Science Education Graduates of a State University from 2008-2018: A Tracer Study

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Abstract This descriptive research determined the extent of employability of science education graduates from 2008-2018 in a state university in the Philippines. The study also ascertained the graduates' retrospective evaluation of the science education program in the aspects of adequacy and relevance. A total of 49 purposively selected graduates responded to the online survey questionnaire. Results revealed that there is a very high employability rate of the graduates of the university. Their educational experience and skills learned are very relevant in their current workplace. They evaluated the 10 program areas as good and indicated that the program outcomes are adequate and relevant. These graduates also suggested that content and pedagogy among pre-service teachers be enhanced. A curriculum review may then be considered for better alignment of the program to the demands of the 21st century learning landscape and to the fourth industrial revolution to produce industry-ready and globally-competitive science educators.

Keywords: *descriptive research, graduate tracer study, retrospective evaluation, science curriculum, science education*

Introduction

The feedback of graduates through tracer study is one reliable indicator to affirm the effectiveness of the educational institution in providing quality education and services. This process is significant to continuously improve the curricular programs to respond to the changing educational landscapes, and the emerging needs of industry 4.0 (IR 4.0). Morales (2017) emphasized that the knowledge-based society and knowledge economy seek new and appropriate skills to meet

countries' growing global and economic development. Hence, higher education institutions (HEIs) must ensure the relevance of the program outcomes in the new industrial era in which machine intelligence and disruptive technologies are transforming the educational setting.

Globally, HEIs conduct regular tracer study to get the most reliable feedback from its graduates on their program's effectiveness. In Africa, Flomo (2013) investigated the congruence between higher education and the labor market among college graduates. Additionally, the tracer study conducted by European Training Foundation (2017) supplemented the existing knowledge on the skills that graduates of secondary vocational schools and HEIs have to offer and to determine the experiences of the graduates in their transition from education to the world of work. In Southeast Asia, Nazron, Lim, and Nga (2017) investigated the relationship between graduates' soft skills attributes and employment status in Malaysia using empirical evidence obtained from a tracer study.

In the Philippines, numerous tracer studies (Belecina & Ocampo, 2017; Cuadra, Aure, & Gonzaga, 2019; Gonzales, 2019; Sira, Celda, Valenciana, & Sobrepaña, 2018) have been done to track the graduates' employability in various disciplines. However, there are only a few tracer studies conducted with a focus on science education program. Evangelista and Morales (2017) conducted a tracer study that determined the adequacy, relevance, and alignment of the science education program of the graduate education offered by the Philippine Normal University Manila. Similarly, another local study was conducted by Cañizares (2015) which traced the science and mathematics education graduates of the University of San Carlos, to determine the relevance of its programs.

In the local scene, there is no formal tracer study that has been conducted solely for science education graduates of the university for the past decade. Thus, this prompted the researchers to conduct the study. The study aimed to trace the employability of the graduates, and evaluate the science curricular programs for alignment to the 21st century learning and global metric such as 4IR. The locale of the study offers programs that include Bachelor of Secondary Education (BSEd) with specialization in general, physical, and biological sciences under

the College of Teacher Education (CTE). As envisioned, the graduates of CTE shall demonstrate professional competencies, specialized skills, and desirable personal and social traits for effective instruction, contribute to the development in teacher education through research and strengthen external linkages in response to the changing needs of the people and the institutions in the service area (CTE, 2018).

To determine whether the graduates have acquired the necessary competencies in their undergraduate preparation and whether these skills are useful in their current work, a tracer study needs to be done. This step may be able to show the success of its educational efforts on its graduates, the labor market, and employers (Aquino et al., 2015). Tracer study enables the institutions to get information that may be useful for the revision of their program (Schomburg & Teichler, 2011). This idea was also supported by the study of Nivera, Toledo, Sualibio, Boral, and Asuncion (2013) as they stressed that results of the tracer study would be the bases for review and evaluation of the program content.

Graduate Tracer Study

Tracer study is a practical process in getting reliable and quick inputs which ensure that the human capital from educational institutions is relevant and ready in the constantly-changing job market. Furthermore, higher education institutions are responsible for equipping students with advanced knowledge and skills which are relevant for their job positions. Thus, tracer studies' main goal is to collect essential information concerning the current status of graduates (Llego & Bañez, 2017) and to enable institutions to gain information about the possible deficiencies in instruction for future improvements (Egesah & Wahome, 2014).

Moreover, some researchers likewise emphasized that tracer study measures the relevance of competencies to the field of work, which can improve curriculum for better human resources (Evangelista & Morales, 2017; Nivera et al., 2013). Henceforth, tracer studies are important feedback mechanisms on the graduates' employability and competencies acquired. This can likewise document the graduates' retrospective evaluation of the program outcomes as a basis for further enhancement.

Science Education Program Competencies

The Commission on Higher Education (CHED) continuously updates the program outcomes and the corresponding sets of competencies of teacher education programs (TEPs) to align with the needs of the current times. These competencies are stipulated in the intended learning outcomes of the TEPs to guide the teacher educators on the skills that they should teach the future educators.

According to CHED Memorandum Order 75 (2017), the BSEd program aims to develop highly motivated and competent teachers specializing in the content and pedagogy for secondary education. In consonance, the commission ventures on the belief of the Philippine government that the capabilities of STEAM (science, technology, engineering, arts and mathematics) education and careers may be able to meet the demands of the emerging technological revolution that eventually influences the citizen's quality of life. Hence, improved STEAM education in the country may eventually lead to a strong and skilled workforce for the Industrial Revolution (IR) 4.0 and a better economic stance of the country (Morales, Anito, Avilla, Abulon & Palisoc, 2019).

Consequently, tracing and evaluating the science education program through a tracer study may contribute to improving STEAM education. Hence, graduate tracer study is a useful tool in ascertaining graduates' employment rate. The present study utilized tracer study as a way to ensure that the graduates of the university are doing well in the workplace. Moreover, this study hopes to fill in the dearth of tracer studies in science education graduates, particularly in the Philippines.

Framework of the Study

The present study is anchored on the concept of institutional evaluation through self-evaluation, which may be provided by graduate tracer studies (Evangelista & Morales, 2017). Self-evaluation allows educational institutions to have an in-depth and comprehensive assessment of the quality of its programs and services, and its institutional effectiveness in support of student success (Accrediting Commission for Community and Junior Colleges [ACCJC], 2020).

Thus, the progress and development of the program and competence of the faculty to train and equip young individuals may be tracked through a tracer study. The self-evaluation process offers an opportunity for the institutional leadership to take stock of the quality and processes for continual improvement of the institution in collaboration with the stakeholders (ACCJC, 2020).

As shown in Figure 1, the science education graduates provided the data needed for the tracer study, which includes their demographic and educational profile, employment and job profile, and the competencies learned. The study also determined the evaluation of the program. The results of the study will serve as a basis for the updating of the graduates' directory and the improvement of the curriculum.

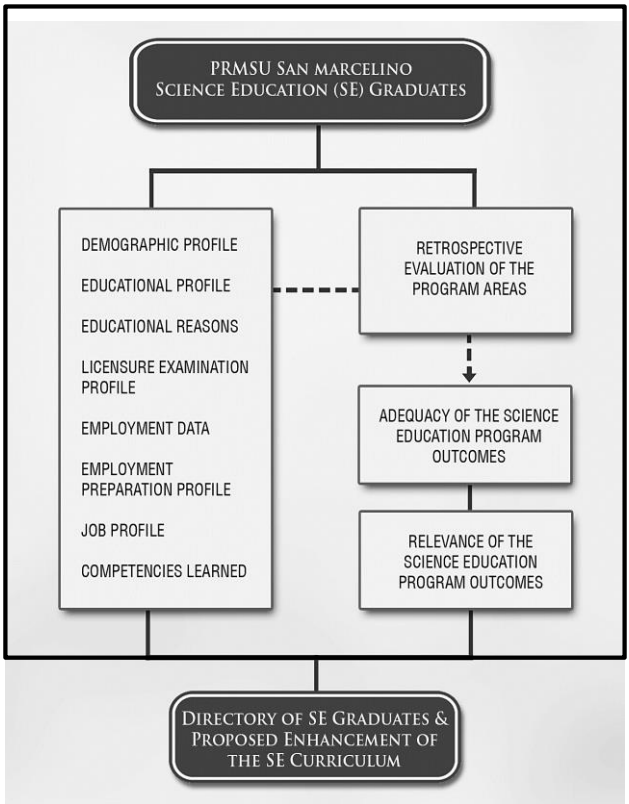

Figure 1. The diagrammatical framework of the study

Purposes of the Research

The study generally aimed to trace the employability of the science education graduates in a state university in the Philippines. The study was designed to determine the graduates' personal and educational background, employment characteristics, and competencies learned. It also determined their retrospective evaluation of the program and their suggestions for its improvement.

Methodology

Research Design

The study used descriptive research employing both quantitative and qualitative approaches in describing the graduates' profile, employment characteristics, competencies learned, and the participants' retrospective evaluation of the program.

Participants

The 49 science education graduates of the university from year 2008 to 2018 were purposively selected as participants of the study.

Figure 2 shows the distribution of the graduate-participants in the tracer study.

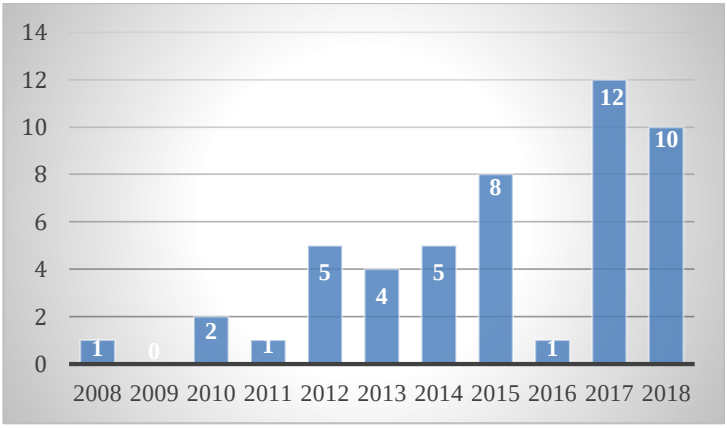

Figure 2. Distribution of Graduate-participants

Only 49 (out of 74, 66.22%) graduates for the past 11 years who were traced, responded in the online survey. Some were not able to respond to the online survey due to busy schedule or some other viable reasons.

Instruments

The Science Education Graduate Tracer Study (SE-GTS) survey questionnaire was used in gathering the data. This instrument is a modified version of the instrument used by CHED and from some studies (Evangelista & Morales, 2017; Nivera et al., 2013). Likewise, an informal interview from select participants deduced qualitative data for data triangulation. Sample questions include: (1) what are your suggestions to improve the science education curriculum further; and (2) how did your program help you in your current workplace.

The survey tool determined the general profile of the graduates, employment data, and their retrospective evaluation of the program. The last part is an open-ended question on their suggestions for improving the curriculum. The tool was subjected to construct and content validity and yielded excellent internal consistency (α=.977).

Data Collection

Pre-Survey

After the instrument development and approval from concerned authorities, an initial tracing of graduates was made through networks based on the list obtained from the registrar's office. Using email and social media, the researchers provided a brief orientation to the participants and explained that their involvement in the study was voluntary. Informed consents were obtained from them prior to the study.

Survey

The survey tool was transformed into a Google form for easier data gathering. The link of the survey was sent to the participants through their Facebook accounts and/or email. The researchers gave them two weeks to provide the required data, follow-up was made to increase the retrieval rate. The data gathering started from November 2 until December 24, 2018.

Post-Survey

The researchers organized the data in tabular format to appropriately respond to the aforementioned research objectives. After organizing the data, the researchers analyzed both the quantitative and qualitative data to generate relevant findings.

Data Analysis

The study employed both quantitative and qualitative methods in analyzing the data. The descriptive and inferential statistics were computed, while manual coding of qualitative data from the interview responses was done to identify the emerging themes. Validation of the identified themes was likewise made through informant feedback.

Results and Discussion

Demographic and Educational Profile of the Participants

Table 1 presents the demographic and educational profile of the participants.

Majority of the graduates are aged 22 to 24 and are still single. This is due to the fact there are more participants who just recently graduated and are still beginning to build their careers. This is consistent with the findings of some studies (Cañizares, 2015; Sentilleces & Rungduin, 2013). The results further suggest that recent graduates are easy to trace and have a higher response rate than the older graduates (Sentilleces & Rungduin, 2013). Male graduates are greater in number than the females in the science education program (Evangelista & Morales, 2017). This is because most women in the university enrolled in language and elementary education programs.

Table 1. Science Education Graduates' Demographic and Educational Profile

Profile		Frequency	Percent
Age	22-24	**26**	53.06
	25-27	15	30.61
	28-30	6	12.24
	31-34	2	4.08
Civil Status	Single	**41**	83.70
	Married	8	16.30
Sex	Male	**27**	55.10
	Female	22	44.90
Specialization	Biological Science	**36**	73.50
	General Science	2	4.10
	Physical Science	11	22.40
Highest educational attainment	Bachelor's	**32**	65.31
	With Master's unit	15	30.61
	Master's	2	4.08

Most of the participants recently graduated and have taken biological science as their major or specialization. More than half (65.31%) of them have not pursued advanced studies due to the nature of their teaching job and financial constraint. The results negate the study of Belecina and Ocampo (2017) who claimed that graduates like to pursue advanced studies immediately for promotion purposes.

Educational Reasons of the Participants

As regards participants' educational reasons, graduates chose the program due to its availability (55.10%), and they were inspired by a previous teacher (51.02%). The foremost reason of the participants for choosing the university are affordability (79.59%), school location (59.18%), and their desire to be a teacher (36.73%). These results imply that the university is true to its mandate of providing quality education to the poor but deserving students. Economics is the major reason for choosing a particular institution to study (Belecina & Ocampo, 2017; Gines, 2014). Most of them consider pursuing advanced studies for professional development, but only a few reasoned out that they enroll in advanced studies for promotion.

Licensure Examination Profile of the Participants

The participants obtained a mean LET (Licensure Examination for Teachers) rating of 80.13 which implies that most of the graduates obtained satisfactory scores for their license. Majority chose to prepare for the board by self-review (75.51%). The institution has also been offering in-house review for teacher education graduates of the campus for five years already. With the offering of the said program, the institutional passing rate has been consistently above the national passing rate. For many teacher-education institutions (TEIs), the performance of graduates in LET is an indicator of high quality and standard (Gerundio & Balagtas, 2014).

Employment Data of the Participants

Table 2 presents the participants' employment data.

Table 2. Participants' Employment Data

Employment Data		Frequency	Percent
Employment Status	Employed	**47**	95.90
	Not employed	2	4.10
Tenure	Permanent	**24**	49.00
	Temporary	6	12.20
	Contractual	17	34.70
	Not-employed	2	4.10
Employment characteristic	Full time	**45**	91.80
	Part time	2	4.10
	Not employed	2	4.10
Present occupation	Public school teacher	17	34.69
	Private school teacher	**24**	48.98
	College/university instructor	1	2.04
	Government(Non-teaching)	1	2.04
	Private(Non-teaching)	4	8.16
Type of Employer	Government	18	36.73
	Private	**29**	59.18
Employment Location	Within Zambales	**35**	71.43
	Olongapo City	8	16.33
	Outside Zambales	4	8.16
Nature of current work	Teaching	**42**	85.71
	Sales	4	8.16
Teaching position	Instructor 1	1	2.04
	Teacher I	**18**	36.73
	Teacher II	3	6.12
	Teacher III	2	4.08
	Private School Teacher	**18**	36.73
	Not applicable	7	14.29
Level taught	Elementary	4	8.16
	Secondary	**33**	67.35
	Tertiary	3	6.12
Monthly income	25,001 – 30,000	1	2.04
	20,001 – 25,000	**14**	28.57
	15,001 – 20,000	6	12.24
	10,001 – 15,000	8	16.33
	5,001 – 10,000	8	16.33
	5,000 below	1	2.04
Job satisfaction	Very satisfied	7	14.29
	Satisfied	**33**	67.35
	Fairly satisfied	4	8.16
	Not satisfied	3	6.12

Table 2 also shows that there is a high employment rate of science education graduates (95.90%). Almost half have permanent status and their tenure is aligned with their undergraduate degree. This suggests

that teachers are highly-needed in the country confirming the findings of some studies (Cañizares, 2015; Evangelista & Morales, 2017).

Most of the graduates are private school teachers since a license and teaching experience are requirements in the public school, even for new entrants. Additionally, most of them applied for a teaching position; thus, the participants' major source of income is teaching. In the Philippines, the teaching profession is highly regarded, as teachers are viewed to be catalysts of change and nation-builders (Rogayan, 2018). Majority of the graduates are employed within Zambales implying that they chose to serve their province, opting to be employed locally and near their home residence (Sentilleces & Rungduin, 2013).

Remarkably, almost all are in the teaching field, serving at the secondary level since they took up BSEd program. The result conforms to that of Nivera and company (2013) who found out the graduates' current position is appropriate to their degree, suggesting they are not underemployed. Majority answered that they are satisfied in their current work. This implies that most of the teachers are happy in the field that they have chosen. As reported by Abulon and Rungduin (2015), teacher education graduates saw that being a teacher is a profession that is treated with the highest regard and admiration.

Employment Preparation and Job Profile

Most of the graduates landed on their first job as walk-in applicants. They (71.42%) were employed in less than a month to six months after graduation conforming to the description of Sentilleces and Rungduin (2013) of a typical teacher education graduate hunting a job in the field. The results connote that a lot of teachers are really needed in the field, thus the ease in the application processes with available vacancies. Furthermore, their first employment is related to their course (77.60%) implying that the graduates chose to be in the teaching career as per their preparation as aligned in this line of work. Cuadra and colleagues (2019) stated that most of the graduates recognized that their degree programs provided them the necessary knowledge and skills useful in their respective careers. Majority (53.06%) of the participants indicated that their current job is their first job after college. Only two (4.08%) have not been employed for personal reasons.

Although, some (34.69%) are still in doubt and few (24.49%) consider career shift, still most of the participants (40.82%) are not planning to change their career. Such was their choice despite the idea flooding their minds that burden of workload in the profession, especially in the public school, entices some teachers to find another job. Despite complaints by public school teachers against excessive paper works and required documents (Tomacruz, 2018), the graduates still managed to stay in their current jobs.

Competencies Learned in College

Table 3 presents the useful competencies learned by the participants which they found useful in their first job.

Table 3. Useful Competencies Learned by the Graduates

Competencies Learned	Frequency*	Percent
Communication	34	69.39
Life and career	29	59.18
Critical thinking	29	59.18
Instructional and assessment	29	59.18
Knowledge and technical	27	55.10
Information, media & technology	25	51.02
Leadership	23	46.94
Research and innovation	23	46.94
Content-based	22	44.90
Problem-solving	20	40.82
Human relations	19	38.78
Hands-on^	1	2.04
Total	**49**	**100.0**

**multi-response item ^added*

Majority found communication (69.39%), life and career (59.17%), and critical thinking (59.18%) as useful skills. Since the teachers are handling science students, these competencies are deemed essential in developing scientific and functional literacy of the learners. Incidentally, Aquino and colleagues (2015) found the same result that learners perceived communication skill as the most useful skill that they have learned.

Retrospective Evaluation of the Science Education Program Areas

Table 4 shows the participants' retrospective evaluation of the program.

Table 4. Retrospective Evaluation of the Program Areas

	Area	Mean	SD	VD	Rank
1.	Vision, Mission, Goals & Objectives	3.55	0.68	VG	1
2.	Faculty Competence	3.35	0.69	G	3.5
3.	Curriculum and Instruction	3.35	0.66	G	3.5
4.	Support to Students	3.16	0.62	G	6
5.	Research Development	3.53	0.74	VG	2
6.	Extension and Community Involvement	3.24	0.69	G	5
7.	Library Services	2.80	0.71	G	10
8.	Physical Plant and Facilities	2.88	0.78	G	9
9.	Laboratories	3.02	0.83	G	7.5
10.	Administration and Management	3.02	0.78	G	7.5
	Overall	**3.19**	**0.54**	**Good**	

**VG-Very Good; G-Good*

Results reveal (Table 4) that the graduates' overall retrospective evaluation of the science program areas is "good" with an overall mean of 3.19. The VMGO (M=3.55); and research and development (M=3.24) obtained the highest mean rating which implies that the program is congruent with the thrusts of the university and other national agenda. Faculty (M=3.35); and curriculum and instruction (M=3.35) ranked next. Research development has been rated very high since the institution has redirected its vision to be a research university, thus, relentless in its pursuit to develop its research culture.

Lower means, but within the "good" assessment, were obtained in the library services (M=2.80); and facilities (M=2.88). Establishment of adequate educational facilities has to be one of the major concerns of institutions (Jacob & Orleans, 2016). Nevertheless, the "good" to "very good" evaluation of the participants in the 10 program areas are indicative that the university is a good training ground which can help graduates in their career. Institutions of higher learning can evaluate the results of education and training provided to students through evidence gleaned from tracer study (Cuadra et al., 2019).

Adequacy and Relevance of the Science Education Program Outcomes

Table 5 presents the extent of adequacy and relevance of the science education program outcomes. Results show that the graduates found the curricular program outcomes adequate (M=3.37) and relevant (M=3.24). Generally, the participants found the outcomes sufficient and useful in their professional growth as teachers. Evidently, these are also the required competencies in the Philippine Professional Standards for Teachers framework (DepEd-Teacher Education Council, 2017) and the Philippine science teacher education framework (SEI-DOST & UPNISMED, 2011).

Table 5. Adequacy and Relevance of the Curricular Program Outcomes

Curricular Program Outcomes	Adequacy (A)			Relevance (R)		
	Mean	SD	VD	Mean	SD	VD
1. Display basic and comprehensive understanding of the sciences.	3.37	.76	A	3.22	.80	R
2. Apply the scientific principles in solving current problems.	3.35	.72	A	3.22	.85	R
3. Manifest meaningful and comprehensive pedagogical content knowledge of science.	3.35	.69	A	3.22	.80	R
4. Uses scientific inquiry in understanding and explaining natural phenomena.	3.47	.68	A	3.29	.82	R
5. Provide examples to illustrate the application of mathematical concepts.	3.39	.73	A	3.27	.84	R
6. Design and utilize appropriate instructional materials in science.	3.41	.76	A	3.27	.81	R
7. Employ effective teaching techniques for diverse types of learners.	3.41	.67	A	3.24	.72	R
8. Design and utilize variety of appropriate assessment techniques.	3.49	.74	A	3.33	.72	R
9. Analyze assessment results and use these to improve learning and teaching.	3.41	.73	A	3.20	.74	R

10.	Provide regular feedback to students.	3.18	.75	A	3.10	.82	R
11.	Utilize appropriate pedagogy and use of technology for different science content areas.	3.39	.67	A	3.24	.78	R
12.	Demonstrate learning skills in various methods of teaching-learning in the sciences.	3.35	.75	A	3.18	.83	R
13.	Create and utilize learning experiences to develop learner's skills in discovery learning, problem learning and critical thinking.	3.24	.69	A	3.18	.83	R
14.	Manifest creativity and critical thinking when selecting examples and problems to be used in the classroom.	3.41	.70	A	3.24	.85	R
15.	Use varied resources for selecting problems to develop students' problem solving skills.	3.24	.78	A	3.22	.87	R
16.	Develop lessons that can help students appreciate the use of science in daily life.	3.35	.80	A	3.29	.84	R
17.	Possess positive values and attitudes in science education.	3.49	.77	A	3.33	.88	R
18.	Develop innovative curricula, instructional plans, resources and training programs for diverse science learners.	3.37	.73	A	3.20	.87	R
19.	Propose curricular reforms in science relevant to the emerging trends and issues.	3.29	.76	A	3.22	.87	R
20.	Exhibit proficiency in relating science to other curricular areas.	3.43	.71	A	3.22	.85	R
	Overall	**3.37**	**.65**	**A**	**3.24**	**.75**	**R**

Legend: VA-Very Adequate/VR-Very Relevant (3.50-4.00), A-Adequate/R-Relevant (2.50-3.49), MA-Moderately Adequate/MR-Moderately Relevant (1.50-2.49), IA-Inadequate/IR-Irrelevant (1.00-1.49)

As shown in Table 5, the outcome in creating and utilizing learning experiences to develop learner's skills in discovery learning, problem learning and critical thinking is commonly high to both

adequacy and relevance. The graduates found this outcome evident in their work as science teachers as they design and implement learning activities which develop scientific literacy among learners deemed as significant goal of science education (Sunga & Hermosisima, 2016). The design and utilization of appropriate assessment techniques is high only in adequacy while the indicator on acquiring positive values and attitudes in science education is high only in relevance. The selection and use of assessment tools in science has been adequately taught in the program, while the acquisition of positive disposition towards science is seen as very relevant by the participants. Hence, science teachers need to be more innovative to improve student achievement and attitudes (Gernale, Duad, & Arañes, 2015). Commonly low to both adequacy and relevance is the provision of regular feedback to students deviating from what Fortes (2016) believe that teacher's regular feedback gives students an impression that teachers are with them in their entire journey. The authors claim that the failure of providing regular feedback to students is due to the bulk of paperwork assigned to teachers and class size.

Meanwhile, the use of varied resources to develop students' problem solving skills is low only in adequacy, while the outcome on demonstrating learning skills in various methods of teaching-learning in the sciences is low only in relevance. The graduates feel that selection of varied resources on solving problem must be given further emphasis in the program. It is surprising that the graduates rated the outcome on the learning demonstration through different pedagogies as low in terms of relevance implying that they do not often see the relevance of varied techniques in demonstrating learning skills. This result may be sourced from what Opre (2015) stated that the conceptions on assessment are shaped by teacher's personal and professional decisions about their teaching.

Proposing curricular reforms in science relevant to the emerging trends is on average in terms of adequacy. The graduates feel that the program provides the students enough avenue to develop their skills in curriculum review and development based on the emerging needs. The faculty and pre-service teachers should have the stronger voice on how the curriculum in school should actually work (Reyes & Murray-Harvey, 2018). Relatedly, the outcome on analyzing assessment results is on average on relevance. The participants see assessment as a critical

process in improving student achievement and teaching practices. In congruence, Gardner (2012) stated that the ultimate intention of assessment is to advance student learning. These results may serve as baseline information to align the science education program with the national and global standards and to further enhance the students' 21st century competencies. As indicated by Evangelista and Morales (2017), modifications may provide better results which will raise the global competitiveness index of the country in terms of education in the 21st century and IR 4.0.

Furthermore, science education graduates also gave suggestions on improving the science education curriculum. Based on the interview responses, they suggested that the university may consider upgrading the laboratory and instructional facilities to improve the curriculum. One graduate said, "the university must provide more laboratory rooms with adequate equipment." Procurement of additional laboratory apparatuses and equipment may be given priority. In terms of science learning, there should be sufficient classrooms and laboratories with adequate and up-to-date instructional resources (Jacob & Orleans, 2016).

Some participants also suggested that the university may spearhead capability building activities to enhance the holistic skills of pre-service teachers. Another suggestion given was to enhance the teachers' pedagogical practices which are aligned with the 21st century mileu and responsive to IR 4.0. One respondent suggested, "teacher educators need to undergo retooling to make science teaching more responsive to the current educational setting." This may imply that the College may also consider sending the faculty to trainings to enhance their teaching competence further. Additionally, one participant suggested that the undergraduate curriculum must be aligned with the K to 12 program.

Conduct of research-based extension programs to improve the students' research and innovation skills was also suggested. Exposing the students to research activities may enhance their proficiency in conducting science investigatory projects and action research. Science teachers are encouraged to conduct research in science teaching and learning (SEI-DOST & UP NISMED, 2011). Hence, the institution may consider conducting capability building activities to help students

enhance their research skills which are relevant for the workforce 4.0 (Kaur, Awasthi, & Grzybowska, 2020).

Quality higher education in the global perspective translates into employment, efficiency, and productivity. All of these elements drive sustainable economies and desirable social transformations (Egesah & Wahome, 2017). Hence, the suggestions of the graduates may serve as initial inputs in order to further develop the curriculum, which will eventually produce more globally-competitive and well-equipped professionals.

Conclusions and Implications

The study sought to trace the employability of science education graduates. It likewise ascertained the retrospective evaluation of the graduates on the adequacy and relevance of the program. The graduates of the university are in their early 20s, recently graduated and have specialized in biological science. The university has been committed to its mission of providing quality education which is accessible and affordable to the poor but deserving students.

The graduates are equipped with the necessary knowledge, skills, and attitude as manifested with the majority of students having a satisfactory licensure (LET) passing rate. The passion and commitment for teaching have been developed among the graduates. Improving their craft in teaching will contribute a lot in producing holistic students in the new industrial era. Hence, TEIs must continue to spearhead programs and activities that will enrich prospective teachers' personal growth and professional development.

The institution has remained to be the top producer of industry-equipped and globally-ready science teachers in the province and surrounding areas. This is exhibited by the high employment rate of science education graduates of the university. These results have significant implications on the policy of the university on quota courses. The institution may include science education as a priority program so that more students can enroll in the program. The 21st century skills were the most useful competencies that the participants learned in the program.

The science education program areas are good, and the program outcomes are adequate and relevant as shown in the high average rating of the graduates. Furthermore, the graduates suggest that the curricular program could further be enhanced. The initial evaluation of the graduates gathered from this tracer study suggests that the program outcomes are responsive. These results have important implications in terms of recommendatory policies and guidelines on how to integrate the aspects of Education 4.0 and the integration of 21st century skills in the offering of the curricular programs towards producing industry-ready and globally-competitive graduates who will provide leadership in various fields, specifically in science education.

Recommendations

The study recommends that the College may devise a more functional system to trace all the graduates and monitor their condition and their extent of employability. Stricter policy on admission must be institutionalized to ensure that the would-be teachers are academically prepared and passionate to enter the program. The institution may also revisit the program adequacy and relevance to ensure its congruence to the current curriculum. Support teacher educators to attend capability building activities to improve their pedagogical competence. The college may strengthen the career guidance program to encourage takers to enroll in a science-oriented program. Upgrading of the instructional facilities may be given priority to further develop students' competencies in response to the demands of IR 4.0.

Since the present study is limited only to science education graduates, a similar tracer study may be done for other disciplines to have a feedback mechanism towards continuous curricular improvement. Further, inclusions of the employers' feedback of graduates' competencies may be considered to have an external assessment of graduates' readiness in the workplace.

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