Student engagement in online learning during COVID-19

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Abstract

Online teaching and learning have become the novel norm amidst COVID-19 pandemic crisis across the world. The educational institutions across the world have switched to online mode of instruction to continue to provide education. Thus, research on effectiveness of online teaching and factors affecting the student's engagement in a virtual classroom has gained importance. Students during pandemic are learning at home and lack motivation and confidence in their academic life. The present study aimed to analyze the student engagement and the factors that affect the student engagement in online learning environment. The study employed a quantitative research design to collect data from 600 students attending online classes in schools and colleges of Bangalore, India. The study found that there is a positive correlation between students' intrinsic motivation and student engagement. Student engagement increases as the academic pressure or tension decreases. The core findings of the study showed that interest towards learning, perceived competence, and perceived choice of students determines student engagement in online classroom. Almost 33.7 % variance in student engagement is because of students' intrinsic motivation. Future researchers may explore external factors affecting student engagement. Student engagement is significant for meaningful learning in online learning environment.

KEYWORDS: Intrinsic Motivation, COVID-19, Online Learning, Student Engagement, Virtual Classroom.

1. Introduction

Covid-19 brought changes in teaching and learning. Technology integrated learning has been the norm of 21st century learners. Teachers teaching in virtual classrooms are striving hard to create newer strategies to enhance the teaching-learning experiences and interactions in the virtual classrooms for effective student engagement (West & Jones, 2007). Many newer virtual platforms have attempted to enhance peer interaction and there is a need for seamless synchronous and asynchronous activities to motivate students online (Rajalingam et al., 2021). Students amid pandemic started to prefer a mixed mode of instruction that includes Face to face and Remote learning. Flexibility provided by online classroom gives a sense of freedom to learners than offline classes. Students can take breaks in between and can have their own study pattern in virtual classroom mode (Ananga & Biney, 2017). Many students have welcomed this move as it provides more autonomy to their learning. Triyason et. al. (2020) reports that hybrid teaching is the way forward in the new normal. Student engagement differs in online mode of instruction and several factors affect it (Dwivedi et al., 2019). Thus, present study attempts to study correlates of student course engagement in covid-19 times.

2. Background of the study

Outbreak of pandemic has led schools and universities to teach online in a virtual classroom set up. Digital technology could set up virtual classroom with flexible and accessible medium for a majority of learners (Cain,

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2015). Platforms like WebEx, Google meet, Zoom, and Skype turned into an educational platform across the globe. Student engagement in an online platform is vital for learning and retention. In a face-to-face interaction, engaging student is possible in many ways like asking questions and holding discussions while in online mode achieving student engagement is difficult, as the instructor cannot understand the body language and mood of students easily. The relatedness to peers, course, teachers, learning-tasks, and motivation plays a major role in learning engagement of the students in virtual set up.

Motivation refers to the drive that a person has for completing any given work or task (Rybnicek et al., 2019). Intrinsic motivation refers to the engagement we have in any task that is because we personally like the task and feel rewarding and it fulfils our belief or expectations (Ryan & Deci, 2000). The way we do a task depends on intrinsic and extrinsic motivation. Eccles and Wang believed that, students who have high-value principles and those who spend more time and effort to learn would complete the task with more involvement (Eccles & Wang, 2012). Lawson (2017) proposed that behavioural engagement shows close relationship with internal motivational processes such as intrinsic motivation and self-efficacy.

Dixson (2010) revealed that, higher student engagement is possible through higher student-instructor interaction and student-student interaction. The classroom engagement inventory (CEI) measures engagement in three dimensions affective, behavioural, and cognitive (Wang et al., 2014). The study conducted by Azrin et. al. (2017) aimed at modifying the student-course engagement questionnaire (SCEQ) for use in various educational settings that include online courses. The modified questionnaire showed a high reliability. Intrinsic-motivation-inventory (IMI) originally developed by Ryan and Deci had multiple factors with specific items for each factor. Researcher considered those factors as a measure of intrinsic motivation as per the norms of the instrument (Ryan & Deci, 1985; 2000, Reynolds, 2006).

Qualitative case study by Saeed and Zyngier (2012) revealed that intrinsic motivation assisted authentic student engagement in learning. Students with intrinsic motivation engaged genuinely in their learning (Schlechty, 2002). Shroff and Vogel (2009) examined the impact of intrinsic motivation in technology-based-learning. Student's interest and perceived choice are the main factors in determining the intrinsic motivation. Raes et. al. (2020) found that, student engagement in an online virtual environment is highly related to the intrinsic motivation of the student and relatedness towards the course.

India being a developing country lacks digital infrastructure in their schools and colleges. Now with sudden shift from face-to-face teaching to online teaching would educational institutes engage online teaching meaningfully? Therefore, the present study

attempts to find out the relationship between intrinsic motivation and learning engagement of students in a virtual classroom. What factors affect student engagement in online learning especially in COVID-19 times?

2.1 Theoretical framework

The development of virtual classrooms over the years is tremendous and there are many theories that explain the online learning environment and student engagement. The most accepted and used theory is Moore's (1993) theory of transactional distance that provides a framework for the current research on student engagement in synchronous online learning (Moore, 2018). Moore's theory mainly focused on the distance education perspective and accordingly as teacher-student interaction decreases the student learning autonomy increases. Vygotsky's social constructivism theory advocates that, students learn when they interact with each other (Garas-York, 2005). The cognitive and social constructivism plays a major role in the students' engagement in an online setup. It is better to measure student engagement as a process construct than product (Azevedo, 2015).

2.2 Virtual classroom in Indian context amid COVID-19

In the context of Schools, the concept of virtual classroom is very new in India. The schools started to provide online education during COVID-19. However, lack of teacher motivation damper their engagement in online learning (Joshi et al., 2020). The collaborative work of teachers, school-management, parents and students have together made this online learning possible. During Covid, teachers underwent the process of technology adoption and integration and students were immersed in online learning (Shenoy, 2021). ICT enabled learning experiences enriches the student learning and knowledge (Sharma, 2020).

In the context of Higher Education, the online learning is gaining popularity amid COVID-19. The convenience of learning from home and equal opportunity in the virtual classroom has made it very popular among young adults (Rapanta et al., 2020). In the virtual environment, various tools and technologies have enabled students to choose their convenient mode to respond to the classroom teaching (McBrien et al., 2009). Online instructions works well with self-motivated and self-regulated learners than who are teacher dependent and lack intrinsic motivation (Sharma, 2020). The online learning in India currently follows two modes: Synchronous – In presence of the instructor. The classes will happen in any online platform like Google Meet, WebEx or zoom and it will be an interactive session. Asynchronous – without instructor, completing the assignments and self-learning (Butola, 2021).

In asynchronous mode students, have more freedom and autonomy to learn. This gives more flexibility and responsibility to the student. To engage successfully in

online class student must be intrinsically motivated and organized in their work and schedule. They should also have good time management skills in order to complete the class-tasks successfully. Asynchronous activities like discussion forums and maintaining a blog journal works well (Bates, 2015).

2.3 Pedagogical challenges in a virtual classroom

The learning environment in an online setting requires appropriate shifts in pedagogical methods used by the teacher that will go hand in hand with the new technology (Doffermyre, 2016). This requires different methods of teaching and different simulated learning activities (Bower et al., 2015). The teacher be flexible enough to adapt to their teaching approaches and sustain comparable learning standards (Lightner & Lightner-Laws, 2016). The teacher's competence in using the technology decides the quality and experience of the learning. Apart from competency the teacher's curiosity, creativity, and efforts to try new things and assess the learning outcomes based on the evidence is very crucial in determining the success of the pedagogy followed in online teaching.

2.4 Technological challenges in a virtual classroom

One of the main challenges is selecting the most effective technologies that can make best use of the social presence of remote students (Kilis & Yıldırım, 2019). The main disadvantage in a virtual learning environment is the absence of visual and audible cues observed in a regular classroom (Weitze & Ørngreen, 2013). Hence, in online classes teachers must ask questions frequently and engage the students through interaction either through chat feature or by answering in microphone for better student engagement (Noesgaard & Ørngreen, 2015). Poor internet connection, audio-video compatibility pose a big challenge to quality of learning (Rizvi & Nabi, 2021). Not all students can afford good bandwidth internet and computers. Weitze (2013) found that remote students had difficulty in answering the questions and could not inform to the teacher, which resulted in less motivation and involvement. Synchronous learning need more self-discipline to have good engagement in online class (Wiles & Ball, n.d.).

2.5 Research Questions

- What are the factors that affect online student engagement among school and college students?
- Is there a relationship between intrinsic motivation of students and student engagement in an online learning environment?
- Is student engagement predicted by their intrinsic motivation?
- Is there any difference in the measures of intrinsic motivation and student engagement in online learning environment across demographic variables gender, age, and education level?

3. Materials and methods

Education in India has seen an unprecedented change in the year 2020. Schools and colleges have moved their teaching and learning online. Even though it was a forced change, it is a much-needed change. Many platforms like Zoom, Google-meet, WebEx, and Microsoft teams have catered to the timely needs of educational management across the world (Lockee, 2021). These platforms made it easy to reach the students in an effective way yet many issues like availability of resources, affordability, and access are there among the student population that hinders them from learning online. Despite these difficulties and issues, many schools and universities are conducting online classes and students are having a chance to learn amidst this pandemic. As the virtual classroom lacks the physical presence, the role of instructor in synchronous learning becomes crucial. The student engagement in virtual classroom learning attributed to their intrinsic and extrinsic motivation. The instructor presence and peer discussions will improve the extrinsic motivation of the students. The intrinsic motivation may come from self. Self-determination theory advocates that the intrinsic motivation can be measured using different factors in online learning like Interest or enjoyment in the learning, Perceived choice, Perceived competence, and Pressure or Tension while doing the task. Intrinsic motivation is a powerful precursor of student behavioral engagement (Suárez et al., 2019). Therefore, the main concerns are in the area of intrinsic motivation of the students and the effect of intrinsic motivation in student's engagement in online virtual classrooms.

Existing earlier studies conducted in different parts of the world and the research gap identified in Indian context, the present study employed correlational design to investigate the relationship between student engagement and motivation. The current study is a cross sectional study that measures the online engagement of students across age, gender, and education level. The relationship between the variables intrinsic motivation and online student engagement cannot be a causal one as the two variables are the measure of different qualities in students. The relationship between the variables are measured only through statistical tests. Regression analysis explained the variance in student engagement in online learning environment by student motivation.

3.1 Population and Sample

The present study involved students studying in schools and colleges of Bangalore, India. Bangalore is one of the metropolitan cities of India and is the capital of Karnataka state. Population of Bangalore is very heterogeneous representing people from almost every state of India, who come here for employment and stable climatic conditions. Therefore, the sample selected for the study almost represent Indian population. The sample selected for this study included 600 students chosen from schools and colleges of Bangalore. Their

age ranged from 14 to 23 years as some of them are studying in schools and remaining in their under graduate (UG) and postgraduate (PG) programs. Convenient sampling technique adopted in selecting the schools and colleges who are conducting online classes and selected the participants randomly.

3.2 Limitations of the study

The study has measured only the relationship between intrinsic motivation and its sub-components against student engagement in online learning environment during COVID-19. The study did not analyse the dimensions of student engagement but considered the overall score for each participant. The study excluded the external factors responsible for student engagement.

3.3 Measuring Instruments

The present study adopted the two standardized instruments to the Indian context with a pilot study.

- Intrinsic-motivation-inventory
- Student-course-engagement-questionnaire

3.4 Reliability of the Instruments

Researchers conducted a pilot study on a sample of 100 students to establish the reliability of the instruments. Study found Intrinsic-motivation inventory reliable with a Cronbach alpha value of 0.887 and similarly the Student Course Engagement Questionnaire (SCEQ) had a Cronbach alpha value of 0.895 indicating high reliability (Nunnally, 1979).

3.5 Hypotheses

i. There is no significant relationship between intrinsic motivation scores of students and student engagement scores in an online learning environment.

ii. Intrinsic motivation of student is not the significant predictor of student engagement.

iii. There is no significant difference between intrinsic motivation scores of students across the demographic variables gender, age, and level of education in an online learning environment.

iv. There is no significant difference between student engagement scores of students across the demographic variables gender, age, and level of education in an online learning environment.

3.6 Statistical analysis

The present study adopted two instruments with a pilot study. Intrinsic-motivation-inventory (IMI) (Ryan & Deci, 1985, 2000; Reynolds, 2006) and Student-course-engagement-questionnaire (SCEQ) (Handelsman et al., 2005).The researchers fed the quantitative data collected by the administration of the instruments IMI and SCEQ into SPSS software version 24 to carry out the descriptive and inferential statistical analysis. Table 1 below presents the descriptive statistics of the intrinsic

motivation and student engagement scores. Figure 1 shows the box plot of variables intrinsic motivation and student engagement. Researchers assumes normality of the data from the visual inspection of box plot and because of large sample size.

| Descriptive statistics		Intrinsic Motivation Score	Student Engagement Score
N	Valid	600	600
	Missing	0	0
Mean		69.48	69.02
Median		71.00	68.00
Mode		72	66
Minimum		46	90
Maximum		46	90
Std. Deviation		10.662	11.207
Variance		113.676	125.597
Skewness		-.253	-.091
Std. Error of Skewness		.100	.100
Kurtosis		-.440	-.579
Std. Error of Kurtosis		.199	.199
Percentiles	25	64.00	62.00
	50	71.00	68.00
	75	80.00	77.00

Table 1 - Descriptive statistics.
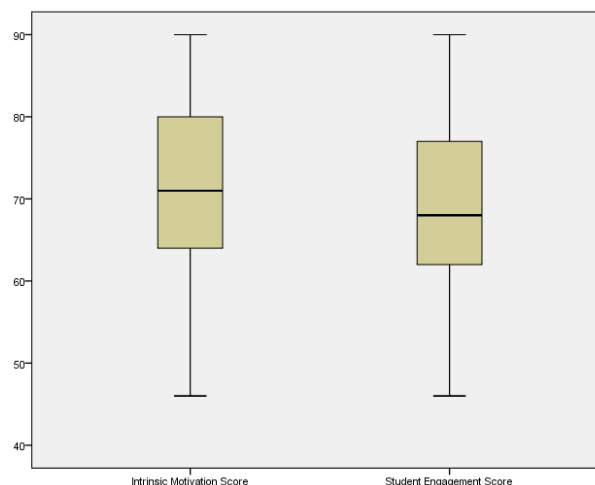
Figure 1 - Boxplots of intrinsic motivation and student engagement.

A Pearson correlation test conducted to find out the relationship between student engagement with intrinsic motivation and its components such as interest/enjoyment, perceived competence, perceived choice, and pressure/tension. Table 2 presents the results of correlation test conducted using SPSS version 22.

Variables	Intrinsic Motivation				
	Interest/enjoyment	Perceived competence	Perceived choice	Pressure/tension	Intrinsic motivation
Student engagement	0.522**	0.513**	0.503**	-0.364**	0.528**

**Correlation is significant at the 0.01 level (2-tailed).

Table 2 - Showing Pearson Correlation statistics.

Model Summary [a]						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	0.581[a]	0.337	0.333	9.153	0.337	75.773

a. Predictors: (Constant), Intrinsic Motivation, Pressure/Tension, Perceived competence, Perceived choice.
b. Dependent Variable: Student Engagement

Table 3 - Showing Model summary statistics of Regression.

From Table 2 it is clear that, there exist positive correlation between the variables student engagement and intrinsic motivation. That means for a rise in the measure of dimensions of intrinsic motivation such as interest, perceived competence, and perceived choice there is a corresponding rise in student engagement ($r = 0.528$). There is a moderate negative correlation between pressure/tension dimension of intrinsic motivation with student engagement ($r = -0.364$). There is a positive correlation between student interest/enjoyment and student engagement ($r = 0.522$). There is a positive correlation between students' perceived competence and student engagement ($r = 0.513$). There is a positive correlation between students' perceived choice and student engagement ($r = 0.503$).

A Regression statistical test conducted to understand the correlation between student engagement and their intrinsic motivation. Regression analysis explains the total variation in the student engagement (dependent variable) as explained by the intrinsic motivation (independent variable) and Table 3 presents the results of regression.

From Table 3 it is clear that the correlation between student engagement and intrinsic motivation is 0.581 indicating high degree of correlation. 33.7 % of the variation in student engagement is because of the intrinsic motivation (Pak & Oh, 2010).

Durbin-Watson statistical test conducted to find out the auto-correlation in the residuals from regression analysis. The result of the auto-correlation between student alienation and organizational culture presented in Table 4 below.

Model	Change Statistics			Durbin-Watson
	df1	df2	Sig. F Change	
1	4[b]	595	.000	2.285

b. Dependent Variable: Student engagement score

Table 4 - Showing Durbin-Watson statistics.

From the Table 4 it is clear that, there is a slight negative autocorrelation between the variables intrinsic motivation and student engagement as per Durbin-

Watson statistics 2.285. It indicates that the correlation established between the variables will remain true in the future and thereby it establishes the consistency of the research output in the present study.

ANOVA output of the regression analysis presented in Table 5 explains how well the regression equation fits the data that means how well the intrinsic motivation predicts student engagement.

From the Table 5 it is clear that, regression model significantly predicts the dependent variable ($p < 0.05$). That means intrinsic motivation predicts student engagement and it is a good fit for the data.

ANOVA [a]					
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25389.957	4	6347.489	75.773	.000
	Residual	49842.841	595	83.769		
	Total	75232.798	599			

a. Dependent Variable: Student engagement score
b. Predictors: (Constant), Intrinsic Motivation, Pressure, Perceived competence, Perceived choice

Table 5 - Showing ANOVA statistics.

Coefficients [a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	40.960	3.153		12.993	.000
	Perceived competence	.134	.173	.052	.773	.440
	Perceived choice	-.057	.198	-.021	-.290	.772
	Pressure/Tension	-.485	.111	-.232	-4.363	.000
	Intrinsic motivation score	.471	.089	.448	5.316	.000

a. Dependent Variable: Student engagement

Table 6 - Showing regression coefficients statistics.

The regression model coefficients presented in Table 6 determine whether intrinsic motivation statistically significantly contributes to the model.

From Table 6 it is clear that, intrinsic motivation contributes significantly to the model and be able to predict student engagement. Following four regression equations formed out of the unstandardized coefficients (B) values.

- Student engagement = 40.960 + (0.134) x (Perceived competence)

- Student engagement = 40.960 + (-0.057) x (Perceived choice)

- Student engagement = 40.960 + (-0.485) x (Pressure/Tension)

- Student engagement = 40.960 + (0.471) x (Intrinsic motivation)

The Regression analysis histogram presented in Figure 2 represents the distribution of standardized residuals data and explains whether the data skewed and are there any outliers. It explains whether the assumptions under lying regression analysis met.
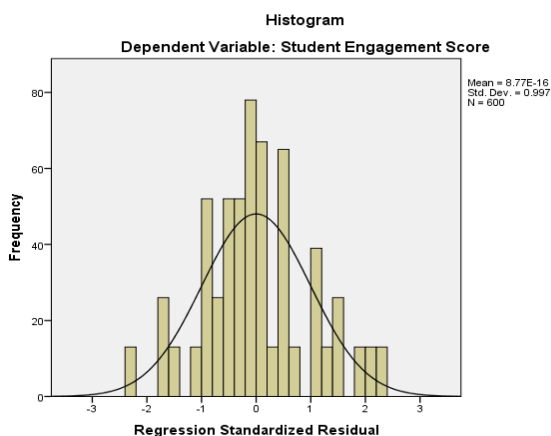

Figure 2 - Regression Histogram.

From the Figure 2, it is clear that the residuals of the regression line are approximately normally distributed. Therefore, the data is suitable for regression analysis and statistical assumptions met.

The Regression Analysis Normal probability plot presented in Figure 3 represents the residuals versus the expected values when the distribution is normal.

The Regression analysis Scatter plot presented in Figure 4 represents the relationship between student engagement and intrinsic motivation. It indicates whether the relationship is linear or non-linear. In other words, it indicates whether the variance of the residual in a regression model is constant.

To test the null hypothesis, there is no significant difference between intrinsic motivation scores of students across the demographic variables gender, age, and level of education in an online learning environment researcher conducted independent sample t-test and one way ANOVA. Table 5 and Table 6 below reports the results of independent sample t-test across gender and age respectively.
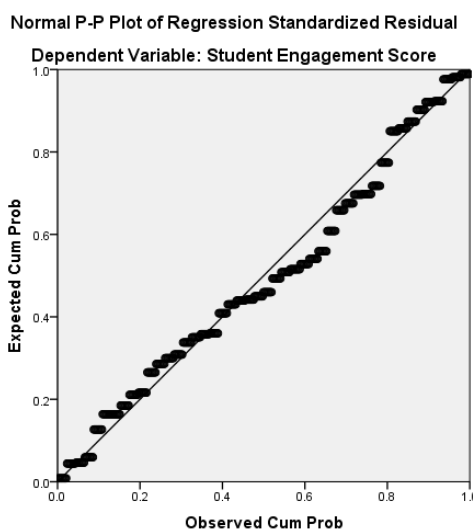

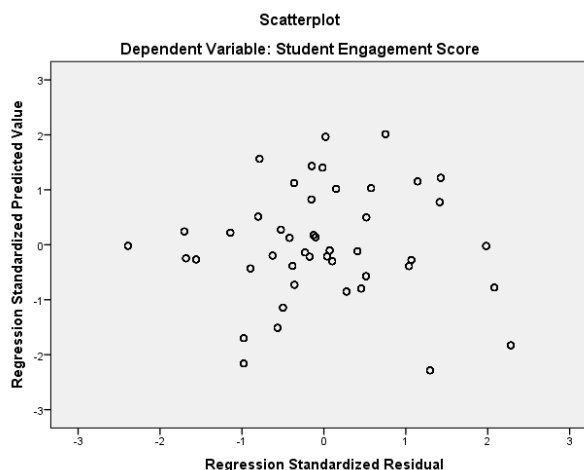**Figure 3** - Regression P-P Plot.

Figure 4 - Regression scatter plot.

From the results of Table 5 above (t = 2.550, p < 0.05) we reject the null hypothesis and accept alternative hypothesis. That is there is a significant difference in intrinsic motivation scores of students across gender. The intrinsic motivation mean value of boys (M = 71.13, SD = 11.499) found to be higher than the girls (M = 68.68, SD = 10.145).

From the results of Table 6 above (t = 2.081, p < 0.05) we reject the null hypothesis and accept alternative hypothesis. That is there is a significant difference in intrinsic motivation scores of students across their age group. The intrinsic motivation mean value of students less than 18 years old (M = 70.88, SD = 11.752) found to be higher than the students above 18 years old (M = 69.83, SD = 10.057).

To test the null hypothesis, there is no significant main and interaction effect between intrinsic motivation online learning environment researcher conducted one-way analysis of variance (ANOVA).

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Difference	
									Lower	Upper
Intrinsic Motivation Score	Equal variances assumed	6.333	.012	2.662	598	.008	2.455	.922	.643	4.266
	Equal variances not assumed			2.550	348.895	.011	2.455	.963	.561	4.348

Table 7 - Showing the results of Independent sample t-test across gender.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Difference	
									Lower	Upper
Intrinsic Motivation Score	Equal variances assumed	8.382	.004	2.200	598	.028	2.047	.930	.220	3.873
	Equal variances not assumed			2.081	327.121	.038	2.047	.983	.112	3.981

Table 8 - Showing the results of Independent sample t-test across age.

Intrinsic Motivation					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4677.557	2	2338.778	22.018	.000
Within Groups	63414.276	597	106.222		
Total	68091.833	599			

Table 9. - Showing ANOVA results for intrinsic motivation and education level.

Dependent Variable: Intrinsic Motivation						
Tukey HSD						
(I) Education level	(J) Education level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
School	UG	6.757*	1.068	.000	4.25	9.27
	PG	6.140*	1.130	.000	3.48	8.80
UG	School	-6.757*	1.068	.000	-9.27	-4.25
	PG	-.617	.976	.803	-2.91	1.68
PG	School	-6.140*	1.130	.000	-8.80	-3.48
	UG	.617	.976	.803	-1.68	2.91

*The mean difference is significant at the 0.05 level.
Table 10 - Showing the results of Tukey post-hoc test for intrinsic motivation and education level.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Difference	
									Lower	Upper
Student Engagement Score	Equal variances assumed	11.076	.001	3.415	598	.001	3.298	.966	1.401	5.195
	Equal variances not assumed			3.277	350.177	.001	3.298	1.007	1.318	5.278

Table 11 - Showing the results of Independent sample t-test across gender.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Difference	
									Lower	Upper
Student Engagement Score	Equal variances assumed	12.622	.000	2.919	598	.004	2.845	.975	.931	4.760
	Equal variances not assumed			2.779	332.136	.006	2.845	1.024	.831	4.859

Table 12 - Showing the results of Independent sample t-test across age.

Student Engagement Score					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9635.777	2	4817.889	43.848	.000
Within Groups	65597.021	597	109.878		
Total	75232.798	599			

Table 13 - Showing ANOVA results for student engagement and education level.

Dependent Variable: Student Engagement Score						
Tukey HSD						
(I) Education level	(J) Education level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
School	UG	10.171*	1.086	.000	7.62	12.72
	PG	6.754*	1.149	.000	4.05	9.45
UG	School	-10.171*	1.086	.000	-12.72	-7.62
	PG	-3.417*	.993	.002	-5.75	-1.08
PG	School	-6.754*	1.149	.000	-9.45	-4.05
	UG	3.417*	.993	.002	1.08	5.75

*. The mean difference is significant at the 0.05 level.

Table 14 - Showing the results of Tukey post-hoc test for student engagement and education level.

Tables 9 and 10 below shows the results of one-way analysis of variance and Tukey post-hoc tests respectively.

From the results of Table 9 above there is statistically significant difference between groups as determined by one-way ANOVA (F (2, 597) = 22.018, p = 0.000) we reject the null hypothesis and accept the alternative hypothesis. That is there is a significant main and interaction effect of student's intrinsic motivation based on their level of education. The independent variable level of education included three groups School (M = 74.41, SD = 8.885, N = 145), Undergraduate (M = 67.65, SD = 9.741, N = 260), Postgraduate (M = 68.27, SD = 11.899, N = 195).

From the results of Table 12, Tukey post hoc test revealed that the intrinsic motivation was statistically significantly lowest in students pursuing UG (67.65, p = 0.000) when compared with PG and School students. Intrinsic motivation of school students are statistically significantly higher (74.41, p = 0.000) when compared with both UG and PG students. The intrinsic motivation of PG students are statistically significantly higher than UG but less when compared with School students (68.27, p = 0.000). Figure 5 presents the means plots of the analysis of variance.

To test the null hypothesis, there is no significant difference between student engagement scores of students across the demographic variables gender, age, and level of education in an online learning environment researcher conducted independent sample t-test and one way ANOVA. Table 13 and Table 14 below reports the results of independent sample t-test across gender and age respectively.

From the results of Table 13 above (t = 3.277, p < 0.05) we reject the null hypothesis and accept alternative hypothesis. That is there is a significant difference in student engagement scores of students across gender. The student engagement scores mean value of boys (M = 71.23, SD = 12.010) found to be higher than the girls (M = 67.94, SD = 10.642).

From the results of Table 14 above (t = 2.779, p < 0.05) we reject the null hypothesis and accept alternative hypothesis. That is there is a significant difference in student engagement scores of students across their age group. The student engagement scores mean value of students less than 18 years old (M = 70.95, SD = 12.176) found to be higher than the students above 18 years old (M = 68.11, SD = 10.615).
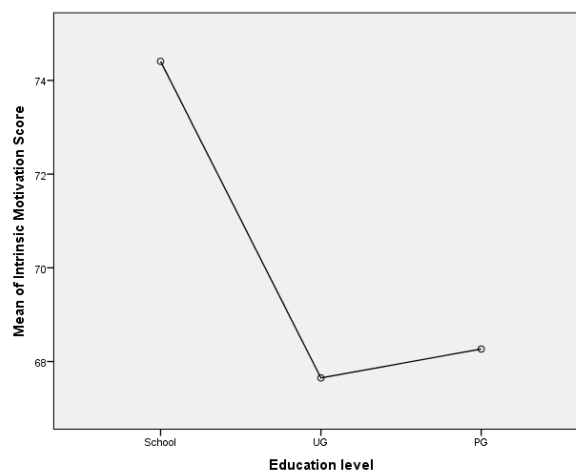

Figure 5 - Means plots for one-way ANOVA.

To test the null hypothesis, there is no significant main and interaction effect between student engagement scores of students across the level of education in an online learning environment researcher conducted one-way analysis of variance (ANOVA). Tables 15 and 16 below shows the results of one-way analysis of variance and Tukey post-hoc tests respectively.

From the results of Table 13 above there is statistically significant difference between groups as determined by one-way ANOVA (F (2, 597) = 43.848, p = 0.000) we reject the null hypothesis and accept the alternative hypothesis. That is there is a significant main and interaction effect of student engagement based on their

level of education. The independent variable level of education included three groups School (M = 75.62, SD = 8.990, N = 145), Undergraduate (M = 65.45, SD = 9.539, N = 260), Postgraduate (M = 68.87, SD = 12.516, N = 195).

From the results of Table 14 above, Tukey post hoc test revealed that the student engagement was statistically significantly lowest in students pursuing UG (65.45, p = 0.000) when compared with PG and School students. Student engagement of school students are statistically significantly higher (75.62, p = 0.000) when compared with both UG and PG students. The student engagement of PG students are statistically significantly higher than UG but less when compared with School students (68.87, p = 0.000). Figure 6 below presents the means plots of the analysis of variance.
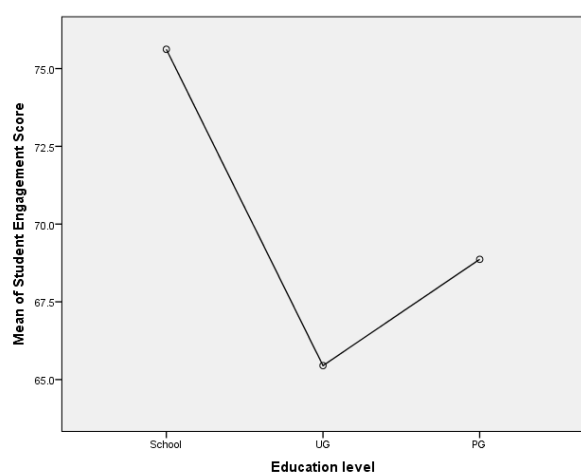

Figure 6 - Means plots for one-way ANOVA.

4. Results and Discussion

From the reviews of related literature, researcher finds the factors influencing online student engagement are intrinsic motivation and extrinsic motivation (Saeed & Zyngier, 2012). Factors determining intrinsic motivation are learners' interest/enjoyment, their perceived competence in learning, their perceived choice of learning mode, and the pressure/tension learner is going through (Ryan & Deci, 2000). Similarly, factors determining student engagement are applied engagement, goal-oriented engagement, self-disciplined Engagement, and interactive Engagement. Students who have self-discipline engage better in an online learning environment (Azrin et al., 2017). A study conducted by Lawson finds that intrinsic motivation and self-efficacy of students are the important aspects for student engagement in online leaning (Lawson, 2017). In a recent study conducted by (Raes et al., 2020) also confirms that intrinsic motivation and relatedness to course matters most for online student engagement.

From the data analysis, researchers found that there is a positive correlation between intrinsic motivation of learners and their engagement in online learning environment (r = 0.528). Three dimensions determining intrinsic motivation that is interest/enjoyment, perceived competence in, and perceived choice had positive correlation with student engagement (r > 0.5). Whereas the dimension pressure/tension negatively correlated with student engagement. Another earlier study also had negative correlation between student anxiety and knowledge attainment (Rapp-McCall & Anyikwa, 2016). That means, in virtual classroom student engage themselves in learning when there are varieties of choice in selecting the learning material such as power point presentations, videos, specific reference text, etc. They learn better, when there is enjoyment in learning and the learning activities are of their interest. They learn better when they feel they have competence to deal with the given learning activity or material. They do not like learning under pressure or tension. Therefore, online instructors must pay attention to the above factors while they deliver online teaching.

The present study finds that 34% (R^2, 33.7%) of the student engagement in online learning is due to the intrinsic motivation of the learner, remaining 70% are yet to explore by the future researchers. Therefore, it is the responsibility of all the stakeholders such as teachers, parents, and administrators to work on the strategies to improve intrinsic motivation of learners in spite of the fact that it is non instrumental (Legault, 2016). Regression equations found in the present study will help predicting the student engagement for unknown incremental values of the factors determining intrinsic motivation except for the factor interest/enjoyment. Therefore, present study support the learner engagement in online and hybrid mode of learning in the future similar crisis.

The present study finds that boys and girls differ in their intrinsic motivation and in their learning engagement. Boys are more intrinsically motivated than girls are (Intrinsic motivation mean value of Boys > Mean value of Girls) and boys learning engagement is better than girls are (Learning engagement Mean value of Boys > Mean value of Girls) in the online learning environment. There is a need for qualitative research to understand the reason for boys being more intrinsically motivated and engaged in online learning. Similarly, the present study also finds that students below 18 years of age and students above 18 years old differ in their intrinsic motivation and in their engagement to online classes. Students below 18 years are more intrinsically motivated than above 18 years old are (Intrinsic motivation Mean value of students less than 18 years is greater than the mean value of students greater than 18 years). Students below 18 years have better learning engagement than above 18 years old are in the online learning environment. There is a need for qualitative research to understand the reason for below 18 years old being more intrinsically motivated and engaged in online learning.

Analysis of variance reported that students studying in schools, undergraduate programs, and postgraduate

programs of university differed in their intrinsic motivation to learn online. They differed in their engagement to online learning based on the level of education pursued by them. As per the Tukey post-hoc analysis the intrinsic motivation and student-engagement of undergraduate (UG) students is lower when compared with PG and school students. School students showed the highest intrinsic motivation and student engagement in online learning than UG and PG students. PG students showed better intrinsic motivation and engagement towards online learning than UG students. There is a need for qualitative research to understand the reasons that UG students are less intrinsically motivated and showing less engagement to learning in online classes.

5. Conclusions

As intended, study found a positive correlation between intrinsic motivation and student engagement in online learning environment. Similar to the earlier research conducted by Chen and Jang (2010). The results revealed that students were happy to learn online and were having good engagement in the virtual classroom (Gupta & Pandey, 2018). Interesting and interactive online classes motivate students to engage in learning. The use of technology and its ease of use affect their intrinsic motivation. Perceived choice and pressure also play a main role in the student's motivation levels. Study found that, intrinsic motivation is one of the significant predictors of student engagement in online learning environment. Study further revealed that, boys had higher intrinsic motivation and increased engagement in learning than girls. Similarly, students less than 18 years had higher intrinsic motivation and learning engagement than the students who are above 18 years. In concurrent to this, school students and PGs had higher intrinsic motivation and learning engagement than the UG students.

The synchronous and asynchronous class should have good choices and ways to engage students actively in the classroom. The results of the study suggests that most of the students had a positive online experience in virtual classroom while using synchronous and asynchronous learning methods. Some of the concerns are; too many inputs, the desire for peer chatting during online session, and the technical glitches that arise during the sessions. There is a need for addressing these concerns and ways to overcome them so that every student can have a positive learning experience in online virtual classroom irrespective of the crisis times like COVID-19.

Suggestions for further research

The role of motivation in online class can be studied extensively and the ways to improve intrinsic motivation can be identified that will help the student as well as teachers. Further research in this field will be very much beneficial to the all the stakeholders as most of the studies until now have measured online engagement and intrinsic motivation separately and have arrived at different conclusions. This research study explained the correlational perspectives of student engagement and intrinsic motivation of students. As mentioned in the discussion there is a need for qualitative research to have in-depth understanding on why boys are more intrinsically motivated and engage better than girls are in online class. Why below 18 years old are more intrinsically motivated and engage better than above 18 years old are. What are the causes for UG students bring less intrinsically motivated and showing less engagement to learning in online classes?

Conflict of interest

The authors in the present study have no conflict of interest. All the authors have equally contributed. Our sincere thanks to all the participants of the study that is school and college students.

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