

Teachers' Experiences Integrating 21st Century Skills in the Science Classrooms of Sisters of Mary Schools-Philippines in Cavite

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Abstract:- This research aimed to explore the experiences of teachers in integrating 21st Century skills in the Science classrooms of the Sisters of Mary Schools - Philippines. The respondents were selected using the purposive sampling. Science teachers of Girlstown and Boystown campuses were preferred participants. A total of 5 respondents agreed to participate in the focus group discussion. Five themes were generated answering research question 1 and 2. These themes were impulsion, undergoing, doing, emotional experience, and obstacle. On the other hand, four themes emerged for question number 3. They are training and seminars, alignment of expertise to teaching load, assessment tools, and motivational programs for students. The findings of the study were used as a basis for forwarding recommendations so that 21st Century skills integration in the classroom will be successfully implemented.

Keywords:- Teachers Experiences, 21st Century skills, and Science Classroom..

I. INTRODUCTION

A. Background of the Study

21st Century skills are a broader set of skills needed by students in order to be successful in today's changing and complex workplace (Campbell & Kresyman, 2015; Rajendra & Patil, 2020). The Assessment and Teaching of 21st Century Skills categorized these skills into ways of thinking, ways of working, tools for working, and living in the world. Specifically, these skills are creativity, innovation, critical thinking, problem-solving, decision-making, learning to learn, metacognition, communication, collaboration, information literacy, ICT literacy, citizenship, life and career skills, and personal and social responsibility (van Laar, van Deursen, van Dijk & de Haan, 2020). Integration of 21st Century skills in the classroom has been driven by concerns, questions and complaints of business institutions over the ability of schools to produce graduates who are competitive in the global market in terms of their technical and soft skills. Moreover, doubts have been raised on the assurance that students with outstanding academic achievement and degree level education can access good job opportunities (Sulaiman & Ismail, 2020). Hence, leaders in the fields of business, politics and higher learning opt for an education that focuses on providing critical and smart market skills to students so that they can be successful in the global economy, flexible in the face of problems, well

informed during decision making processes, and effective in communication skills. This kind of education emphasizes and develops 21st Century skills in different lessons by providing a link for transferring ideas from specific academic disciplines to real-life situations (Semilarski, Soobard, & Rannikmäe, 2021).

Various efforts on integrating 21st Century skills in academic disciplines gain increasing attention and implementation. For one, inclusion of instructions for 21st Century skills were located in lesson plan design and preparation with scientific ways of determining whether low or high level of skill acquisition is being targeted (Stehle & Peters-Burton, 2019). Specific approaches were applied in order to facilitate students' learning of 21st Century skills. Project-based teaching and learning approach effectively improved students' skills on creativity, teamwork, communication and self-learning skills (Rajendra & Patil, 2020). The use of mind-mapping activities and everyday life-related scenarios positively impacted students' self-efficacy on 21st Century skills during the conduct of Science lessons (Semilarski et al., 2021). Specific subject areas had incorporated 21st Century skills in their pedagogy. In English, some 21st Century skills were incorporated into the content and an experimental result showed a positive effect on students' listening and speaking skills (Ashraf, Ahmadi & Hosseinnia, 2017).

It is noteworthy that various studies focused only on different ways of incorporating 21st Century skills through planning and specific implementations and the impacts of such integration. They poorly, if not at all, tackled the experiences of teachers during the integration of the 21st Century skills in the Science classroom. It is important to understand the different aspects of teachers' experiences so that programs aimed at meeting their needs can be created (Schneider & Plasmanl, 2011, as cited in Qureshi, 2017). Moreover, it will be very interesting to investigate how integration is done in science education due to many intertwining obstacles. Some of the complicated challenges in Science education include the availability of appropriate resources, the prerequisite skills and knowledge of Science teachers and their professional development trainings, the religious and political constraints to advanced Science instruction, the need to satisfy government standards and prepare students for standardized assessments and the rising popularity on the use of internet as a sole source of information (Anderman, Sinatra & Gray, 2012).

The integration of 21st Century skills in lessons and learning activities of Science and other subjects is clearly illustrated in the Christ-Centered Curriculum (3Cs) of the Sisters of Mary Schools-Philippines in order to produce graduates who are God-loving, functional and holistic as it recognizes the fact that students of the current generation are having a highly technological and digital environment. The 21st Century skills for integration are communication, critical thinking, creative thinking, cross-cultural understanding, collaboration, computing, and career and life skills (Administrative and Research and Development Center, n.d.). Every Sisters of Mary School is a charitable school, a boarding school and a Catholic school. Given these peculiarities, it is compelling to gain insight on the experiences of Science teachers in integrating the 21st Century skills in the classroom. To date, no scholarly research has been conducted to explore this phenomenon in this particular school setting. Hence, this present study is being pursued in order to fill-in this gap in the field of research. Moreover, it is also hoped that a better understanding of teachers' experiences in integrating 21st Century skills will help formulate programs promoting effective practices in this integration process.

B. Trends on Integrating 21st Century Skills in the Classroom

➤ *Sustainable Employability*

Sustainable employability seeks for the development of skills in students so that when they graduate it will be easy for them to do job hunting activities. Furthermore, they are able to master skills which will ensure that they remain productive and competitive in their chosen career for the long term basis or they are also able to easily transition to new employment opportunities if they need it (Campbell & Kresyman, 2015, citing the study of Watts, 2006).

Information and communication technology (ICT) is prevalent in the workplace and there is a great demand for ICT-proficient professionals and employees. Technical skills are under the umbrella of 21st Century skills. These are skills that workers need to apply in order to operate software or manage a digital device. They are dynamic and require that workers continually keep their knowledge and skills updated with the surge of new technologies and practices (van Laar et al., 2020)

➤ *Development of Relevant Skills on Students*

Certain 21st Century skills serve as precursors for the development of other relevant skills. Communication and collaboration leads to knowledge construction and problem solving skills involving real world applications. Self-regulation of students promotes efficiencies resulting in added competencies for practical problem solving and construction of knowledge (Stehle et al., 2019). Integration of 21st Century skills in English classroom teaching was found very advantageous in positively facilitating students' speaking and listening skills (Ashraf et al., 2017) The use of ICT supports skills such as technical, information management, communication, collaboration, creativity, critical thinking, and problem-solving (van Laar et al., 2020).

➤ *Role of Teachers*

Teachers who reflect, grow professionally, recommend for new aspects of lessons and make straightforward or clearer instructions for the development of 21st Century skills are at the same time practice self-assessment on how they integrate 21st Century skills in their lesson plans with the use of available rubrics for lesson plan assessment such as 21 CLD rubric (Stehle et al., 2019).

Dimensions of teacher competence in line with 21st Century skills further develop their potential in learning 21st Century concepts. No less than the 21st Century skills that teachers personally are able to practice or manifest are the powerhouse to improve the quality of teaching in line with current educational developments (Sulaiman & Ismail, 2020).

In the light of changing trends in curriculum, the need for 21st century teachers who can be able to communicate well with 21st century students, know their characteristics, and guide them in the teaching-learning processes is greatly emphasized. Institutions that will meet the needs of qualified individuals, in other words, that will train 21st century teachers are faculties of education. Faculties of education are responsible for equipping and training pre-service teachers, each of whom must be 21st century students first, with 21st Century skills (Kanmaz, 2021).

Digital media literacy is incorporated as part of teachers' pedagogical content knowledge. This competence is important and necessary in order to become more responsive and sensitive to the kind of learners we have in today's advanced world whose social, intellectual, and emotional lives are intertwined with the use of digital technologies (Jansen & Merwe, 2015).

➤ *Teachers' Resources*

Teachers acknowledge that participation in Teacher Professional Education and the Vocational Competence Improvement Program was beneficial because these Professional Development programs offer topics in 21st Century skills integration by offering learning theories, facilitating the methodological practice on designing lessonplans with 21st Century skills integration, and staging the conduct of micro-teaching with 21st Century skills component (Haryani, Cobern, Pleasants & Fetters, 2021).

The teachers reported that they utilize curriculum guidelines as a framework for the formulation of teaching documents, including annual and semester learning plans, syllabi, and daily learning plans. The curriculum guidelines help them organize their lesson plans to include learning objectives, selected teaching materials, learning models, learning strategies, and learning scenarios that integrate attitude, characters, and skills for the 21st Century based on the Standard Competency, Core Competencies, and Basic Competencies (Haryani et al., 2021).

Exemplary STEM schools which are successful in integrating 21st Century skills in teaching and learning process will help other schools to understand how these practices can be done. Instruments to determine the levels of 21st Century skills integration in lesson plans and students' work products are available. For lesson plan, 21st Century Learning Design (21CLD) Learning Activity Rubric is used. To analyze each student work product, the 21st Century Learning Design Student Work Rubric is used (Stehle et al., 2019).

Teachers emphasized that collaboration work with their colleagues within the same school, especially learning from teachers in the same science subjects, fostered their 21st Century skills integration (Haryani et al., 2021).

Increased availability of online resources makes it easy to find and locate information, such as finding examples of 21st Century skills integrated lesson plans, teaching and learning activities, and keeping up-to-date on current educational issues (Haryani et al., 2021).

➤ *Pedagogical Approaches*

The Project Based Learning (PBL) approach is one of the best approaches to develop the needed basic concepts, specific engineering skills required for real world problem solving and systematic project development. PBL is a student-driven approach for learning that encourages the students towards the formation and construction of knowledge and enabling skills that are new to them (Rajendra & Patil, 2020 citing the study of Tiwari 2017).

Utilizing everyday life-related scenarios as a context-based approach enables the development and linking of interdisciplinary core ideas, plus their practical application to everyday life, which potentially increases and highlights the relevance of Science learning for students. In such an approach, a scenario is a teaching strategy that involves real-world problems and situations, or concerns in which students are involved in specifically performing relevant tasks and play specific roles (Semilarski et al., 2021).

C. Issues on Integrating 21st Century Skills in the Classroom

➤ *Readiness*

In today's highly technological world, when graduate people from all institutions, universities or senior high schools are asked if they are ready for their profession, they mostly reply "I'm not ready." Studies show that people who have graduated from universities or relevant institutions are insufficient, especially in 21st Century skills and attainments based on practice (Kanmaz, 2021).

➤ *Essential Skills*

The expected skills required and needed by the employers in the present century workplaces are deficient in the graduates produced by higher learning institutions. Hence, the graduates' chances of landing in a job or being retained in the said job once employed are

negatively affected or compromised. (Campbell & Kresyman, 2015).

➤ *Flexibility*

It is unavoidable that graduates will encounter increasingly complicated and more demanding workplaces affecting the different aspects of their lives. Hence, a great amount of flexibility and resiliency on their part are necessary (Ashraf et al., 2017).

➤ *Indicators*

Determinants or precursors for creativity and critical thinking are less investigated in a digital context. Academic studies show that each 21st-century skill has a digital variant. Moreover, 21st-century skills and 21st-century digital skills studies measured the determinants of problem-solving skills were always reported, whereas collaboration and communication skills studies were relatively infrequent. A large majority of available assessment tools test students' digital information and technical skills, whereas other aspects of ICT literacy are not tested with the same frequency (van Laar et al., 2020).

➤ *Self-efficacy*

Self-efficacy refers to students' belief that they are able to organize or perform activities that require 21st Century skills. Studies show that students tend to have low perceived self-efficacy towards 21st Century skills. This negatively limits the application of their actual scientific competence. While research showed that students' perceived self-efficacy towards 21st century skills varied, it was always low towards problem-solving skills (Semilarski et al., 2021).

➤ *Personality*

One personality-related aspect that negatively affects teachers' attitudes towards the incorporation of digital technology in their pedagogy is their lack of self-confidence. There is insufficient study aimed at giving guidance to practice teachers in developing lesson plans with digital media literacy integration which could have developed their needed confidence (Jansen & Merwe, 2015).

➤ *Opportunities*

Opportunities which could have enhanced teachers' development of 21st Century skills are lacking. It was found that opportunities to develop their skills to communicate, collaborate, be more creative and innovative and be ICT literate to succeed in the application of 21st Century skills in their teaching are simply insufficient. Much needed encouragement from school administrators for the formulation of technology based pedagogy by teachers is also meager in frequency (Sulaiman & Ismail, 2020).

➤ *Preparation for Pre-service Teachers*

The curriculum for pre-service teachers requires teaching of Basic Computer courses in their initial year level. This set-up does not involve continuous improvement of relevant computer skills as their education progresses. It only requires simple computer work in order

to pass the course. Thus, the much needed information and skills of pre-service teachers are insufficient for application during the time to actually practice their teaching career. It was also noted that the computer courses taken by their students surpass their technology knowledge. Generally, the current syllabi for 21st Century skills preparation of pre-service teachers are insufficient and ineffective altogether. Moreover, the Public Personnel Selection Examination for teachers does not provide questions to determine levels of 21st Century skills acquisition of teachers because it only focuses on knowledge-based goals. This discourages students to focus on their digital improvement process (Kanmaz, 2021).

➤ *Guidelines*

Official guidelines and provision of resource materials authorizing and guiding the incorporation of digital media literacy in classroom pedagogies which can serve as clear direction for teachers in the field are lacking (Jansen & Merwe, 2015). Many of the criticisms related to 21st Century skills teaching have something to do with lack of systematic framework for applying these skills in courses.

➤ *Assessment Policies*

21st Century skills are theoretically defined at the program level but in practice they are not being achieved for two reasons. 1. There are no assessment policies specifically designed for these skills and competencies and there is lots of confusion on how to evaluate teachers and students on the attainment or practice of these skills and competencies. 2. There are no programs detailing how to attain the skills outlined in the curriculum and there is a lack of studies to show whether the skills are acquired or not (Kanmaz, 2021).

➤ *Eligibility for Training Programs*

Besides having few training programs targeting the development of 21st Century skills for teachers, not all related skills are given focus because ICT skills predominantly invite the interest of organizers. Attendance to the said Professional Development programs are optional and new Science teachers were not eligible to attend (Kanmaz, 2021).

➤ *Online Resources*

Studies are available showing that many teachers utilize and benefit from technology-based tools such as Internet access and e-mail in their daily lives because it only requires a basic knowledge to manipulate. It was noted, however, that these online tools were not used to get content such as 21st Century skills and how to attain high level quality of the said skills. Moreover, teachers were cautioned on selecting appropriate online educational resources so that they will not be misled by open online resources which are not reputable. (Kanmaz, 2021; Haryani et al., 2021).

➤ *Pedagogical Practices*

Studies show that practices on Integrating the 21st Century skills in school curricula or with classroom teaching pedagogies is poor due to the many limitations of teachers in this aspect and there is a need to continuously improve on the incorporation of these skills (Campbell & Kresyman, 2015; Kanmaz, 2021 citing Bernhardt, 2015). Traditional teaching strategies like classroom lecture, note taking, and use of textbooks are still being popularly and conveniently practiced resulting in low levels of 21st Century skills attainment by students in Science classroom (Semilarski et al., 2021; Kanmaz, 2021). On the other hand, implementation of lesson through student centered approaches like PBL shy away teachers due to time requirement and preparations needs like involving laboratory and teaching assistants so that the activity will become successful (Rajendra et al., 2020)

➤ *Lesson Planning*

Even though the majority of the lesson plans at the inclusive STEM high schools included 21st Century skills integration, it can be noted that many lesson plans still do not provide this inclusion. Low levels of 21st Century skills are targeted by most lesson plans because the design can be qualified as introductory steps towards acquisition of related skills. Teachers are not frequently incorporating higher level 21st Century skills into their lessons. Higher level skills are targeted by only a few lesson plans (Stehle & Peters-Burton, 2019).

➤ *Synthesis*

The workplace has changed highly demanding for ICT proficiency of workers to get and sustain employment (van Laar et al., 2020; Campbel et al., 2015) However, graduates feel that they are not ready to face increasingly complicated workplaces (Kanmaz, 2021; Ashraf, 2017). This calls to question the graduate's flexibility and the development of relevant skills in them. The development of relevant skills facilitate efficiencies resulting in improved 21st Century skills particularly real-world problem solving and other skills (Stehle et al., 2019) However, students have low self-efficiency and confidence toward problem solving skills (Semilarski et al., 2021). Furthermore, indicators to prove that skills were indeed successfully developed are lacking (van Laar et al., 2020).

The role of teachers is highly emphasized but they must be digital media literates in order to communicate well with 21st Century students (Jansen et al., 2015; Kanmaz, 2021). Teachers can obtain from their competence potential in line with 21st Century learning and practice self-assessment on their integration efforts (Sulaiman et al., 2020; Stehle et al., 2019). However, they lack confidence in their ICT skills and lack guidance on how to develop appropriate lesson plans (Jansen et al., 2015). They lack opportunities to enhance their skills and the curriculum by which they were educated inadequately improves the required level of 21st Century qualifications. Moreover, Personnel Selection Examination for teachers does not focus on improvement processes (Kanmaz, 2021).

Teachers' resources include professional development activities which offer learning theories, practice on designing lesson plans and conducting micro-teaching but they pointed out in the same study that new Science teachers were not eligible to attend, raising the issue of equal opportunities for professional development programs. Other resources include collaboration work with their co-teachers and availability of online resources. However, the challenge of finding authoritative sources is evident and the choice on content enabling high-level attainments needs careful consideration (Kanmaz, 2021).

Earlier studies clamored for a lack of frameworks and assessment policies but STEM schools can serve as exemplars in integrating 21st Century skills with available rubrics to analyze lesson plan integration and student work product (Kanmaz, 2021; Stehle et al., 2019).

Lastly this thematic analysis of related studies highlighted pedagogical approaches such as PBL which positively facilitated student motivation and project development skills. However, PBL requires extra time and personnels during the preparation and implementation part (Rajendra, 2020). Context based approaches that call for application of core ideas to everyday life scenarios increased relevance of Science learning for students (Semilariski et al., 2021). Low level of students' 21st Century skills can be blamed on classroom lectures and use of traditional teaching strategies (Kanmaz, 2021).

II. METHODOLOGY

A. Research Design

The aim of this study was to understand the Science teachers' experiences in integrating 21st Century skills in the classrooms of Sisters of Mary Schools-Philippines in Silang, Cavite. The study is bounded by the experiences of teachers in integrating 21st Century skills during the length of years of their teaching in the Sisters of Mary Schools. The unit of analysis was high school Science teachers. In a case study, a researcher advances an in-depth analysis of a case which can be a program, event, activity, process, or one or more persons. Time and the kind of activity are important elements in this inquiry. It considers collection of detailed information using different kinds of data collection procedures over a period of time (Creswell, 2014). The descriptive nature of case study is rooted in the depth and variety of sources for information. It can bring to life the many complicated variables of the focused phenomenon by employing quotes from interviews of main participants (Hancock & Algozzine, 2006). The case study provides a means of exploring complex social units with many variables of importance in understanding the phenomenon. It offers a rich and holistic account of a phenomenon because it is grounded in real-life situations. It also offers meaningful insights that widen the readers' experiences. These insights can be considered as tentative hypotheses to help design future research. Through case study, processes, problems, programs can be scrutinized to provide understanding that in turn can impact and improve practice (Reis, 2009). In that sense, this design is pursued in order to

understand how Science teachers construct their viewpoints about integrating 21st Century skills in the classrooms with a much fuller description of their lived experiences. By gaining detailed verbal descriptions of Science teachers' lived experiences, we can shed light on the intermingling of human action and interaction through an interpretive and naturalistic approach.

B. Research Participants

The participants in this study were selected using the purposive sampling. This sampling technique is used in order to deliberately choose participants possessing qualities with great importance to the phenomenon being investigated. The participants are chosen due to their willingness to provide factual information due to their knowledge and experience. They also serve as readily available resources with rich information on this case (Etikan, Musa, & Alkassim, 2016). Science teachers of the Sisters of Mary Schools-Philippines are all eligible to participate in the study regardless of their educational background and length of service in the school. There are 5 Science teachers in Boystown campus while 6 in the Girlstown campus. Out of 11 Science teachers, only 5 managed to be present during the Focus Group Discussion. The 5 participants all came from the Sisters of Mary School-Atlas, Inc or the Boystown campus.

C. Data Collection and Instrument

The goal of this qualitative study is to understand the experiences of teachers in integrating 21st Century skills in Science classrooms. Focus group discussion is applied to interview a group of persons. In this procedure, researchers take the role of a facilitator or moderator between participants. Methods of data collection applied in this focus group discussion include audio recording, note-taking and participant observation (O. Nyumba, Wilson, Derrick & Mukherjee, 2018). The instrument used in this study was self-made semi-structured interview questionnaires adapted from 26 and guided by Dewey's Theory of Experience. The interview guide consisted of the following questions: 1. Why is it important for our students to have 21st Century skills? 2. What factors serve as your motivation in integrating 21st Century skills? 3. What Pre-service and In-service training and preparations help you in integrating 21st Century skills? 4. What stages are observed/ techniques employed/ in integrating 21st Century skills in Science classrooms? 5. What material tools are used in integrating 21st Century skills in Science classrooms? 6. Describe the time and place for integrating 21st Century skills in Science classrooms? 7. Describe your relationship with the physical and social environment during the integration of 21st Century skills in Science classrooms? 8. Describe your emotional experience before, during, and after the integration of 21st Century skills in Science classrooms? 9. What difficulties and/or limitations on the whole or at different stages are encountered during the integration of 21st Century skills in Science classrooms? 10. What programs can help teachers in integrating 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite?

III. RESULTS AND DISCUSSION

A. Problem #1: Teachers' experiences in integrating 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite.

➤ Theme 1: Impulsion

This theme refers to what serves as motivation for the participants in integrating 21st Century skills in the Science classroom. Based on their description, the following sub themes emerged: a) Globalization; b) Need; c) and Type of Learners.

• Globalization

The participants are aware of the implications of globalization to the future profession of the graduates. New occupations are coming out in the market and students' competitive edge must be supported by emphasizing students' development of 21st Century skills to be at par with graduates from other countries. Nation building and attainment of sustainable development goals are crucial in this event of globalization which demands students' acquisition of 21st Century skills, too. One participant, said:

“For me 21st Century skills are very important for my students for nation building. If we love this country we should be equipped with all the materials necessary for building our nation.”

This finding confirms the idea presented by Rajendra and Patil (2020) that students need to develop a wide range of skills so that they can be successful in today's modern, rapidly changing and complex world. It is also consistent with the claim of Rannikmäe (2021) that acquisition of 21st Century skills is necessary so that graduates can compete and become successful in the global market. Moreover, Campbell et al. (2015) raised an issue that sustainable employability is crucial in this constantly changing global market.

• Need

Integration of 21st Century skills is required in preparing for instructional materials and lesson planning for all subjects so that their development happens across subject areas. The identification of 21st Century skills being targeted in every learning activity or competency is expected as an important role of teachers. This was emphasized by one teacher when he said:

“One thing that encourages me is the need to integrate the 21st Century skills because in the program back when we were still students and until now that we are teachers we are required to integrate the 21st Century skills to our classroom and laboratory based discussion. For example, in the different formats that we use in our lesson/instructional planning there is always a need to integrate it with 21st Century skills. We need to point out what skill or skills our students will meet after learning the competency.”

This finding is consistent with the suggestion of Haug and Mork and Tight as cited in the study of Rannikmäe

(2021) that 21st Century skills must be incorporated and applied in different lessons or different subject areas in academic fields. Integration of 21st Century in lesson planning by including them in learning objectives and applied 30 in meeting the competencies is supported by the findings of Haryani et al. in their 2021 study.

• Type of Learners

Communication between the teacher and students is effectively facilitated with consideration to the type of learners that our present students are. It entails accepting the type of culture surrounding them and the modern interest that drives the different aspects of their lives. The participants recognize that students evolve and their needs evolve, too. They are inclined to the use of technology. So teachers are invited to cater to the unique needs of this type of students by integrating technology and 21st Century skills. This confirms the idea of Jansen and Merwe (2015) that the pedagogical content knowledge of teachers must contain digital media literacy. This competence, if mastered by teachers, will incline them to become more responsive to the kind of learners we have nowadays whose social, intellectual, and emotional lives are intertwined with the use of digital technologies. Kanmaz (2021) advised that in order for teachers to have a good rapport with their 21st Century learners, they must get to know them better and properly plan their lessons to better fit in the needs of their students.

➤ Theme 2: Undergoing

This theme refers to what preparations experienced by participants in terms of Preservice and In-service training and character of teacher. Based on their description, the following sub themes emerged: a) Pre-service Preparation ; b) In-service Training; c) and Character of Teacher.

• Pre-service preparation

Most participants expressed inadequacy of pre-service preparations for 21st Century skills integration. Skills were taught on a singular basis and not as a conglomeration of multiple skills. Hence, not all skills were taught in college education of teachers. Two participants even claimed that the skills were only indirectly taught. They were taught to be adaptive and responsive which make them open to changes in the new curriculum requiring integration of 21st Century skills. However one participant expressed an opposing view and gave examples on how the skills were directly taught to him. He, said:

“Actually in our undergraduate year, we actually have subjects like PCK and Prof. Ed subjects which encourage us to prepare learning plans that will focus on the integration of 21st Century skills.”

This finding is consistent with the suggestion of Kanmaz (2021) that pre-service teachers must be equipped with 21st Century skills by being 21st Century students themselves while having their training in the faculty of education.

• In-service training

The participants all agreed that they were able to attend training and seminars organized by PEAC for free. They acknowledge that this opportunity recalibrates and re-equips them with necessary knowledge and skills to teach 21st Century students. But some rooms for improvement are identified with regards the conduct of the said seminar and workshop which if given attention would result in maximizing the learning and skills take-aways of the participants. One, said:

“The same is true with the training during In-Service seminars but one problem that I realize just now is that the facilitators, I cannot say they failed, but they lack of adequate feedbacking practices. For example, if we are asked to submit a learning plan, they lack the feedback if our learning plan will really hit the 21st Century skills or not. I think that’s the problem that I can remember so far with regards to the training with the integration of the 21st Century skills in the classroom.”

Haryani et al. (2021) reported that teachers learned from the topics offered in professional development activities. Topics on 21st Century skills integration, learning theories, designing of lesson plans and micro-teaching were beneficial learning opportunities included. Unlike the findings in this study, no deficiencies or rooms for improvement were mentioned.

- Character of Teacher

Teachers’ character is given premium attention. Teacher is someone who encourages students to be inquisitive and someone who does not invite fear among students. One teacher captured this characteristic when he said:

“I think with the students we should be approachable so there’s should be time that we are welcoming to them because if you are terror they will hesitate to ask question sometimes we don’t know, without actually knowing, we are preventing them to think because they are just afraid to ask questions. So we must be approachable.”

These qualities of teachers will complement their crucial role in raising wellinformed or educated people. Teachers bear major responsibilities in educating 21st Century students (Kanmaz, 2021). This finding also confirms the prediction of Sulaiman et al. (2020) that personal characteristics contribute to a greater degree on the learning of 21st Century skills.

➤ *Theme 3: Doing*

This theme refers to the stages and techniques, time and place involved; and the materials employed by teachers in integrating 21st Century skills in the Science classroom. Based on their description, the following sub themes emerged: a) Techniques; b) Tools; c) and Time and Place.

- Techniques

Various techniques were employed in integrating 21st Century skills in the Science classroom. These involve facilitating students to learn how to think for themselves, engaging students in the different Science activities like grouping time in planning and working together for performance tasks with scaffolding activities, and promoting divergent problem solving skills through connections with contextual situations. One example was provided by the teacher when he said:

“ For me, one way to teach 21st Century skills is to start it with their personal experience, ignite curiosity in their minds by asking them normal observations and then asking them what are unique or new or other point of view from that normal observation so I am just allowing them to think and after thinking if there are problems we are giving the normal solutions but aside from that we are asking if they have other ways to solve the problem so we are helping the students or teaching the students to realize that there are many ways to find solution to a certain problem so in that way we are promoting the critical thinking skills, the creativity in solving problems and also improving their problem solving skills. So we are not just teaching one specific solution instead we ask them to find their own solution because once they find their own solutions it will be very personal to them. So they will really understand the lesson if they find their own shortcuts to certain problems. Specifically in Physics and Chemistry, so as much as possible I am not teaching them my shortcuts. I am asking them to find connections, find patterns and then they have to generalize so that they will find their own conclusion about the problem.”

This promotion of target 21st Century skills through connections with contextual situation was also explored by Semilarski et al. (2021). He reported that approaches involving applicability to everyday life increases relevance of Science learning and development of skills for real-world applications.

- Tools

The participants were able to highlight a number of tools in integrating 21st Century skills in the Science classroom. Workbooks were provided to students. Compliance to the activities contained in the workbooks entails the practice of specific 21st Century skills such as communication and use of ICT. Use of calculators which is usually ignored requires specific techniques in order to gain its potential benefit on problem solving development of students. The school has advanced calculators so its use must be maximized. Moreover, tools necessary for video editing projects were also emphasized. Availability of these tools ease concerns on the difficulty and big effort involved in video editing and production process. Interactive computer simulations like PhET were utilized especially in the study of Physics, Chemistry and other sciences. One teacher presented it when he said:

“In Physics, we use PhET simulations to explain constants just like work, projectile motion and from that we are able to connect or to let the student describe or explain the relationship between different variables in discussing Physics such as range, angles by using the simulator and in that way in some part of the lessons students also use PhET simulations instead of just listening to the concept, they play and after playing by using PhET simulation they get the concept from the simulation.”

The use of various digital tools implies development and application of information literacy and ICT literacy which are included in the group of 21st Century skills listed under Assessment and Teaching of 21st Century Skills (ATC21S) and highlighted as tools for working (van Laar et al., 2020).

- Time and Place

Time and place for the improvement of 21st Century skills can happen beyond the setting of the Science classroom. One teacher has this claim when he said:

“Anywhere and anytime because they are really curious and anywhere and anytime once they have their observation they can be learning at least a little about 21st Century skills. There is no specific time for learning that because for example they look at the sky in the morning or in the afternoon if you are curious you will always find questions so boosting your curiosity will help you to learn a little from 21st Century skills. (Researcher: You mean to say the time and place is not a factor). Yes, for me. I don't know with the other teacher.”

This finding confirms the idea of Rannikmäe (2021) that 21st Century skills can be gained not only through academic subject areas but also in other settings throughout the life of a student.

➤ *Theme 4: Emotional Experience*

This theme refers to the emotions manifested by teachers before, during and after integrating 21st Century skills in the Science classroom. Based on their description, the following sub themes emerged: a) Disappointment; b) Happiness; c) and Satisfaction.

- Disappointment

Disappointments occurred when teachers already taught the skills but students forgot it. Students' lack of initiative and the drive to continue learning despite 36 encountering difficult or boring subjects were really disappointing. They shut down and stay lazy during such situations. Another big disappointing situation is encountered upon witness weaknesses on 21st Century skills on higher level students as one teacher explained when he said:

“I am still in the process of before and during and I do not have the after emotional experience yet. So far it is somewhat disappointing because I am handling Grade 10 but I expect them to have the

basic skills, basic process skills and 21st Century skills but once you give opportunity to show those skills sometimes they do not meet the expectations. So before and during experiences are still disappointing. Maybe in the future it will no longer be disappointing when they reach Grade 11 or Grade 12. I do not know if it will yield a positive result. So far disappointing. By the way, I am handling lower sections.”

- Happiness

Teachers have a common knowledge that students in the school come from the poor communities where their elementary education also lacks adequate materials to ensure high quality learning of students. Happiness was elicited when with proper scaffolding, Grade 7 students exceeded teacher's expectation and delivered high quality outputs. One teacher reported this when he said:

“Last Friday and even this afternoon when I saw their projects on making a lighting plan, I am very happy because I didn't see myself doing those things when I was in Grade 7. They are very good already. They know how to approach other people to ask for help. That is one good thing that I am very happy with them. There are some students, especially in the higher sections, they are really already very good at delivering themselves in front of the class. That is why I recommended some of them in the English Department already because they are very good not, so far, since it is my first time also to teach in Grade 7, not the typical idea that I have for Grade 7 students. So when I want them to speak in front and most of them can speak very well in front. I am very happy. My heart is filled with joy.”

- Satisfaction

Teachers feel satisfied when they are able to witness the skills in students. They are satisfied with how they taught the lessons because their students gained from it and even after a period without monitoring them, the skills are still retained. One specific example is on the development of communication skills which serves as students' Waterloo. After years of employing collaborative and reporting activities, the teacher witnessed the development of this specific skill and felt satisfied about it. One teacher illustrated it when he said:

“I think, in my emotion if that student, you know, you see their improvement when it comes to the skill of speaking in front. There is growth because for my case the students I have, I am handling them for at least 3 years now and I see growth in them. Growth not just in the speaking skills so as with the confidence. Some of them are very confident already when they speak in front of the class and I guess it is very satisfying to me as a teacher.”

B. Problem #2: Challenges are encountered by teachers in integrating 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite.

➤ *Theme 5: Obstacle*

This theme refers to the difficulties and/or limitations encountered on the process of integrating 21st Century skills in the Science classroom. Based on their description, the following sub themes emerged: a) Request of Materials; b) Students' Lack of Motivation; c) Teachers' Workload; d) and Alignment with PVMGO.

● Request of Materials

There is a delay in the provision of materials, equipment, and tools needed for Science lessons and activities. Teachers are aware that the school is willing and capable to provide but early requisition of materials on the part of teachers needs serious consideration. Teachers are aware that in order to ensure the provision of materials, a request must be made not less than a week before the implementation of the lesson.

● Students' Lack of Motivation

Teachers highlight the importance of intrinsic and extrinsic motivation of students. One teacher pointed this out when he said:

“When students are not motivated, even the teachers possess the skill on how to really teach 21st Century skills, it is useless. So it is a challenge for us teachers to really intrinsically motivate our students because it is hard for us to intrinsically motivate them because from the word itself it should be coming from them. I think that motivation is the key factor so that we can instill the skill in our students.”

Students' motivation can be affected by numerous factors. Semilariski, Soobard and Rannikmäe (2021) reported that students have low perceived self-efficacy towards 21st century skills. It can be an interesting topic to explore if this low evaluation of their abilities to organize or perform activities that require the use of skills also impact their motivation to learn 21st Century skills.

● Teachers' Workload

Teachers agreed that when they are required to make two lesson preparations, the preparation becomes raw for two year levels. Teachers feel divided because they cannot focus on one grade level. There is an admission that they are not able to do their best given the situation of handling two different grade levels. One teacher explained this when he said:

“I feel divided. I do suggest that the school especially the administration should really see the strength of each teacher that not every teacher can hit two birds with one stone because if you really want your students to be skilled in this academic subject for example then see first the teacher if he or she is really equipped with, you know, all the skills, the knowledge to develop the students. One

comment is they are assigning teachers to a subject wherein a teacher is not knowledgeable and I don't agree with that because how can you teach what you don't have. Just like for example in MIL they are assigning teachers that are not that knowledgeable in that subject matter and we don't know if really the skill needed for that subject is learned by the students.”

● Alignment with PVMGO

Teachers expressed that when a specific 21st Century skill is targeted but possibly might not be consistent with the school's PVMGO, a guidance on what should be prioritized during culminating performance tasks will be of great help. One teacher expressed pessimism on how to bridge this conflict between supposedly advanced application of 21st Century skills with the values or the religious background of the school. He said:

“Another thing that I observe is that it is hard to meet right away even though it is there already, it is already closer. The problem that we have is “Is it aligned with our PVMGO? We always have to focus on this. Of course, we are a private institution really need to do that but I like to mention it because that is one problem that I have seen. Since we want to try to hit the competency using the 21st Century skills, while also hitting the PVMGO of the school, there are activities that are better and would facilitate quicker attainment of 21st Century skill but in conflict with the values of the school. That is one of the problems and I don't think if there's a solution for that.”

C. Problem #3: Programs that can help teachers in 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite.

In answering this question, the participants were able to deliver the following themes: a) Training and Seminars; b) Alignment of Expertise to Teaching Load; c) Assessment Tools; d) and Motivational Program for Students .

● Training and Seminars

Participants suggested exposure of teachers to actual or real life scenarios for developing their 21st Century skills like critical thinking and problem solving because it is not possible to teach these skills to students when they themselves don't have it. One reality in the private schools being staffed with beginner teachers every year with few veteran ones remaining. An educational outing can be incorporated so that teachers' holistic well-being can be addressed, too. One teacher gave the reason behind it when he said:

“I think what will develop the skills of the teachers in the 21st Century are the training and seminars so I think that should be the focus of the private institution before more or less the private school they have a beginner teacher so those 41 teachers lack 21st Century skills or underdeveloped skills. So training and seminars will help the teachers improve their 21st Century skills.”

This finding is supported by Sulaiman and Ismail (2020) because training and seminars can hone teachers' talents and polish their potential to display superior individual competencies. Teachers who are competent and strongly motivated are instrumental for acquiring 21st Century skills especially when they apply real-world approaches.

- **Alignment of Expertise to Teaching Load**

Teachers can be assessed in terms of their strengths and weaknesses and also their individual learning styles. Through this, selecting teachers who are effective to facilitate the learning of students at the grassroots level can be facilitated. Teachers believe that if the foundation of younger students is strong, even though the succeeding years may be weaker, the skills will be sustained. One teacher emphasized this idea when he said:

"I also suggest the alignment of expertise to teaching load. That will be a good program, if we really want to improve 21st Century skills. They should learn those skills from the experts. We should not assign teachers who will handle research if they don't have background knowledge on research."

This confirms the idea presented by Sulaiman et al. (2020) that in order to ensure the successful implementation of 21st Century skill, the competence of teachers must be thoroughly evaluated due to its massive influence in the integration process.

- **Assessment Tools**

A program for identifying appropriate assessment tools for the attainment of 21st Century skills among students can be sourced out in order to address teachers' need 42 on this instrument. One teacher brought to light this concern or need for an assessment tool when he asked the following question:

"Do we have tangible assessment for 21st Century skills? What I mean. How do you assess if they really gained a skill necessary for them to be promoted to another year level for example? How do you gauge? If you are in Grade 7, do we have limitations for 21st Century skills? Do you have a basis for example if you are grade 7, this is your level of 21st Century skills? How about if you are in Grade 8? (Researcher: Are you asking for some assessment tools to measure the attainment of 21st Century skills or to check if the skills are really attained?) Yes. We tend to integrate it but we don't have this assessment tool that okay you can be promoted because you have already gained the skill."

This finding detailing teacher's sentiment on the lack of assessment tools for 21st Century skills confirms the conclusion of Bernhardt (2015) as cited by Kanmaz (2021) that the lack of framework for skills application in courses and confusion about how skills

attainment evaluation for both teachers and students can done garnered the most number of criticisms related to teaching and learning of 21st Century skills. Moreover Kanmaz (2021) reported that teaching programs do not explain or detail how skills are acquired. No finding has been delivered on whether the skills are even acquired or not and they are only defined theoretically in the program and not being achieved in practice.

- **Motivational Program for Students**

Teachers recognize the importance of developing students' intrinsic motivation so that they will be more open to developing different areas of their lives especially on the attainment of 21st Century skills. The help coming from the Guidance and Counseling Center is most welcome here. Some important concepts can be entitled in the minds of students just like having higher expectancy and utility value which was explained by one teacher when he said:

"They have to develop the mindset of the students and I believe in the expectancy value theory. It says there that if a student has a higher utility value, in the attainment value and in the expectancy belief of the student, the engagement of the student is also higher. So maybe we can develop the expectancy and the utility. When you say utility, how that subject is useful to them. When you say expectancy, how they will do in that subject. Will they be successful or not?. Because if they have a positive belief in a certain subject, they also have higher attainment or engagement in that subject. That is what I believe."

IV. SUMMARY

This case study was aimed at exploring teachers' experiences integrating 21st Century skills in the Science classrooms of Sisters of Mary Schools-Philippines in Cavite. Three research questions were forwarded. 1. What are teachers' experiences in integrating 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite? 2. What challenges are encountered by teachers in integrating 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite? 3. What programs can help teachers in 21st Century skills in Science classrooms of Sisters of Mary Schools - Philippines in Silang, Cavite? This research was conducted in a Catholic, charitable, and boarding school setting of the Sisters of Mary School - Philippines in Cavite particularly in the Boystown campus. Dewey's theory of experience served as the theoretical framework of this study. Five Science teachers participated in the study. They were selected on the basis of their employment as Science teachers without due regard to the length of their service. Before the research study was conducted, the participants read and signed the consent form. Data collection was done solely through focus group discussion. For data analysis, thematic analysis was guided by the theoretical framework. Five themes were generated answering research question 1 and 2. These themes were impulsion, undergoing, doing, emotional experience, and obstacle. On the other hand, four themes emerged for question number 3. They are training and seminars, alignment of expertise to teaching load,

assessment tools, and motivational programs for students. The strength of this research lies in the collection of rich data through the 45 insights of Science teachers. It can lead to better understanding of teachers' experiences on integrating 21st Century skills and the betterment of related practices. Furthermore, it brought out teachers' concern so that well-informed administrative policy can be formulated. However, there are weaknesses such as limited employment of available data collection methods. It cannot be generated to a larger population of the research setting since only the Science teachers of Boystown Campus participated.

V. CONCLUSION

Integration of 21st Century skills in the teaching-learning process is mandated by the school's curriculum. Previous study is not available to give insight on the extent of integration implementation of 21st Century skills in the Science classroom of a Catholic, charitable, and boarding school setting of the Sisters of Mary Schools Philippines in Cavite. Teachers' experiences on this integration process were highlighted to give rich insight on this phenomenon. Teachers shared that their motivations to implement this integration stem from administrative guidelines and awareness on the type of learners we have today. Teachers' pre-service preparations, though varied, positively contributed to this integration during their practice. In-service training is available but there's room for improvement on seeing to it that teachers' ability to practice the integration of 21st Century skills in the classroom are ensured during these professional development activities. Multiple techniques and tools were employed in the implementation of integration of skills such as employment of contextual situations, project based learning, proper scaffolding for culminating performance tasks, computer interactive simulations, workbooks and many more. Emotional experiences of teachers before, during, and after the integration varied from 46 disappointment to happiness and satisfaction. Programs to proceed with the implementation of 21st Century skills integration were laid down to overcome identified obstacles. Overall, teachers' belief on the importance of arming students with these 21st Century skills and their enthusiasm to proceed forward to this direction come with the acceptance of the fact that the future workplaces and the modern world are ever changing and growing in complexity.

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