



## RESEARCH ARTICLE

# COMPETENCE AND DIFFICULTIES IN GENERAL BIOLOGY OF GRADE 12 STUDENTS IN THE NEW NORMAL

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### ABSTRACT

This research aimed to find out the competence level and difficulties of the Senior High School students taking Biology as a subject. Descriptive and comparative analyses were employed to analyze the data using Kolmogorov-Smirnov, Mann Whitney U and Kruskal Wallis. Catholic Senior High School in the Philippines, Online Google Forms, 2021The respondents of this test were randomly selected from the total number of students who answered the questionnaire; the total number of respondents was 191.The questionnaire was used as the primary research instrument in data gathering. It was adapted from and based on the Department of Education of the Philippines learning curriculum guide for Senior High School Biology, otherwise known as Most Essential Learning Codes. Results shows that males have very low overall competence in General Biology I (M=40.76, SD=17.12) compared to females with low overall competence in the subject (M=52.70, SD=17.86).There is a significant difference in the level of competence in General Biology when Grade 12 senior high school students are grouped according to sex (U=2627.0, p=0.000), and parents' profession ( $\chi^2(2)=11.325$ , p=0.003).The respondents of the study answered a survey with a yes to most of the eight choices. There is a significant difference in the level of competence in General Biology when Grade 12 senior high school students are grouped according to sex and parents' profession. Various difficulties that plague students in taking biology subjects exist.

## INTRODUCTION

While linked to various fields of study, biology has an escalated value, as shown by the many studies that focus on its betterment despite students having difficulty understanding the subject (1).Biology as a field of study has an exceptionally comprehensive range. It scrutinizes the diverseness, foundation, and adaptation of existing organisms (2). In many secondary schools, the biology curriculum is more often than not overburdened (3). As a science course, biology requires blending theory and practice to allow it to be comprehensible to the students skillfully (4). In the specific case of learning biology subjects regarded as tiring, high school students have difficulty understanding notions and themes that influence biology learning (5). Biology education pursues to advance the competency of students to result in them being able to comprehend the natural environments by discovering and acting based on personal exposure to the natural environments. Students in biology education are assumed to generate operational abilities in manifesting behavior and principles (6).

The scientific education of biology focuses on enriching the student's mastery of biological theory and intellectual capability, which leads to the purposeful application of that knowledge in novel context-specific circumstances (7). Biology as a school of learning is, in essence, comprised of byproducts, procedures, and a scientific frame of mind. Biology school education must not only emphasize the student's proficiency in truths, notions, essences, and scientific hypotheses but requires the student to obtain practical knowledge through the carrying out of scientific exploratory undertakings that enable them to come upon truths, notions, and essences (8). Difficulty in the biology subject could be accredited to many variables, including classroom educational environment, deficiency of engrossment in studying the science subject, overburdened curriculum components, and separation between science and society, to name a few (9).

## METHODOLOGY

This study utilized a descriptive and comparative research design.

Descriptive research aims to give a phenomenon and its many distinguishing traits. Any comparative research aims to compare at least two factors under study. This research aims to test the hypothesis by describing and comparing the correlation between existing variables, namely that of level of competence in Biology, sex, and parent's profession. The questionnaire was used as the primary research instrument in data gathering and was distributed to the total number of respondents was 191.

## RESULTS AND DISCUSSION

**Level of Competence in the General Biology I of Grade 12 Senior High School Students:** Table 1 shows that males have very low overall competence in General Biology I ( $M=40.76$ ,  $SD=17.12$ ) compared to females with low overall competence in the subject ( $M=52.70$ ,  $SD=17.86$ ). A breakdown of the results shows that males rated in the categories as follows: very low in Cell, low in Biological Molecules, and very low in Energy Transformations.

**Table 1. Level of Competence in the General Biology Subject of Grade 12 Senior High School Students**

Variable	Cell			Biological Molecules			Energy Transformations			Competence		
	M	SD	Int	M	SD	Int	M	SD	Int	M	SD	Int
Gender												
Male	26.28	10.63	VL	4.11	2.36	Lo	10.37	5.62	VL	40.76	17.12	VL
Female	34.15	11.04	Lo	5.51	2.34	Lo	13.04	6.00	VL	52.70	17.86	Lo
Track												
STEM	30.36	11.51	Lo	4.83	2.45	Lo	11.75	5.96	VL	46.95	18.46	Lo
Parents' Profession												
Both	24.70	10.00	VL	3.90	2.13	VL	9.30	5.10	VL	37.90	14.89	VL
Only one	25.72	9.38	VL	3.72	2.28	VL	10.56	6.17	VL	40.00	15.78	VL
Neither	31.90	11.71	Lo	5.17	2.43	Lo	12.22	5.91	VL	49.30	18.76	Lo
Whole	30.36	11.51	Lo	4.83	2.45	Lo	11.75	5.96	VL	46.95	18.46	Lo

Mean Range: Cell 0.00-13.20=Very Low (VL), 13.21-26.40=Low (Lo), 26.41-39.60=Average (Av), 39.61-52.80=High (Hi), 52.81-66.00=Very High (VH); Biological Molecules 0.00-2.00=Very Low (VL), 2.01-4.00=Low (Lo), 4.01-6.00=Average (Av), 6.01-8.00=High (Hi), 8.01-10.00=Very High (VH); Energy Transformation 0.00-6.60=Very Low (VL), 6.61-13.20=Low (Lo), 13.21-19.80=Average (Av), 19.81-26.40=High (Hi), 26.41-33.00=Very High (VH); Competence 0.00-21.80=Very Low (VL), 21.81-43.60=Low (Lo), 43.61-65.40=Average (Av), 65.41-87.20=High (Hi), 87.21-109.00=Very High (VH)

On the other hand, a similar breakdown of the results shows that females rated in the categories as follows: low in Cell, low in Biological Molecules, and very low in Energy Transformations. Gender variations have become crucial worldwide, with greater scrutiny by teachers and investigators (10). Gender is one of many details that affect student accomplishment in science courses at the secondary high school level (11). Gender problems have in the past been associated with the accomplishment of students in educational activities in several pieces of research but have no concrete deduction (12). It has been publicized that female students may achieve greater science undertaking competency than their male counterparts (13). Female students accomplished greater male students in biology applied exercises (14). Students who have both parents with a medical-related profession have very low overall competence in biology ( $M=37.90$ ,  $SD=14.89$ ), students who have only one parent with a medical-related profession have very low overall competence in biology ( $M=40.0$ ,  $SD=15.78$ ), and finally, students who have no parent with a medical related profession have low overall competence in biology ( $M=49.30$ ,  $SD=18.76$ ). A further breakdown of the results shows that students with both parents with a medical-related profession rated in the categories as follows: very low in Cell, very low in Biological Molecules, and very low in Energy Transformations.

A similar breakdown of the results shows that students with only one parent with a medical-related profession rated in the categories as follows: very low in Cell, very low in Biological Molecules, and very low in Energy Transformations. A corresponding breakdown of the results shows that students with neither parent with a medical-related profession rated in the categories as low in Cell, low in Biological Molecules, and low in Energy Transformations. A final breakdown of the results shows how they rated in the categories as follows: low in Cell, very low in Biological Molecules, and low in Energy Transformations. As summarized in the table, the results show that there is a low competence in Biology ( $M=46.95$ ,  $SD=18.46$ ) as a whole for all the respondents of the study. Biology was better in younger than older students and better among girls than boys (15). The subpar accomplishment and aptness in the laboratory in biology are influenced by the absence or lack thereof of the approaches that describe the challenges posed by the goals of biology education (16). In the realm of biology, the practical use of collected knowledge, alongside allowing students to use it in their everyday lives, is a major factor (17).

Biology, as natural science, deals with fauna, flora, and other living organisms where students must have the reasoning skills and know-how, alongside the application of the mastery that they have within the means of the scientific approach (18).

**Table 2. Difference in Level of Competence according to Sex**

Variable	U	z	p
Sex	2627.0*	-5.050	0.000

Note: \*the difference is significant when  $p \leq 0.05$

**Difference in the Level of Competence in General Biology I when grouped according to Sex:** Table 2 shows that there is a significant difference in the level of competence in General Biology when Grade 12 senior high school students are grouped according to sex ( $U=2627.0$ ,  $p=0.000$ ). Hence the null hypothesis is rejected. Female students scored significantly higher than male students. Student sex may play a role in influencing student practical accomplishment abilities (19). For a prolonged period, sex has been categorized by investigators as a single component that shapes the educational accomplishment of the youth (20). Besides the educational approach, sex is also involved in students' educational accomplishments in biology (21). Sex in the past was deemed to be required to understand the degree of the effectiveness of

the content layout for both male and female students' education (22).

On the justification of sex, females have more receptive views on education in biology since females tend to take to subject matters that are concerned with life. On the other hand, males prefer subjects, such as physics and chemistry that are concerned with conflict, especially military conflicts (23). In actuality, females are likely to achieve greater education than males in mathematics and science subjects (24). It was discovered that there is a crucial correlative outcome between sex and developmental assessment of students' accomplishments in biology. As a result, educational accomplishment in biology can be credited to the interplay between sex and approach specifications (25).

**Difference in the Level of Competence in General Biology I when grouped according to Parents' Profession:** Table 3 shows that there is a significant difference in the level of competence in General Biology when Grade 12 senior high school students are grouped according to parents' profession ( $\chi^2(2)=11.325$ ,  $p=0.003$ ). Hence the null hypothesis is rejected. Respondents with one parent with a scientific profession scored significantly higher than those with parents without a scientific profession. Expectancy-value theorists hypothesize that students' decisions, with examples of choosing to seek a STEM profession, are affected by the students' self-confidence and principles and the credence of crucial social influencers such as kin or parents. Under the parent socialization model rooted in expectancy-value theory, parents' convictions about their children's skills are conveyed through their attitudes and actions regarding students' educational options (26). Students have revealed that familial impact exhibits its presence in familial principles and know-how, academic schooling, parental occupations/careers, religious affiliations, and demographic grounding of the parents (27). The parental impact has been one of the greatest and most consistent elements that direct the child's behavior with respect to learning a specific educational program alongside their choice of profession (28).

**Table 3. Difference in Level of Competence according to Parents' Profession**

Variable	$\chi^2$	df	p
Parents' Profession	11.325*	2	0.003

Note: \*the difference is significant when  $p < 0.05$

**Learning Difficulties encountered by Grade 12 students in General Biology I:** The respondents of the study answered a survey listing eight choices which were to be answered with either yes or no. Table 4 shows that items that garnered a yes response are as follows: difficulty in understanding the topics due to abstractness, complexity, and issue misunderstandings (82.7%); learning environment in homes (81.7%); absence of applied learning/laboratory classes (78.5%); overloaded curriculum content (77.5%); lack of instructional tools (64.4%); poor study habits (60.2%); lack of enthusiasm in learning science (50.3%); and others (17.3 %). This indicates that the first set of difficulties is more prevalent than other factors affecting the level of competency in General Biology I of Grade 12 students within the new normal. The leading causes of difficulties experienced by students include the attributes of the educational subject matter, disorderly study practices of the students, student obstructive behavior regarding educational subject matter, inadequate study

premises, and physical, economic, and psychological circumstances that do not aid in student education, less adaptive educator teaching method, and finally detrimental student evaluation of educators (29). Many factors have been identified as reasons for students' difficulty learning biology. These reasons are the conceptual characteristics of the subject, most of the subject matters were detailed through the use of complicated language terminology, the vastness of the subject matter, subpar laboratory activity, insufficiency of educational tools, and finally, the educators' inability to connect subject matter to daily life circumstances (30).

**Table 4. Encountered Difficulties in the General Biology Subject of Grade 12 Senior High School Students**

Items	f	%
Learning environment in homes.	158	82.7
Difficulty in understanding the topics due to abstractness, complexity, and issue misunderstandings.	156	81.7
Absence of applied learning/laboratory classes.	150	78.5
Overloaded curriculum content.	148	77.5
Lack of instructional tools.	123	64.4
Poor study habits.	115	60.2
Lack of enthusiasm in learning science.	96	50.3

This study assumes that student competency in General Biology I differs by sex and parents' profession. The researcher's use of the Cognitive Theory of Motivation of Expectancy-Value Theory on the competence, and difficulties of Grade 12 students under the new normal are grouped according to sex, and the parents' profession was proven true but only in regard to when Grade 12 students are grouped according to sex and parents' profession. The results of the study support the researcher's theory by showing that there is a significant difference in the results of the students when grouped according to sex, wherein the females scored greater than the males, and according to parents' profession, wherein students with a parent with a scientific or related profession have greater results than those that have no parents with a scientific or related profession. The results of the study also present the idea that multiple behavioral factors, named in this study as difficulties, interact with one another rather than one sole individual factor, affecting individual ability that translates to competence in biology subjects. This study was not designed and equipped to explore the relationship between each difficulty and competence in biology as a whole and the degree of effect each difficulty plays on a student's competence in biology.

## CONCLUSION

In the context of learning accomplishments in biology, sex and parents' professions significantly affect the students' general ability to answer questions guided by Bloom's taxonomy. This implies that sex and parents' professions affect the level of understanding of biology, which correlates with the accomplishments in biology through various learning levels based on Bloom's taxonomy of learning. The effect on sex may result from societal influences on each of the respective sex, which results in various goals and practices distinct to each sex, which may indicate that sex has a role in how one has invested in specific learning fields compared to others. The influence of parents' profession as a guiding post of the students' ability to understand and learn effectively from the

course is a major factor in their performance in biology. The parents' profession correlated to biology implies greater ease in obtaining better results in a course related to the individual's parents' occupations through a mode of learning that teaches similar lessons leading to the said profession. The results of this study imply that various factors play a role in learning biology, which results in better accomplishment in biology as a whole. The various difficulties experienced by the respondents of this study attest that biology is a multifaceted issue and is more complex than first observed. The relationship of these factors with one another is outside the scope of this study and, as such, is not mentioned at any point in this study.

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To God be the glory!

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