A COMPARATIVE ANALYSIS OF STUDENTS PERFORMANCE IN AN ONLINE (VS) FACE-TO-FACE ENVIRONMENT

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Abstract—**This study is comparing the student's performance in online classes and face-to-face classes of higher secondary school students. Our results complement this research analysis finding that, when we control for factors such as learning medium, major group, and having PC/Mobile, students in online classes do as well in objective measures of performance, but not better than students in face-to-face classes. We also found that in the online sections, females performed at least as well as males. We discuss these results in relation to some changes in online classes and the persistent perception by some that online classes are somewhat problematic because students need more discipline in online classes.**

Keywords— **Online Education, Face-to-Face classes, student performance.**

I. INTRODUCTION

The advent of online education has made it possible for students with busy lives and limited flexibility to obtain a quality education. As opposed to traditional classroom teaching, Web-based instruction has made it possible to offer classes worldwide through a single Internet connection. Although it boasts several advantages over traditional education, online instruction still has its drawbacks, including limited communal synergies. Still, online education seems to be the path many students are taking to secure a degree.

This study compared the effectiveness of online vs. traditional instruction in an environmental studies class. Using a single indicator, we attempted to see if student performance was affected by the instructional medium. This study sought to compare online and F2F teaching on three levels—pure modality, gender, and class rank. Through these comparisons, we investigated whether one teaching modality was significantly more effective than the other. Although there were limitations to the study, this examination was conducted to provide us with additional measures to determine if students performed better in one environment over another.

The methods, procedures, and operationalization tools used in this assessment can be expanded upon in future quantitative, qualitative, and mixed-method designs to further analyze this topic. Moreover, the results of this study serve as a backbone for future meta-analytical studies.

II. THEORETICAL BACKGROUND

Origins of Online Education
Computer-assisted instruction is changing the pedagogical landscape as an increasing number of students are seeking online education. Colleges and universities are now touting the efficiencies of Web-based education and are rapidly implementing online classes to meet student needs worldwide. One study reported, "that increases in the number of online courses given by universities have been quite dramatic over the last couple of years" (Lundberg et al., 2008). Think tanks are also disseminating statistics on Web-based instruction. "In 2010, the Sloan Consortium found a 17% increase in online students from the years before, beating the 12% increase from the previous year" (Keramidas, 2012).

Contrary to popular belief, online education is not a new phenomenon. The first correspondence and distance learning educational programs were initiated in the mid-1800s by the University of London. This model of educational learning was dependent on the postal service and therefore wasn't seen in America until the later nineteenth century. It was in 1873 when what is considered the first official correspondence educational program was established in Boston, Massachusetts is known as the "Society to Encourage Home Studies." Since then, a non-traditional study has grown into what it is today considered a more viable online instructional modality. Technological advancement indubitably helped improve the speed and accessibility of distance learning courses; now students worldwide could attend classes from the comfort of their own homes.

Qualities of Online and Traditional Face to Face (F2F) Classroom Education
Online and traditional education share many qualities. Students are still required to attend class, learn the material,

submit assignments, and complete group projects. While teachers, still have to design curriculums, maximize instructional quality, answer class questions, motivate students to learn, and grade assignments. Despite these basic similarities, there are many differences between the two modalities. Traditionally, classroom instruction is known to be teacher-centered and requires passive learning by the student, while online instruction is often student-centered and requires active learning.

In teacher-centered, or passive learning, the instructor usually controls classroom dynamics. The teacher lectures and comments, while students listen, take notes, and ask questions. In student-centered, or active learning, the students usually determine classroom dynamics as they independently analyze the information, construct questions, and ask the instructor for clarification. In this scenario, the teacher, not the student, is listening, formulating, and responding (Salcedo, 2010).

In education, change comes with questions. Despite all current reports championing online education, researchers are still questioning its efficacy. Research is still being conducted on the effectiveness of computer-assisted teaching. Cost-benefit analysis, student experience, and student performance are now being carefully considered when determining whether online education is a viable substitute for classroom teaching. This decision process will most probably carry into the future as technology improves and as students demand better learning experiences.

Thus far, "literature on the efficacy of online courses is expansive and divided" (Driscoll et al., 2012). Some studies favor traditional classroom instruction, stating "online learners will quit more easily" and "online learning can lack feedback for both students and 3 instructors" (Atchley et al., 2013). Because of these shortcomings, student retention, satisfaction, and performance can be compromised. Like traditional teaching, distance learning also has its apologists who aver online education produces students who perform as well or better than their traditional classroom counterparts (Westhuis et al., 2006).

The advantages and disadvantages of both instructional modalities need to be fully fleshed out and examined to truly determine which medium generates better student performance. Both modalities have been proven to be relatively effective, but, as mentioned earlier, the question to be asked is if one is truly better than the other.

III. METHOD

The normative survey method is used in the present study. It seeds to obtain precise information concerning the current status of phenomena and to draw valid general conclusions from the facts discovered. This study is not restricted only to fact findings but to the formulation of important principal knowledge and solution of a significant problem related to higher secondary school students and other significant variables related to it. This method of research attempts to describe and interpret what exists at present in the form of conditions, practices, processes, trends, and effects. In brief, it is an attempt to analyze, interpret and report the present level of student performance in higher secondary schools in online and face-to-face classes.

The statistical analysis of the data has been presented in this chapter. The data collected from 150 students in the Cuddalore Education district (Tamil Nadu) have been analyzed as follows to arrive at meaningful conclusions.

A comparative analysis of students' performance in an online vs face-to-face environment is one of the important objectives of the present study is to assess the student performance in an online vs face-to-face environment. For that, the investigator used a performance scale to construct the data. The test consists of 40 questions and it is divided into two parts. One is for Performance in online classes and another one is for face-to-face classes.

The maximum score for this test is 100 in each part. For that, the performance in an online and face-to-face environment is divided into very low, low, moderate, high, and very high 46 performance categories. In order to divide the sample into the above-stated categories investigator adopted the following method. The categorization was done by dividing the baseline normal curve into 5 units. Each unit begins with very low (0-20), low (21-40), moderate (41-60), high (61-80), and very high (81-100).

ANALYSIS OF THE PERFORMANCE IN AN ONLINE AND FACE-TO-FACE ENVIRONMENT OF HIGHER SECONDARY SCHOOL STUDENTS.

Percentage analysis of performance in an online class of higher secondary school students scores of the total sample			
S.No	Performance towards online classes	Score	Percentage
1	Very Low	0-20	0
2	Low	21-40	0
3	Moderate	41-60	22
4	High	61-80	73.33
5	Very High	81-100	4.67

From the above table, it is clear that 73.33 percent of students' performance online is high, 22 percent of students have performance online is moderate and 4.6 percent of students have performance online is very high.

Percentage analysis of performance in a face-to-face environment of higher secondary school students scores of the total sample			
S.No	Performance towards Face-to-Face classes	Score	Percentage
1	Very Low	0-20	0
2	Low	21-40	0
3	Moderate	41-60	1
4	High	61-80	50
5	Very High	81-100	49

From the above table, it is clear that 50 percent of students' performance toward face-to-face classes is high, 49 percent of students' performance towards face-to-face classes is very high and 1 percent of students have performance towards face-to-face classes is moderate.

One of the important objectives of the study is to assess the level of performance in online and face-to-face environments of higher secondary school students not only for the entire sample but also subsamples-wise. For that the mean, standard deviation values have been calculated for the entire and subsample which includes the school type, age, gender, medium, group, qualification, father qualification, parental occupation, and parental income, no of family members, family type, email, and PC/Mobile.

DESCRIPTIVE ANALYSIS THE TOTAL PERFORMANCE TOWARDS ONLINE AND FACE-TO-FACE CLASSESS

S.NO	Variable		N	Percentage	Online Mean & SD		F2F Mean & SD	
1	School Type	Government	50	33.33	67.4	5.83	78.46	5.87
		Aided	50	33.33	68.22	8.67	78.78	6.26
		Self Finance	50	33.33	67.82	10.95	86.92	11.17
2	Age	16	31	20.67	67.16	12.13	88.74	13.46
		17	105	70	67.89	7.64	79.83	6.29
		18	14	9.33	68.64	7.49	76.71	4.19
3	Gender	Female	47	31.33	63.36	6.35	82.78	11.72
		Male	103	68.67	69.84	8.87	80.74	7.39
4	Locality	Rural	84	56	67.69	9.55	79.45	6.56
		Urban	66	44	67.96	7.51	83.84	10.91
5	Medium	English	50	33.33	67.82	10.95	86.92	11.17
		Tamil	100	66.67	67.81	7.36	78.62	6.04

6	Group	Biology	35	23.33	64.88	8.43	83.11	6.86
		Commerce	115	76.67	68.7	8.6	80.86	9.5
7	Mother Qualification	College	3	2	65	7.81	86.66	6.35
		Diplamo	1	0.67	58	5.7	112	7.1
		School	124	82.67	67.75	8.99	81.18	8.93
		None	22	14.67	68.95	7.02	80.4	7.16
8	Father Qualification	College	7	4.67	64.28	6.87	83	13.83
		Diplamo	9	6	67.88	6	81.33	8.06
		School	125	83.33	67.88	9.04	81.2	8.89
		None	9	6	69	7.36	82.66	8.06
9	Parental Occupation	Business	3	2	68.33	10.26	81.33	10.4
		Cooli	124	82.67	67.37	7.27	80.38	8.8
		Government	2	1.33	64.5	9.19	101.5	14.84
		Self-employment	21	14	70.6	14.5	85.3	6.26
10	Parent Income	0-50,000	2	1.33	63.64	3.97	78.42	4.43
		50,000 - 75,000	141	94	68.6	8.9	81.7	9.43
		75,000 Above	7	4.67	61.57	7.04	81.42	6.29
11	No of family	1 to 3	9	6	76.33	19.14	82.33	6.48
		4 to 6	136	90.67	67.32	7.5	81.7	9.72
		7 to 9	5	3.33	66.95	6.84	79.27	4.43
12	Family Type	Join family	43	28.67	69.46	10.33	81.18	6.23
		Nuclear family	84	56	67.44	7.84	81.96	10.11
		Single Parent	23	15.33	66.08	8.15	79.65	9.05
13	Email	Yes	40	26.67	68.87	11.17	82.9	9.02
		No	110	73.33	67.42	7.61	80.83	8.94
14	PC/Mobile	Yes	134	89.33	68.48	8.17	88.72	12.73
		No	16	10.67	70.5	14.08	81.87	6.77
15	Total Hours	0-2	96	64	68.47	9.38	81.78	9.41
		2-4	20	13.33	69.15	8.29	82.05	7.98
		4-6	34	22.67	65.14	6.16	79.88	8.34

STEPWISE REGRESSION BETWEEN TOTAL PERFORMANCE AND PERSONAL VARIABLES

Model	B	Std. Error	Beta	Pearson r	Sr2	Structured Coefficient
(Constant)	77.46	9.48				
Medium	24.04	3.02	0.87	0.30	0.23	0.88
Group	22.47	3.37	0.73	0.05	0.15	0.74
Note: The Dependent Variable Performance in Online and Offline class R ^{2} = 0.3 Adjusted R ^{2} = 0.29						
Sr ^{2} is a squared semi-partial correlation. * p<.05						

The prediction model contained 2 of the 15 predictors and was reached in step 2 with 13 variables removed. The model was statistically significant, **F(2,147) = 31.854 p < .001, and accounted for approximately 30%** of the variance of performance of higher secondary school students (R^2=0.3) Adjusted (R^2=0.29). Performance of higher secondary school students is primarily predicted by the low levels of medium instruction and to a lesser extent by a higher level of the group.

The raw and standardized regression coefficients of predictors together with their correlation with medium instruction, their squared semi-partial correlation s, and their structure coefficient are shown in the table.

The medium of instruction received the strongest weights, and the group received the lowest weights of the two weights. With the sizable correlation between the predictors, the unique variance explained by each of the variables indexed by semi-partial correlation was relatively slow.

With the sizable correlation between the predictors, the unique variance explained by each of the variables indexed by squared semi-partial correlation was relatively low. Medium of instruction and group uniquely accounted for approximately 29% and 1% of the total performance of higher secondary school students.

Inspection of the structure coefficient suggests that the medium of instruction was a relatively strong indicator of the total performance of higher secondary school students and the Group was a moderate indicator of the total performance of higher school students.

IV.   SUMMARY

This current study is an attempt to compare student performance in online classes and face-to-face classes. 150 samples were taken for the assessment of the performance in online and face-to-face classes of higher secondary school students. There were 40 items in a 5-point scale instrument used in this study. It assesses the online and face-to-face class aspects of student performance. Descriptive analysis, inferential, correlation analysis, and regression were used to analyze the data. The overall study revealed that **the student performance in a face-to-face class is higher than in an online class.** There is a significant difference among the students related to personal variables only in the medium of instruction and group in total performance. The prediction model contained 2 of 15 predictors and was reached in two steps with 13 variables removed. The model was statistically significant, **F(2,147) = 31.854 p < .001, and accounted for approximately 30%** of the variance of performance of higher secondary school students (R^2=0.3) Adjusted (R^2=0.29). The performance of higher secondary school students is primarily predicted by the medium instruction. **The medium of instruction was a relatively strong indicator of the total performance of higher secondary school students and Group was a moderate indicator of the total performance of higher school students.**

V.   MAJOR FINDINGS

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❖ 73.33 percent of students have performance online is high
❖ Performance towards face-to-face classes is high
❖ The students studying in a Self-financing school have more performance in face-to-face classes than others.
❖ The students in the age of 16 years have high performance in face-to-face classes than students the aged 17 and 18.
❖ The female students have more performance in face-to-face classes than male students.
❖ The students from the urban area have more performance in face-to-face classes than rural area students.

- ❖ The students from English medium have more performance in face-to-face classes than Tamil medium students.
- ❖ The students from the Commerce group have more performance in face-to-face classes than the Biology group.
- ❖ The student's mother qualified school to have more performance in an online class than others.
- ❖ The student's fathers qualified for college have more performance in an online class than others.
- ❖ . The students with parent's occupations Government have more performance in face-to-face classes than others.
- ❖ The students with parents' income of 50,000 - 75,000 have more performance in face-to-face classes than others.
- ❖ The student's family member in 1 to 3 has more performance towards online classes than others.
- ❖ The students who are in join family have more performance towards online classes than others.
- ❖ The students having emails have more performance in online classes than students who have no emails.
- ❖ The students having PC/Mobile have more performance towards face-to-face classes than students those who have no PC/Mobiles.
- ❖ The students who spend 0 to 2 hours online have more performance in face-to-face classes than others.
- ❖ It is concluded that the male and female students significantly differ in their performance in online classes.
- ❖ It is concluded that the male and female students significantly do not differ in their performance in face-to-face classes.
- ❖ It is concluded that the male and female students significantly do not differ in their total performance.
- ❖ It is concluded that the Tamil and English medium students significantly do not differ in their performance in online classes.
- ❖ It is concluded that the Tamil and English medium students significantly differ in their performance in face-to-face classes.
- ❖ It is concluded that the Tamil and English medium students are significantly differ in their total performance.
- ❖ It is concluded that the Commerce and Biology medium students significantly differ in their performance in online classes.
- ❖ It is concluded that the Commerce and Biology medium students significantly do not differ in their performance in face-to-face classes.
- ❖ It is concluded that the Commerce and Biology medium students significantly do not differ in their performance in face-to-face classes.

- ❖ It is concluded that the Urban and Rural students significantly do not differ in their performance in online classes.
- ❖ It is concluded that the Urban and Rural students significantly differ in their performance in face-to-face classes.
- ❖ It is concluded that the Urban and Rural students significantly differ in their total performance.
- ❖ It is concluded that the email user and non-user significantly do not differ in their performance in online classes.
- ❖ It is concluded that the email user and non-user significantly do not differ in their performance in face-to-face classes.
- ❖ It is concluded that the email user and non-user significantly do not differ in their total performance.
- ❖ It is concluded that the PC/Mobile user and non-user significantly do not differ in their performance in online classes.
- ❖ It is concluded that the PC/Mobile user and non-user significantly do not differ in their performance in face-to-face classes.
- ❖ It is concluded that the PC/Mobile user and non-user significantly do not differ in their total performance.
- ❖ The students with different school types significantly do not differ in their performance in online classes.
- ❖ The students with different school types significantly differ in their performance in face-to-face classes.
- ❖ The students with different school types significantly differ in their total performance.
- ❖ The students of different ages significantly do not differ in their performance in online classes.
- ❖ The students of different ages significantly differ in their performance in face-to-face classes.
- ❖ The students of different ages significantly do not differ in their total performance.
- ❖ The students with different mother qualifications significantly do not differ in their performance in online classes.
- ❖ The students with different mother qualifications significantly do not differ in their performance in face-to-face classes.
- ❖ The students with different mother qualifications significantly do not differ in their total performance.
- ❖ The students with different father qualifications significantly do not differ in their performance in online classes.
- ❖ The students with different father qualifications significantly do not differ in their performance in face-to-face classes.
- ❖ The students with different father qualifications significantly do not differ in their total performance.
- ❖ The students with different parent occupations significantly do not differ in their performance in online classes.

❖ The students with different parent occupations significantly differ in their performance in face-to-face classes.

❖ The students with different parent occupations significantly do not differ in their total performance.

❖ The students with different parent incomes significantly do not differ in their performance in online classes.

❖ The students with different parent incomes significantly did not differ in their performance in face-to-face classes.

❖ The students with different parent incomes significantly do not differ in their total performance.

❖ The students with a different number of family members significantly do not differ in their performance in online classes.

❖ The students with a different number of family members significantly did not differ in their performance in face-to-face classes.

❖ The students with a different number of family members significantly do not differ in their total performance.

❖ The students with different family types significantly do not differ in their performance in online classes.

❖ The students with different family types significantly did not differ in their performance in face-to-face classes.

❖ The students with different family types significantly do not differ in their total performance.

❖ The students with different hours spent online significantly do not differ in their performance in online classes.

❖ The students with different hours spent online significantly not differ in their performance in face-to-face classes.

❖ The students with different hours spent online significantly do not differ in their total performance.

❖ There is a negative significant relationship between school type, group, age, mother qualification, and hours spent online.

❖ There is a positive significant relationship between school type, group, age, mother qualification, and hours spent online. But the correlation between school type, medium, gender, locality, parent occupation, performance f2f, and total performance.

❖ There is a negative significant relationship between medium, group, age, and mother qualification.

❖ There is a positive significant relationship between medium, gender, locality, parent occupation, parent income, performance f2f, and total performance.

❖ There is a negative significant relationship between the group, gender, locality, and parent occupation.

❖ There is a positive significant relationship between the group, father qualification, and performance online.

❖ There is a negative significant relationship between gender, age, mother qualification, parent income, hours spent online, and performance online.

❖ There is a positive significant relationship between gender, family type, and email.

❖ There is a negative significant relationship between age, parent occupation, performance f2f, and total performance.

❖ There is a positive significant relationship between age, PC/Mobile, and hours spent online.

❖ There is a positive significant relationship between locality, parent occupation, PC/Mobile, performance f2f, and total performance.

❖ There is a positive significant relationship between mother qualification and father qualification.

❖ There is a positive significant relationship between father qualification and email.

❖ There is a negative significant relationship between parent occupation and email.

❖ There is a positive significant relationship between parent occupation, parent income, performance f2f, and total performance.

❖ There is a negative significant relationship between parent income, family type, and email.

❖ There is a negative significant relationship between the number of family members and performance online.

❖ There is a negative significant relationship between email and hours spent online.

❖ There is a positive significant relationship between performance online and total performance.

❖ There is a positive significant relationship between performance f2f and total performance.

❖ The medium of instruction was a relatively strong indicator of the total performance of higher secondary school students and the Group was a moderate indicator of the total performance of higher school students.

❖ The Offline score was the relatively strong dominant factor in the total performance of higher secondary school students and online score was moderate dominant factor of total performance of higher secondary school students.

VI. CONCLUSION

Our study compared the performance of higher school students in online and face-to-face classes. Students' performance in a face-to-face class is higher than in an online class. Female students studying in Self-financing schools and English medium have higher performances in face-to-face classes. The medium of instruction was a relatively strong indicator of the total performance of higher secondary school students and Group was a moderate indicator of the total performance of higher school students. Our finding that students in online and face-to-face sections perform equally well would seem to be inconsistent with the

persistent perception by some that online students are at a disadvantage because they need greater discipline in online classes. We discussed possible compensating mechanisms that are available in online classes and are utilized by students and faculty.

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