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[Mary Rose Briones](#) ^{*}, [Maricar Prudente](#), [Denis Dyvee Errabo](#)

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Article

Characteristics of Filipino Online Learners: A Survey of Science Education Students' Engagement, Self-Regulation, and Self-Efficacy

Mary Rose Briones ^{1,*}, Maricar Prudente ² and Denis Dyvee Errabo ²

¹ De La Salle University; maryrose.briones@ssu.edu.ph

² De La Salle University; maricar.prudente@dlsu.edu.ph; denis.errabo@dlsu.edu.ph

* Correspondence: mary_rose_mabini_briones@dlsu.edu.ph

Abstract: Online education allows learners to develop knowledge and skills flexibly and conveniently—such observation among students whose characteristics involve student engagement, self-regulation, and self-efficacy. However, studies to characterize Filipino online learners seem lacking. Thus, this study aimed to characterize science education tertiary students in the Philippines concerning their online student engagement (OSE), self-regulated learning (SRL), and online learning self-efficacy (OLSE). The unprecedented events brought by COVID-19 pandemic also urged the implementation of online modalities while there is no available information on students' online learning profiles. Hence, researchers used a survey research employed through ex post facto approach to determine the effects of the demographic profile on OSE, SRL, and OLSE. The survey was participated by N=373 respondents who answered the questionnaire with informed consent administered via Google Forms. Results revealed that OSE indicators moderately characterized students, while SRL and OLSE indicators are true of them, substantiated by the overall mean $M=3.85(SD=0.90)$, $M=3.86(SD=0.92)$, and $M=3.14(SD=0.73)$, respectively. Also, multivariate tests showed no significant effect among the independent groups ($p>0.05$), except for gender and OLSE interaction ($p<0.05$) so, only in OLSE was a significant difference found in gender. In conclusion, Filipino online learners are moderate across aspects of student engagement, self-regulation, and self-efficacy.

Keywords: online learning; student engagement; self-regulated learning; self-efficacy

1. Introduction

Influenced by factors such as advanced educational technologies, the introduction of the internet, and the global crisis brought by the COVID-19 pandemic, the educational system in higher education institutions (HEIs) is one of the most challenged institutions to shift from the conventional classes to a more flexible system of distance modality through online learning [1–6].

Online learning is used interchangeably with distance education, online course, and e-learning [7]. E-learning refers to an innovative web-based system supported by digital technologies and other forms of educational materials to primarily provide students with a personalized, learner-centered, open, enjoyable, and interactive learning engagement, thus, supporting and enhancing the learning process [8]. Consequently, online education allows learners to develop knowledge and skills flexibly and conveniently [9] that play a crucial role for online learning, and among these include the student's engagement [10], self-regulated learning [11], and self-efficacy [12].

1.1. Student Engagement

[13] defined student engagement (SE) as 'the investment of time, effort and other relevant resources by both students and their institutions intended to optimize the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution' (p. 2). SE is beneficial to students who take responsibility for their own learning, making their own decisions about what, when, and how they will engage in their studies [14]. Hence, student engagement results from students' involvement in learning that, in turn, affects their learning and maintains their involvement in coursework [15]. According to [16], student engagement as one of the most important online instructional strategies.

Empirical studies showed the critical role of student engagement in an online learning environment (OLE). [10] concentrated on engagement strategies, including student–content, student–student, and student–teacher strategies. Among these strategies, students perceived student–content (e.g., screen sharing, summaries, & class recordings) as the most effective. The other two strategies, student–teacher strategies (e.g., Q & A sessions and reminders), are found to be more effective than the student–student strategies (e.g., group chat & collaborative work) which are perceived as least effective.

The findings on student–teacher strategies may be associated with [17] findings on students' online learning as engaging when they feel the instructors' presence through social, managerial, & technical facilitation in online instruction. Meanwhile, online facilitators perceived that online discussions contributed to the improvement of SE in OLE [18]. In addition, authors' reflection narrated that improvement in student engagement occurs when teachers use pedagogical strategies using various virtual materials such as gamified learning tools like Kahoot and Socrative [19].

Apparently, the findings on student–student strategies are contrary to [20] study, claiming that an online forum during asynchronous online learning is effective in SE, especially when students respond to peers' posts or when asked to relate topics to their personal experiences. In addition, regular interaction encourages active engagement among virtual students that, in turn, push them to complete online modules and collaboration through group tasks, which is beneficial for building knowledge in OLE [21].

1.2. Self-Regulated Learning

Self-regulation refers to using personal strategies to control learning involving learners' motivational, cognitive, and behavioral aspects to achieve their specified learning goals [22]. Hence, self-regulated learning (SRL) strategies play an essential role in one's desire to achieve learning [23]. SRL may include students' goal setting, time management, task strategies, environment structuring, and help-seeking. Because students desire to achieve learning, they use specific SRL skills and strategies to perform their tasks. SRL skills and strategies have a dual purpose in differentiating among individuals concerning academic achievement and enhancing academic achievement outcomes [23]. During the COVID-19 pandemic, self-regulated learning greatly influences the success of online learning [11,24].

Noteworthy, empirical findings showed that students with low SRL are less likely to regulate distance learning activities during the COVID-19 pandemic [11]. Likewise, other studies showed that some students encountered difficulties in studying at home during the pandemic because of their inability to self-regulate, considering they perceived autonomy as a burden and having no self-accountability [25,26].

According to [23], virtual students vary depending on the self-regulation strategies they apply to learn online. Their study revealed five distinct profiles of virtual students: super self-regulators, competent self-regulators, forethought-endorsing self-regulators, performance/reflection self-regulators, and non- or minimal self-regulators. This finding correlates with student differences in their academic achievement. Among the profiles, the authors emphasized that non- or minimal self-regulators have poor learning outcomes.

Meanwhile, some authors discovered that students exhibit different SRL strategies in learning science education in OLE. The results of their study developed systems that help identify and support students who struggle in active learning, particularly in science education [27]. For instance, [28] employed a metacognitive-based learning materials to teach a chemistry lesson among pre-service teachers and determined their self-regulated learning. Findings revealed students has high criteria and very high in learning chemistry in terms of their self-motivation, belief task analysis, self-control, self-observation, self-judgment, and self-reaction.

Furthermore, other scholars investigated how the different SRL factors affect academic performance. [29] focused on SRL factors such as goal-setting, environment structuring, computer self-efficacy, social dimension, and time management. The authors claim that among these five factors, environment structuring, computer self-efficacy, social dimension, and time-management impact students' academic performance, whereas goal-setting is not significant. In contrast, the study by [30] suggests that in a flipped learning setting, none of the SRL strategies (study strategies, metacognition, self-talk, interest enhance, environment structuring, self-consequating effort, and help-seeking) predict students' achievement after conducting a multiple regression analysis. In the study by [31], they regarded students' performance in OLE regarding interaction with others, particularly the variable explaining their SR. The result study showed that teachers' scaffolding influenced how students interact with their instructors and peers. Indeed, SRL of students plays a crucial role in their learning success, especially when they study at their own pace with minimal or without teacher's presence.

1.3. Self-Efficacy

Bandura (1977) defined self-efficacy as a quality that affects an individual's judgment of him/herself and how his/her behavior emerges, about his/her capacity to organize the necessary activities to carry out a specific performance and to do it successfully [32]. Moreover, Bandura (1977) expresses self-efficacy as an individual's beliefs regarding how well he/she can perform the actions required to deal with potential situations. Based on these definitions, developing individuals' beliefs regarding how well they will carry out the activities they need to perform concerning a specific aim may also affect their performances. [33] emphasizes that self-efficacy involves an individual's judgments of his/her ability to carry out and succeed in a task.

Some scholars attempted to examine students' self-efficacy and their perceived competency on a certain learning experience. For instance, [34] investigated student-teachers' perceived self-efficacy over their digital competency, particularly on maintaining discipline and its influence on students' use of ICT. Two notable findings revealed that students' teachers' instructional efficacy is positively related to their perceived digital competency and positive attitude as substantiated by the association seen in their model. However, the researchers stipulated that they found significant association in the former but not in the latter.

Meanwhile, other researchers investigated SE together with other factors such as self-regulation and self-directedness. For instance, [9] examined self-efficacy, self-regulation, and self-directedness predicted persistence among first-year students and tertiary non-traditional online learners. [12] studies the characteristics of online learning success in which results revealed that computer self-efficacy also plays a key role in the process. In addition, [35] examined the students' SE and SRL skills in online learning. The findings suggest that self-efficacy & task value are significant predictors of SRL in students' online learning environment.

1.4. Research Gap

Noteworthy, the studies mentioned earlier were conducted in other countries. In the Philippines, [36] conducted a quasi-experimental study to explore students' self-efficacy and engagement together with other variables such as knowledge gain and perception relative to the use of home-based biology experiments. Findings revealed that the intervention has a significant influence on improving students' self-efficacy, engagement, knowledge gain and perception. However, studies to characterize Filipino online learners seem lacking, particularly their OSE, SRL, and OLSE. This is

likely because the Philippines has recently implemented online distance learning to continue teaching-learning despite difficult times during the COVID-19 pandemic. Therefore, this study is motivated to determine whether Filipino online learners also exhibit the characteristics indicated in OSE, SRL, and OLSE scales. Accordingly, this study is conducted to answer the following research questions (RQs):

RQ1: What is the demographic profile of the respondents in terms of:

- Age group;
- Gender Preference;
- Internet Access;
- Internet signal;
- Region of Residence;
- Gadgets used in online learning;
- Most preferred or best time to study online; and
- Online learning tools?

RQ2: How do the students perceive themselves in terms of:

- Student Engagement (OSE);
- Self-Regulated Online Learning (SROL); and
- Online Learning Self-efficacy (OLSE)?

RQ3: Is there a significant difference in the effect of any demographic profile on OSE, SROL, and OLSE?

2. Materials and Methods

2.1. Research Design

This study used a survey research design employed through an ex post facto approach. The unprecedented event in the education system due to COVID-19 pandemic has been the pressing reason for schools to use online learning modality yet, in the Philippines, scholars and education policy-makers do not have the idea about students' online learning profile, particularly among science education students in the tertiary level. According to [37] a research uses ex post facto to study any causal relationship between events and circumstances or the effect of any single variable. Hence, ex post facto was employed to determine the effects of the demographic profile on the constructs OSE, SROL, and OLSE.

2.2. Research Sampling and Participants

This study utilized convenience sampling. Respondents included a total of N=373 tertiary students from 9 regions in the Philippines (National Capital Region, Region I-Ilocos Regions, Region III- Central Luzon, Region IV-A - CALABARZON, Region V- Bicol Region, Region VIII- Eastern Visayas, Region IX- Zamboanga Peninsula, Region XIII- CARAGA Region, MIMAROPA). The researchers ensured these students were enrolled in science education courses taken via online learning. Figure 1 shows the locale of the study.

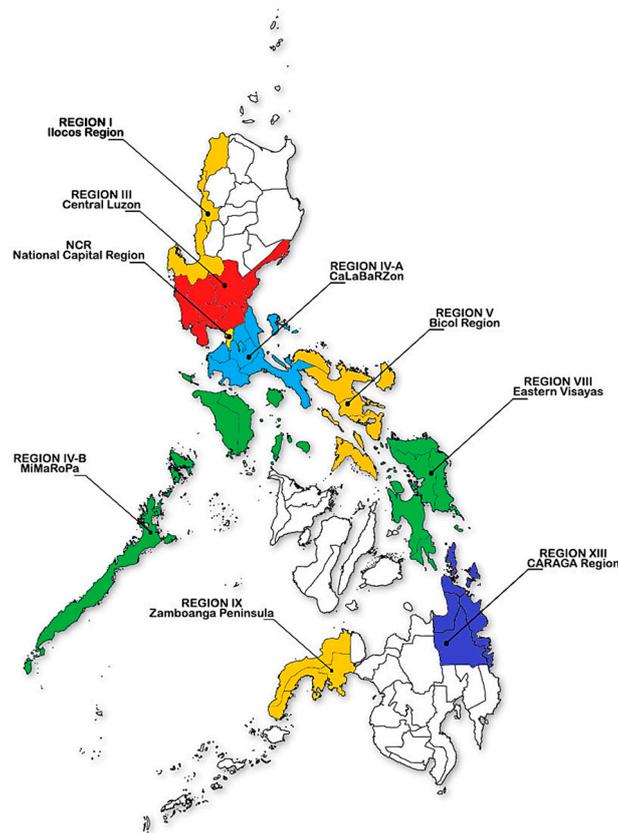


Figure 1. Philippine Map Showing the Locale of the Study.

2.3. Research Instruments

The researchers prepared the survey questionnaire in Google Forms. It was composed of four sections, namely (1) profile of student participant, (2) online student engagement (OSE) scale, (3) self-regulated online learning (SROL) skills, and (4) online learning self-efficacy (OLSE) scale. The profile variables asked in the first part were age group, gender preference, internet access, internet signal, region of residence, gadgets used in online learning, most preferred time to study online, and the online learning tools they use. The OSE scale is answerable by a 5-point Likert scale represented as 5- very characteristic of me, 4- characteristic of me, 3- moderately characteristic of me, 2- not really characteristic of me, and 1- not at all characteristic of me. Another 5-point Likert scale was used to answer the third part on SROL skills where 5- very true for me, 4- true for me, 3- moderately true for me, 2- rarely true for me, and 1- not at all true for me. Meanwhile, the fourth part, relating to OLSE, was answerable with a 4-point Likert scale where 4- strongly agree, 3-agree, 2-disagree, and 1- strongly disagree. The indicators used in parts 2, 3, and 4 were adopted from [38–40], respectively. Noteworthy, OSE is adopted in observance of the fair use of the instrument, whereas the SROL and OLSE are adopted from articles retrieved from open access databases which contents are licensed under creative commons attribution 4.0.

2.4. Data Gathering and Ethics

Using email and Facebook Messenger, the researchers sent the survey questionnaire to science education teachers known to the researchers who teach at various higher education institutions in the Philippines. Noteworthy, the researchers ensured that respondents voluntarily participated in this study by providing informed consent in the preliminary part of the Google Form. It informed them of the nature of their participation, the study's objectives, the confidentiality of their identity in observance of the Philippine Data Privacy Act of 2012, and the treatment of the data collected from them. At the end of the form, all respondents needed to tick a Yes/No question to participate in the

study voluntarily. The survey lasted for three weeks. Of the total number of respondents (N=373), only one answered no and withdrew from participation, while the remaining 372 continued and submitted a fully accomplished questionnaire.

2.5. Data Analysis

Both descriptive and inferential statistics were conducted to analyze the data from the survey questionnaire. Responses then underwent an exploratory data analysis to determine the appropriate descriptive statistics. The researchers included descriptive statistics such as mean, frequency, and standard deviation. To address the research question on determining the effects of the multiple profile variables to the 3 dependent variables (OSE, SROL, OLSE), one important consideration includes the assumptions for testing MANOVA. Specifically, this research selected a factorial MANOVA test to determine the significant difference among the demographic profile relative to their effect on the dependent variables.

2.6. Assumptions for MANOVA

The researchers considered the tests for assumptions to determine whether or not Multivariate Analysis of Variance (MANOVA) will be employed. Specifically, MANOVA tests need continuous and categorical data for dependent and independent variables, respectively. In this study, the dependent variables were the OSE, SRL, and OLSE Likert scale responses were considered continuous. According to [41], continuous variables are usually used in assigning values in social sciences, such as the Likert scale whereas, the profile variables are all categorical and observations are independent thereby, meeting the assumptions for the levels and nature of data. In terms of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, the result showed a value greater than 0.6, indicating that the assumption was met. In testing the univariate outliers, the Box Plots revealed that outliers exist in the data for age group and region of residence, so only the profile variables gender, internet access and signal, laptop and desktop for gadgets, and time to study online were considered in the following steps. As regards the dependent variables (OSE, SRL, and OLSE), outliers all discovered were disregarded which resulted to 359 samples included in further analysis. The Mahalanobis distance revealed that no multivariate outliers were observed among the remaining profile and dependent variables thereby meeting the assumption. Furthermore, in testing the linear relationship, the results of Barlett's test of sphericity revealed that the assumptions were met since $p < 0.05$. Moreover, the Box test of equality of covariance matrices showed that the assumption was met with $p > 0.05$.

3. Results

3.1. Demographic Profile

Table 1 shows the profile variables of the student-respondents. Notice that the majority are 18-22 years old (n=350, 94.09%) and most are men (n=183, 49.19%). In terms of internet connection, the majority has internet access via home broadband with a good signal (> 40%). Also, the majority are from NCR (n=183, 49.19%), and most of them studies at night (n=173, 46.51%).

Table 1. Demographic Profile of the Respondents.

Demographics		Number of Respondents	Percentage
Age Group	18-22 years old	350	94.09
	23-26 years old	21	5.65
	27 years old and above	1	0.26
Gender Preference	Women	157	42.20
	Men	183	49.19

	LGBTQ+	29	7.80
Internet Access	Via School Access	4	1.08
	Via Home Broadband	222	59.67
	Via Mobile Data	146	39.25
Internet Signal	Poor (B/s)	35	9.41
	Good (KB/s)	182	48.92
	Better (MB/s)	147	39.52
	Best (GB/s)	8	2.15
Region of Residence	National Capital Region (NCR)	183	49.19
	Region I- Ilocos Region	2	0.54
	Region III- Central Luzon	33	8.87
	Region IV-A- CALABARZON	66	17.74
	Region V- Bicol Region	8	2.15
	Region VIII- Eastern Visayas	39	10.48
	Region IX- Zamboanga Peninsula	1	0.27
	Region XIII- CARAGA	38	10.22
	MIMAROPA	2	0.54
Most Preferred Time to Study Online	Morning	91	24.46
	Afternoon	58	15.86
	Evening	173	46.51
	Dawn	49	13.17

3.2. Gadgets for Online Learning

Figure 2 illustrates the gadgets used for online learning by the respondents. The figure reflects that most of the student respondents' personally owned gadgets are smartphones (87%). Other respondents personally own a desktop (27%), laptop (52%), basic mobile phone (46%), and tablet (9%). Meanwhile, others borrow only their gadgets: desktop (9%), laptop (21%), basic mobile phone (3%), and tablet (9%). While very few rent desktops (6%) and tablets (3%) at internet café due to the restrictions due to the pandemic, 79% do not own tablets, 58% have no desktop, 51% have no basic mobile phone, and 8% have no smartphone.

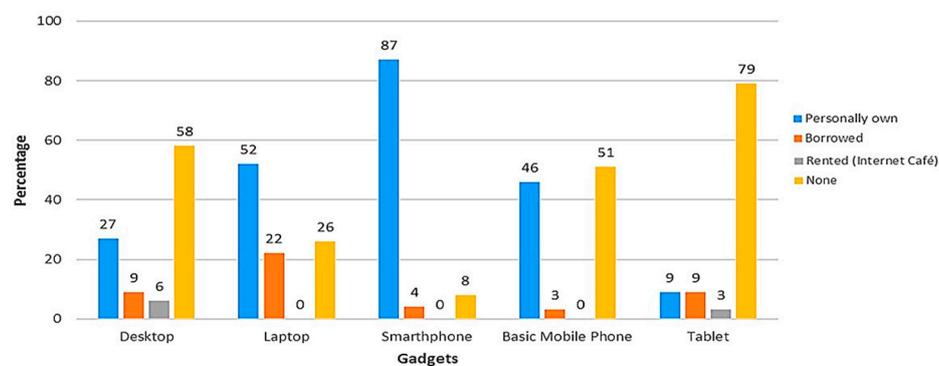


Figure 2. Gadgets for Online Learning.

3.3. Online Learning Tools

Shown in Figure 3 is the frequency of using online learning tools. As reflected in the figure, student respondents often use social learning networks (SLNs) in their online learning with 34% response rate under “very often”. In addition, they often visit available content. Furthermore, e-portfolios are only used occasionally with 41% response rate despite their benefits in monitoring students’ progress in learning. Moreover, most respondents claimed they never use personalized learning environments (PLEs) with 38% response rate.

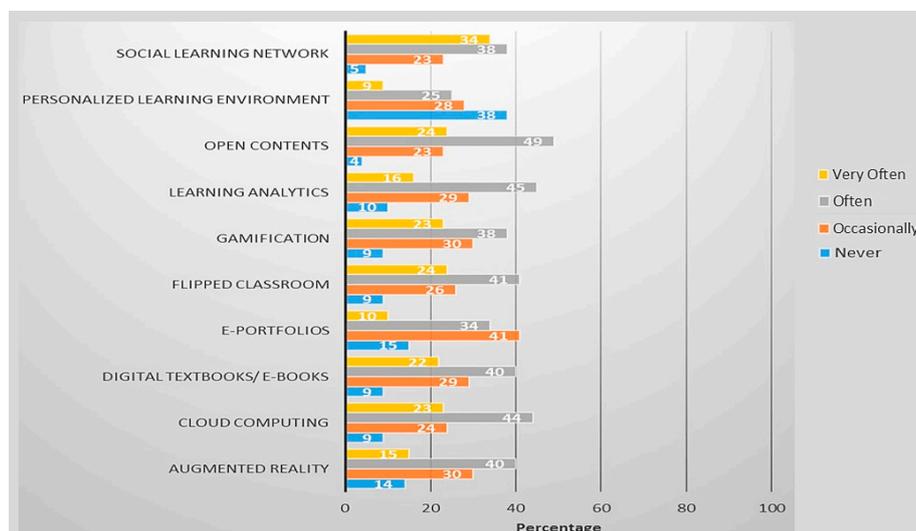


Figure 3. Frequency of Using Online Learning Tools.

3.4. Online Learning Characteristics

3.4.1. Online Student Engagement

Table 2 displays the student respondents perceived OSE. Such was substantiated by the mean scores ranging from $M=3.27$ ($SD=1.11$) to $M=4.17$ ($SD=0.85$). Specifically, student respondents are into “helping fellow students” ($M=4.17$, $SD=0.85$). However, they are not into “posting in the discussion forum regularly” which garnered a relatively lower mean ($M=3.27$, $SD=1.11$). Also, they testified that being engaged in online learning they are “putting put effort”, “listening/reading carefully”, and into “getting good grade” with response rate $M=4.05$ ($SD=0.80$), $M=4.10$ ($SD=0.78$), and $M=4.05$ ($SD=0.80$), respectively, under characteristics of me. Noteworthy, the overall mean ($M=3.85$, $SD=0.90$) clearly shows that student respondents labeled themselves as moderately engaged in online learning.

Table 2. Perceived Online Student Engagement.

Characteristics	(5)	(4)	(3)	(2)	(1)	Mean	SD
	Very Characteristic of me (%)	Characteristic of me (%)	Moderately Characteristic of me (%)	Not really Characteristic of me (%)	Not at all Characteristic of me (%)		
1. Making sure to study on a regular basis	20.70	43.55	27.96	7.26	0.54	3.77	0.73
2. Putting forth effort	30.65	48.12	18.28	2.42	0.54	4.06	0.80
3. Staying up on the readings	14.78	35.48	36.83	10.75	2.15	3.50	0.94
4. Looking over class notes between getting online to make sure I understand the material	26.88	44.62	25.00	3.23	0.27	3.95	0.82
5. Being organized	30.65	40.86	22.04	4.03	2.42	3.93	0.95

6. Taking good notes over readings, PowerPoints, or video lectures	27.96	36.56	27.96	6.45	1.08	3.84	0.94
7. Listening/reading carefully	32.53	47.31	17.74	2.15	0.27	4.10	0.78
8. Finding ways to make the course material relevant to my life	28.23	41.67	23.39	5.38	1.34	3.90	0.92
9. Applying the course material to my life	23.92	43.28	26.08	5.91	0.81	3.84	0.89
10. Finding ways to make the course material relevant to me	25.54	46.77	21.77	4.84	1.08	3.91	0.87
11. Really desiring to learn the material	28.76	45.16	22.58	2.69	0.81	3.98	0.83
12. Having fun in online chats, discussions, or via email with the instructor or classmates	25.81	39.52	23.92	8.33	2.42	3.78	1.00
13. Participating actively in small-group discussion forums	20.70	41.94	27.15	7.80	2.42	3.71	0.96
14. Helping fellow students	40.59	40.32	15.32	2.96	0.81	4.17	0.85
15. Getting a good grade	30.11	48.39	18.28	2.69	0.54	4.05	0.80
16. Doing well on the tests/quizzes	20.70	52.96	22.85	2.69	0.81	3.90	0.78
17. Engaging in conversations online (chat/discussions, email)	25.54	41.40	24.19	6.72	2.15	3.81	0.96
18. Posting in the discussion forum regularly	14.78	26.61	37.63	12.63	8.33	3.27	1.11
19. Getting to know other students in the class	27.96	38.71	20.97	8.33	4.03	3.78	1.07
						Overall	3.85 0.90

3.4.2. Self-Regulated Learning

Shown in Table 3 is the student respondents perceived self-regulated online learning. Based on the table, there are five (5) characteristic of self-regulated online learning namely metacognition, time management, environment structuring, persistence, and help-seeking. Firstly, the indicators “I think of alternative ways to solve a problem and choose the best one for this online course” and “I periodically review to help me understand important relationships in this online course” gained the highest response (M=4.08, SD=0.75) and lowest response (M=3.71, SD=0.89), respectively, under metacognition. Secondly, the indicator “I often find that I don’t spend very much time on this online course because of other activities” has a relatively lower mean (M=3.68, SD=1.00) compared to the other two indicators with a similar response rate under time management. Next, the indicators “I choose the location where I study for this online course to avoid too much distraction” and “I know what the instructor expects me to learn in this online course” gained the highest response (M=4.03, SD=0.98) and lowest response (M=3.79, 0.84), respectively, under environmental structuring. Moving on, the indicators “I work hard to do well in this online course even if I don’t like what I have to do” and “When I am feeling bored studying for this online course, I force myself to pay attention” garnered the highest response (M=3.95, SD=0.89) and lowest response (M=3.63, SD=1.05), respectively, under persistence. Finally, the indicators “When I do not fully understand something, I ask other course members in this online course for ideas” and “I am persistent in getting help from the instructor of this online course” garnered the highest response (M=3.98, SD=0.95) and lowest response (M=3.50, SD=1.09), respectively, under help seeking. Significantly, the overall

mean score (M=3.86, SD=0.92) indicates that student respondents are moderately self-regulated online learners.

Table 3. Perceived Self-Regulated Online Learning.

Characteristics	(5) Very true for me (%)	(4) True for me (%)	(3) Moderately true for me (%)	(2) Not really true for me (%)	(1) Not at all true for me (%)	Mean	SD
A. Metacognition							
1. I think about what I really need to learn before I begin a task in this online course.	26.34	45.16	24.73	3.76	0	3.94	0.81
2. I ask myself questions about what I am to study before I begin to learn for this online course.	25.54	44.62	25.81	3.49	0.54	3.91	0.83
3. I set short-term (daily or weekly) goals as well as long-term goals (monthly or for the whole online course).	23.12	42.47	25.27	6.99	2.15	3.77	0.95
4. I set goals to help me manage my studying time for this online course.	35.84	37.63	19.35	5.91	1.61	3.99	0.97
5. I set specific goals before I begin a task in this online course.	27.42	42.47	23.12	6.18	0.81	3.90	0.90
6. I think of alternative ways to solve a problem and choose the best one for this online course.	30.38	49.19	18.55	1.88	0	4.08	0.75
7. I try to use strategies in this online course that have worked in the past.	31.18	44.89	19.62	3.76	0.54	4.02	0.84
8. I have a specific purpose for each strategy I use in this online course.	22.58	45.16	27.15	4.84	0.27	3.85	0.83
9. I am aware of what strategies I use when I study for this online course.	20.97	47.58	26.34	4.03	1.08	3.83	0.84
10. Although we don't have to attend daily classes, I still try to distribute my studying time for this online course evenly across days.	20.43	43.28	27.15	6.99	2.15	3.73	0.94
11. I periodically review to help me understand important relationships in this online course.	17.74	45.70	27.42	8.06	1.08	3.71	0.89
12. I find myself pausing regularly to check my comprehension of this online course.	22.31	44.89	26.34	5.38	1.08	3.82	3.88
13. I ask myself questions about how well I am doing while learning something in this online course.	27.15	43.01	24.73	4.84	0.27	3.92	0.86
14. I think about what I have learned after I finish working on this online course.	22.58	48.39	23.12	5.38	0.54	3.87	0.84
15. I ask myself how well I accomplished my goals once I'm finished working on this online course.	24.73	49.46	22.31	3.23	0.27	3.95	0.79
16. I change strategies when I do not make progress while learning for this online course.	27.96	42.74	23.12	5.11	1.08	3.91	0.90

17. I find myself analyzing the usefulness of strategies while I study for this online course.	23.12	47.04	24.73	4.57	0.54	3.88	0.83
18. I ask myself if there were other ways to do things after I finish learning for this online course.	24.19	47.85	23.12	3.76	1.08	3.90	0.84
B. Time Management							
19. I find it hard to stick to a study schedule for this online course.	30.65	38.17	22.04	7.80	1.34	3.89	0.97
20. I make sure I keep up with weekly readings & assignments for this online course.	25.27	45.70	21.77	5.91	1.34	3.88	0.90
21. I often find that I don't spend very much time on this online course because of other activities.	22.58	37.10	28.49	9.41	2.42	3.68	1.00
C. Environmental Structuring							
22. I choose the location where I study for this online course to avoid too much distraction.	39.78	32.80	19.89	6.18	1.34	4.03	0.98
23. I find a comfortable place to study for this online course.	37.90	33.60	19.89	6.18	2.42	3.98	1.02
24. I know where I can study most efficiently for this online course.	29.03	39.52	24.19	5.91	1.34	3.98	0.94
25. I have a regular place set aside for studying for this online course.	27.96	41.94	20.43	7.53	2.15	3.86	0.98
26. I know what the instructor expects me to learn in this online course.	20.16	44.35	30.11	4.84	0.54	3.79	0.84
D. Persistence							
27. When I am feeling bored studying for this online course, I force myself to pay attention.	22.04	36.83	28.69	9.41	4.03	3.63	1.05
28. When my mind begins to wander during a learning session for this online course, I make a special effort to keep concentrating.	22.04	42.47	27.42	6.72	1.34	3.77	0.91
29. When I begin to lose interest for this online course, I push myself even further.	23.92	35.48	29.30	8.87	2.42	3.70	1.01
30. I work hard to do well in this online course even if I don't like what I have to do.	29.57	43.28	21.24	4.84	1.08	3.95	0.89
31. Even when materials in this online course are dull and uninteresting, I manage to keep working until I finish.	26.88	43.82	22.04	6.18	1.08	3.89	0.91
E. Help Seeking							
32. When I do not fully understand something, I ask other course members in this online course for ideas.	33.87	38.44	21.24	4.57	1.88	3.98	0.95
33. I share my problems with my classmates in this course online so we know what we are struggling with and how to solve our problems.	31.99	32.53	22.04	8.87	4.57	3.78	1.12

34. I am persistent in getting help from the instructor of this online course.	18.01	35.22	31.99	8.06	6.72	3.50	1.09
35. When I am not sure about some material in this online course, I check with other people.	31.99	40.59	21.51	3.23	2.69	3.96	0.95
36. I communicate with my classmates to find out how I am doing in this online course.	37.75	30.65	23.66	4.57	5.38	3.87	1.12
						Overall	3.86 0.92

3.4.3. Online Learning Self-Efficacy

Table 4 shows the perceived online learning self-efficacy of the student-respondents. Notice that except for using online library resources, communicating effectively with instructors and focusing on school work when faced with distraction, student-respondents agree that they are self-efficient as far as the indicators of OLSE is concerned. Meanwhile, students are most efficient in using synchronous technology to communicate with others (such as Skype) ($M=3.39$, $SD=0.64$). However, there is a relatively lower mean scores for using library online resources ($M=2.27$, $SD=0.94$) and for communicating effectively with instructor via e-mail ($M=2.98$, 0.76).

Table 2. Perceived Online Learning Self-Efficacy.

Characteristics	(4)	(3)	(2)	(1)	Mean	SD
	Strongly Agree (%)	Agree (%)	Disagree (%)	Strongly Disagree (%)		
1. Navigate online course materials efficiently	31.99	58.60	9.41	0	3.23	0.60
2. Find the course syllabus online	36.02	53.49	9.41	1.08	3.24	0.66
3. Communicate effectively with my instructor via e-mail	26.08	48.12	23.92	1.88	2.98	0.76
4. Communicate effectively with technical support via e-mail, or live online chat	27.69	48.12	20.97	3.23	3.00	0.79
5. Submit assignment to an online drop box	45.70	41.94	10.75	1.61	3.32	0.73
6. Overcome technical difficulties on my own	37.90	50.00	11.02	1.08	3.25	0.73
7. Navigate online grade book	26.34	55.11	16.13	2.42	3.05	0.72
8. Manage time effectively	33.33	43.82	17.74	5.11	3.05	0.85
9. Complete all assignments on time	39.25	44.09	13.71	2.96	3.20	0.78
10. Learn to use a new type of technology efficiently	43.01	45.97	10.22	0.81	3.31	0.68
11. Learn without being in the same room as the instructor	26.34	52.69	18.82	2.15	3.03	0.73
12. Learn without being in the same room as the students	27.42	51.34	18.28	2.96	3.03	0.76
13. Search the internet find the answer of a course-related question	37.90	48.12	11.83	2.15	3.22	0.73
14. Search the online course materials	40.32	48.66	10.48	0.54	3.29	0.67
15. Communicate using asynchronous technologies (discussion boards, e-mail, etc.)	33.87	50.54	12.90	2.69	3.16	0.74
16. Meet deadline with very few reminders	30.11	54.03	13.17	2.69	3.12	0.73
17. Complete a group project entirely online	38.71	49.73	11.02	0.54	3.27	0.67
18. Use synchronous technology to communicate with others (such as Skype)	47.04	44.89	7.80	0.27	3.39	0.64
19. Focus on schoolwork when faced with distractions	25.00	49.46	20.70	4.84	2.95	0.81

20. Develop and follow a plan for completing all required work on time	30.91	55.91	12.37	0.81	3.17	0.66
21. Use the library's online resources efficiently	20.97	42.20	24.19	12.63	2.72	0.94
22. When a problem arises, promptly ask questions in the appropriate forum (e-mail, discussion board, etc.)	35.48	44.35	17.20	2.96	3.12	0.79
					Overall	3.14 0.73

3.4.1. Effects of the Demographic Profile on OSE, SROL, and OLSE

The multivariate tests reflected results with no evidence of a significant effect of any of the predictor (independent variables) given the Pillai's Trace > 0.05. Finally, tests between-subject effects revealed that there was no significant effect among the independent groups or levels of that outcome, except for gender and OLSE interaction ($p < 0.05$). Thus, only in OLSE a significant difference was found in terms of gender.

4. Discussion

This study was conducted to primarily obtain a profile of science education students in higher education institutions in the Philippines to characterize their OSE, SROL, and OLSE. As regards their profile variables, an emphasis on internet access and studying at night are not surprising because students were on a study at home at their own pace due to the pandemic. Meanwhile, a good internet connection indicates a favorable status to use online resources for distance learning, especially in the new normal.

As to the gadgets they use for online learning, findings revealed that 87% of the students own a smartphone. The result is consistent with the previous study in the Philippines conducted by [42], in which students claimed that 91% owned smartphones, although that case was for senior high school students from private schools in the Philippines. Therefore, course online designers should consider a virtual environment accessible through mobile devices, especially smartphones. In addition, results showed the students are into the use of social learning network, implying the critical role of SLNs in the new normal. With the widespread misinformation yet easily accessible resources and faster communication even without load like in Facebook Messenger, online learning policymakers and implementers should consider an appropriate and timely plan to teach students how to extract and validate the information access or transmitted via SLNs. Furthermore, students often visit available content. Therefore, it necessitates more accessibility to these learning references, so teachers should include open content in online instructions. However, they should do it cautiously by looking at the accuracy and currency of the references. Moreover, the higher response rate on never using PLEs is similar to the result found by [42] among high school students in the Philippines. It is about time to consider introducing these tools to online students so we can fully discover how they can benefit them.

Looking at OSE, students are fond of helping their fellow. This means that online learners highly practiced collaboration among themselves. This result manifests active learning among online students. [43] reported that students extended help to fellow students to make online learning less isolating. In doing so, they use social networking to communicate with each other and their teachers. Such a statement counters the findings of [25], where students felt a sense of isolation, making them demotivated due to the lack of social interaction. Meanwhile, findings revealed a relatively lower response rate on regularly posting in the discussion forum, indicating that they may be hesitant to publicly express their thoughts or questions. Hence, teachers should also consider explaining to students the benefits of participating in public discussion forums by encouraging them to express their ideas and opinions openly. [44] found online discussions and interactive assignments engaging, such as when thought-provoking questions that are relevant to real-world situations prompt students' thinking or when they share diverse opinions and when asked to develop personal perspectives.

In terms of SROL, student respondents testified that self-regulated learning indicators are moderately true to true for them. Significantly, they think of alternative ways to solve problems encountered in online learning. Students are resourceful in solving their online learning problems. To address such problems, teachers could help students make contingency plans. They may also provide them with various online learning resources so the latter can prepare better and could predict what they might do if a particular problem arises during their learning encounter. However, there is a relatively lower mean score for persistence in getting help from online instructors. One reason could be their reluctance to consult their instructors. Some authors found that this help-seeking issue is related to disappointment in teachers because of their inflexibility in course requirements and their instructors' passive role in online learning [26]. Other authors stated that students also experienced help-seeking issues due to a lack of interaction and immediate feedback from instructors [25,45]. Therefore, the teacher should build a good rapport among their students so they will find it welcoming to get help from them. Students recognize the instructor's effort in consistently assisting them to keep them engaged and to ensure participation in productive discussion, as well as the way their instructor encourages them to acknowledge the point of view of their peers [46].

When it comes to their OLSE, findings revealed that students are most efficient in using synchronous communication tools. The result can be attributed to the rampant use of communication tools during the pandemic, particularly virtual meeting rooms such as Zoom and Google Meet. Unfortunately, students testified they are not that efficient in using their library's online resources. This might be attributed to their access to open content easily available in Google, as revealed in their profiles. However, online instructors should also encourage students to access library resources as they are reliable and validated learning resources.

Noteworthy, the findings on multivariate tests showed no evidence of a significant effect on any of the predictors and researchers found no significant effect among the independent groups, except for gender and OLSE interaction. The result contradicts to the previous work of [47] in which findings revealed no significant difference on the overall self-efficacy in terms of gender. One consideration for the contradicting results could be the difference in the number of study participants. [47] included over nine thousand participants, while this study covered only over three hundred students. Another could be the context because this study involved Filipino students who are neophytes in online learning while those in literature are into compulsory courses delivered in distance learning. Thus, it may concern teachers' attention to the different strategies used by different genders among Filipino students for their self-efficiency.

5. Conclusions, Implications and Recommendations

Based on the findings, the majority of the respondents are 18-22 years old ($n=350$, 94.09%), most are men ($n=183$, 49.19%), the majority has internet access via home broadband with a good signal ($>n=147$, 40%), the majority are from NCR ($n=183$, 49.19%), and most of them studies at night ($n=173$, 46.51%). In terms of online learning characteristics, results substantiated that the student respondents characterize themselves as moderately engaged in online learning ($M=3.85$, $SD=0.90$), they are moderately self-regulators in their online learning ($M=3.86$, $SD=0.92$), and they agreed that the OLSE indicators are true of them ($M=3.14$, $SD=0.73$). Results imply that teachers may consider teaching strategies and provide specific instructions that will help students fully engage in online learning, have SRL skills and or employ strategies as their very characteristics, and become very self-efficient in online learning to prepare them when another exceptional time comes so quality and inclusive will continue. Finally, the findings on MANOVA showed that except for gender and online learning self-efficacy, there was no significant main effect among the independent groups (demographic profile) or levels of that outcome (OSE, SROL, and OLSE). Therefore, a significant difference exists in OLSE regarding gender and not the other profile variables. This implies that online instructors may be considerate when assigning assignments involving gender preferences of the students. In this way, gender-bias issues would be avoided.

The findings of this research contributes to the literature by providing the baseline data of the students' profile as far as online learning is concerned, especially science education students'

engagement, self-regulation, and self-efficacy, thereby addressing this gap in literature. In addition, this study offers the readers, science education teachers, and higher education policy-makers in the Philippines a grasp of empirically-based information about how students manage their online learning given their accessible online learning tools. In this manner, decision-making for policy or curriculum revisions when considering flexible learning modalities such as online learning, designing an inclusive OLE, or providing an appropriate online learning materials for better student engagement and to support SROL and self-efficacy among higher education students who are highly expected of being autonomous and active learners.

As for the recommendations, the inclusion of Structural Equation Modelling (SEM) is highly recommended to determine whether the indicators of OSE, SRL, and OLSE can be considered latent variables of independent learning. In literature, what is available includes the use of SEM to investigate the relationship among the learning environment, self-regulate strategies, and pre-service science teachers' beliefs on studying Physics [48] and student-teachers' self-efficacy on digital competency in a technology-rich classroom [34]. Also, synchronous observation of classes may be done in future studies to verify student characteristics in the classroom. Lastly, students' academic achievement may be considered in future studies to determine the existing relationship with OSE, SRL, and OLSE of online learners.

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