

Exploring Prospective Teachers' Reasons for Choosing General Science as a Specialization

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ABSTRACT Choosing a career path is difficult for students, especially in their transition from senior high school to college. Students struggle to select the most viable program that suits their interests, skills, and passion. Hence, most students end up shifting among courses and, at worst, dropping out of their program. This qualitative study explores the reasons prospective teachers specialize in General Science in a teacher education program. The data were gathered through interviews and were treated through thematic analysis. Eight themes emerged including (1) alignment to chosen senior high school strand; (2) personal choice and interest; (3) passion for science; (4) personal knowledge and skills; (5) inspiration by teachers; (6) encouragement from family; (7) challenge to oneself; and (8) non-availability of a preferred course. The study has established important implications for admission policies in terms of the selection process for students enrolling in the General Science program. Higher education institutions (HEIs) should support the continuous improvement of the science education curriculum, campus and physical facilities, and student services, which are at the heart of education in a volatile, uncertain, complex and ambiguous (VUCA) world.

Keywords Career choice, Education in VUCA world, General science specialization, Prospective teachers, Science education

1. INTRODUCTION

Choosing a career path is a difficult decision to make for most of the students who are in transition from senior high school to college. Students are confronted with dilemmas about choosing what degree to pursue in college (Fouad, Ghosh, Chang, Figueiredo, & Bachhuber, 2016; Hacker, Carr, Abrams, & Brown, 2013; Lent, Ezeofor, Morrison, Penn, & Ireland, 2016). Also, they are struggling with what university to enroll in that caters to their interests and needs. In other words, choosing a career to pursue in college remains to be a challenge, especially in the volatile, uncertain, complex, and ambiguous (VUCA) world.

The education in the modern world faces compounded uncertainties due to globalization, and extensive and contemporary use of technologies (Morales, 2019), thus it is imperative to develop among students the passion and love for learning in a VUCA world. VUCA serves as the new normal in education, which describes the chaotic, turbulent, rapidly changing education environment (Morales, 2019; Waller, Lemoine, Mense, Garretson, Richardson, 2019). With this change in the educational landscape, it is imperative to guide the students on their career paths.

Making a career choice is a significant phase in every student's life. Students must consider several factors before arriving at a decision. The influence of several factors such as parental education, profession, and income on the career (Kazi & Aklaq, 2017), demand of parents, mothers, in particular, are more influential in the career choice of the secondary school students compared to their peers (Halim, Rahman, Zamri, & Mohtar, 2018; Hashim & Embong, 2015). The reconceptualizing of science could affect the students' attitudes towards the said subject because it will be a new topic for them to understand (Erduran & Dagher, 2014). Students' attitude towards science is also one influencing factor that can lead them to choose science as a career (Razali, Talib, Manaf, & Hassan, 2018).

Science teaching is one of the many careers that students can pursue in college. This profession requires a heart and a soul because those who would want to enter this job must possess the burning desire to teach (Rogayan, 2018) not only the science content but also scientific attitudes and scientific values. Furthermore, Science

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teachers showed some major influence on students' motivation towards the subject and eventually in their employment in science-related careers (Bohndick, Kohlmeyer, & Buhl, 2017; Du Preez, 2018). Teachers influence students through the following ways: experiences in science classrooms, extracurricular activities initiated by science departments, and information about the content of courses, and strategies for coping with advanced studies (Munro & Elsom, 2016). Relatedly, Krajcik & Czerniak (2014) mentioned that teachers as the key to the doors of the students' careers also affect the reason of the students in choosing their careers.

In the Philippines, researches on teaching career mainly focused on preservice teachers' teaching perspectives and motivations (Abulon, 2012; Abulon & Rungduin, 2015; Lopez, & Irene, 2017), high school students' motivation to pursue teaching career (Mangaoil, Rungduin, Abulencia, & Reyes, 2017), preservice teachers' attitude towards teaching and work values (Torres, Ballado, & Catarman, 2014), and wastage in teacher preparation investments (Abulon et al., 2015). Likewise, local studies on students' career paths in science teaching are minimal. Previous studies have focused on the driving forces of graduating college students' choice in specializing science (Dela Fuente, 2019), gender inequality as an influence in the students' interest in pursuing a career in science teaching (Morales, Avila, & Espinosa, 2016), and developing students' attitude leading towards a life-changing career (Laguador, 2013). The present study explores first-year college students' reasons for choosing general science as a specialization in a teacher education program.

Despite the offering of science education as an available degree program in colleges and universities, students who pursue this degree remains limited. Ambag (2018) claimed that there is a shortage of science and math teachers in the Philippines. In 2016, the Department of Education (DepEd) Philippines stressed the need to hire more teachers with the implementation of the K to 12 programs. Further, the government tried to solve the shortage by offering teaching posts with above entry-level salary grades to Science and Technology graduates under the junior level science scholarships of the Department of Science and Technology-Science Education Institute (DOST-SEI). DepEd also called for graduates of science, math, or engineering courses without license certification, as well accredited technical-vocational graduates with expertise in specific learning areas, to apply as part-time teachers for the K to 12 senior high school program (Ambag, 2018).

Teaching science has always been a challenge for many since it requires rich content knowledge and innovative pedagogical knowledge. Moreover, the scientific background of the facilitators of learning must also be in place. These are some encumbrances that hamper senior high school students to major in science. Data on students' preferred college courses revealed an inclination towards

actuarial sciences, engineering, architecture, computer-based, and management-related courses (CHED, 2016). Due to the dearth of local studies conducted on the students' reasons for specializing in general science teaching prompted the researchers to conduct this study.

The study explored prospective teachers' reasons for choosing general science as their specialization in a teacher education program. It further described the factors and driving forces that influenced these teacher education students to pursue a career in science education.

2. METHOD

2.1. Research Design

The study adopted a qualitative approach in research to explore the reasons for students in specializing in general science using an in-depth structured interview guide. The qualitative approach of research relies on text and image data and has different steps in data analysis, and draws on diverse designs (Creswell, 2014). Qualitative researchers build their patterns, categories, and themes from the bottom up by organizing the data into increasingly more abstract units of information. This inductive process illustrates working back and forth between the themes and the database until the researchers have established a comprehensive set of themes. Then deductively, the researchers look back at their data from the themes to determine if more evidence can support each theme or whether they need to gather additional information. Thus, while the process begins inductively, deductive thinking also plays a vital role as the analysis moves forward (Creswell, 2014).

2.2. Research Site and Participants

The study was conducted in a state-owned university in Central Luzon, Philippines, for the academic year 2018-2019. The researchers selected the locale as a research site for it offers Bachelor of Secondary Education (BSEd) program major in General Science under the new teacher education curriculum in the Philippines.

The participants of this study were first-year college students who are taking BSED major in General Science at the time of the study. The participants were chosen through purposive-comprehensive sampling. Purposive-comprehensive sampling refers to a sampling plan where the sampling is carried out in the criteria. Purposive-comprehensive sampling can be an easy form of sampling because it is a type of sampling that is widely used in qualitative research for the identification and selection of information-rich cases related to the phenomenon of interest (Palinkas, Green, Wisdom, & Hoagwood, 2015).

The researchers involved all the 13 first year BSED General Science students, six males, and seven females. The researchers only involved 13 participants because they already have reached the data saturation in the study. Faulkner and Trotter (2017) defined data saturation as the point in the research process when no new information is

discovered in data analysis and this redundancy signals to researchers that data collection may cease. Saturation means that a researcher can be reasonably assured that further data collection would yield similar results and serve to confirm emerging themes and conclusions. The participants met selection criteria: (a) first-year students, (b) taking up Bachelor of Secondary Education Major in General Science, and (c) bonafide students of the university, and (d) currently enrolled in Academic Year 2018-2019.

2.3. Data Collection Tools

The structured interview guide served as the main instrument in gathering the data. It is composed of two parts. The first part consists of questions about the students' demographic profiles like age, sex, and religion. The second part consists of an open-ended question regarding the prospective teachers' reasons for choosing general science as specialization. Sample follow-up questions were asked during the interview: (a) what is the attitude of the prospective teachers towards science?; (b) who influenced prospective teachers to enroll in science education program; (c) what are the characteristics of students in a science-related program; (d) why do prospective teachers choose science instead of choosing other fields of specialization; and (e) what career path do the prospective teachers plan to take.

The tool was subjected to content and construct validity. Experts in language and qualitative research were tapped to check the tool in terms of content, grammar, and coherence to the purpose of the qualitative study. After this, a pilot interview of the tool was made by the researchers. Three non-participants took the pilot interview to identify some potential problems in the conduct of the interview. Some improvement in the tool was made based on the problems encountered in the pilot interview.

2.4. Data Collection and Analysis

In phase 1 of the study, the researchers developed an interview guide that was validated by the experts. In the second phase, the researchers secured the permission and the approval from the campus director and the college program chair, before conducting the study. Assents were also secured by the participants. The next phase was the conduct of the interview to the students taking up BSED major in General Science. The interview was held in the students' classroom. The interview was conducted for about half an hour per participant. Participants' assent was secured before the interview was done.

The recorded interviews were individually transcribed to arrive at an extended text. Transcription of the tape recordings was done as soon as the interview concluded.

In analyzing the qualitative data, the researchers assigned broad code to the transcribed responses, which served as a basis for the identification of the emerging themes. The themes that emerged in the study were further

subjected to member checking procedures via an informal interview. Through the informal interview, the researchers assured the trustworthiness and truthfulness of the data collected. Using qualitative methodology indicates an emphasis on the qualities of entities and on processes and meanings that are not experimentally tested or measured in terms of quantity, amount, or intensity (Labaree, 2009). When one examines and judges accomplishments and effectiveness, one is engaged in evaluation. When this examination of effectiveness is conducted systematically and empirically through careful data collection and thoughtful analysis, one is engaged in evaluation research (Patton, 1990).

Validation of data was conducted to establish reliability. Two external reviewers checked the interview transcripts for validity and accuracy. Informant feedback was likewise done to make sure the consistency of the findings. The primary role of the researchers in this study is data gatherer. The researchers served as interviewers to the participants, and they also did an in-depth analysis of the interview transcripts.

3. RESULT AND DISCUSSION

Eight essential themes emerged from the analysis of interview transcripts. These themes served as a guide in the identification of the reasons of the prospective teachers in specializing in a general science under the teacher education program (Table 1).

3.1. Alignment to Chosen Senior High School (SHS) Strand

Some of the participants considered their senior high school track in their choice of a college degree. They cited that they wanted to enhance and explore their previous knowledge about science by taking general science as their major or specialization. One of the participants stated: "*I took up STEM when I was in senior high school, so I decided to take up general science because it is inclined to that, and I think it's practical (P6).*"

Based on the findings, students have considered their SHS strand in the degree to pursue higher education. The alignment of senior high school strand to the degree in college is critical because students have been equipped with the prerequisite knowledge and skills in the program they will enroll in. This implies that several kinds of hands-on science, technology, engineering and mathematics (STEM) engagement activities are likely to foster or maintain positive STEM dispositions at the middle school and high school levels and that these highly positive levels of dispositions can be viewed as a target toward which projects seeking to interest mainstream secondary students in STEM majors in college and STEM careers, can hope to aspire. (Christensen, Knezek & Tyler-Wood, 2015).

Table 1 Eight essential themes emerged from the analysis of interview transcripts

Theme	Significant Statement	Frequency (N=13)	Theme Description
1. Alignment to chosen senior high school strand	<i>I took up STEM when I was in senior high school, so I decided to take up general science because it is inclined to that and for it to be efficient.</i> [P6, Female]	5	This deals with the congruence of the senior high school curriculum to the current science education program that students enrolled in.
2. Personal choice	<i>Nobody influenced me to enroll in this course, and it's just my interest and passion in life.</i> [P1, Male]	4	This focuses on the participants' selection of the program based on their own perspective.
3. Passion for science	<i>This [science] is my favorite; I wanted science, and I think this is my passion.</i> [P9, Female]	1	This pertains to the love of the students for science and its nature.
4. Personal knowledge and skills	<i>I chose science because for me it's easier than the other fields of specialization.</i> [P1, Male]	3	This deals with the students' capabilities in handling science education course.
5. Inspired by teachers	<i>I took up science because of my teachers when I was in senior high school. Our teachers are very professional.</i> [P3, Male]	5	This pertains to the influence of teachers and mentors in the basic education to the students' choice of career.
6. Inspired by family	<i>I am influenced by my family to take up science teaching because it is in demand, and it's easy.</i> [P6, Female]	4	This theme focuses on the influence of family members on the students' selection of college degree.
7. To challenge oneself	<i>I want to challenge myself to explore more.</i> [P3, Male]	11	This describes how students challenge themselves in the career they choose.
8. Non-availability of the preferred course	<i>We don't have any other courses at the university, so my second choice is to explore other courses.</i> [P4, Female]	1	This theme deals with the non-offering of the preferred degree programs of the students.

3.2. Personal Choice

Another reason for the prospective teachers in specializing in general science is a personal choice. They stated that they enrolled in the program based on their own decision, belief, passion, curiosity, excitement, among others. In other words, the participants' choice of the program was based on their perspective. "Nobody influenced me to enroll this course; it's just my interest and passion in life," said one of the prospective teachers. The prospective teachers commonly mentioned that they personally chose general science as their specialization. It implies that they are not forced to enroll in the said course. Another participant shared, "I chose science because it's good to teach like Math and English and because I really like science ever since I was a kid. So, I'll finish what I started." The personal choice of the participants in choosing general science as a major in college can be rooted in their pleasurable experiences when they were kids, as well as their positive experiences in the basic education program.

One participant expressed, "I'm not going to choose science because it's not my favorite subject, but when I think further, I decided to take up science." In this response, the participant's decision to take science is out of the picture, but when he thought about it deeper, he ended up choosing science as his major.

According to Wang and Degol (2016), the driving force to enroll in a science-related program is current knowledge. If the students have prior knowledge in science, know how to do some investigation and explore things, know the rules and laws, and the future goals to attain, it's where the science student is motivated to pursue a science-related program.

3.3 Passion for Science

The love and passion for science is another reason given by prospective teachers. One of them said that she really wanted science, and she is passionate about learning more about the field. This implies that a strong desire of a person can be a significant factor in pursuing a specific career. If they are passionate about a certain area, they always find a way to pursue what they are passionate about. Relatedly, enthusiasm for science can be considered as a driving force in pursuing a science career (Concannon & Grenon, 2016; Fernet, Lavigne, Vallerand, & Austin, 2014; Insall, 2018).

3.4 Personal Knowledge and Skills

One of the participants said that "I choose science because, for me, it's easier than the other fields of specialization." This statement suggests that prospective teachers should consider their capabilities, knowledge, and skills in selecting a degree to take in college. They make sure that they have acquired the necessary knowledge and skills to be able to

pass their chosen specializations. This is consistent with the findings of several studies that personal knowledge and skills are influencing factors in one's choice of specialization (Mupinga, & Caniglia, 2019; Salonen, Hartikainen-Ahia, Hense, Scheerso, & Keinonen, 2017; Salonen, Karkkainen, & Keinonen, 2018; Stipanovic, Stringfield, & Witherell, 2017).

3.5 Inspired by Teachers

Half of the prospective teachers stated that they were influenced by their teachers during high school. They described their positive experiences under the tutelage of their innovative and inspiring teachers. In the case of one participant, she was inspired to take up general science because of her teacher in high school. She stated, *"I was inspired by my teachers when I was in senior high school. Our teachers are professional."* In this statement, it is very evident that teachers assume a big role in motivating students in their career choice. The teachers teaching style and strategy contributed to the development of students' interest to venture science (Dela Fuente, 2019). Several studies support the findings of the present study that teachers are one of the many factors why students choose a science-related career path like science teaching (Mau, & Li, 2018; Sorgo et al., 2018; Van Rooij, Fokkens-Bruinsma, & Goedhart, 2019; Wilhelm, 2010).

3.6 Inspired by Family

The prospective teachers expressed that they were influenced by their families and relatives to pursue science teaching because it is in demand. They also cited that the program is easy for them. *"My mom told me to take science. She said that a science major is very rare in schools. So, I decided to take a science major, and I think it is in-demand."* This implies that the family has a strong impact on the choice of students specializing in general science. Dela Fuente (2019) averred that students have direct connections with parents and relatives due to the Filipino culture of "close family ties."

The environment affects students' career paths. They commonly have a significant other that they look up and they want to be like them in the future. Parents have a significant role for their children in choosing their careers. Although, based on the interview, in some instances, parents dictate what career their child should take in college. Parents have been very influential individuals in the career choice of the students (Kazi & Akhlaq, 2017; Lee, Lee, & Dopson, 2019; Muenks, Peterson, Green, Kolvoord, & Uttal, 2020; Xing, & Rojewski, 2018).

3.7 To Challenge Oneself

To challenge oneself is one of the reasons why students specialize in general science. One participant shared that he wants to challenge himself to know his knowledge about the subject. He said, *"I want to challenge myself and to explore more."* This suggests that students specialize in the field that they see as challenging and worth exploring, like science. Hippman and Davis (2016) argued that students should challenge themselves not only in terms of taking steps to

achieve what they want in their career but also in their own negative self-talk. Hence, science teacher educators may consider providing challenging learning tasks for prospective teachers that can be helpful in their future career in science teaching.

3.8 Non-availability of the Preferred Course

One of the prospective teachers expressed that he just enrolled in this field because his desire is not available in the university. His response, *"First, we don't have any other courses offered in the university, so my second choice is to explore other courses."* This implies that students specialize in general science because they have no other choices. HEIs may consider offering degree programs that are aligned to the needs of the industry and responsive to the service areas. The schools should also offer other STEM-related programs apart from science education as the country needs more STEM professionals and more scientists and researchers.

A conceptual framework of students' reasons for specializing in general science in a teacher education program was crystallized, which may be a basis in further investigations (Figure 1). Eight significant themes ultimately emerged to describe the prospective teachers' reasons to specialize in science. They specialized in general science because it is in alignment with chosen senior high school strand; a personal choice and interest; passion for science; personal knowledge and skills; inspired by teachers; inspired by family; to challenge oneself; and non-availability of the preferred course in the university.

A multitude of factors has influenced the students in taking general science as their major in college. Salient findings in this study include the students' indication of the alignment of senior high school strands in their degree to pursue in college. Interestingly, the passion for science also surfaced in the findings of the study as one reason for students specializing in the field. To challenge oneself is

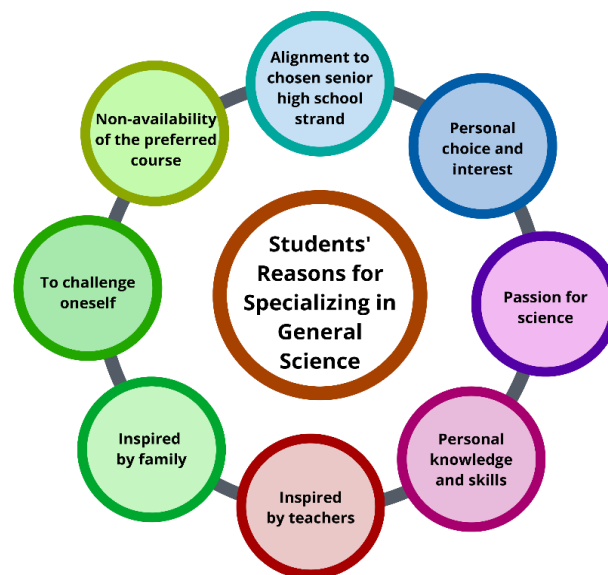


Figure 1 Students' reason for specializing in general science

another salient finding of this qualitative investigation suggesting that students also try to go out of their comfort zone and challenge themselves to try courses that they see as challenging.

Hence, the crystallized conceptual framework must be used as a basis for teacher education institutions (TEIs) to craft policies and programs, specifically in their admission and retention mechanisms. It can also serve as a significant input in the schools' career guidance programs and career interventions, specifically in embracing the VUCA world, the new normal in education.

4. CONCLUSION

The rich narrative data obtained in the study showed significant and positive reasons why prospective teachers enrolled in a teacher education program and specialized in general science.

Implications of the findings to the university's admission policies in terms of the selection process of students in the program were established in the study. In terms of policies, freshmen students who wish to enroll under the BSED General Science program may be given an intensive interview with emphasis on their motivations, interests, attitude towards science and skills. The university administrators may further review and reformulate the admission and retention policies to better select students in the science teacher education program.

Furthermore, a review and updating of the science education curriculum, enhancement of the university's plant and physical facilities, as well as improving the student services may be considered by higher education institutions (HEIs). 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 (Reusia, Rogayan & Andres, 2020). Continuing professional development programs for Science faculty members may also be strengthened at the heart of education in a volatile, uncertain, complex and ambiguous (VUCA) world.

Since the study is purely qualitative with only 13 participants, findings were solely dependent on the participants' responses and experiences. Hence, a small number of participants limits the results. Further research may use a mixed-method research design to elucidate further prospective teachers' reasons for taking general science as a field of specialization under the teacher education program. Other samples from different regional contexts may also be considered since the present study only focused on the Central Luzon area of the Philippines.

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