities and Colleges (SUCs). Encourage each province with a state university to establish a STEM training center. As observed in BU-RCSMED data, distance of school divisions from the center



has been a barrier to training participation. Divisions such as Camarines Norte, Camarines Sur, Iriga City, and the island divisions of Catanduanes, Masbate City, and Province persistently show low participation due to travel costs, time, and logistics. This challenge is likely shared by other regions – specially island provinces nationwide. Local STEM centers decentralize PD, making it accessible to rural and provincial educators. Localized PD programs improves teachers’ competence in science inquiry and STEM teaching (Malusay et al., 2025) (Shahat et al., 2025) and directly addresses the critical shortage of qualified STEM teachers while supporting effective implementation of the basic education curriculum.

Foster Inter-SUC Collaboration and Mentorship. Regional and provincial SUCs with expertise in STEM Education and pure science should provide targeted capacity-building for teachers in content knowledge and pedagogical skills – addressing one of the country’s core STEM challenges. Science faculty will be guided by science educators to ensure training content directly matches the needs of DepEd Teachers and curriculum requirements. This coaching and mentoring model highlights the value of cross-institutional partnerships, builds shared standards, and promotes long term sustainability by helping new centers develop their own capacity and reduce reliance on one-time national support.

Formalize Partnership with National Agencies and Institutions. Establish a formal partnership through a Memorandum of Agreement (MOA) with UP-NISMED, the national leader in STEM PD – to provide technical assistance, Training-for-trainer programs, and guidance on developing high-quality instructional materials, integrating AI tools, and 3D-printed models, and other innovative teaching strategies. This extends NISMED’s regional reach while building local capacity. Additional partnership will be pursued with DOST SEI, and where possible, international bodies, to expand resources funding opportunities, and access to global best practices.

Secure Incentives, Funding, and Policy Alignment. CHED and DepEd should provide targeted incentive to SUCs – including infrastructure grants and faculty development support- modeled after competitive international grant mechanisms. DepEd will align all PD programs with the Philippine Professional Standard for Teachers (PPST) and recognized completed training towards PD hours required for Expanded Career Progression (ECP) system, creating strong motivation for teacher participation. This initiative may also secure funding from DOST SEI, international agencies like USAID, and private sector partners such as UNILAB, diversifying support and strengthening long-term sustainability.

Implementation Timeline

Phase	Time-Frame (month)	Key Activities
Pilot Phase	1-12	Select 2-3 provincial SUCs with strong STEM potential; conduct capacity assessment; design center structure; sign MOAs with UP-NISMED and DepEd; develop core training modules; establish M&E baseline; launch initial Training-of-trainers program.
Scale-up Phase	13-24	Expand to 4-5 additional SUCs; roll out full teacher PD programs; formalize inter-SUC mentorship networks; integrate AI and 3D printing resources; secure multi-year funding agreements; begin comparative effectiveness reporting.
Institutionalization Phase	25-36	Establish permanent STEM Center program with CHED/DepEd systems; standardized curriculum, M&E tools, and funding formulas; achieve national coverage; transition to sustainable mixed funding; publish annual national STEM center.

Success Metrics

Category	Indicators
Reach & Participation	Number of teachers trained annually (target: ≥ 200 per center/year) Training participation rate (target: $\geq 85\%$ of eligible teachers in service area) Reduction in distance-related non-participation (target: $\geq 50\%$ reduction within 1 year)
Teacher Competency	Pre-and post-test improvement in content knowledge and pedagogy (target: $\geq 20\%$ average gain) Percentage of teachers applying inquiry-based/ STEM approaches in classrooms (target: $\geq 80\%$) PPST-aligned competency ratings before and after training

Student Outcomes	Improvement in regional/provincial NAT/STEM subject scores Increase in students participating in science fairs and STEM competitions Changes in student interest and enrolment in STEM tracks
Institutional Health & Sustainability	Number of trained master trainers sustained at the center (target: ≥ 10) Number of active partnerships maintained Percentage of operating costs covered by non-grant sources by Year 3 (target: $\geq 20\%$) Annual center retention and renewal rate

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Declaration

Grammarly was used in enhancing the grammar of the policy brief, but the entire writeup was formulated by authors.

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The Philippine Normal University through the EPRDO aims to be an innovation hub of teacher education research and educational policy studies.

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To strengthen the culture of excellence in teacher education research and educational policy studies.

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The EPRDO shall manage the University's research production, enhance human resource capabilities, and share expertise to other Teacher Education Institutions (TEIs) in the area of teacher education research

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1. Establish and maintain a web-based university research portal that facilitates automated research management systems, and which also serves as the database of teacher education policies and teacher education research in the country and Southeast Asia.
2. Share research expertise and competence in teacher education research with other TEIs throughout the country;
3. Develop and disseminate the University research agenda
4. Design and implement the research capability program for faculty and staff;
5. Manage University's research production particularly the conduct of educational policy studies in education and teacher education; and
6. Serve as the implementing arm for research incentives and research ethics review.

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