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Math Readiness and its Effect on the Online Academic Performance of Science, Technology, Engineering, and Mathematics Students

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ABSTRACTS

This study sought to determine if the Mathematics readiness of the Grade 12 Science, Technology, Engineering, and Mathematics (STEM) students of SKSU-LHS during the academic year 2020-2021 has directly affected their academic attainments within the STEM strand amid the online learning modality. In doing so, this study employed a descriptive-correlational quantitative research design because conclusions only drove the results without any inference to conform to the main intent of this research. The study revealed no significant association between one's readiness in Mathematics and their academic performance as Grade 12 STEM students amid the online learning modality in online learning modality. With this in mind, in an online learning setup, although Mathematics has a huge part within the STEM strand, students who are not mathematically inclined can still establish a decent academic standing and, at most, even excel.

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1. INTRODUCTION

Math Readiness refers to how ready a student is in Mathematics before being fully admitted to a particular academic program, specifically, how they can incorporate the right mathematical concepts in particular situations, in general. With this, the Science, Technology, Engineering, and Mathematics (STEM) strand requires students to push their Mathematics preparation as far as possible because it includes the said area of knowledge daily considering that it is an independent discipline in the STEM strand (Li & Schoenfeld, 2019).

To continue, Mathematics has been and is still perceived as a complex subject even among STEM students. Proof of this is the problem being experienced by some STEM students in which they find it hard to grasp the mathematical concepts of their courses (Quigley & Herro, 2016). Similarly, a similar study stated that this is the case because students, in general, are troubled byMathematics itself (Silver, 1994). In the Philippines, the majority of the students have a negative attitude and treatment towards Mathematics and this contributes to the high rate of underachievers in Mathematics in the country (Gamit *et al*., 2017). Apart from this, it has been revealed that students from chosen schools in one of the Philippines' main islands, Mindanao, still need to thoroughly assess and give attention to their mathematical skills.

Public institutions that place a high value on their track courses are excellent subjects when used to assess the said point because their students' achievements reflect their standing. Specifically, this study took into account the STEM students of SKSU-LHS because they are qualified as a basis for this study. Thus, this study sought to answer the connection between theoverall online academic performance of STEM students, emphasizing their standing within the said setting, and how their overall level of Mathematics readiness can contribute to it.

2. METHODS

Primarily, this study used a quantitative research design. Specifically, this study is quantitative research that has made use of the descriptive-correlational approach. A descriptive-correlational research design states the association between the variables established in a particular study and has concluded it without inference, not taking into it account their causal connection all at once (Lappe, 2000).

The respondents of this study were the entire Grade 12 STEM students of Sultan Kudarat State University - Laboratory High School (SKSU-LHS) of the Philippines, Mindanao, within the school year 2020-2021. Specifically, the respondents used to be students of the said university, because they had already finished complying with their courses within the mentioned school year. Because all of the respondents are manageable in size and share a given characteristic that will help further the progress of this study, the whole population was of interest (Heller *et al*., 2021).

The data used for this study to make its progression were already fixed and ready. In elaborating, the tools used as the bases for this study were (1) the results of the respondents' Center for Educational Measurement (CEM) Entrance Assessments, the medium used as a premise that the respondents had taken prior to them being fully admitted to the school, and (2) their first and second-semester grades, and general averages for the school year 2020-2021. Moreover, Tables 1 and 2 were used as bases for concerning the interpretation of the data of the study. The statistical tools used in this study were: the mean which helped disclose a general description of the variables assessed because it is the central value extracted from every value there is in a data set; the standard deviation which determined the dispersion of the data points based on all of the respective values under a given data set; and the P-Pearson correlation which has been utilized to find out if there is an association between the variables and how strong their connection is towards one another.

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Table 1. SKSU-LHS' grading scale.

Score	Verbal Description
90-100	Outstanding
85-89	Very Satisfactory
80-84	Satisfactory
75-79	Fairly Satisfactory
< 75	Did Not Meet Expectations

Table 2. Entrance exams' competency measure.

Score	Verbal Description
200-330	Very Poor
331-379	Poor
380-427	Below Average
428-475	Low Average
476-523	Average
524-571	High Average
572-619	Above Average
620-668	Superior
669-800	Excellent

3. RESULTS AND DISCUSSION

3.1. Level of readiness in mathematics among the respondents

Table 3 discloses the mean and standard deviation of the CEM Mathematics Entrance Exam results which helped determine the general level of Math Readiness of the Grade 12 STEM students. Altogether, the mean of the elaborated data is 497.500 and when interpreted using the competency measure used for describing one's readiness in the CEM entrance exams, the overall readiness in Mathematics among the Grade 12 STEM respondents is said to be average. However, it is of great importance to consider the data's standard deviation, which is 85.697. Given its large size, it denotes that the respective scores of the respondents extremely vary from one another because their data are immensely spread out.

Table 3. Math readiness of the respondents.

Score	Frequency	%
654-729	2	6
578-653	1	3
502-577	11	32
426-501	15	44
350-425	3	9
274-349	2	6

STEM students are not just students with a normal background considering that institutions deemed them as people capable and deserving of belongingness within the strand (Breiner *et al.,* 2012). Another statement to support the said point is the fact on how the grades of STEM students themselves were being handled with high maintenance, especially in its four main disciplines, including Mathematics (see https://depedtambayan.net/criteria-entry-senior-high-school-tracks-strands/), since they are expected to deliver their performance that will leave an impression because a general implication about STEM students being capable enough to have at least an average comprehension level of mathematical concepts was already established and well-known (Breiner *et al.,* 2012).

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3.2. Academic competence of the respondents within the stem strand

Table 4 shows the online academic competence during the first semester. Only one student got a grade of 95 among the respondents which constitute the 2.94%. On the other hand, 13 students got a grade of 94 while 15 students got 93, and both of the percentages that contain these students constitute 38.24% and 44.12% of the respondents, respectively. Following this, only one student got a mark of 91 which constitutes 2.94% of the respondents. Equally, one got a mark of 90 and they also contribute to 2.94% of the respondents. With a standard deviation of 0.963, the data implies that the respective grades of the STEM students during the first semester do not have a significant gap that much from one another. Conforming to the institution's basis for interpretation regarding grades, with a mean of 93.206, the general level of academic competence of the respondents is said to be outstanding. **Table 5** shows the level of academic competence of the STEM students during the second semester of the said school term. Concisely, six (6) students got a grade of 95 and they constitute 17.65% of the population.

Table 4. Online academic competence during the first semester.

Grade	Frequency	%
95	1	2.94%
94	13	38.24%
93	15	44.12%
92	3	8.82%
91	1	2.94%
90	1	2.94%

Table 5. Online Academic Competence during the Second Semester

Grade	Frequency	%
95	6	17.65%
94	12	35.29%
93	8	23.53%
92	4	11.76%
91	3	8.82%
87	1	2.94%
95	1	2.94%

Meanwhile, 12 students got a mark of 94 while eight students got a grade of 93 and they respectively constitute 35.29% and 23.53% of the respondents. Those who got a grade of 92 arefour of the respondents and they contribute to 11.76% of the respondents while those who got a grade of 91 are three (3) in number and constitute 8.82% of the respondents. Lastly, only one student got a mark of 87 and they constitute 2.94% of the STEM respondents. With these data, the mean is 93.235 and when interpreted, it says that the overall level of academic competence among the STEM respondents during the second semester of the said school year is still outstanding and is alike the first semester. Moreover, with a standard deviation of 1.591, the grades of STEM students during the second semester experienced a much wider spreading out from one another compared to the first semester grades.

Table 6 reveals the scope of the academic performance of the STEM respondents during the whole school year. Succinctly, two students got a general average of 95 and they constitute 5.88% while 12 students got a grade of 94 for the whole academic term and they contribute 35.29% of the respondents.On the other hand, 13 students got a grade of 93, constituting 38.24% of the STEM respondents, denoting that majority of the students got a

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grade of 93. Meanwhile, for the whole academic year, five students got a grade of 92, and constitute 14.71% of the population. Lastly, one student got a grade of 90 and one also got a grade of 89, both contributing to 2.94%, respectively. Those within the STEM strand had eventually gotten accustomed to its experimental and practical approaches, which is why almost all of its students have outstanding academic performance, and this point aligns with the result gathered from this particular section (Breiner *et al.,* 2012). In addition, the majority of students within the STEM strand are consistent with their outstanding marks. This point also provides enlightenment towards the statement that STEM students themselves were extremely competent and capable within the strand (Owston *et al.,* 2020).

3.3. Readiness in mathematics and academic performance of STEM students

We also evaluated the results of the relationship between the student's readiness in Mathematics in terms of their Center for Educational Measurement (CEM) Mathematics entrance assessments and their academic performance and competence in terms of their first semester grades. The results from this particular table disclose the p-value which is 0.8376 which has been extracted by utilizing the significance level of 0.05. If the p-value is larger than the significance level, then a significant relationship between the variables does not exist. With this in mind, one's Math Readiness does not determine the competence and overall academic performance of STEM students during the first semester. Another value to prove the said point is the value of Pearson's r which is featuredabove in the table. Since Pearson's r is 0.0365 and is far from 1 or -1, it is said to have a weak correlation.

Generally, we evaluated the relationship between one's readiness in Mathematics to their academic performance for the whole school year. It has been elaborated that one's readiness in Mathematics in terms of their Mathematics entrance exams does not have a significant relationship with one's attainments within the STEM strand. Succinctly, as the whole general weighted averages of the 34 STEM students were taken into account, we immediately sought to determine whether one's generalized attainment within the STEM strandhas an association with one's respective readiness in Mathematics and if there will be a contradiction that will happen to the results gathered from the first and second semesters. Witha p-value of 0.7663 and an R-value of 0.0538, still, there has been no significant relationship between the predictor variable and the criterion variable.

Concisely, the findings gathered under this particular section proved the point regarding how being well-inclined in Mathematics does not guarantee success because even though the STEM strand tackles the said area of knowledge thoroughly, it also involves an experimental approach that will appeal to each learner's learning method that will help each one ofthem attain the very essence of what it is to learn under STEM (Breiner *et al.,* 2012). Following this, the medium taken by the respondents that helped define their readiness in Mathematics is their results before being admitted to the said strand, which implies that their learning pace differed from what it was back then at the time they took the entrance exams compared to their time amid the strand since they might have developed a rational scepticism towards the world, analytical skills for various issues, a healthy curiosity that brings out its very essence which is to find learning fun and a lot more entertaining than how it is commonly perceived—essential attitudes the STEM strand brings out, contributing to a not direct impression regarding how they will do in the said strand.

4. CONCLUSION

The general level of the respondents' readiness in Mathematics in terms of their results from the Center for Educational (CEM) Mathematics entrance exams was average. Following

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this, because almost all of the Grade 12 STEM students during the school year 2020-2021 were able to attain high marks, it has been said that the general level of their academic performance amid the online learning modality is outstanding, specifically during the first and second semester, and for the entire academic year. Altogether, the study proved that there is no direct association between one's readiness in Mathematics and their academic standing under the STEM strand amid the online modality, given the fact that almost all of the students are average in terms of their math readiness and still exhibited an outstanding performance amid the academic year.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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