Prospective Lifelong Learning Activities of Students and Faculty Members in Philippine HEI Centers of Excellence and Centers of Development in STEAM Programs

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Abstract

The Philippine higher education institutions (PHEIs) adopted learning competency-based standards and outcome-based systems to develop graduates imbued with the positive attitude of continuous or lifelong learning necessary for this 21st century. Also, several HEI programs were awarded as centers of excellence (COE) or center of development (COD) in recognition of the excellent quality of education and development of students with positive attitudes toward lifelong learning in Science, Technology, Engineering, Agriculture-Fisheries, and Mathematics (STEAM) programs. This descriptive-correlational research study surveyed 24,172 students and 1,016 faculty members from 83 PHEIs awarded as COE/COD in STEAM programs to investigate their perceptions on the importance and possibility of engagement toward lifelong learning activities. Students' possibility to engage in lifelong learning activities was correlated with their willingness to engage in lifelong learning. Faculty members' engagement possibility was correlated with their agreement on the institution's expectation to acquire our update their background knowledge. Most STEAM students and faculty members regarded lifelong learning as important to very important and with moderate to high possibility of engagement. Unlike fisheries, mathematics, and technology programs, students under agriculture, engineering, and science programs were willing to engage in lifelong learning provided that their possibility of engagement is moderate or higher. Most faculty members expressed their willingness to engage in lifelong learning activities, be role models to their students, and be effective in their roles at work, in life, and the community. Faculty members engage in lifelong learning not only because it was expected of them by their institution.

Introduction

The International Labor Organization (ILO) defines lifelong learning as all learning activities undertaken throughout life for the development of competencies (knowledge, skills, and know-how applied and mastered in a specific context) and qualifications (formal expression of the vocational or professional abilities recognized at international, national or sectoral levels) (Macaranas, 2007).

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Lifelong learning is a necessity for future learning as it is the most important tool for enhancing economic growth and individual development (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 1996; Organization for Economic Cooperation and Development [OECD], 2001; European Commission [EC], 2001). Lifelong learning is essential to be successful in Industry 4.0 (IR4.0), the new industry landscape where rapid changes in technological advances and information technologies constantly affect the competencies (Wrobel-Lachowska et al., 2017). In response to the need for the IR4.0, the Education 4.0 was devised (Fisk, 2017). Education 4.0 requires establishing a framework for lifelong learning recognized by education professionals, governing bodies, accreditation organizations, certification boards, employers, and the general public as one of the most important competencies that everyone must possess (Collins, 2009; Benson 2017). However, promoting lifelong learning is a major challenge in the educational system because it requires changes in the approaches in teaching and learning (Collins, 2009). The challenge of promoting lifelong learning must be addressed to prepare and develop in everyone relevant competencies for employability and skills and attitudes to continue further training beyond schooling (Crow, 2006).

The Philippine Development Plan for 2017-2022 includes lifelong learning as one of the strategic frameworks to accelerate human capital development and growth of the country's agriculture, industry, and service sectors (National Economic and Development Agenda [NEDA], 2017). Lifelong learning opportunities must be strengthened to equip all Filipinos with the necessary skills to engage in meaningful and rewarding careers despite constant change in the workplace. The strategic framework reiterates, among others, integrating the 21st century competencies; strengthening the quality assurance mechanism; improving research, innovation, and extension services; expanding collaboration between government, academe, and industry; and promoting excellence among HEIs.

Being in-charge in ensuring quality higher education, the Commission on Higher Education (CHED) issued a policy standard under CMO No. 3, s. 2012 to enhance the quality assurance by adopting learning competency-based standards and outcome-based systems in the hope to produce graduates with "the competency to learn continuously throughout life," among others. The adoption of quality standards and systems was motivated by the demands of a rapidly changing workplace. Hence, the shift from education as "the transmission of expert knowledge" to lifelong learning as building learner competencies, including the "learning how to learn." However, Anito and Morales (2019) concluded that the STEAM education framework remains more dependent on the teacher and the institution than on student empowerment and lifelong learning.

The PHEIs awarded as Center of Excellence/ Center of Development (COE/COD) are expected to deliver better quality higher education (CHED Memorandum Order No. 55, s. 2006). These PHEIs are assumed to have exemplarily demonstrated the outcome-based education system and have been excellently promoting lifelong learning to their students.

Therefore, this study investigated students' and faculty members' prospective lifelong learning activities in the PHEIs awarded as COE/COD in the STEAM disciplines projecting from their

attitude towards lifelong learning. Specifically, the study attempted to answer the following questions:

1. What is the level of importance and possibility of engagement of STEAM students and faculty members in the lifelong learning activities?;

2. What are the lifelong learning activities of STEAM students that have the highest significant association with their willingness to engage in lifelong learning?; and

3. What are the lifelong learning activities of STEAM faculty members that have the highest significant association with their agreement on the expectation of their institution to update/acquire background knowledge on STEAM when grouped according to age and academic rank?

Among other disciplines, Science, Technology, Engineering, and Mathematics (STEM) are of utmost importance because these are the economic drivers that play a vital role at multiple levels of the society and has a tremendous impact on the everyday life of the people in all parts of the world, (Ejiwale, 2014; Mpofu 2020). In the Philippine context, Agriculture and Fisheries were acknowledged to have the same importance hence the establishment of the STEAM meta-discipline. The need for additional knowledge and engagement in lifelong learning were mentioned as one of the program outcomes in the revised policies and standards of some STEAM programs, while others expect engagement of continuing advance courses from their graduates like engaging in graduate studies and involvement in research.

Methodology

The study employed a descriptive-correlational survey research design. The main purpose was to describe and interpret the perception of the target population on a particular phenomenon of interest using a survey questionnaire (Creswell, 2014). At the same time, correlation/ association was employed on the STEAM students' willingness to engage in lifelong learning and the faculty members' agreement to update/ acquire background on STEAM as expected from them by their institution with the possibility of engagement on the lifelong learning activities.

The survey questionnaires were piloted and administered to STEAM students, and faculty members in the Philippine HEIs awarded as COE/ COD on STEAM programs. Two questionnaires were utilized separately for STEAM students and faculty members. Both questionnaires contain the same list of lifelong learning activities. STEAM students and faculty members rated their perceived level of importance and possibility of engagement for each of the activities enumerated. The level of importance was measured using 3-point Likert Scale (1 = Not Important, 2 = Important, 3 = Very Important), and also the possibility of engagement (1 = Low, 2 = Moderate, 3 = High). Moreover, the students were asked about their willingness to be engaged in lifelong learning activities (0 = No, 1 = Yes), while the faculty members were asked whether their institution is expecting them to update/acquire background knowledge on STEAM (0 = No, 1 = Yes).

This study used a pre-tested survey instrument and focus group discussions (FGDs). The FGDs were conducted at the University of Southern Mindanao, Benguet State University, and Philippine Normal University to validate the initial results from the survey. The sample size of students in each STEAM program per HEI was calculated using Slovin's Formula at a 5% margin of error, while all faculty members were enumerated. There were 4,172 students and 1,016 faculty who responded from the HEIs awarded as COD/COE of STEAM programs. The following table presents the disaggregation of student and faculty members according to the STEAM disciplines and disaggregation of faculty members according to age and academic rank (Table 1).

The Arithmetic mean (descriptive statistic) and Chi-Square Automatic Interaction Detection (CHAID) Tree model (Kass, 1980) were employed to analyze the quantitative data. The qualitative data collected from the FGDs were utilized for further understanding and enrichment of the statistical results.

Table 1

Number of STEAM Student and Faculty Member-Respondents for Each Discipline

Discipline	Student	Faculty Member	Faculty Members According to:				
			Age	n	Academic Rank	n
Sciences	3,642	151	21-30 yrs.	291	Professor	181
Technology	5,918	232	31-40 yrs.	289	Associate Professor	206
Engineering	6,247	377	41-50 yrs.	170	Assistant Professor	171
Agri-Fisheries	7,455	212	51-60 yrs.	205	Instructor	458
Mathematics	910	44	>60 yrs.	61		
TOTAL	24,172	1,016				

R e s u l t s   a n d   D i s c u s s i o n

The Level of Importance and Possibility of Engagement of STEAM Students on the Activities that Foster Lifelong Learning

There is a common agreement on the importance of attitudes or motivations, such as perceived importance and the possibility of engagement, as the key to lifelong learning in general or specific technical fields (McCombs, 1991). The lifelong learning activities were grouped into three drawnout from the perceived level of importance and possibility of engagement of STEAM students (Figure 1). These groups were inferred as activities in the themes of advancement of content knowledge towards practical application and extension (Set A); research, lifestyle, travel, and digital technology (Set B); and customary activities (Set C).

SET A: Activities on Advancement of Content Knowledge Towards Practical Application and Extension

STEAM students regarded this first set of activities as very important with a high possibility of engagement. These activities were observed to be the core mandates of the HEIs to cater advancement in content knowledge towards practical application then sharing one's gained knowledge and skills to clienteles. Except for the extension part, most of the activities in this set were conducted in a formal setting.

The viewed high importance and possibility of engagement of STEAM students on these activities may have been influenced by the teaching approaches of the faculty members. During the FGD, faculty members were confident that they had promoted lifelong learning by employing a student-centered learning approach. Moreover, community engagement programs or extension activities were integrated into instruction aside from their practicum. Community engagement activities introduced service-learning pedagogy for a student-centered learning approach, where students had the opportunity to be hands-on in proving theories and principles learned at school. Also, through such activities, students were able to extend their knowledge and skills to the community. Though industry immersion/ practicum/on-the-job training/internship is already part of the curriculum of STEAM programs, this activity was enhanced, as revealed during the FGD. In some programs, this activity was required to be enrolled simultaneously with the conduct of their thesis/ capstone. Students were exposed to practical application in the industry through such schemes mentioned while determining possible experiments, designs, and innovations for their thesis.

As a supplement for what they are learning at school, students were encouraged to attend trainings, seminars, conferences, and workshops related to enhancing their core competencies. Some HEIs also collaborate with experts from line agencies and private companies to provide an overview of the practical applications of the content knowledge being taught.

SET B: Activities on Research, Lifestyle, Travel, and Digital Technology

Except for the research engagement or collaboration, the second set (Set B) of activities were mainly on lifestyle, travels, and digital technology upskilling. While Set B activities were also regarded as very important as the activities in Set A, the students' possibility of engagement is moderate, perhaps because these activities require funding.

In the curriculum of STEAM programs, research activities were in the form of a thesis or capstone project. The faculty members mentioned during the FGD that the students' theses should integrate all possible learning outcomes since the end goal of teaching in STEAM is to equip and encourage students toward becoming scientists/ researchers. Moreover, student theses or capstone projects make them resourceful, creative, and innovative in addressing the time problems present in the locality. Additionally, students were encouraged to write their research outputs and publish them. Some HEIs even funded students to present their papers at conferences. In addition, technology pitching activity was conducted by some HEIs, particularly the engineering programs, to promote and transfer the technologies developed by the students.

In the hope of inculcating student appreciation toward the community and nature, hiking or trekking was mentioned during the FGD as another interesting activity required for students to do outreach activities and document nature. Such activity may have influenced the students on their interest or perceived importance and the moderate possibility of engagement to lifestyle, travel, and digital technology. These engagements are observed to be commonly used in "vlogging," the new hobby of 21st Century generation.

SET C. Customary Activities

While the third group of activities was considered to have moderate engagement, it was viewed as less important than the activities in Sets A and B. As observed, the third group were customary activities that STEAM students were most likely to engage in or too early to be engaged in. Except for attending short-term related and non-related courses and capacity building, the rest of the activities in this group were informal and customary activities relative to building and strengthening relationships and being actively involved in their community. Customary activities were perceived as less important not because they are not essential but because they were usually done as part of day–to–day life compared to those they are yet to engage in. It was deduced from the FGD that STEAM students were rarely provided individual activities. Often, they work in teams. For instance, during their practicum and community engagement, students were honed to build and strengthen relationships with the community and their clientele. Their involvement in presentations to conferences, technology pitching, and publication provided them an avenue for international linkages and networks.

Generally, STEAM students regarded lifelong learning activities as important and likely to engage in. Looking into the revealed teaching methodologies of the faculty members, they were mainly focused on the practical application along technical knowledge and building the desire and appreciation of the students in constructing and acquiring knowledge and skills. These teaching methods develop autonomy, intrinsic motivation, enculturation, discourse and collaboration, and reflection as instructional features that foster lifelong learning (Dunlap & Grabinger, 2008). Teachers should take up the role of facilitator for learners to take more responsibility for setting goals, identifying resources for learning, and reflecting on and evaluating their own learning (Collins, 2009).

Association of the Possibility of Engagement of STEAM Students to Lifelong Learning Activities with their Willingness to Engage in Lifelong Learning

The activities that the STEAM students are most likely to engage in were narrowed down by correlation with their willingness to engage in lifelong learning (Figure 2 and 3). Figure 2 reveals that most students under agriculture, engineering, and science programs are willing (yes) to engage in lifelong learning. In contrast, most fisheries, mathematics, and technology program students are uncertain (maybe) or unwilling (no) to engage in lifelong learning (Figure 3).
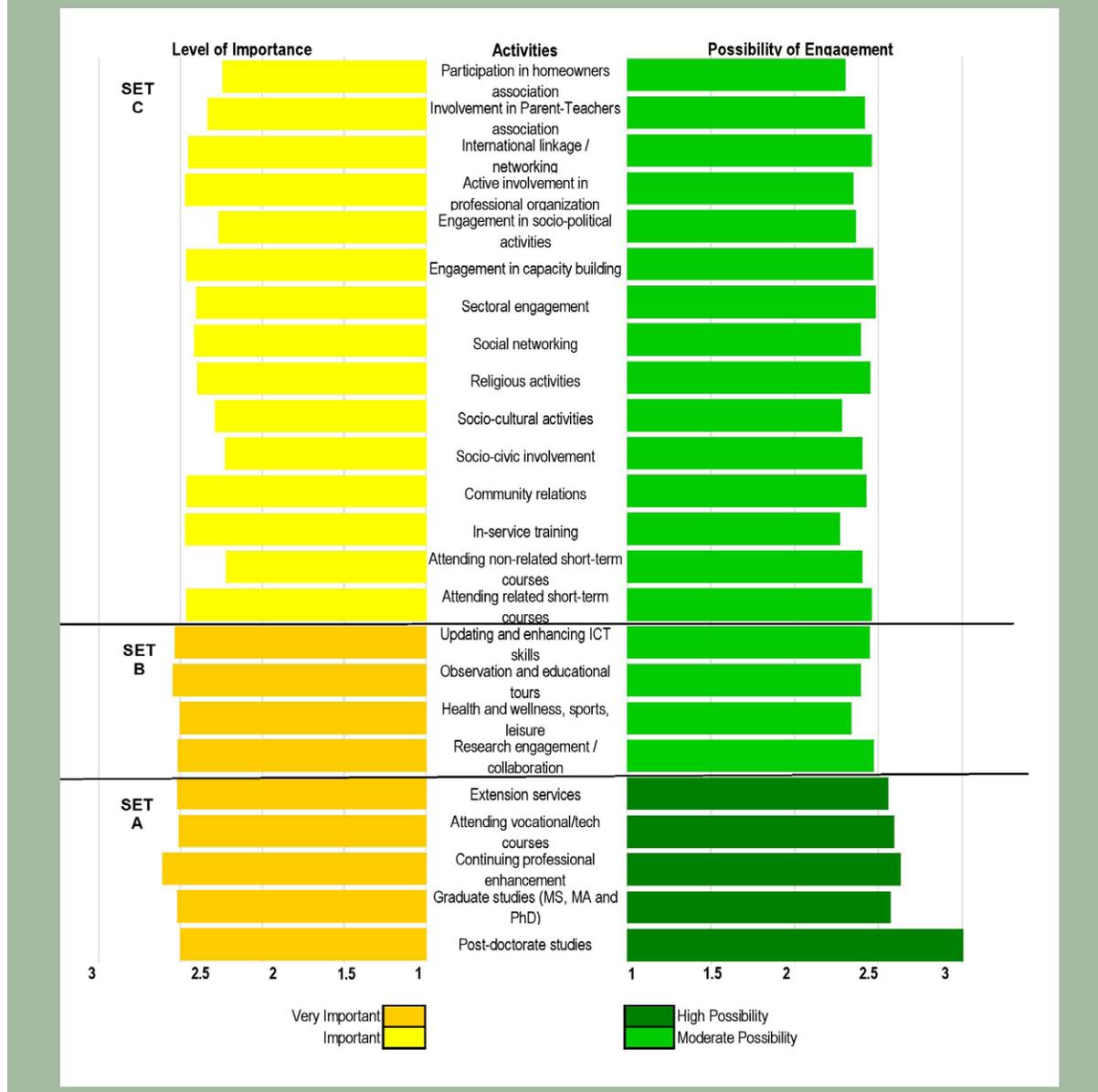
Agriculture, Engineering, and Science Students

For agriculture students, the learning activities

Figure 1

Perceived Level of Importance and Possibility of Engagement of STEAM Students on Lifelong Learning Activities
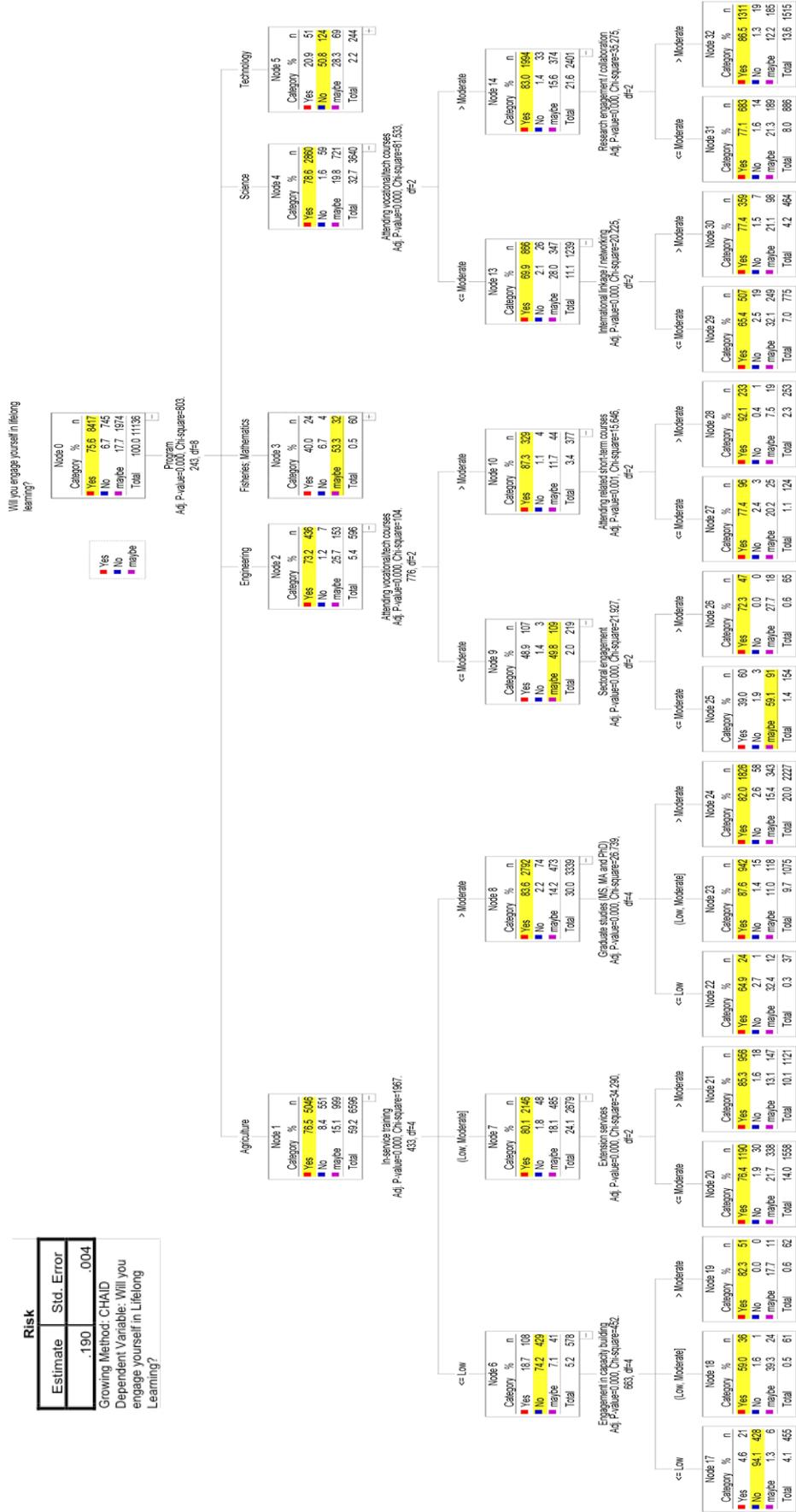

that have the highest significant association with their willingness to engage in lifelong learning were the in-service training (school-based, in-campus, institutional training), capability building activities, extension services, and graduate studies (MS, MA, and PhD). The tree classification showed that agriculture students who were willing (yes) to engage in lifelong learning have moderate or above possibility of engagement in these activities.

The willingness of engineering students has the highest significant association with vocational and technical courses, sectoral engagement, and short-term courses related to their field or discipline. The tree classification revealed that engineering students who were willing (yes) to engage in lifelong learning have above moderate possibility of engagement in these activities. Engineering students with moderate or below possibility of engagement in these activities have doubts

Figure 2

Tree Classification of Lifelong Learning Activities of Agriculture, Engineering, and Science Students

(maybe) in terms of their willingness to engage in lifelong learning.

The willingness of science students to engage in lifelong learning activities has the highest significant association with vocational and technical activities, international linkage and networking, and research engagement and collaboration. As observed from the tree classification, science students were willing to engage in lifelong learning regardless of whether their possibility of engagement is below or above moderate.

Generally, students under agriculture, engineering, and science programs were willing to engage in the determined activities in Figure 2 provided that the possibility of their engagement, which is moderate or above moderate, were sustained. Based on the FGD, sustaining students' positive attitude implies that faculty members should continue providing or creating motivational learning experience through pragmatic teaching approaches, experiential learning, service and community-based learning, and reflective learning. These learning strategies are effective for both teachers and students to develop and apply technologies (Francis et al., 2011; Frache, 2019).

Fisheries, Mathematics, and Technology Students

For fisheries and mathematics programs, students were uncertain (maybe) about their willingness to engage in lifelong learning (Figure 3). Fisheries and mathematics students have similar learning activities highly associated with their uncertain willingness to engage in lifelong learning, particularly attending short-term courses related to their field. The tree classification revealed that having above moderate possibility of engagement in the mentioned activity changed the students' likelihood from uncertain (maybe) into being willing (yes) to engage in lifelong learning. Like other STEAM programs, the FGD revealed that faculty members were more facilitative towards student-centered learning to motivate their students into continuous learning. However, the result implies that faculty members or the HEIs offering fisheries and mathematics programs need to motivate their students rigorously more than usual.

Most of the Technology students were not willing to engage in lifelong learning (Figure 3). Despite having a moderate or above possibility of engagement on capacity building, international linkages and networking, and in-service trainings, technology students remain uncertain (maybe) or unwilling to engage in lifelong learning. During the FGD, some faculty members mentioned that students taking up technology programs are more expected to be lifelong learners since what they have learned in school may be obsolete when they graduate. However, the results are paradoxical in that technology students were unsure about their willingness to engage in lifelong learning despite their high level of possibility of engagement. It is pertinent then that HEIs offering technology programs and faculty members must be more attentive in motivating their students and looking into other factors that hamper their willingness to engage in lifelong learning. Also, it may be pertinent to review their teaching approaches again and align them to experiential learning, service and community-based learning, action learning, and reflective learning. As mentioned above, these strategies were found effective for both teachers and students to develop and apply technologies (Frache 2019, Abramochi et al., 2019, Weinberg et al., 2011, Warnick et al., 2014).

The Level of Importance and Possibility of Engagement of STEAM Faculty Members on the Activities that Foster Lifelong Learning

One of the main tasks of teachers is to harness their students' disposition toward lifelong learning; hence their commitment and enthusiasm towards lifelong learning must be demonstrated (Day, 1999). During the FGD, faculty members acknowledged their role as models to their students. This result is similar to Demirel (2009), which reported that faculty members expressed that it is impossible to encourage or motivate students to engage in lifelong learning activities, which they have not engaged in themselves.

Figure 4 shows the grouping of lifelong learning activities based on the elicited perceived level of importance and possibility of engagement of STEAM faculty member-respondents. These groups were observed mainly as activities on professional development for their mandates or work-related roles (Set A), activities on personal development for life-related roles (Set B), and activities for citizen-related roles (Set C).

Figure 3

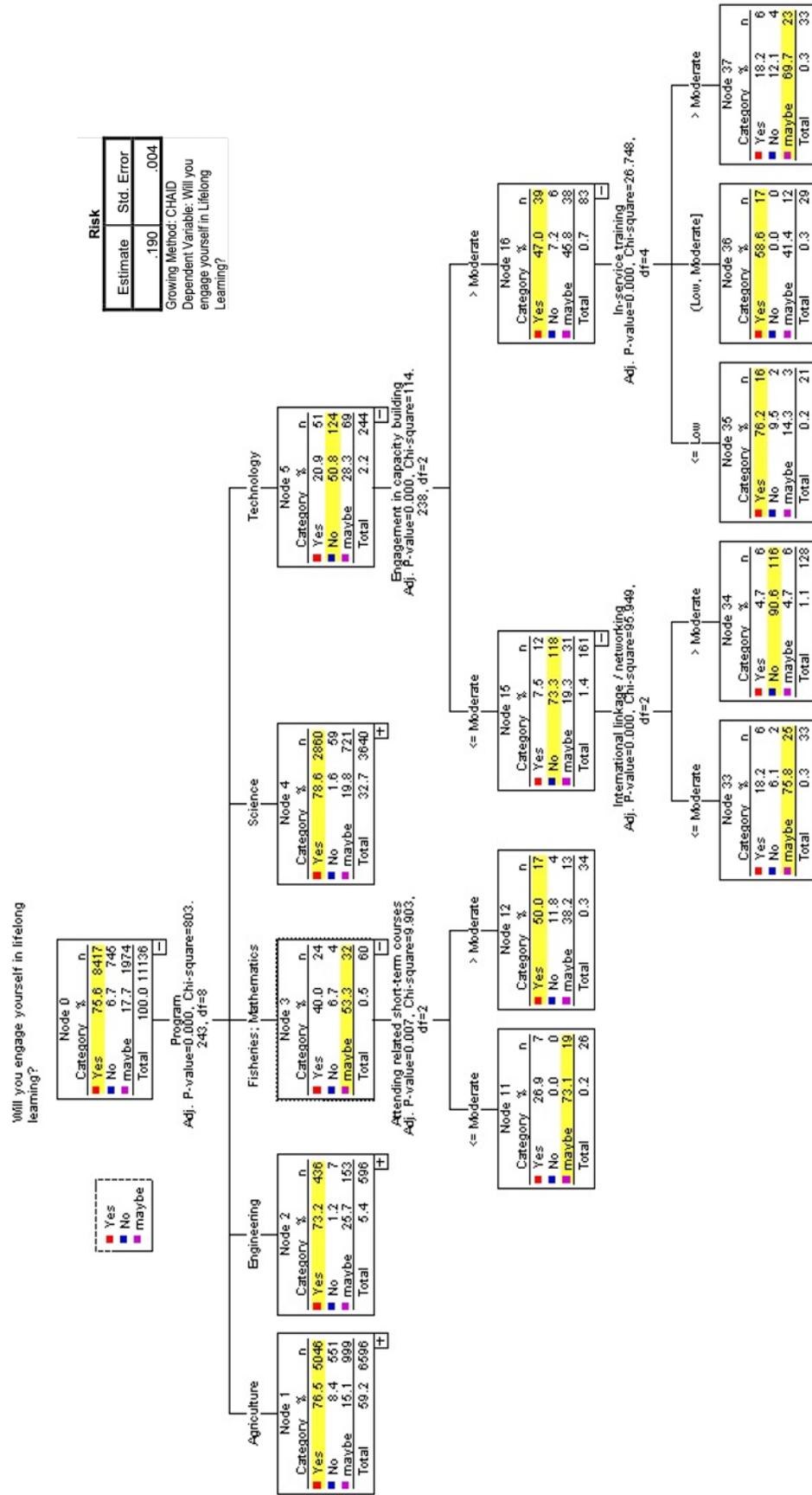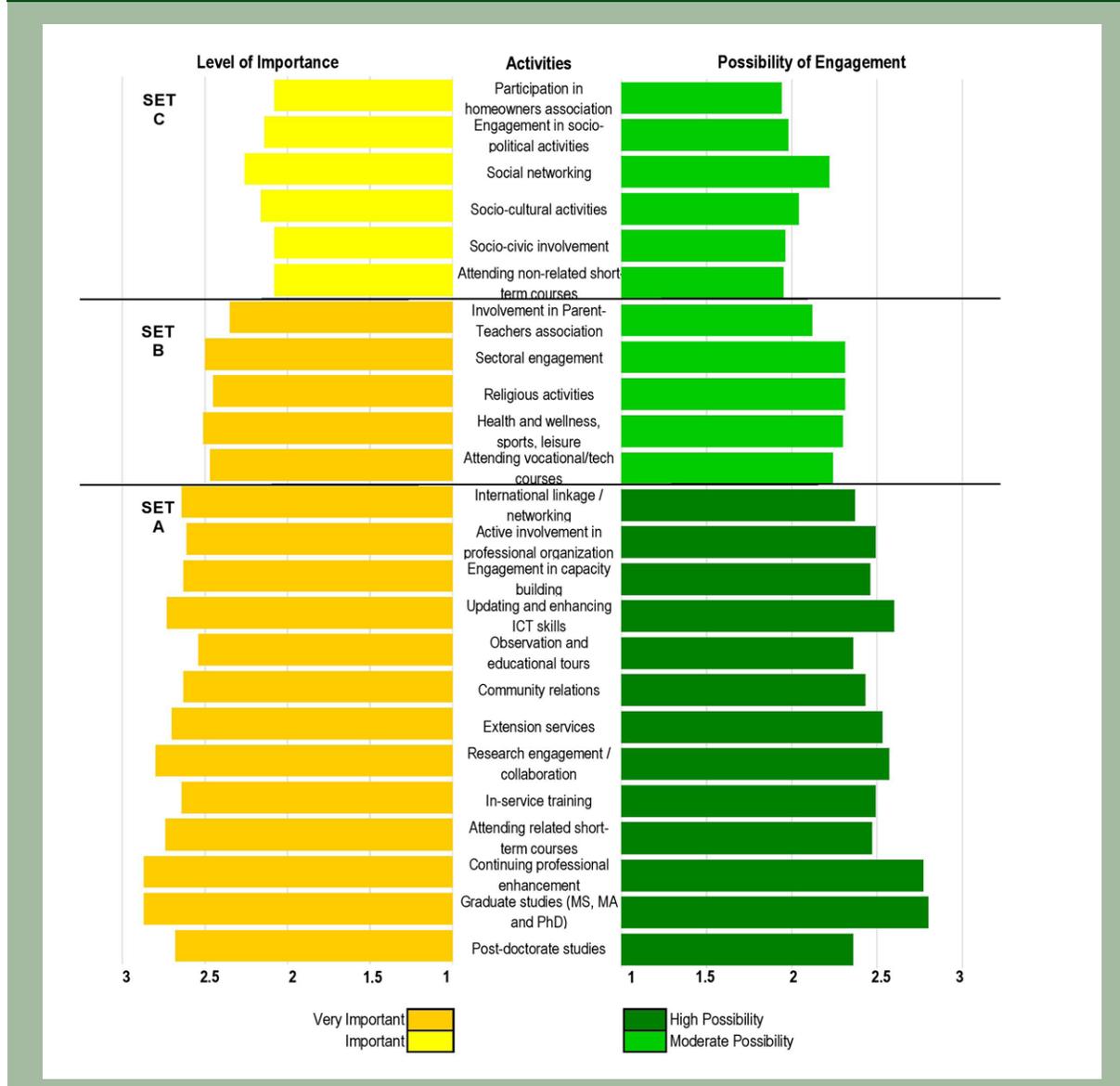*Tree Classification of Lifelong Learning Activities of Fisheries, Mathematics, and Technology Students*

Figure 4

Perceived Level of Importance and Possibility of Engagement of STEAM Faculty on Lifelong Learning Activities

SET A: Activities on Professional Development for their Mandates or Work-Related Roles

The first set of activities was regarded by STEAM faculty members to be very important with a high possibility of engagement. These activities were observed to revolve around the competencies and mandates of faculty members in an HEI, such as advance studies and continuing professional enhancement, research, development, and extension engagements. Moreover, the activities herein were someway interrelated with the teaching effectiveness of the faculty members.

SET B: Activities on Personal Development for Life-Related Roles

The second set of activities was still viewed by STEAM faculty members as very important as those in Set A, however, with moderate possibility of engagement. The faculty member activities in this set are observed to be roles

outside university work. These roles are being a parent, a friend, a coach, a child, a minister, and similar roles. Health and wellness activities, and technical and vocational courses can help faculty members develop the practical skills necessary to effectively carry out their life roles. Moreover, observation and educational tours may imply involvement in such activities, for instance, as a parent accompanying his or her children in field visits or tours.

SET C: Activities for Citizen-Related Roles

The third set of activities has a moderate possibility of engagement among STEAM faculty members like those activities in Set B, however, regarded as important only. The activities herein were deduced to revolve around carrying out civic roles. Being a responsible citizen requires involvement in socio-civic, socio-cultural, and socio-political activities. As community members, they are also expected to be involved in community associations, such as homeowners' associations.

It may be challenging, but lifelong learning is necessary for teachers to increase their professionalism and update and deepen their knowledge towards developing their profession (Day, 1999, Duță & Rafailă, 2014) or life in general. As the results showed, the STEAM faculty members perceived lifelong learning activities as important with moderate to high possibility of engagement towards role effectiveness. As expressed by faculty members during the FGD, they also perceive lifelong learning as a continuous professional development which they described as "a never-ending attitude towards learning", "forever learning", and "from-cradle-to-grave learning". Such perspective corroborates the conclusion of Morales et al. (2020) that the positive outlook of teachers in STEAM disciplines can motivate more students to the STEAM pipeline and sustain a pool of STEAM professionals.

Association of the Possibility of Engagement of STEAM Faculty Members to Lifelong Learning Activities with their Institution's Expectation of Them to Update/ Acquire their Background Knowledge

Niloofar et al. (2020) mentioned that the extrinsic motivation factor of faculty members to be productive comes usually from institutional expectations. Thus, the HEI expectations to their faculty members to update or acquire background knowledge on their respective disciplines or fields was correlated with the faculty members' possibility of engagement towards lifelong earning.

According to STEAM Faculty Members' Age

Continuous learning for all workers is essential. However, age affects the decline of self-confidence or self-efficacy for learning and skills development relevant to one's career (Maurer, 2001). Worker age indirectly affects the workforce involvement in work-related learning and development activities; hence, age groups must be treated differently (Maurer et al., 2003). With that, the lifelong learning activities of faculty members were classified according to age.

Most of the STEAM faculty members agreed that they were expected to update or acquire background knowledge on their respective disciplines (Figure 5). For faculty members within 41 to 50 years old, the activity that has a high significant association with their agreement was on updating and enhancing ICT knowledge and capacity, while those ages between 31 to 40 years old and 51 years and above were on capability building activities and short-term courses not related to field or discipline. Regardless of the level of possibility of engagement, STEAM faculty members still agree to update their or acquire background knowledge.
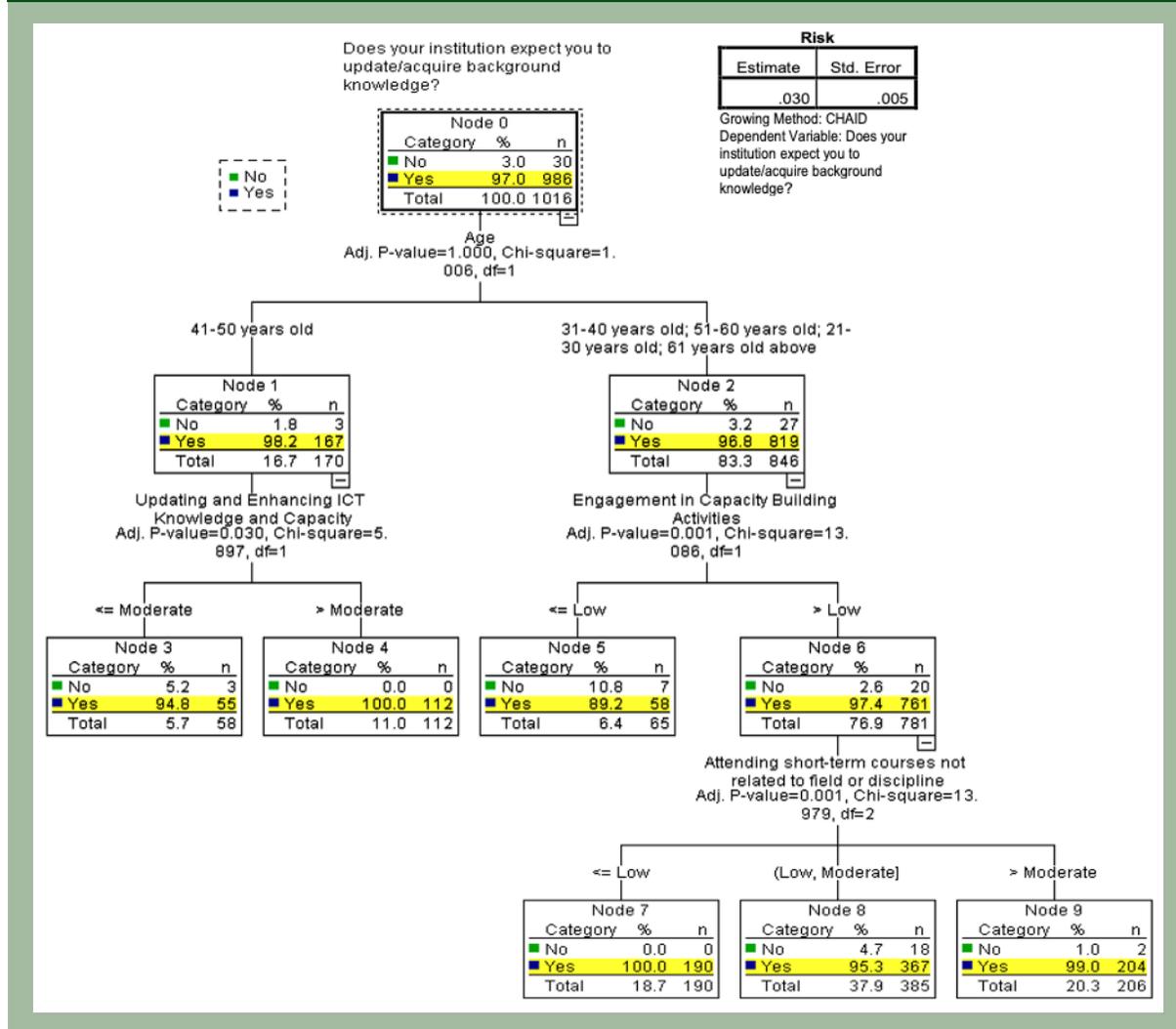
According to Academic Rank

The activities significantly associated with the institution's expectation to update or acquire background knowledge for instructors are vocational and technical courses and community relations (Figure 6). In the case of assistant professors, associate professors, and professors, extension services and international linkages and networking are the activities that significantly associated with the University's expectation of them to update or acquire background knowledge.

The lifelong learning activities observed according to academic rank were quite interrelated with the defined academic productivity by Niloofar et al. (2020). They defined academic productivity as referring to teaching, services to the community, publication in refereed journals, and presentations. They found that faculty members were motivated

Figure 5

Tree Classification of Learning Activities with the Age of STEAM Faculty Members

to increase their academic productivity by, among many factors, their academic rank. Connecting it with the observed lifelong learning activities of faculty members according to academic rank, faculty with instructor ranks were more into the activities that provide them practical application skills and relationships with the community. On the other hand, assistant professors, associate professors, and professors were more into international linkages and networking and extension services, which entails publication to refereed journals, conference presentations, and community services.

Conclusions and Recommendations

STEAM Students

Lifelong learning activities were regarded as important to very important and with moderate to high engagement possibility by STEAM students. Also, agriculture, engineering, and science students with moderate to high possibility of engagement were certain in their willingness to engage in lifelong learning. In contrast, students with low possibility of engagement were doubtful about their willingness to engage in lifelong

Figure 6

Tree Classification of Learning Activities with the Academic Rank of STEAM Faculty Members
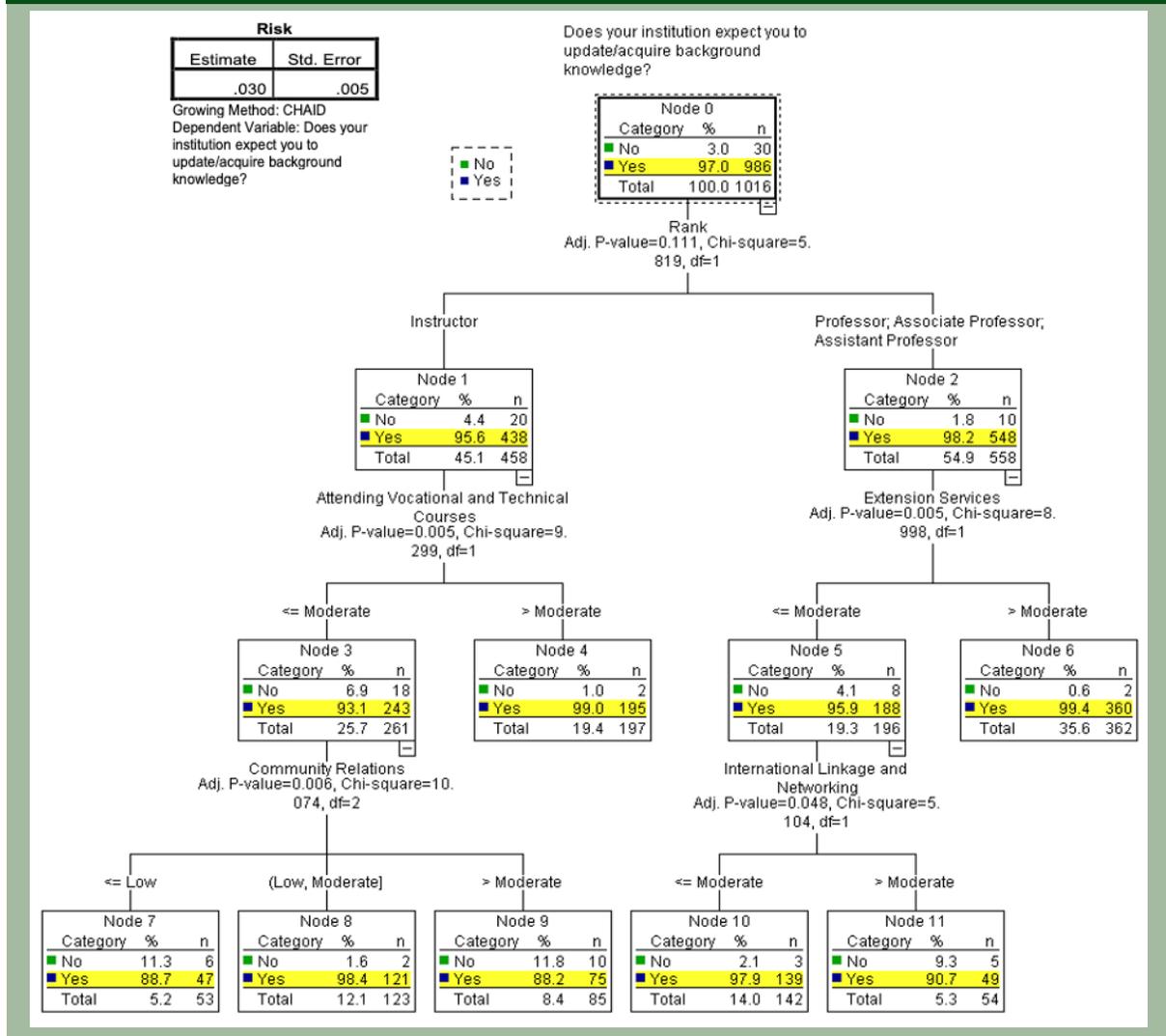
learning. For fisheries and mathematics, students were unsure of their willingness to engage in lifelong learning. Their willingness became certain provided that the level of possibility of engagement is above moderate. Paradoxically, the students taking up technology programs who were more expected to be lifelong learners were unwilling to engage in lifelong learning even at an above moderate level of possibility of engagement.

Based on the series of FGDs, faculty members primarily designed learning experiences and the application of STEAM discipline to real-life situations. Through these activities, learners have opportunities to transfer the acquired knowledge at school to their community, where they can create learnings that cannot be delivered from the four walls of the classroom. They mainly implemented outside traditional classroom-teaching approaches such as experiential and active learning, which have shown promising effectiveness in promoting lifelong learning to STEAM students. Faculty members took facilitative roles and created learning environments where students construct and reflect on ideas other than merely transferring them. Faculty members do not merely transfer the knowledge to students but direct them to the sources of information and

create learning experiences or environments where STEAM students will generate ideas and knowledge.

While the PHEIs awarded as COE/COD in STEAM programs excelled in promoting lifelong learning to their students, they should sustain the positive attitudes of the STEAM students by ensuring that faculty members maintain their teaching approaches, strategies, and practices, or elevating them higher. However, in the case of students under technology programs, PHEIs and faculty members need to reconsider their teaching strategies and learning environments to motivate their students more towards lifelong learning.

STEAM Faculty Members

STEAM faculty members perceived lifelong learning as important or very important with a moderate or high possibility of engagement. Their attitudes towards lifelong learning were affected by their roles at work, life, and society or community. Naturally, their institutions expect them to capacitate themselves regardless of the level of the possibility of their engagement. However, the older faculty members are more interested in ICT upskilling, while younger faculty members are more interested in building their capacity. With the gained knowledge from years of experience, assistant professors, associate professors, and professors were more interested in engaging in extension services and international linkages and networks. Instructors, who were mostly assumed young, were more interested in improving their practical applications through technical and vocational courses and community relation engagements.

This study also proved that STEAM faculty members' lifelong learning activities vary by age groups and academic ranks. These observations can help the administration provide capacity building and learning and development activities for particular age groups and academic ranks of heir faculty members, other than just expecting them to engage in lifelong learning.

References

Abramovich, S., Grinshpan, A.Z., & Milligan, D.L. (2019). Teaching Mathematics through Concept Motivation and Action Learning. E*ducation Research International*, 2019: 1–13. https://doi.org/10.1155/2019/3745406

Anito Jr., J.C., & Morales, M.P.E. (2019). The Pedagogical Model of Philippine STEAM Education: Drawing Implications for the Reengineering of Philippine STEAM Learning Ecosystem. *Universal Journal of Educational Research*, 7(12), 2662–2669. https://doi org/10.13189/ujer.2019.071213

Becirovic, S., & Sinanovic, J. (2016). The Determinants of Lifelong Learning. *European Researcher*, 103(2): 107-118. doi:10.13187/er.2016.103.107

Benson, H. (2017). *Continuous Learning: Millennials Want It, Organizations Need To Foster It*. Infosys. https://www.infosys.com insights/human-potential/continuous-learning millennials.html

Commission on Higher Educattion. (2006). CHED CMO No.55, s. 2006. Revised Policies and Standards on the Centers of Excellence Project. https://ched.gov.ph/wp-content/uploads/2017/10/CMO-No.55-s2006-1.pdf

Commission on Higher Educattion. (2012). CHED CMO No.3, s. 2012. Enhanced policies, guidelines and procedures governing increases in tuition and other school fees, introduction of new fees, and for other purposes. https://ched.gov.ph/wp-content/uploads/2017/10/CMO-No.03-s2012.pdf

Collins, J. (2009). Lifelong Learning in the 21st Century and Beyond. *RadioGraphics*, 29(2): 613 622. https://doi.org/10.1148/rg.292085179

Creswell, J.W. (2014). *Research design: qualitative, quantitative, and mixed-methods approaches, 4th edition*. Sage Publications.

Crow, S.R. (2006a). What Motivates a Lifelong Learner? *School Libraries Worldwide*, 12(1): 22–34. https://www.researchgate.net/publication/251296152_What_Motivates_a_Lifelong_Learner

Day, C. (1999). *Developing Teachers* (1st edition) [E-book]. Being a Teacher, Developing as a rofessional (pp. 1–2). Routledge. https://doi org/10.4324/9780203021316

Demirel, M. (2009). Lifelong learning and schools in the twenty-first century. *Procedia - Social and Behavioral Sciences*, 1(1): 1709–1716. https://doi.org/10.1016/j.sbspro.2009.01.303

Dunlap, J.C., & Grabinger, S. (2008). Preparing students for lifelong learning: A review of instructional features and teaching methodologies. *Performance Improvement Quarterly*, 16(2): 6–25. https://doi org/10.1111/j.1937-8327.2003.tb00276.x

Duţă, N., & Rafailă, E. (2014). Importance of the Lifelong Learning for Professional Development of University Teachers – Needs and Practical Implications. *Procedia - Social and Behavioral Sciences*, 127: 801–806. https://doi org/10.1016/j.sbspro.2014.03.358

Ejiwale, J. (2014). Facilitating collaboration across science, technology, engineering, mathematics STEM) fields in program development. *Journal of STEM Education*, 15(2): 35-39. https://www.learntechlib.org/p/151097/.

European Commission. (2001). *Making European area of Lifelong learning a reality*.https://eur-lex.europa.eu/LexUriServLexUriServ.do?uri=COM:2001:0678:FIN:EN:PDF

Fisk, P. (2017). *Education 4.0 . . . the future of learning will be dramatically different, in school and throughout life*. GeniusWorks. https://www peterfisk.com/2017/01/future-education-young everyone-taught-together/

Frache, G., Tombras, G., Nistazakis, H., & Thompson, N. (2019). Pedagogical Approaches to 21st Century Learning: A Model to Prepare Learners for 21st Century Competencies and Skills in Engineering. *2019 IEEE Global Engineering Education Conference (EDUCON)*. Published. https://doi.org/10.1109/educon.2019.8725214

Francis, C.A., Jordan, N., Porter, P., Breland, T.A., Lieblein, G., Salomonsson, L., Sriskandarajah, N., Wiedenhoeft, M., DeHaan, R., Braden, I., & Langer, V. (2011). Innovative Education in Agroecology: Experiential Learning for a Sustainable Agriculture. C*ritical Reviews in Plant Sciences*, 30(1–2): 226–237. https://doi.org/10.080/07352689.2011.554497

Goodyear, P. (2000). Environments for Lifelong Learning. *Integrated and Holistic Perspectives on Learning, Instruction and Technology*, 1-18. https://doi.org/10.1007/0-306-47584-7_1

Kass, G.V. (1980). An Exploratory Technique for Investigating Large Quantities of Categorical Data. *Applied Statistics*, 29(2): 119–127.

Macaranas, F.M. (2007). *Lifelong learning in the Philippines*. Subregional Office for South East Asia and the Pacific - Manila: International Labour Organization. https://www.researchgatenet/profile/Federico_Macaranaspublication/242469791_Lifelong_Learning_inthePhilippines links/57111ba208aeebe07c023f21/Lifelong LifelongLearning-in-the-Philippines.pdf

Maurer, T.J. (2001). Career-relevant learning and development, worker age, and beliefs about self efficacy for development. *Journal of Management*, 27(2). https://doi.org/10.1016 S0149-2063(00)00092-1

Maurer, T.J., Weiss, E.M., & Barbeite, F.G. (2003). A model of involvement in work-related learning and development activity: The effects of individual, situational, motivational, and age

ariables. *Journal of Applied Psychology*, 88(4): 707–724. https://doi.org/10.1037/00219010.88.4.707

McCombs, B. L. (1991). Motivation and Lifelong Learning. *Educational Psychologist*, 26(2): 117 127. https://doi.org/10.1207s1526985ep2602_4

Morales, M.P.E., Palisoc, C.P., Avilla, R.A., Sarmiento, C.P., Palomar, B.C., & Ayuste. T.O.D. (2020). Self professed Proficiency of Philippine Higher Education (PHE) Teachers of STEAM Disciplines. *Philippine Journal of Science*, 149(2): 415-426.

Mpofu, V. (2020). A Theoretical Framework for Implementing STEM Education. *Theorizing STEM Education in the 21st Century*. Published. https://doi.org/10.5772/intechopen.88304

National Economic and Development Agenda. (2017). *Philippine Development Plant 2017-2022; Chapter 10: Accelerating Human Capital Development* (Pp 144-155). http:/pdp.neda.gov.ph/wp-content/uploads/2017/01Chapter-10.pdf

Niloofar, N.A., Theodore, K., & Miriam, C. (2020). Examining motivation theory in higher educationamong tenured and non-tenured faculty: Scholarly activity and academic rank. *International Journal of Educational Administration and Policy Studies*, 12(2): 77–100. https://doi.org/10.5897ijeaps20200644

Organization for Economic Cooperation and Development. (2001). *Economics and finance of lifelong learning in Paris, France*. OECD Publications.

United Nations Educational, Scientific, and Cultural Organization. (1996). *Learning: The treasure within Paris, France*. UNESCO Publications.

Warnick, G.M. (2014). ASEE PEER - An Experiential Learning Approach to Develop Leadership Competencies in Engineering and Technology Students. American Society of Engineering Education. https://peer.asee.org/an-experiential-learning-approach-to-develop-leadership-competencies-in-engineering-and-technology-students

Watson, L. (2003). *Lifelong Learning in Australia, Canberra, Department of Education, Science and Training*. DEST. http://www.dest.gov au/NR/rdonlyres/DBF92E32-99DA-4253-9C81 52157022BF6/805/03_13.pdf.

Weinberg, A.E., Basile, C.G., & Albright, L. (2011). The Effect of an Experiential Learning Program on Middle School Students' Motivation Toward Mathematics and Science. *RMLE Online*, 35(3), 1–12. https://doi.org/10.1080/19404476.2011.11462086

Wrobel-Lachowska, M., Wisniewski, Z., & Polak Sopinska, A. (2017). The Role of the Lifelong Learning in Logistics 4.0. A*dvances in Intelligent Systems and Computing*, 402–409. https://doi org/10.1007/978-3-319-60018-5_39