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Short Paper

Opportunities for K to 12 Science Education in the New Normal in Bicol, Philippines

Al B. Besmonte
Bicol University Regional Center for Science & Mathematics Education Development, Philippines
al.besmonte@bicol-u.edu.ph
(corresponding author)

Joan B. Sionicio
Bicol University Regional Center for Science & Mathematics Education Development, Philippines
jbsionicio@bicol-u.edu.ph

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Abstract

The objectives of this research were to recognize the different opportunities in teaching K to 12 Science in the new normal along: content, learning modalities, and assessment. This study employed descriptive research design utilizing survey method. Respondents were 217 secondary Science teachers in the different provinces in Bicol Region. Data were collected with the aid of questionnaires. The qualitative data was analyzed and examined to provide a holistic picture of the experiences, challenges and opportunities obtained from the questionnaire. Findings showed that science teachers in Bicol Region, Philippines during the pandemic have found opportunities to improve their (1) content mastery through participation in seminars and professional networks, (2) designing effective teaching strategies that hone their creativity and inventiveness in learning modalities, and (3) venturing into innovation has allowed them to create assessment tools that reduce dishonesty and strengthen honest reflection of assessment results. The study concluded that the curriculum was unsuitable and that the Department was unprepared to implement distant learning, yet teachers earned opportunities for personal and professional growth as a result of their resilience, innovativeness, and resourcefulness.

Keywords – COVID-19, science teaching, learning modalities, K to 12 curriculum, opportunity

INTRODUCTION

One of the main thrusts of Bicol University-Regional Center for Science and Mathematics Education Development (RCSMED) is to provide continuing education programs to upgrade the professional knowledge, skills, practice and attributes of science and mathematics educators in the region. This was the same mandate of the then Bicol University Regional Science Teaching Center (now RCSMED) designed to update and upgrade the knowledge and skills of Science and Mathematics Teachers.

These programs are in support to Sec. 5.4 of 1987 Philippine Constitution which aims to enhance the right of teachers to professional advancement, Section 7 of RA 10533 (2013) or the K to 12 Law also which states, "to ensure that the enhanced basic education program meets the demand for quality teachers and school leaders, the DepEd and the CHED, in collaboration with relevant partners in government, academe, industry, and nongovernmental organizations, shall conduct teacher education and training programs such as in-service training on content and pedagogy where current DepEd teachers shall be retrained to meet the content and performance standards of the new K to 12 Curriculum," and BU Comprehensive Plan which cites that the general direction of BU's development is supportive to regional development.

With the implementation of the K to 12 in basic education, the center conducted professional development trainings specifically on content and pedagogy from 2017 to 2019. In 2020, the trainings shifted from face to face to online webinars and were only limited in scope and content due to several constraints in terms of mode of delivery and access to adhere to the health protocols set by IATF in the region. With the early closure of school in mid-March in 2020, the wide implementation of community quarantine in the country, the DepEd along with the administrators, learners and teachers were faced with issues and concerns on teaching and learning. The use of different teaching and learning modalities such as modules, television, radio, online and combination thereof along with home schooling and online learning received various feedbacks, both from the students, parents and teachers this school year. Moreover, issues on readiness and access to technology were also presented. However, the trainings conducted by RCSMED specifically for content were focused to one division, Legazpi City, through the Teacher Assistance Program. Such trainings which were only focused on three (3) topics in Mathematics were based on the needs previously identified by the teachers in the DepEd Legazpi City Division before the pandemic except for the two (2) webinars on pedagogy in June which were based on the perceived needs of teachers for flexible learning. Only one training for science specifically in Chemistry which was offered to the whole region was conducted but only served 40 participants.

The present scenario in the basic education in the new normal is very challenging especially for Science and Mathematics educators and learners. DepEd Secretary Briones mentioned that with the new learning modalities in the new normal, there is a need for teachers to be trained. With this, this center, hopes to explore on the teachers' experiences, challenges encountered and opportunities available along science and mathematics education in the K to 12 during this pandemic for the development of responsive development programs which will benefit not only the science and mathematics educators but also the learners and the community in general.

The output of this study will be useful to RCSMED in re-designing and enhancing teacher training programs in science and mathematics education in the K to 12 to widen its reach and scope of its delivery of service to the region. It shall likewise support Bicol University's Comprehensive Development Plan through endeavors pursuing continuing professional education and intensive training programs at the post-baccalaureate degree level in response to demands for competency enhancement from specific sectors of the community.

The goal of this study is to recognize the different opportunities in teaching K to 12 Science in the New Normal along the Content, Learning modalities, and Assessment

LITERATURE REVIEW

With the advent of the COVID-19 pandemic worldwide, all sectors of the community including education have been greatly affected. According to UNESCO Institute for Statistics, the pandemic has led to the closure of schools in the different countries affecting 1.5 billion of students and 63 million primary and secondary teachers worldwide. This phenomenon is a reminder that there is a need for educational transformation considering the impossibility of face-to-face interactions in classrooms.

Paul Reville, former Secretary of Education for Massachusetts, stated that school closures due to the pandemic have turned a spotlight on inequities and other shortcomings in education. He highlighted the existence of financial and resource disparities between districts, schools and individual students and that disadvantaged students suffer the consequences of the gaps in learning opportunities more than the affluent children who have lots of opportunities to fill in the gaps. However, he also expressed optimism that this pandemic will bring out innovations not only in instruction but array of opportunities for learning and support and in redesigning better systems of education and child development (Mineo, 2020).

Saavedra (2020) mentioned that a lot can be done to at least reduce the impact of the pandemic through remote learning strategies. According to him, richer countries are better prepared to move to online learning strategies although with a lot of efforts and

challenges for teachers and parents. In middle income and poorer countries, the situation is very mixed, the vast inequality of opportunities as many children do not have desk, books, internet connectivity, a laptop at home, or supportive parents. He presented several delivery modes to make learning possible amidst pandemic. The use of online, according to him, will assure that lesson plans, videos, tutorial and other resources are available for some students and probably most teachers. Radio and televisions are also powerful tools that can communicate effectively with parents and teachers and provide guidelines, instructions and structure to the learning process, using contents delivered by radio and television.

In the Philippines, DepEd Undersecretary San Antonio presented 3 platforms in SulongEduKALIDAD to make learning possible in the new normal. Such platforms include distance learning using modular and online modalities. The modular can be in the form of printed or digital materials and online includes either synchronous or asynchronous. The other platforms include educational radio and TV-based instructions and Homeschooling.

President Duterte, in one of his press briefings, expressed his doubt on the readiness of the country for the distance learning (Bernardo, 2020). Meanwhile, the DepEd, through its Secretary Briones, maintained that education must continue and that lack of access of technology should not be a problem as schools will be providing printed modules for students. She further mentioned that existing learning modalities such as distant (blended learning, online learning, education through television and radio) are not really new since these have been available for the longest time (Hernando-Malipot, 2020).

However, parents and students started to criticize the DepEd's decision on the opening of classes on August 24, 2020 and its plans of implementing different platforms for learning. The criticisms include issues on finances as households have been affected by quarantine policies, parent's capability to supervise their children's learning at home, teachers' readiness and availability of resources both for teachers and students. Some questioned the soundness of the policy as some households do not even have access to internet or computers. This is further supported by the teachers' group claiming that a shift to distance learning will further disadvantage poor students (Magsambol, 2020).

Several researches were conducted looking into the implications of distance learning. One study reported that there were numerous adjustments done by teachers to cope with the challenges of remote teaching and articulated their concerns about student learnings. They also mentioned that teachers who had no prior experiences with remote teaching were less confident about instructional goals and student outcomes (Moser et al., 2021).

Along with the issues arising from the DepEd's plans, opportunities were also presented by several authorities. Briones mentioned that with the new learning modalities to be rolled out, there is a need for teachers to be trained, thus increasing teachers' digital skills. According to the DepEd Order No. 12 (2020), many improvements,

initiatives and investments that school system will have to make might have a positive lost lasting effect in the field of education. For instance, Doucet et al. (2020) mentioned one positive aspect of distance learning to educators which is deepening understanding and collaborations through discussion with peers and that educators were able to explore on the different platforms such as videoconferencing like Google Meet, Zoom and others. These allowed teachers to develop their creativity and to actively collaborate with one another to address their concerns in distance learning, specifically, online learning.

Numerous researches reveal positive impact of professional development programs for teachers not only on their professional growth but also on the part of the learners. A report from OECD (2009, p. 49) underscored the importance of professional development programs for teachers. The insufficiency of pre-service training for teacher preparation was emphasized highlighting the need for opportunities for in-service professional development for quality teaching and quality workforce. OECD (2005) also enumerated the kind of professional development programs which are effective as on-going, includes training, practice and feedback, provides adequate time and follow-up support, and involves teachers in learning activities which are similar to what they give to their students.

In the Philippines, DepEd authorities, San Antonio, et al (2009) examined the impact of implementing module-based professional development for teachers (MBPDT) in the Philippines. The investigation revealed that the group who were given the opportunity using the module-based professional development had greater professional content knowledge compared to those who were not given the same opportunity after five weeks of implementation. Results of the study suggested that a larger scale implementation of MBPDT may be undertaken as a cost-effective option for teachers' professional development.

In 2002, Bicol University Regional Science Teaching Center (now RCSMED) conducted a study the perceived effects of in-service teacher training programs on the development of science and mathematics concepts, skills and values at the elementary and secondary levels, specifically the Bicol Region experience in collaboration with the UP NISMED and DOST SEI. Based on the findings, the science and mathematics teachers with training exhibited a higher level of competence in teaching the subject, conceptual understanding, laboratory skills, thinking skills and reasoning patterns and values development and that in-service trainings of teachers had positive impact on students' competence in terms of laboratory skills, thinking skills and values developed but not in terms of conceptual understanding.

Taking into consideration the different factors that might affect teaching and learning in the new normal, this study is anchored on the different domains of teacher practices as mentioned in the Philippine Professional Standards for Teachers such as:

Domain 1: Content Knowledge and Pedagogy, Domain 4: Curriculum and Planning and Domain 5: Assessment and Reporting.

METHODOLOGY

Method

This study employed descriptive research design utilizing survey method. Data were collected with the aid of questionnaires. The teachers' opportunities in teaching Science in the K to 12 curricula during the pandemic period extracted from their responses in the questionnaire.

Data Collection

Permission to conduct the study in DepEd Region V was sought from the DepEd Regional Director as assisted by the science education supervisor. The questionnaires were sent to the High School Science teachers with the supervision of school's division science education supervisors through email and messenger through google forms as well as the consent form from the respondents. Online interview to random science teachers in the region who express willingness to be interviewed was conducted for the triangulation of data.

Data Analysis

In answering the problems of the study, the data obtained from the responses in the questionnaire were tallied, classified and treated using descriptive statistics. The qualitative data was analyzed and examined to provide a holistic picture of the experiences, challenges and opportunities obtained from the questionnaire. The information which was obtained from the interviews were also analyzed qualitatively. These qualitative data were coded to reduce them into smaller groupings so that they are more manageable. In coding, the following steps were considered (Miles & Huberman, 1994):

a. Give codes to the notes drawn from questionnaire and interviews;
b. Note personal reflections and other comments on margins;
c. Sort and sift through the materials to identify similar phrases, relationships between variables, patterns, and commonalities among responses;
d. Identify patterns and processes, commonalities and differences and take them out to the field in the next round of data collection through interview;
e. Begin elaborating a small set of generalization that cover the consistencies discovered;
f. Examine generalizations in the light of a formalized body of knowledge in the form of constructs and theories.

Data Gathering Instrumentation

The instrument used in gathering the data was developed by RCSMED team and undergo intense validation as validated by research-faculty from different state universities in Bicol Region and DepEd curriculum supervisors. The questionnaire was composed of personal background, educational background, teaching experience, helpful seminars attended for flexible learning, experiences, problems encountered, and opportunities on the modality and assessment used in science teaching.

Respondents

Respondents were the secondary Science teachers in the different provinces in Bicol Region. 29 for Albay, 21 for Camarines Sur, 33 for Catanduanes, 20 for Masbate Province, 25 for Sorsogon Province, 6 for Iriga City, 4 for Legazpi City, 62 for Tabaco City, 16 for Sorsogon City and 1 for Masbate City. The sampling includes those who were teaching in small, medium and large schools in the different Divisions in the region regardless of how long they are in the teaching profession and those who are assigned in rural and urban areas. Added consideration in the choice of participants were the teacher's specialization, since all areas such as Biology, Chemistry, Physics, General Science and Earth Science must be represented. However, the choice of respondents will also depend on their willingness to participate in the study.

RESULTS

The operation of schools during the pandemic era with the Covid-19 virus still on the rise posed a challenge and opportunity for science teachers due to the new normal in teaching. The current system of regular education offers science teachers unorthodox ways to mobilize instruction. The important conclusions drawn from the accounts and responses of science teachers in the Bicol region are discussed below.

Opportunities in Teaching K to 12 Science in the New Normal

The global Covid-19 pandemic has had a significant impact on the educational sector, particularly in it should respond to the unprecedented upheaval brought on by these terrible circumstances. Nevertheless, despite the challenges of what was for many a rapid and chaotic shift to a location much outside of their comfort zone, a number of opportunities among science teachers have been revealed. Gleaned from the responses of the science teachers in the new normal, opportunities were determined by the succeeding discussions on content, learning modalities, and assessment.

Content

Although technological advancement in education was always going to occur, the pandemic sped up the process, forcing acceptance of this requirement and adaption to digital hurdles on a timeframe that was far faster than it would have otherwise been. Despite allegations that science teachers perceived limited use of technology as a barrier, this provided an opportunity for them to use, master, or at the very least become acquainted with the platform. Virtual teaching and learning has demanded a new level of focus and effort from teachers and students who are compelled to complete their studies in a distant setting, as well as a new level of technological adoption from teachers in ways they may have never encountered before. Table 1 shows the summary of the opportunities gleaned by the science teachers in the new normal.

Table 1. Opportunities in the new normal for teaching content

Codes	Categories/Themes
Webinars	Content mastery
Strengthening mastery	
Peer mentoring	
Video lesson development	Material innovation
Use of ICT	
Contextualization	
Supplies	

Science teachers responded by saying they were "*forced to prepare video-based lessons*," while others were asked to "*use ICT*" in organizing and mobilizing instruction. Despite the conclusion that science teachers use technology infrequently, the answer is a manifestation of positive feedback regarded as an opportunity for teachers to develop materials upon further refining of digital skills. Although it is advised that teachers learn 21st century skills such as digital media, screencasting, video conferencing, and digital awareness (Kharbach, 2022), certain findings show neglect in teachers' usage of technology through the lens of TPACK (Koehler & Mishra, 2005) which is parallel to the findings of the present study. Other codes demonstrated that the content challenge resulted in the possibility to innovate materials through supply contextualization. Whether the content is digital or in print, the supplies from educational reformers refined the ability of science teachers to draft their own learning resources based on the students' context to impact learning results. This shows that, despite the difficulty in the processing of erroneous materials, science teachers were able to create a chance to develop and master the skill of material creation in order to solve content learning gaps of the materials for the students.

Learning Modalities

Three major themes emerged in the code of teachers' responses on the opportunities gained during the new normal. These include (1) paradigm shift, (2) professional development, and (3) instructional support.

A teacher response mentioned the "*need to be considerate with students' differences and be flexible with instruction*" while others responded the need to draft learning materials based on the "*needs of the students (context)*". These accounts have a strong foundation to claim that the pandemic has brought paradigm shift to science teachers particularly on change in instruction, adaptability, and resourcefulness. While challenges posed the struggles experienced by the teachers in the mobilization of learning modalities, their resilience to the faced challenges has impact in the way they teach to bring out the best among the learners. Accommodation of experienced challenges has created opportunity for them to re-calibrate and become more flexible, creative, imaginative, and resourceful to sustain their stamina in teaching in the new normal. Table 2 shows the summary of codes and the corresponding themes.

Table 2. Opportunities in the new normal for teaching learning modalities

Codes	Categories/Themes
Flexibility in teaching Creativity and innovation Resourcefulness	Paradigm shift
Trainings/Seminars Situational LAC ICT Knowledge	Professional development
Allowance Community involvement	Instructional support

Although prior accounts suggested a paucity of technology usage, comments from science teachers on the opportunities for learning modalities highlighted ICT literacy as an acquired knowledge. "We had a training to up-skill our ICT skill," for example, would suggest a lack of mainstreaming of the learned skill in the distance learning modality. In other words, the ICT expertise gained was not applied in the real world. This is further confirmed by the fact that a poor internet connection and a lack of gadgets restrict the optimal use of technology to improve instruction. Nonetheless, science teachers identified an opportunity for ICT knowledge development based on trainings that was not realized in the sphere of implementation. In addition to the accounts on the conduct of LAC sessions, participation at seminars/training programs has instilled the competence of proper implementation of various learning modalities. "LAC sessions to advise teachers

on the best techniques to be employed by sharing of practices," according to a sample response, indicates that job shadowing has been an opportunity for most science teachers to assist and be assisted by more knowledgeable others. Though seminars and LAC sessions were held prior to the pandemic, the study of pedagogy specifically for distance learning was a new subject for those professional networking platforms. Because of the simplicity and assistance provided by such educational platforms, science teachers have been able to cope with the difficulties and establish class management situational abilities in the midst of the new normal. Indeed, this had aided science teachers in developing a "planning and decision scheme," as seen by a teacher response and other related synonyms that embrace the best practices of their colleagues throughout the sharing sessions. LAC session and other professional networks has been long proven to be an effective learning avenue from the sharing of expertise and practices from peers and knowledgeable others (Delsa et al., 2013).

Assessment

Previous discussions have revealed that academic dishonesty exists, which is one of the key issues faced by science teachers during assessment. This has been demonstrated by educational reformers prior to the deployment of distance learning modalities. Despite the fact that the issue of the reliability of assessment results in science has continued, teachers were able to use the opportunity to build self-initiated solutions to address academic dishonesty in the field. Table 3 summarizes the list of codes and the corresponding themes.

Table 3. Opportunities in the new normal for assessment

Codes	Categories/Themes
Various strategies Online tools know-how Authentic assessment	Multi-assessment methods
Testing credibility Innovation Considerate	Filling learning gaps

During the implementation of the new normal, science teachers used multi-assessment methodologies to guarantee that students were given opportunities to feel free while combining their best learning styles and minimizing the likelihood of cheating. In response to the idea of employing several assessment methods, a science teacher stated that "*using their learning strengths will reduce the risks of cheating.*" While other teachers use authentic assessment methodologies and online resources, the goal of their use is to consolidate the raw and honest reflection of students' learning quality in science throughout the duration of the new normal. This simply confirms that science teachers are developing methods to best assess learning outcomes and maximize their ability in creating assessment instruments to capture the best picture of learning quality. These

opportunities were initially gained by scientific teachers from emerging challenges in assessing learning outcomes, which is an example of creativity and perseverance to setbacks. Multiple assessment strategies have been long proposed to ensure that inclusivity of assessment instruction to all students based on the nature on how they learn through triangulation of performance and product-based assessment strategies (Chopra, 2022).

DISCUSSION

Content

Teachers should be pedagogy and content masters, according to UNESCO (n.d.). Even though the pandemic and new normal had posed serious challenges in the content of the material and of the topic, it had provided opportunities for science teachers to have ample time to master the content of the material through webinar participation, peer tutoring, and strengthening of their mastery of the subject. This is a solid foundation that indicates the science teachers' time availability to revisit their knowledge and receive up-to-date information about science that they may utilize in designing their own coursework. "*I attended seminars to strengthen my expertise of other science subjects so that I may freely build my own context-based module for students,*" says one sample response, indicating that science teachers used the knowledge gained from sponsoring organizations to meet their issues in the field. Literature has long known that teachers' content mastery affects student accomplishment (Bold et al., 2017), but earlier responses revealed that one of the challenges faced by science teachers is students' inadequate mastery, despite teachers' substantial training for content mastery. This discrepancy between study findings and literature accounts should be thoroughly studied in order to identify the mediating element that impedes student understanding of the topic despite teachers' content mastery of the material.

The challenges given by the new normal on content have clear ramifications, since it has provided opportunities for science teachers to improve their content knowledge, which may then be used for material innovation to fill gaps in the area.

Learning Modalities

Collaboration has been formed to channel learning resources, particularly on a modular approach, in order to successfully deploy distance learning modalities and decrease the burden of the new educational scheme on teachers. This was demonstrated in the code of response, which demonstrated community involvement as a great educational support to teachers and students. The same approach was done in other countries utilizing the potential of the community and cellphone to reinforce the learning modalities (Leung *et al.*, 2021). Teachers were also given load allowances, particularly on digital learning platforms, to communicate with students in remote areas utilizing basic communication applications such as social networking

platforms. The introduction of community relations and load allowance has created numerous opportunities for teachers to broadcast updates on students' education and important school-related information. This merely demonstrates that, with full support from authorities and the community, the school may create an enabling force to expand the distant learning modality.

In general, the opportunities for science teachers have always arisen from the problems of exhibiting interest in teaching and experimenting with new techniques and schemes that have a long-term impact on learning modalities. Teachers have employed paradigm shifts, professional development, and received instructional support to successfully implement distance learning modalities throughout this uncertain time.

Assessment

There are also opportunities to fill learning gaps caused by assessment problems. The prevalent pragmatic responses from science teachers highlighting the need to reduce the gaps in distance learning modalities were testing credibility, inventiveness, and consideration. A teacher highlighted "*created testing approaches to ensure credibility of results*" in one of the comments, which hones the skill of science teachers to innovate assessment tools and materials that up-skilled the teachers in material development. There were also responses that science teachers were considerate of other students who failed to submit assessment materials on time or with poor scores, reflecting that they should be held accountable for the students' learning struggles and redesigning the assessment tool through the lens of student capacity and skills. All of these narratives imply that teachers are the sole bearers of assessment gaps, which they have transformed into an opportunity to employ their creative skills in building appropriate tools based on the needs and context of learners.

CONCLUSIONS AND RECOMMENDATIONS

Exploration of science teachers' opportunities in the new normal of COVID-19 pandemic period revealed significant reports of emerging problems that presented unusual challenges to teachers on content, modality, and assessment, indicating the department's lack of readiness in implementing the new normal and the science curriculum's unsuitability for distant learning modalities. Although challenges arose in all learning modalities, the opportunities that emerged highlighted teachers' resilience and resourcefulness in addressing identified learning gaps through situational self-initiated solutions and benchmarking from colleagues through sharing best practices.

IMPLICATIONS

This study aims to produce the following outputs: a) profile of participating teachers and schools; b) training needs of Science and Mathematics teachers in Bicol Region, c) teachers' best practices in coping the challenges in the new normal. The output of the study will also be the basis for redesigning or enhancing the professional development

programs of the Center. Through this, RCSMED may be able to offer responsive in-service training programs for science and mathematics teachers in the region to address their needs. The result of the study may also contribute significantly to human resource development specifically in the field of education and to the improvement of the service delivery of the center.

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DECLARATION

Conflict of Interest

No conflicts of interest exist between the authors that might be deemed significant to the article's content.

Informed Consent

Informed consent was obtained from all respondents involved in the study.

Ethics Approval

Approval to conduct the study was obtained.

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Author's Biography

AL B. BESMONTE is affiliated at Bicol University Regional Center for Science and Mathematics Education Development, Legazpi City. He's teaching professional education subjects and major subjects for BSEd Science. He finished his Master of Arts in Physics Education at Bicol University Graduate School in 2015, and in 2018 he finished his PhD in Educational Foundations in the same institution awarded as Best Paper and Best Poster for the study: Context-based Learning in Physics for Fishing Communities. He has a published paper entitled "*Physics Principles Gleaned from the Indigenous Fishing Practices of Fisherfolks in Santo Domingo, Albay, Philippines*"

JOAN B. SIONICIO is affiliated at Bicol University Regional Center for Science and Mathematics Education Development, Legazpi City. She finished her BSEd Mathematics in Bicol University College of Education (2001), Master of Arts in Mathematics Education (2011) at Bicol University Graduate School, and Doctor of Philosophy in Mathematics Education (2018) in the same institution where she enjoyed a three-year CBSME scholarship program of the DOST-SEI. Her publication includes Effects of Teaching through Problem Solving (TtPS) on Students' Metacognition and Academic Performance. Her expertise includes Assessment and Mathematics teaching.