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PERCEIVED SELF-EFFICACY AND ACADEMIC PERFORMANCE OF STEM SENIOR HIGH SCHOOL STUDENTS

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Abstract

The manner schools taught changed from face-to-face to online delivery due to the Covid-19 pandemic. But learners perceived online lessons burdened mental and psychological health, ability to learn, and literacy in reading, writing and arithmetic. Conversely, local studies deemed learners' ability to succeed in classes improved from moderate pre-pandemic to high during. This study described the sources of self-efficacy, which are mastery experiences, vicarious experiences, verbal persuasion, and physiological feedback of STEM students at NU Fairview Incorporated,

were utilized as respondents. As a result of the study, it is showed that the source of their self-efficacy were their mastery experiences which are attributed to frequent engagement in activities and success experiences. It is also found out that there is no significant difference between the sources of self-efficacy and STEM students' GWA. On the other hand, perceived self-efficacy vary between male and female. Also, vicarious experiences appear to vary on perceived self-efficacy across different specialization within STEM. Findings call for improving teachers' practices in giving positive feedback on the learners' output and performance in class. In addition, the need to improve on constructing written works, and activities which are time-bound, and meaningful which intends to encourage and not to exhaust students.

Keywords

Perceived Self-Efficacy, Academic Performance, STEM Students, Senior High School, NU Fairview

1. Introduction

Due to the onset of the Covid-19 pandemic, there was a shift in the educational landscape, with schools and other learning institutions transitioning from traditional face-to-face classes to online delivery. This change not only impacted the mode of instruction but also influenced how students absorbed their lessons. As the Covid-19 situation gradually improves, educational institutions are now adopting a hybrid teaching model. This approach introduces a new challenge for students as they must once again adapt to a different style of learning, adding to the pressures they face in their academic journey. Some students are perceived that the two-year online class placed burdens on their physical, mental and psychological health (Wang et al., 2020). Similarly, the prolonged closure of schools negatively affected the students' ability to learn. Also, it has been blamed for the rise in dropout rates and decreased literacy (De Guzman, 2021). On the other hand, it is deemed by local studies that the self-efficacy of students improved from moderate before pandemic to high during pandemic (Flavier, 2018; Tus 2020; Ducay & Alave, 2021; Bangsa, 2021). With the aforementioned scenarios, interventions should be carefully planned and constructed to restore the positive belief of students in approaching or dealing with goals, tasks, and challenges. These are inclusive of molding or enhancing their positive mindset by instilling that students have the ability to succeed in what they engage themselves in or what they are dealing with.

1.1. Nature of Self-Efficacy in Social Cognitive Theory

Albert Bandura is a psychologist who developed the Social Learning Theory and was later renamed Social Cognitive Theory (SCT) to better reflect the role of cognition in the learning process. SCT posits that learning occurs in a social context with a dynamic and reciprocal interaction of the person, environment, and behavior. The unique feature of SCT is the emphasis on social influence and its emphasis on external and internal social reinforcement (LaMorte, 2019). SCT takes on agent-like perspective to change, development, and adaptation. Bandura describes an agent as someone who intentionally influences one's functioning and life circumstances (Kosgei, 2018). Furthermore, SCT emphasizes how cognitive, behavioral, personal, and environmental factors interact to determine motivation and behavior.

An important concept in SCT is self-efficacy which is defined as "a person's belief in their ability to succeed in a particular situation." These beliefs are seen as determinants of how people think, behave, and feel (Cherry, 2020). There are four (4) sources of self-efficacy: mastery experience, vicarious experience, verbal persuasion and physiological feedback. These sources can influence the perceived self-efficacy of an individual (Lopez-Garrido, 2020). Mastery experiences can be attributed to repeated success or disappointment. Repeated success can contribute a boost of self-efficacy while repeated disappointment can condense it. Furthermore, vicarious experiences are second-hand experiences. When an individual believes that they can do a task when he or she witnesses that others succeed, it will result in an increase in their self-efficacy. Another source of self-efficacy is verbal persuasion. This is related to the influence of verbal encouragement from other people in connection to a certain task. And lastly, physiological feedback is the individual emotional state which influences self-efficacy judgments in performing tasks (Bangga, 2021).

Perceived self-efficacy is a crucial element in translating plans into actions, playing a significant role in how individuals approach goals, tasks, and challenges. According to Oldham (2018, self-efficacy influences a student's behavior in the classroom, their approach to academic work, the duration of their perseverance on a given topic, and the types of goals they set for themselves. Cherry (2021) suggests that individuals with higher self-efficacy exhibit a deeper interest in tasks they have previously undertaken, developing a stronger commitment to their interests. Moreover, they demonstrate an enhanced ability to manage setbacks, disappointments, and perceive challenge and adversities as opportunities to overcome and master. Similarly, as

highlighted by Getachew and Birhane (2016), higher self-efficacy is associated with students investing great effort

1.2. Self-efficacy of K-12 Students Before and Amidst Covid-19

Self-efficacy plays a major role in the teaching and learning process. High self-efficacy suggests a boost in student's achievement. Also, it is a predictor of motivation and learning. This is supported by Flavier (2018) wherein students possessed a moderate level of self-efficacy. He revealed that these students believe they can perform and succeed or cope with adversity. Moreover, students' level of self-efficacy does not vary regardless of age, gender and strand. Similarly, according to Villas (2019), senior high school students are confident in performing academic activities. Their success in each academic-related task contributes to their confidence. Moreover, self-efficacy does not vary based on sex. Both male and female are equally confident to perform academic-related tasks. On the other hand, self-efficacy of public and private school students differs in terms of vicarious experience and verbal persuasion. It is also revealed that there is a significant difference in students' self-efficacy between Science, Technology, Engineering and Mathematics (STEM) and Technical Vocational Livelihood (TVL) students in terms of verbal persuasion as STEM students received more encouragement from the people around them than TVL students.

But in the midst of Covid-19, schools and educational institutions are forced to suspend face-to-face classes and resort to online delivery of classes. The new modality of learning puts the learners in a situation where they learn without being in the same room with their teachers and other students. But this situation does not hinder their capabilities to engage themselves in relative tasks, participating in discussion, and fostering a positive mindset towards learning. According to Tus (2020), the self-efficacy of the students is interpreted as high during the time of pandemic. He revealed that students give necessary effort in dealing with problems they have encountered. But it reflected that there is no association between self-efficacy and academic performance of the students. Similarly, in the study of Ducay and Alave (2021), students have a high level of self-efficacy. They believe that they possess the ability to meet the challenges ahead of them and to complete a task successfully. There is a moderate positive association between academic performance and self-efficacy. Students who were successful in school were consequently more confident in their academic abilities.

According to Bangsa (2021), it projected that emotional arousal as a source of self-efficacy of students is in average level wherein other sources like performance accomplishments and vicarious learning are in high level. Also, overall self-efficacy does not vary regardless of gender but it is found significant across gender on emotional arousal as source of self-efficacy. Thus, male students tend to have more positive emotion as feedback to challenge in their online class setting. Furthermore, there is a large positive correlation between overall self-efficacy and cognitive engagement of the students. Hence, the higher the self-efficacy of the students, the further cognitively engaged the students would be.

2. Statement of the Problem

This study aims to describe and analyze the perceived self-efficacy and academic performance of STEM senior high school students from NU Fairview during the academic year 2022-2023. Specifically, it sought to answer to the following questions:

1. What is the demographic profile of the respondents in terms of:
 - a. Sex;
 - b. Specialization; and
 - c. General Weighted Average (GWA)?
2. How may the perceived self-efficacy of the respondents be described in terms of:
 - a. Mastery Experiences;
 - b. Vicarious Experiences;
 - c. Physiological Feedback; and
 - d. Verbal Persuasion?
3. Is there a significant difference in the perceived self-efficacy of the respondents when grouped according to their profile?
4. Is there a significant relationship between perceived self-efficacy and academic performance of the respondents?

3. Methodology

This study used correlational research design since this study aims to provide the present situation of students perceived self-efficacy and correlate it to their academic performance. Also, this study utilized 362 students which were the whole population of grade 12 STEM students from a private institution, NU Fairview Incorporated. Statistical techniques employed on the data gathered were frequency, percentage, ranking, weighted mean using 4-point rating scale, Mann-Whitney U-test and Kruskal-Wallis H-test for the test of difference, and Pearson Product-Moment Correlation for the test of relationship.

4. Results and Discussion

Table 4.1: *Demographic Profile of the Respondents*

	Male		Female		Total	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Specialization						
Allied Health	39	19.8	91	55.1	130	35.9
Architecture	13	6.6	26	15.8	39	10.8
Engineering	90	45.7	34	20.6	124	34.3
ICT	55	27.9	14	8.5	69	19.0
GWA						
84 and below	27	13.7	0	0	27	7.5
85 – 89	49	24.9	12	7.2	61	16.8
90 – 94	105	53.3	127	77.0	232	64.1
94 and above	16	8.1	26	15.8	42	11.6

(Source: Author's Own Illustration)

This table indicates that there are 197 males and 165 females. Hence, there are more male STEM respondents than female. In addition, majority of the respondents are STEM section whose specialization are engineering and allied health. Lastly, at least 75% of the population are achievers with general weighted average of 90 and above.

Table 4.2.1.: *Perceived Self-efficacy of Respondents in terms of Mastery Experiences*

Indicators	WM	VI	Rank
a. I have had consistent successes at relatively difficult task in our class.	3.35	VHE	1
b. I coped up with the weaknesses in our class through good study habits.	2.96	HE	3
c. I can attribute success solely from my hard work and persistence in my class.	2.91	HE	4
d. I have experienced failures in my class but I continue to improve steadily over time.	2.73	HE	5
e. I had many successes in my class even when my performance has subsequently levelled off.	3.03	HE	2
Total	3.00	HE	

(Source: Author's Own Illustration)

Note: WM – Weighted Mean, VI – Verbal Interpretation, 3.26 – 4.00 = To a Very High Extent (VHE), 2.51 – 3.25 To a High Extent (HE), 1.76 – 2.50 = To a Low Extent (LE), and 1.00 – 1.75 = No Extent at All (NE)

In this table, mastery experiences contribute to students' self-efficacy to a high extent. This suggests that sustained level of success in tasks even with setbacks, challenges, and relative difficulties promotes perceived self-efficacy. Hence, engagement in activities and success experiences develop a sense of mastery which boost their self-efficacy beliefs.

Table 4.2.2.: Perceived Self-efficacy of Respondents in terms of Vicarious Experiences

Indicators	WM	VI	Rank
a. I believe I can pass the examination since my classmates can.	3.30	VHE	1
b. I develop self-assurance from hearing other's success in our class.	2.94	HE	3
c. I feel confident in every task in our class whenever I see my classmates do well on it.	2.81	HE	4
d. I become persistent when seeing my classmates exert effort even if they are struggling in our task.	2.71	HE	5

e. I have composure on doing my seat work in my class when others accomplished it very well.	3.03	HE	2
Total	2.96	HE	

(Source: Author's Own Illustration)

Note: WM – Weighted mean, VI – Verbal interpretation, 3.26 – 4.00 = To a Very High Extent (VHE), 2.51 – 3.25 To a High Extent (HE), 1.76 – 2.50 = To a Low Extent (LE), and 1.00 – 1.75 = No Extent at All (NE)

This table shows vicarious experience is a source of self-efficacy to a high extent. This means that students were about to feel confident, motivated, and reassured with the task giving inside the classroom through hearing and witnessing the success of others. Therefore, observing the success and efforts of others enhances their confidence or motivation.

Table 4.2.3.: Perceived Self-efficacy of Respondents in terms of Physiological Feedback

Indicators	WM	VI	Rank
a. My heart rate does not increase whenever I deal with oral recitations.	3.27	VHE	1
b. I am able to sit still whenever I encounter a word problem I cannot solve.	2.80	HE	3
c. I do not experience episodes of headaches during class.	2.74	HE	4
d. After finishing my homework or seatwork in class, I do not experience a lack of energy.	2.43	LE	5
e. I am not nervous whenever I am asked to recite or explain my answer in front of the class.	3.04	HE	2
Total	2.85	HE	

(Source: Author's Own Illustration)

Note: WM – Weighted mean, VI – Verbal interpretation, 3.26 – 4.00 = To a Very High Extent (VHE), 2.51 – 3.25 To a High Extent (HE), 1.76 – 2.50 = To a Low Extent (LE), and 1.00 – 1.75 = No Extent at All (NE)

In this table, even when faced with difficulties and challenges relating to engagement and tasks inside the classroom, physiological arousal like being nervous and headaches, does not affect the

students to a high extent. But it is observable that respondents tend to feel tired or lack of energy when they finished homework or seatwork.

Table 4.2.4.: Perceived Self-efficacy of Respondents in terms of Verbal Persuasion

Indicators	WM	VI	Rank
a. I received recognition for my consistent progress in our class	2.89	HE	1
b. Our teacher acknowledges my dedication and perseverance in completing assignments.	2.75	HE	2
c. My classmates expresses appreciation when I excel in challenging assignments or exams.	2.56	HE	4
d. My teacher extends praise for my achievement, fostering a positive learning environment.	2.27	LE	5
e. Peers frequently commend my problem-solving skills, whether the tasks are easy or difficult.	2.64	HE	3
Total	2.62	HE	

(Source: Author's Own Illustration)

Note: WM – Weighted mean, VI – Verbal interpretation, 3.26 – 4.00 = To a Very High Extent (VHE), 2.51 – 3.25 To a High Extent (HE), 1.76 – 2.50 = To a Low Extent (LE), and 1.00 – 1.75 = No Extent at All (NE)

This table reveals that verbal persuasion contributes to self-efficacy belief of the students to a high extent. This shows that praises and recognition of peers, classmates, and teachers to the hard work, dedication, and skills of the students enhances one's self-efficacy belief. On the other hand, it is notable that teachers extend praises for the students' achievement to a low extent.

Table 4.3: Test of Difference on Perceived Self-Efficacy

Sex	Specialization	GWA
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	<i>U-value</i>	<i>P-Value</i>	<i>H-value</i>	<i>P-Value</i>	<i>H-value</i>	<i>P-Value</i>
a. Mastery experiences	9493	<0.000	7.009	0.720	24.029	0.870
b. Vicarious experiences	8956	<0.000	15.924	0.001	16.708	0.970
c. Physiological Feedback	9185	<0.000	6.718	0.081	8.288	0.540
d. Verbal persuasion	11935	<0.000	11.398	0.100	26.612	0.150

(Source: Author's Own Illustration)

Note: The U-value is computed using Mann-Whitney U-test, H-value is computed using Kruskal-Wallis H-test, level of significance is 0.01

H₀₁: *There is no significant difference in the perceived self-efficacy of the respondents when grouped according to their sex.*

H₀₂: *There is no significant difference in the perceived self-efficacy of the respondents when grouped according to their specialization.*

H₀₃: *There is no significant difference in the perceived self-efficacy of the respondents when grouped according to their GWA.*

In this table, it showed that the calculated u-value and p-value of perceived self-efficacy of the respondents when grouped according to their sex was statistically significant between the two groups. Therefore, the hypothesis 1 is rejected when grouped according to sex. On the other hand, when grouped according to their specialization and GWA, the calculated h-value and p-value was not statistically significant among the said groups. Hence, hypotheses 2 and 3 were retained.

Table 4.4: *Test of Relationship between Perceived Self-efficacy and Academic Performance*

	1	Interpretation
1. General weighted average (GWA)	---	---
2. Mastery experiences	0.4422	Moderate positive correlation
3. Vicarious experiences	0.1490	Weak positive correlation
4. Physiological feedback	0.1932	Weak positive correlation
5. Verbal persuasion	-0.1064	Weak negative correlation

(Source: Author's Own Illustration)

H₀₄: *There is no significant relationship between the perceived self-efficacy and academic performance of the respondents.*

In this table, it shows the Pearson correlation test result between perceived self-efficacy and academic performance of the respondents. With $r = 0.4422$ ($p < 0.01$), it indicates the existence of moderate positive correlation between mastery experiences and academic performance which was statistically significant at 0.01 level. In addition, with the coefficient values $r = 0.1490$ ($p < 0.01$) and 0.1932 ($p < 0.01$), shows the weak positive correlation between vicarious experiences and physiological feedback respectively, and academic performance which deemed statistically significant at 0.01 level. On the other hand, verbal persuasion and academic performance shows a negative weak correlation with coefficient value $r = -0.1064$ ($p > 0.01$) which was not statistically significant at 0.01 level. Hence, the relative increase in the perceived self-efficacy was seen with increase academic performance in study of Grade 12 STEM students.

5. Conclusion and Recommendation

As carried in the study, it can be concluded that the students believe their self-efficacy is best derived from their mastery experiences. Success, particularly when faced with challenges during the process, strengthens their confidence in their skills and capabilities, ultimately contributing to the achievement to their goals. In addition, the success of others contributes on their belief that they can also do the same. On the other hand, this belief on their selves diminished when they faced setbacks like tiredness and exhaustion. And notably, perceived self-efficacy contributes moderately on the academic performance of the students.

The result of this study may be used in crafting seminars and workshops in improving hard and soft skills of teachers. This includes giving positive feedback when interacting with students on discussion or performance in class, using motivating and non-discriminating words and phrases, and utilizing success stories of students for motivation. Also, the need to improve on constructing homework, seatwork, and/or activities which are time-bound, relevant, and meaningful which intends to encourage and not to exhaust students.

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