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REGULAR ISSUE

PEER REVIEWED
RESEARCH PAPERS

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BY THE ITALIAN E-LEARNING ASSOCIATION**

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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.

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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 & Yildirim, 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

- There is no significant relationship between intrinsic motivation scores of students and student engagement scores in an online learning environment.
- Intrinsic motivation of student is not the significant predictor of student engagement.
- 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.
- 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.

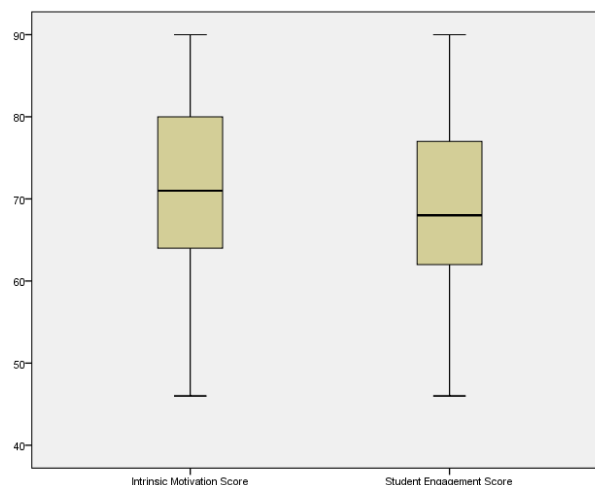


Figure 1 - Boxplots of intrinsic motivation and student engagement.

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				Intrinsic motivation
	Interest/enjoyment	Perceived competence	Perceived choice	Pressure/tension	
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.

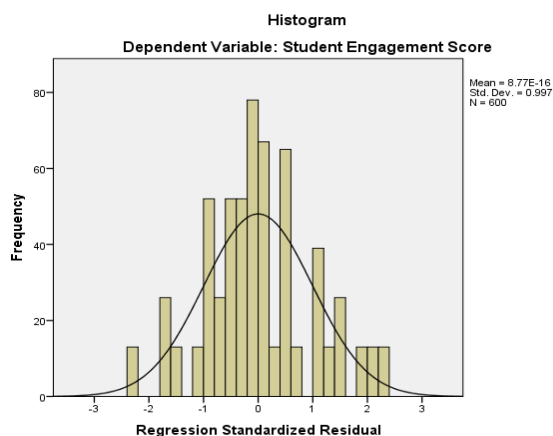


Figure 2 - Regression Histogram.

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.

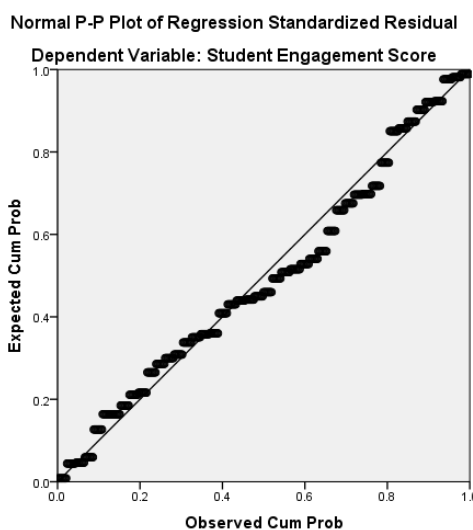


Figure 3 - Regression P-P Plot.

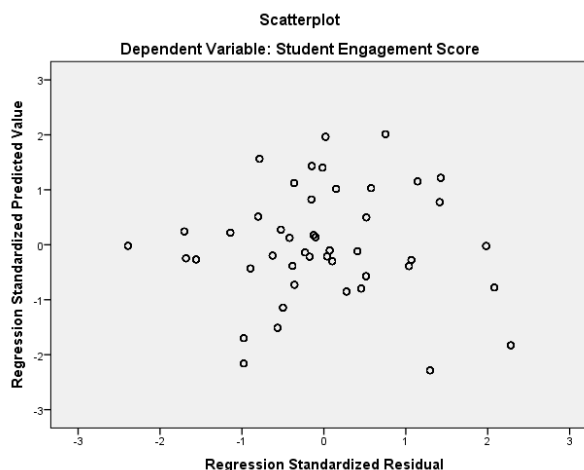


Figure 4 - Regression scatter plot.

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	
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	
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	
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	
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 ($M = 68.11, SD = 10.615$).

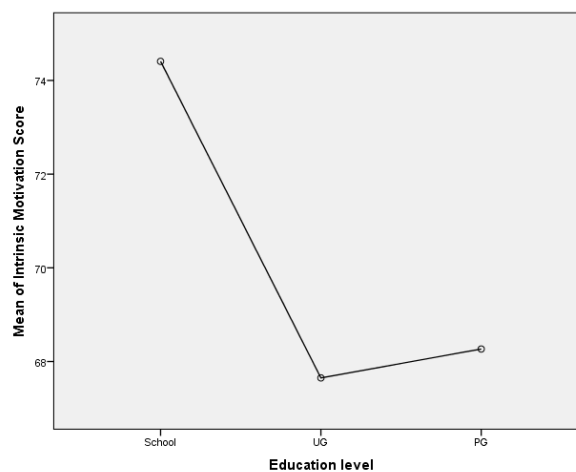


Figure 5 - Means plots for one-way ANOVA.

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.

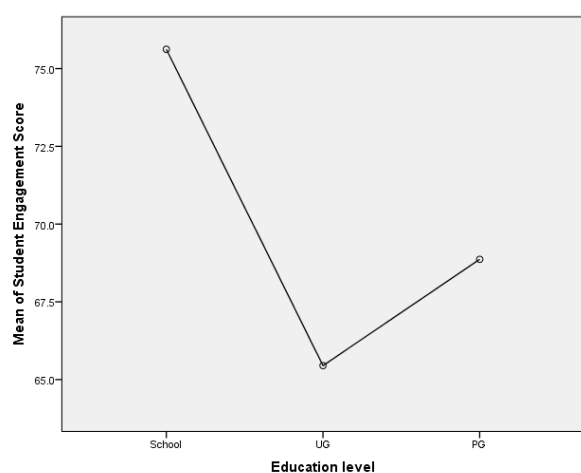


Figure 6 - Means plots for one-way ANOVA.

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 learning (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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References

- Ananga, P., & Biney, I. K. (2017). Comparing face-to-face and online teaching. *MIER Journal of Educational Studies, Trends & Practices*, 7, 165–179.
<https://www.researchgate.net/publication/322445537%0ACOMPARING>
- Azevedo, R. (2015). Defining and measuring engagement and learning in science: Conceptual, theoretical, methodological, and analytical issues. *Educational Psychologist*, 50(1), 84–94.
<https://doi.org/10.1080/00461520.2015.1004069>
- Azrin, M., Nasir, M., Janikowski, T., Guyker, W., & Wang, C. (2017). Modifying the Student Course Engagement.
- Bates, T. (2015). Teaching in the digital age. BC Open Textbooks. Retrieved from
<https://opentextbc.ca/teachinginadigitalage/>
- Bower, M., Dalgarno, B., Kennedy, G. E., Lee, M. J. W., & Kenney, J. (2015). Design and implementation factors in blended synchronous learning environments: Outcomes from a cross-case

- analysis. *Computers & Education*, 86, 1–17. <https://doi.org/10.1016/j.compedu.2015.03.006>
- Butola, L. K. (2021). E-learning-a new trend of learning in 21st century during COVID-19 pandemic. *Indian Journal of Forensic Medicine and Toxicology*. <https://doi.org/10.37506/ijfmt.v15i1.13443>
- Charlotte Lærke Weitze, Rikke Ørngreen, K. L. (2013). The Global Classroom Video Conferencing Model and First Evaluations. In M. A. Mélanie Ciussi (Ed.), *Proceedings of the 12th European Conference on E-Learning : SKEMA Business School, Sophia Antipolis France* (pp. 503–510). Academic Conferences and Publishing International.
- Chen, K.-C., & Jang, S.-J. (2010). Motivation in online learning: Testing a model of self-determination theory. *Computers in Human Behavior*, 26(4), 741–752. <https://doi.org/10.1016/j.chb.2010.01.011>
- Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging? *Journal of the Scholarship of Teaching & Learning*, 10(2), 1–13. <http://ezproxy.deakin.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=52225431&site=eds-live&scope=site>
- Doffermyre, J. J. (2016). Formative assessment in the classroom: Getting it right. ProQuest LLC, 78(8-A(E)). <https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=psyh&AN=2017-23160-226&site=ehost-live&scope=site&custid=gsul>
- Dwivedi, A., Dwivedi, P., Bobek, S., & Sternad Zabukovšek, S. (2019). Factors affecting students' engagement with online content in blended learning. *Kybernetes*. <https://doi.org/10.1108/K-10-2018-0559>
- Eccles, J., & Wang, M.-T. (2012). Part I Commentary: So What Is Student Engagement Anyway? In *Handbook of Research on Student Engagement* (pp. 133–145). Springer US. https://doi.org/10.1007/978-1-4614-2018-7_6
- Garas-York, K. (2005). Exploring Student engagement in an online course.
- Gupta, M., & Pandey, J. (2018). Impact of Student Engagement on Affective Learning: Evidence from a Large Indian University. *Current Psychology*, 37(1), 414–421. <https://doi.org/10.1007/s12144-016-9522-3>
- H. Shroff, R., & R. Vogel, D. (2009). Assessing the Factors Deemed to Support Individual Student Intrinsic Motivation in Technology Supported Online and Face-to-Face Discussions. *Journal of Information Technology Education: Research*, 8, 059–085. <https://doi.org/10.28945/160>
- Handelsman, M. M., Briggs, W. L., Sullivan, N., & Towler, A. (2005). A Measure of College Student Course Engagement. *The Journal of Educational Research*, 98(3), 184–192. <https://doi.org/10.3200/JOER.98.3.184-192>
- Joshi, A., Vinay, M., & Bhaskar, P. (2020). Impact of coronavirus pandemic on the Indian education sector: perspectives of teachers on online teaching and assessments. *Interactive Technology and Smart Education*, ahead-of-p(ahead-of-print). <https://doi.org/10.1108/ITSE-06-2020-0087>
- Kilis, S., & Yıldırım, Z. (2019). Posting patterns of students' social presence, cognitive presence, and teaching presence in online learning. *Online Learning*, 23(2). <https://doi.org/10.24059/olj.v23i2.1460>
- Lawson, M. A. (2017). Commentary: Bridging student engagement research and practice. *School Psychology International*, 38(3), 221–239. <https://doi.org/10.1177/0143034317708010>
- Legault, L. (2016). Intrinsic and Extrinsic Motivation. In *Encyclopedia of Personality and Individual Differences* (pp. 1–4). Springer International Publishing. https://doi.org/10.1007/978-3-319-28099-8_1139-1
- Lightner, C. A., & Lightner-Laws, C. A. (2016). A blended model: simultaneously teaching a quantitative course traditionally, online, and remotely. *Interactive Learning Environments*, 24(1), 224–238. <https://doi.org/10.1080/10494820.2013.841262>
- Lockee, B. B. (2021). Online education in the post-COVID era. *Nature Electronics*, 4(1), 5–6. <https://doi.org/10.1038/s41928-020-00534-0>
- McBrien, J. L., Cheng, R., & Jones, P. (2009). Virtual Spaces: Employing a Synchronous Online Classroom to Facilitate Student Engagement in Online Learning. *The International Review of Research in Open and Distributed Learning*, 10(3). <https://doi.org/10.19173/irrodl.v10i3.605>
- Moore, M. G. (2018). The Theory of Transactional Distance. In *Handbook of Distance Education* (pp. 32–46). Routledge. <https://doi.org/10.4324/9781315296135-4>
- Noesgaard, S. S., & Ørngreen, R. (2015). The effectiveness of e-learning: An explorative and integrative review of the definitions, methodologies and factors that promote e-Learning effectiveness. *Electronic Journal of E-Learning*, 13(4), 278–290.
- Nunnally, J. C. (1979). *Psychometric Theory: Second Edition*. Applied Psychological Measurement.
- Pak, S. II, & Oh, T. H. (2010). Correlation and simple linear regression. *Journal of Veterinary Clinics*. https://doi.org/10.1007/978-3-319-89993-0_6

- Raes, A., Vanneste, P., Pieters, M., Windey, I., Van Den Noortgate, W., & Depaepe, F. (2020). Learning and instruction in the hybrid virtual classroom: An investigation of students' engagement and the effect of quizzes. *Computers & Education*, 143, 103682. <https://doi.org/10.1016/j.compedu.2019.103682>
- Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L & Koole, M. (2020). Online University Teaching During and After the Covid-19 Crisis: Refocusing Teacher Presence and Learning Activity. *Postdigital Science and Education*, 2, 923–945. <https://doi.org/10.1007/s42438-020-00155-y>
- Rapp-McCall, L. A., & Anyikwa, V. (2016). Active Learning Strategies and Instructor Presence in An Online Research Methods Course: Can we Decrease Anxiety and Enhance Knowledge? *Advances in Social Work*, 17(1), 1–14. <https://doi.org/10.18060/20871>
- Reynolds, J. L. (2006). Measuring intrinsic motivations. *Handbook of Research on Electronic Surveys and Measurements*, Imi, 170–173. <https://doi.org/10.4018/978-1-59140-792-8.ch018>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78. <https://doi.org/10.1037/0003-066X.55.1.68>
- Rybnicek, R., Bergner, S., & Gutschelhofer, A. (2019). How individual needs influence motivation effects: a neuroscientific study on McClelland's need theory. *Review of Managerial Science*, 13(2), 443–482. <https://doi.org/10.1007/s11846-017-0252-1>
- Saeed, S., & Zyngier, D. (2012). How Motivation Influences Student Engagement: A Qualitative Case Study. *Journal of Education and Learning*, 1(2). <https://doi.org/10.5539/jel.v1n2p252>
- Schlechty, P. C. (2002). Working on the Work: An Action Plan for Teachers, Principals, and Superintendents. <https://eric.ed.gov/?id=ED465719>
- Rajalingam, S., Kanagamalliga, S., Karuppiah, N., & Caesar Puoza, J. (2021). Peer interaction teaching-learning approaches for effective engagement of students in virtual classroom. *Journal of Engineering Education Transformations*. <https://doi.org/10.16920/jeet/2021/v34i0/157191>
- Rizvi, Y. S., & Nabi, A. (2021). Transformation of learning from real to virtual: an exploratory-descriptive analysis of issues and challenges. *Journal of Research in Innovative Teaching & Learning*, 14(1), 5–17. <https://doi.org/10.1108/JRIT-10-2020-0052>
- Sharma, R. (2020). Online learning and its positive and negative impact in Higher education during COVID-19. *International Journal of Multidisciplinary Research*, 6(9), 177–181. <https://doi.org/10.36713/epra2013>
- Suárez, N., Regueiro, B., Estévez, I., del Mar Ferradás, M., Guisande, M. A., & Rodríguez, S. (2019). Individual Precursors of Student Homework Behavioral Engagement: The Role of Intrinsic Motivation, Perceived Homework Utility and Homework Attitude. *Frontiers in Psychology*, 10. <https://doi.org/10.3389/fpsyg.2019.00941>
- Triyason, T., Tassanaviboon, A., & Kanthamanon, P. (2020, July). Hybrid classroom: Designing for the new normal after COVID-19 pandemic. In *Proceedings of the 11th International Conference on Advances in Information Technology* (pp. 1-8).
- Wang, Z., Bergin, C., & Bergin, D. A. (2014). Measuring engagement in fourth to twelfth grade classrooms: The Classroom Engagement Inventory. *School Psychology Quarterly*, 29(4), 517–535. <https://doi.org/10.1037/spq0000050>
- West, E., & Jones, P. (2007). A Framework for Planning Technology Use in Teacher Education Programs that Serve Rural Communities. *Rural Special Education Quarterly*, 26(4), 3–15. <https://doi.org/10.1177/875687050702600402>
- Wiles, G., & Ball, T. (n.d.). The Converged Classroom. 2013 ASEE Annual Conference & Exposition Proceedings, 23.1176.1-23.1176.10. <https://doi.org/10.18260/1-2--22561>

Development of online system checkable for Japanese writing tasks

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Abstract

Online learning environments have attracted attention of many educators especially in recent years since COVID-19 is still ongoing situation. Meanwhile, the various resources are becoming more and more available in online. In this study, some available online resources were used to create the system checkable for some writing abilities and the depth of understanding for Japanese writing tasks. The system was also made to provide some evaluation scores without depending the number of characters. The demonstration of system were given after the integration and implementation of some modules customized using online resources. The data sheet in the system finally saved the written content for 67 students. The writing task was given as the writing of summarization for what a student understand in a class. The following features were demonstrated from the analytical findings of online system developed in this study. The effectiveness of some available online resources was indicated through the demonstration of system checkable for some writing abilities and the depth of understanding for Japanese writing tasks. It was definite that the system was also made to provide some evaluation scores without depending the number of characters.

KEYWORDS: Online Evaluation System, Writing Task, Key Word, Key Sentence, Latent Semantic Analysis.

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1. Introduction

Education environment with information and communication technology (ICT) becomes more and more important than ever in the ongoing COVID-19 situation. The systems related to online learning environment such as e-learning have attracted attention of many educators especially in recent years. Moreover, the systems have been developed with the derived variation of educational terms such as distance learning, online training, distance education and so on (Ouaoud et al., 2021). To enhance students' learning effectiveness and experience, multimedia technologies are implemented to the systems in some learning objectives (Lau et al., 2014). The systems are generally created by

integrating various modules. Slavuj et al. (2016) described several modules to create the system for language learning. With technological advances of ICT, the various resources have been gradually available in online. Even if a focus is given to the one module in the system research and development, it is possible to lead to the development of an advanced system.

The evaluation module of writing tasks is one of the modules in the online learning system. The module has been studied so far for the automation of evaluation. Descriptive type questions currently appear on the written assignment or examination. These questions are typically classified into two types. The one is commonly referred to essay question, and the other is known as short answer question (Ishioka, 2016). In essay question, the scoring process takes a lot of time if a teacher or human grader has to check all the answers written by test-takers. Automated essay scoring has been studied to enhance the scoring efficiency and to overcome the coupled difficulties since the 1960s (Ramesh & Sanampudi, 2022).

The various related methods have been proposed as some automated essay scoring systems. The work by Ajay et al. (1973) is known as Project Essay Grader

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(PEG) in which an essay is graded based on the writing characteristics such as grammar, diction, construction, and so on. The PEG was modified by Shermis et al. (2001), and a high correlation was obtained between human graders and the system. Intelligent Essay Assessor (IEA) using latent semantic analysis was developed to estimate a holistic score (Foltz et al., 1999). E-rater was introduced to evaluate the analytical writing assessment in Graduate Management Admission Test (GMAT) (Powers et al., 2002). Since then, the other systems were also created using natural language processing techniques (Rudner et al., 2006). Recently, the systems with deep learning techniques were proposed for essay scoring (Dong et al., 2017).

Some essay scoring systems have been also developed so far to deal with Japanese language. One of the systems was Japanese essay scoring system (Jess) (Ishioka & Kameda, 2006). Jess is similar to E-rater, and the system focuses especially on evaluating rhetoric, organization, and content. Mainichi Daily News data was used in the system development to collect linguistic features such as sentence length and “kanji”/“kana” ratio. JWriter (Lee & Hasebe, 2017) is also one of the Japanese essay scoring systems. The readability score was proposed based on a regression analysis of data collected from 100 language textbooks and the balanced corpus of contemporary written Japanese (Hasebe & Lee, 2015). There also exist several studies to develop Japanese essay scoring systems with machine learning techniques (Tanaka & Tsubone, 2011; Hirao et al., 2020). However, few application cases have been reported on these Japanese essay scoring systems, and the available Japanese language data is not necessarily sufficient to make these systems more sophisticated.

The related technologies of automated essay scoring have matured gradually with the times. Especially, natural language processing and its related technologies are developing rapidly with the advancement of information and communication technologies. In recent years, the various resources are available online. The background conditions would enable us to create an automated essay scoring system more easily through organizing some resources.

The objective of this study is to assess one of the possibilities in developing an online learning system. Some available online resources are used to create the system checkable for some writing abilities and the depth of understanding for Japanese writing tasks. The system is also made to provide some evaluation scores without depending the number of characters. The demonstration of system will be given after the integration and implementation of some modules customized using online resources.

2. Online system checkable for writing tasks

Important criteria were considered before the creation of an online system. This study focuses on writing tasks in

a lecture for undergraduate students in our university. The lecture is related to production engineering and managed by one of the authors. The writing task in each class was set to be essay-style content in Japanese language. It is well known that an evaluation of writing quality and dexterity contain many complex factors. The cause of complexity results from the existence of various criteria to evaluate writing elements (Steendam et al., 2012). It means that the criteria depend on the subject of writing task, and the common, uniform ones are indeterminate in practice. In this study, some criteria were thus arranged to check the writing quality and dexterity in written content submitted by a student taking the lecture. These were vocabulary, Chinese characters, formality, sentence length, and descriptive validity.

The four criteria except for descriptive validity were evaluated through “Yasashii Nihongo Checker” which was an online support system of Japanese official document (Iori, 2016). The system has been developed with incorporating various tools in Japanese natural language processing such as Japanese dictionary and dependency parser. An entered text can be analyzed with the system. The evaluation of four criteria are obtained on a 5-point scale. The 3rd grade vocabulary of Japanese-Language Proficiency Test was a measure of scoring the vocabulary in a target sentence. Chinese characters was graded using the content rate of Chinese characters in a target sentence. Formality was determined based on the density of nouns in a target sentence. The average sentence length was used to evaluate sentence length in a target sentence.

Descriptive validity expresses the essential conformity of writing contents and the depth of understanding for a writing task. This study employed latent semantic analysis (LSA) to reveal the criterion based on the linguistic features of a target sentence. The analyzing algorithm includes singular value decomposition and can statistically compute the amount of words’ or sentences’ information. It is known that the scoring results of humans and LSA are in agreement to some extent (Landauer et al., 1998). In addition, the other related study reported the results with extracting keywords and key sentences from Japanese sentences (Tsubakimoto et al., 2007). The results indicated that the key sentences were well accorded with the sentences on which human graders focused during the scoring. On the basis of these results, this study applied LSA to the estimation of descriptive validity. A proofreading tool was also used to check grammatical correctness and typographical errors.

An online system was created in this study. Figure 1 shows the architecture of online system checkable for the above-mentioned criteria of writing tasks. The system was organized with some sub-functions implemented using Google Apps Script. The criteria can be checked using the sub-functions after an essay-style content is submitted by a student taking a lecture. The online form for submission was developed with Google

forms. Student's identification numbers were also collected through the form. Then, the collected information was individually accumulated to a data sheet created using Google spreadsheet. The results of Yasashii Nihongo Checker were extracted to the data sheet after some analyses in the system. Application programming interface (API) of external tools was also used to obtain the data related to morphological analysis and proofreading. We took advantage of Japanese morphological analysis API and proofreading API provided by Yahoo! Japan, respectively.

Two kinds of text analysis results were prepared to compare them in the developed system. The one was a result of select sentences whose selection was implemented after closing students' submissions, and the other was a result of target sentences written by each student. Here, what should be careful is that model, thoughtful sentences are determined by a lecturer as the select sentences. Figure 2 illustrates the brief flowchart of computational processes. These processes are as follows. Firstly, extraction of writing contents is executed after each student's submission. Then, the processing results in vocabulary, Chinese characters, formality, and sentence length can be acquired through the sub-function designed specially to communicate data with Yasashii Nihongo Checker. After that, Japanese morphological analysis is performed before LSA. Information contents of keywords and key sentences are obtained as a result of LSA. Key sentences are selected with reference to the result, and resultant keywords are extracted from the selected key sentences. The above-mentioned processes are accomplished in almost the same manner.

The conformity of two results can be checked through the comparison of select and target sentences. The following formula was used in the comparison:

$$CF = \frac{10 \cdot KW_{match}^2 \cdot rnc}{KW_{target} \cdot KW_{select}} \quad (1)$$

where CF is the conformity of two results; KW_{match} is the number of matches for resultant keywords; rnc is Ratio of the number of characters in each sentence to be compared; KW_{target} is the number of keywords in a target sentence; KW_{select} is the number of keywords in a select sentence. In the calculation of a certain target sentence, the above formula is used in combination of all select sentences. Then, a certain target sentence is graded using the total score of calculated results. In addition, Japanese proofreading can be performed through proofreading API provided by Yahoo! Japan. In the proofreading, deduction points are calculated based on the number of errors.

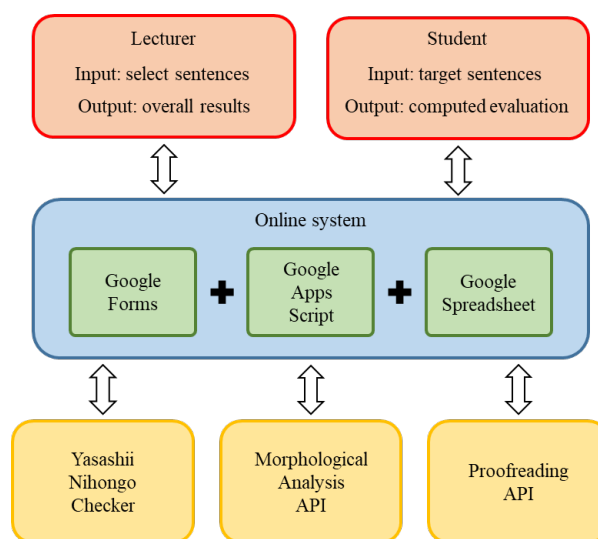


Figure 1 - The architecture of online system.

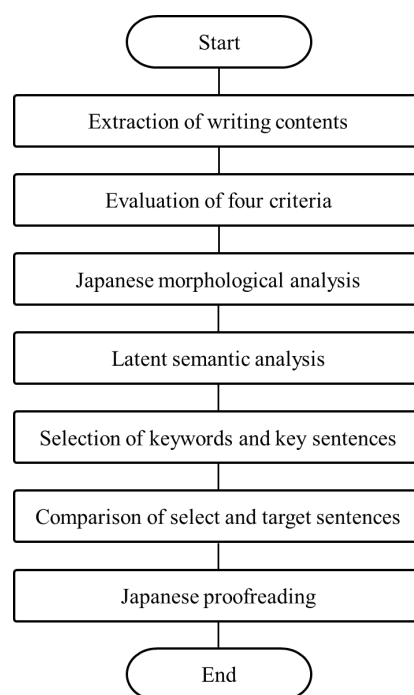


Figure 2 - The flowchart of computational processes.

3. Results and discussion

The writing task was given as the writing of summarization for what a student understand in a class. The all writing tasks were collected through the online system. The series of processes mentioned in section 2 were executed through a customized algorithm operable on Google Apps Script. The data sheet in the system finally saved the written content for 67 students.

Figure 3 shows the relationship between the number of morphemes and the number of characters. From the figure, it was found that two data had a proportional relationship. The correlation coefficient was 0.92, and the result represented a strong correlation between the two data. The fact demonstrated that morphological analyses were properly implemented through Japanese morphological analysis API provided by Yahoo! Japan. Moreover, we confirmed that there was no undoubted problem in some analysis results.

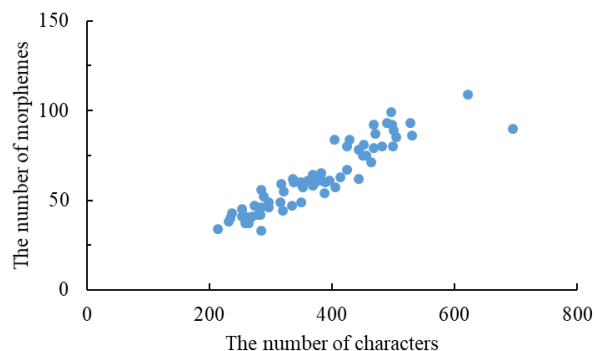


Figure 3 - Relationship between the number of characters and morphemes.

Figure 4 displays the details of scores in each criterion. In the figure, legends express each evaluation score, respectively. Figures 5 to 8 also express the relationships between the number of characters and evaluation score in each criterion. The plotted data on the figures were obtained as the results of Yasashii Nihongo Checker, and the external tool returned integer values only.

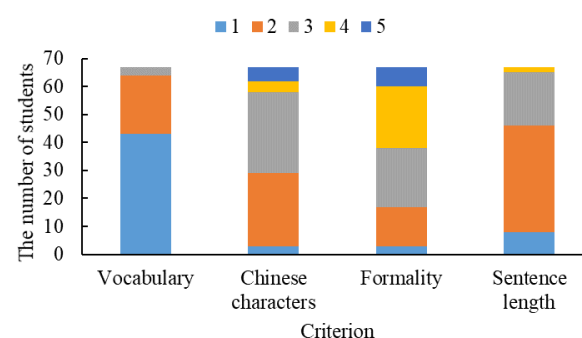


Figure 4 - Details of scores in four criteria obtained from an external tool used in the developed system.

In vocabulary, Figures 4 and 5 illustrated that about 95% of the students acquired the score of 1 and 2. Two causes were considered to have an effect on the result. The one was that this class dealt with some specialized content for third-year university students, and the other was that Yasashii Nihongo Checker was an online support system of Japanese official document. It was also clear from the two figures that there was scarcely correlation between the number of characters and evaluation score, and the correlation coefficient was -0.36.

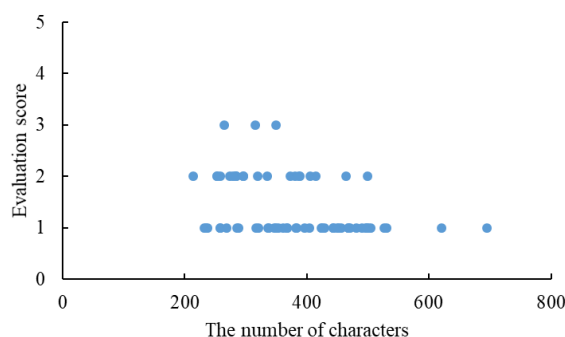


Figure 5 - Relationship between the number of characters and evaluation score in vocabulary.

In Chinese characters, Figures 4 and 6 denoted that more than 80% of the students obtained the score of 2 and 3. From the result, it was revealed that a lot of the students used Chinese characters found commonly in Japanese official documents. In addition, the two figures clarified that there was no correlation between the number of characters and evaluation score, and the correlation coefficient was calculated as -0.14.

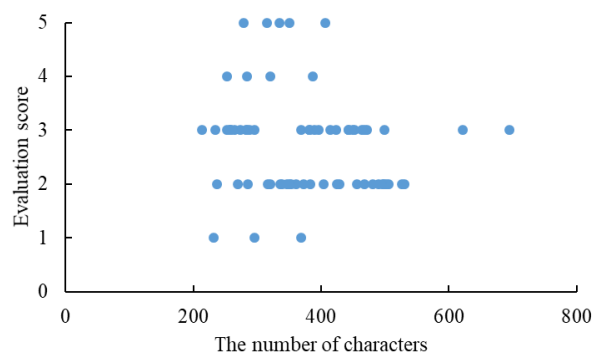


Figure 6 - Relationship between the number of characters and evaluation score in Chinese characters.

In formality, Figures 4 and 7 displayed that there dispersedly existed the students with the score from 2 to 5. This result was considered to imply an improvement in the writing task of this class. In fact, there was a wide range of formality in sentences written by the students. It was also definite from the two figures that there was no correlation between the number of characters and evaluation score, and the correlation coefficient was computed as -0.19.

In sentence length, Figures 4 and 8 represented that about 85% of the students achieved the score of 2 and 3. The result indicated that most of the students provided the length of a sentence found commonly in Japanese official documents. Moreover, the two figures demonstrated that there was no correlation between the number of characters and evaluation score. The correlation coefficient was 0.015, and it was confirmed to be extremely small.

In the results explained above, we could not detect any relationship between the number of characters and evaluation score in each criterion. From this fact, the scores were almost unaffected from the number of characters.

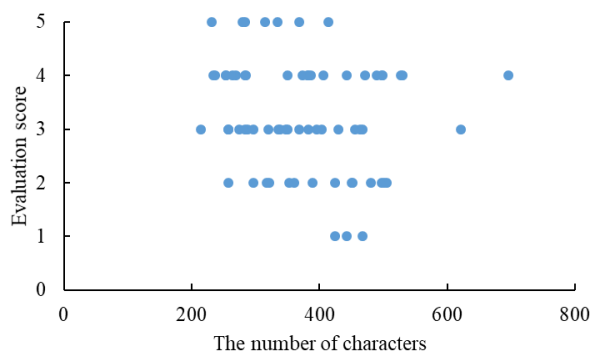


Figure 7 - Relationship between the number of characters and evaluation score in formality.

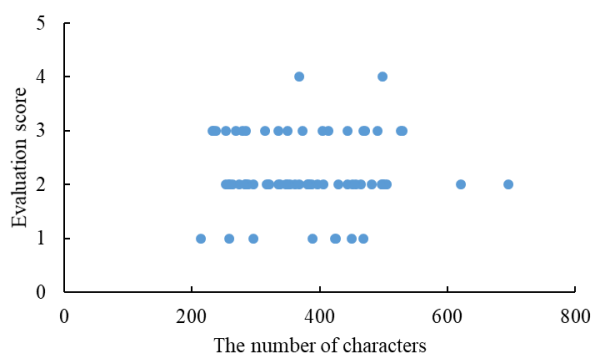


Figure 8 - Relationship between the number of characters and evaluation score in sentence length.

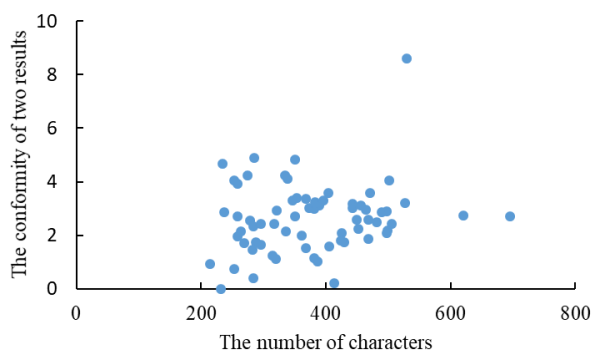


Figure 9 - Relationship between the number of characters and the conformity of two results.

Figure 9 shows the conformity of two results after the comparison of select and target sentences. The scores plotted on the figure were evaluated on a scale of 10 points, and double-precision real number was used in the calculation. The evaluation approach for this criterion was rather strict seemingly since almost all of the students acquired the score lower than 5. The figure also indicated that there was no correlation between the number of characters and evaluation score; furthermore, the correlation coefficient was 0.19.

What should be emphasized was that there was no evidence indicating a relationship between the number of characters and evaluation score in each criterion even if the last result was added to the other results. According to these results, the developed system would enable us to check an evaluation score based on each evaluation approach. In this writing task, we had students check whether unconscious errors are in the written content before submitting. The several cautionary instructions were displayed on Google forms, so that the proofreading only pointed out a few mistakes such as typographical error and so on.

4. Conclusion

An online system checkable for a writing task was developed in this study. The system had the functionalities of external tools such as Google forms, Yasashii Nihongo Checker, Japanese morphological analysis API, and so on. Five criteria were managed to check the writing quality and dexterity in written content submitted by a student taking the lecture. These were vocabulary, Chinese characters, formality, sentence length, and descriptive validity. The all writing tasks were collected through the online system. The series of processes mentioned in section 2 were executed through a customized algorithm operable on Google Apps Script. The data sheet in the system finally saved the written content for 67 students. The following features were demonstrated from the analytical findings of online system developed in this study. The number of morphemes had a proportional relationship between the number of characters. Evaluation scores using the results of Yasashii Nihongo Checker had little relations between the number of characters. There was no correlation between the number of characters and evaluation score obtained as the conformity of two results after the comparison of select and target sentences. From these results, the developed system could provide the reasonable criterion without depending the number of characters. The effectiveness of some available online resources was indicated through the demonstration of system checkable for some writing abilities and the depth of understanding for Japanese writing tasks. It was definite that the system was also made to provide some evaluation scores without depending the number of characters. In the future work, the further sophistication would be required in scoring approach and algorithm for the detailed evaluation of Japanese writing tasks.

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References

- Ajay HB, Tillett PI, Page EB. (1973). Analysis of essays by computer (AEC-II) (No. 8-0102). Washington, DC: U.S. Department of Health, Education, and Welfare, Office of Education, National Center for Educational Research and Development.
- Dong F, Zhang Y, Yang J. (2017). Attention-based recurrent convolutional neural network for automatic essay scoring. In: Proceedings of the 21st Conference on Computational Natural Language Learning (CoNLL 2017), pp. 153–162.
- Foltz PW, Laham D, Landauer TK. (1999). The Intelligent Essay Assessor: Applications to Educational Technology. *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning*, 1, 2, <http://imej.wfu.edu/articles/1999/2/04/index.asp>
- Hasebe, Y., Lee, J. (2015). Introducing a Readability Evaluation System for Japanese Language Education. The 6th International Conference on Computer Assisted Systems For Teaching & Learning Japanese (CASTEL/J).
- Hirao, R., Arai, M., Shimanaka, H., Katsumata, S., Komachi, M. (2020). Automated Essay Scoring System for Nonnative Japanese Learners, the 12th Language Resources and Evaluation Conference, pp. 1250–1257.
- Iori, I. (2016). The Enterprise of Yasashii Nihongo : For a Sustainable Multicultural Society in Japan, *Hitotsubashi review of arts and sciences*, 10, pp. 4-19.
- Ishioka, T., Kameda, M. (2006). Automated Japanese Essay Scoring System based on Articles Written by Experts, the 21st International Conference on Computational Linguistics and 44th Annual Meeting of the Association for Computational Linguistics, pp. 233–240.
- Ishioka, T., (2016). Computer-based Writing Tests, *The journal of the Institute of Electronics, Information and Communication Engineers*, 99(10), pp. 1005-1011. (in Japanese)
- Landauer, T.K., Foltz, P.W., Laham, D. (1998) An introduction to latent semantic analysis, *Discourse Processes*, 25, pp. 259-284.
- Lau, R.W.H., Yen, N.Y., Li, F., Wah, B. (2014). Recent development in multimedia e-learning technologies, *World Wide Web*, 17, pp. 189–198.
- Lee, J., Hasebe, Y. (2017). jWriter Learner Text Evaluator, URL: <https://jreadability.net/jwriter/>.
- Ouadoud, M., Rida, N., Chafiq, T. (2021). Overview of E-learning Platforms for Teaching and Learning, *International Journal of Recent Contributions from Engineering, Science & IT*, 9(1), pp. 50–70.
- Powers, D. E., Burstein, J. C., Chodorow, M., Fowles, M. E., & Kukich, K. (2002). Stumping e-rater: challenging the validity of automated essay scoring. *Computers in Human Behavior*, 18(2), pp. 103–134.
- Ramesh, D., Sanampudi, S.K. (2022). An automated essay scoring systems: a systematic literature review. *Artificial Intelligence Review*, 55, pp. 2495–2527.
- Shermis MD, Mzumara HR, Olson J, Harrington S. (2001). On-line grading of student essays: PEG goes on the World Wide Web. *Assess Eval High Educ* 26(3), pp. 247–259.
- Slavuj, V., Kovačić, B., Jugo, I. (2016). Adaptive E-learning system for language learning: Architecture overview, 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), pp. 951-955.
- Tanaka, M., Tsubone, Y., (2019). New Writing Feedback: A Collaborative Approach Utilizing Human and Machine Evaluation, *CAJLE 2019 Proceedings*, pp. 315-324. (in Japanese)
- Tsubakimoto, M., Nakamura, M., Kishi, M. (2007). A Fundamental Examination of the Report Assessment Method Focusing on Key sentences and Key words, *Journal of Science Education in Japan*, 31, pp. 210-219.
- Van Steendam, E., Tillema, M., Rijlaarsdam, G., Van den Bergh, H. (Eds.) (2012). *Measuring Writing: Recent Insights into Theory, Methodology and Practices*.

A Framework for Empowering Women of Terengganu via Hybrid English Language Community Based Learning

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Abstract

The Malays are Terengganu's largest ethnic group, accounting for over 95% of the population. English language is treated as a foreign language and rural cultural settings affect English language proficiency. This project offers a successful ongoing community-based model of partnership between university and several women local authority units addressing the issue of anxiety to speak in English. Five women leaders and twenty members of the community, together with three experts were included to develop the model via face-to-face and online teaching and learning sessions. Soft systems methodology (SSM) was applied to tackle the issue of empowering women in Terengganu by improving their English language communication skills. At the end of the SSM process, the Empowering Women of Terengganu via English Language Learning Framework was introduced as a clear guide for the application and implementation of English communication modules. It is believed that SSM can help instructors and policy makers of Malaysian organisations in making a sound judgement in cultivating English Language in hybrid method, and help to develop Terengganu women's potential to be more confident in using English.

KEYWORDS: Community-Based Partnership, Hybrid Learning, L2 Learning, Soft Systems Methodology.

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1. Introduction

Speak English for Women's Empowerment in Terengganu (SEWEiT) is a 12-week project designed to cater the needs of a group of professional women staff of Terengganu State Legislative Assembly in improving their communication skill in English language. This project was conducted every week for 2 hours from October to December 2020 and joined by a small group of 25 active participants. This project involved three facilitators from the English Language Learning Centre (ELC) of the Centre of Foundation and Continuing Education, Universiti Malaysia Terengganu.

The participants have expressed their feedback that this intensive communicative English project has helped them to improve in areas such as; confidence in speaking English, ability to make an English presentation, increased vocabulary, improved pronunciation and improved English communication skills. During the final session, they have stated the good points including such comments as: they were able to communicate confidently now with fellow colleagues; they were able to use English on a daily basis; and most importantly they did not feel pressured or nervous due to the relaxed and easy-going atmosphere. They stressed that they also have tremendously executed tasks given successfully and expressed their hope and intention to join another intensive English speaking program.

Three prominent objectives of this program are:

- 1) to develop self-confidence among the participants to use English language for the purposes of workplace vocation, leadership, politics and professionalism;

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- 2) to provide stress-free platform for participants to communicate in English guided by experienced facilitators;
- 3) to guide facilitators in showing the professional ways of presenting paper works and reports in English at international and press conferences.

2. Literature review

Bringle and Clayton (2012) defined community-based learning (CBL) as a pedagogical approach in professional programs at higher education institutions around the globe. In CBL, students can learn more about themselves and develop a greater knowledge of their personal strengths and weaknesses in their learning. Students can relate and give critical reflection on their learning which can impact their community based on their learning experiences (Wiersma-Mosley & Garrison, 2022).

In this study, researchers infused CBL with a group of professionals to develop their communication skills by providing opportunities for them to speak in the target language. Participants in this study also need to do several projects which involve active participation and the use of social media. Project based learning (PBL) can improve L2 learners' speaking skills from different aspects such as fluency, pronunciation, and vocabulary (Maulany, 2013; Astawa et al. 2017; Nani & Kusumah, 2015). As suggested by Boardman, Garcia, Dalton & Polman (2021), the integration of PBL in L2 study mainly to elevate student's willingness in learning and to make sure they are fully motivated to involve and engage in all classroom activities. Ruslan, Fatimah & Marlina (2021) found that PBL also can increase students' enthusiasm towards learning because when the students are excited and enthusiastic about what they are learning, they often get more involved thus the level of their anxiety is reduced. Therefore, they can expand their interest in that subject and they tend to retain what they have learned, not only for examination purposes. Also, since some of the projects in this study requires the participants to work in groups, the participants also can improve their self-confidence, learn to organize work as a team and work with commitment and responsibility (Jaelani & Afyattena, 2021).

Currently, due to the Internet revolution, many studies have shown the potential of using social media in teaching and learning. One of the most prominently used social media among Malaysians is Facebook. This study used Facebook as a tool as it has an ability to serve a pedagogical purpose in the field of education and ESL instruction. According to Zarzycka, Krasodomska, MazurczakMąka, and Turek-Radwan (2021), and Wongsa and Son (2022), Facebook improves learners' confidence, promotes collaborative efforts and stimulates active participation among students. Also, it allows users to conduct private and open group

discussions online, which are the best platforms for the sharing sessions or formal presentations which can help them to communicate with each other in the target language. The peers also can give comments and feedback to their friends' presentations via Facebook. This is very helpful in identifying strengths and weaknesses of their work or performance and also becomes the point of departure for participants to improve their work (Ramdani & Widodo, 2019).

3. Materials and Methods

The problematic situation of empowering professional Terengganu staff in English language learning is considered complex and ill-defined. The reality of the problem of speaking and using English in an environment where English language is less used is perplexing and the people who were invited to define the problem reflected various worldviews, experiences, descriptions of events and activities, and factors that affected the problem situation. Soft systems methodology (SSM) is an interpretivist approach that seeks to identify the human activity systems within the situation and encourage the participants to identify the problem based on their perspectives of the situation being studied (Checkland & Poulter, 2006). Using SSM in this study helped to investigate participants' perspectives, values, and future hope. These activities help to build a rich picture of the situation. The cultural stream analysis and rich picture allowed progression to the modelling stage and the development of root definitions and conceptual models appropriate for improving the situation (Ahmad Tajuddin & Subramaniam, 2015).

In the case of this study, the stakeholders – Terengganu women professionals are the 'interveners' who are searching, grasping and creating the best solutions of the problematic situation of low self esteem professionals in using English language for the purpose of workplace vocation, leadership, politics and professionalism. Applying SSM in this research will hopefully clarify and explore solutions to the problem of incompetence of Terengganu women professionals in English language. SSM acts as a systematic tool to orchestrate and implement change in the real world in topics concerned to human affairs. Its seven-step framework is organised not only to understand the actual problems but also to offer possible solutions and apply desirable changes (Checkland, 2000). Furthermore, stakeholders are involved during all stages (see Figure 1) which will ensure that their needs are reflected in the outcomes and their feedback are adhered to in ensuring the change implemented are valid and reliable.

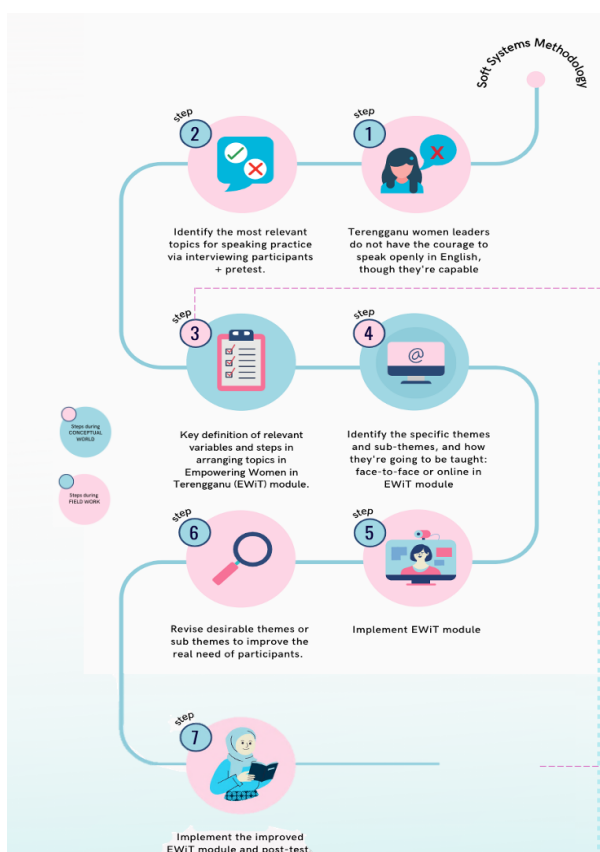


Figure 1 - Seven Stages of Soft Systems Methodology.

Stages 1 and 2

The first role of researchers in the context of SSM approach is to identify the ill-structured problem. For the purpose of this study, SSM was used to assist researchers to explore the real world situation of Terengganu women leaders, in particular, to improve self confidence in speaking in English language.

In stages 1 and 2 the researchers tried to understand the situation by developing the richest picture possible of the problematic situation. The function of these two stages was “to display the situation so that a range of possible and, hopefully, relevant choices [of relevant systems to be described in the following stages] can be revealed” (Checkland, 2000). Rich picture was built by capturing the problem situation; recognising that different groups of leaders had diverse views of this issue and their own experience in having low self esteem in using English at workplace. Through rich-pictures, such different world-views were highlighted.

Undergoing this stage, the researchers began to focus on similar issues which were considered critical as well as eliminating disagreement associated between the stakeholders involved. Focus group interview sessions were held to understand the phenomena. The participants were given an opportunity to define their problems in expressing themselves using English language. It was discovered that 92% of the respondents had high foreign language anxiety which affected their speaking and writing ability in English language. This

relates closely with communication apprehension (Macintyre & Gardner, 1991), whereby 86% of them felt more anxious when speaking in front of the public. Findings during the interview revealed that only 15% of the respondents regarded the rural environment is conducive to helping Terengganu leaders to improve on their English language skills. Only a few of the Terengganu women leaders, which mostly come from the 20-30 year old group, believed that 100% online learning will help to lower their anxiety in learning English language (27%). On the other hand, it was also discovered that they unanimously demanded to learn face-to-face and have additional practices via technology.

Additionally, the areas of concerns by the stakeholders were their line of thoughts were inaccurately described in English language since the lack of vocabulary. Making connections between ideas and being engaged in an on-going speaking process are also other areas of concern. Some even choose to stay quiet during discussions for they were afraid to make mistakes in speaking. The respondents were concerned with grammatical errors made while speaking. Since this is prolonged for quite some time, the professionals became scared and timid, especially if they need to speak in public. The main findings of this stage were factors that constrained usage of English language, which then could be changed into elements for improvement in classroom teaching in the next stages.

Based on the different perspectives of stakeholders, Step 2 of SSM offered three forms of scaffolding in English language learning namely via sensory, interactive and infographics language learning activities. Different learning styles will be used during sensory language learning activities which include hands-on demonstrations, modelings and role play, demonstrating physical activities and watching and reviewing videos and films. Inserting language use and functions during the activities will hopefully help the participants to understand processes, learn by doing and through demonstration, contextualise abstract ideas and make connections between ideas. The activities planned are in the form of interactive ones whereby they need to work in pairs or small groups to ensure the learners are engaged in on-going speaking activities by strengthening their listening and speaking skill.

Stage 3

Meanwhile in Stage 3, Patel (1995) has used SSM’s root definitions to identify responsible actors, key transformations, and the knowledge resources that are appropriate to the needs of all stakeholders. A root definition “expresses the core intention of a purposeful activity system” (Wells, 1995) and is structured into three distinct parts: the *what*, the *how* and the *why*. The *what* is the immediate aim of the system, the *how* is the means of achieving that aim, and the *why* is the longer term aim of that purposeful activity. Another significant characteristic of SSM is that the root definition must

include a number of elements, which Checkland and Scholes (1990, pp.32) characterize under the mnemonic CATWOE and the definitions of CATWOE of this study were listed in Table 1 below.

Customer	Terengganu women leaders
Actors	English language instructors
Transformation Process	Speak English for Women’s Empowerment in Terengganu (SEWEiT)
Worldview	The belief that the framework will be able to empower women of Terengganu in speaking English and improving their self confidence
Owner	Module developers
Environment	Conducive learning environment both face to face and online learning where learners feel comfortable in practising L2 at their own pace

Table 1 Definition of CATWOE in this study

Stage 4

In stage 4, SSM is used to develop conceptual models that identify patterns in knowledge activities (Venters, Cushman & Cornford, 2002). Such patterns can be used to provide a basis for technical design and organisational and social intervention. Based upon the need to address the problems in Stage 1, ideas and activities in Figure 2 below are being incorporated into investigations in this research.

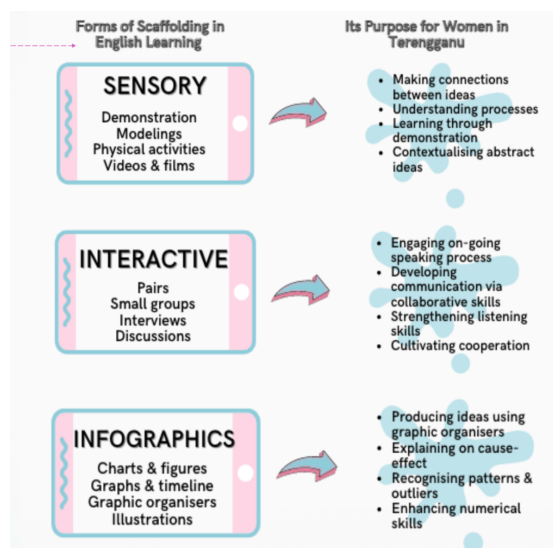


Figure 2 - Forms and purpose of scaffolding in English language learning for Terengganu women leaders.

Specifically, these were the topics that are planned to be implemented within the 12-week period. Speak English

for Women’s Empowerment in Terengganu (SEWEiT) was designed to include interactive and fun activities to help the participants to practise speaking in English language comfortably as prior to the project, these women have barely used and spoken in English before. It is indeed important to highlight that as compared to any urban area in Malaysia, a vast majority of people in Terengganu may not apply English in their daily life hence lack of platforms and means for any to apply the use of English language. Keeping this in mind, the facilitators created a jubilant environment with the help of intensive and properly-thought after materials in class every week.

In a mission to improve the participants’ vocabulary and grammar in every session conducted throughout the project, these language practices were included in all activities:

- 1) applying transitional signals in phrases and sentences
- 2) restating and retelling processes to test listening skills
- 3) expressing contrasting ideas by showing sequence of events
- 4) using expressions and phrases on how to agree, disagree and interrupt.

A collective of collaborative activities were assigned to the participants. Table 2 below shows the topics taught in a module called Empowering Women in Terengganu (EWiT) in English.

Assimilating the use of technology in the module helps the participants to be more connected to the substantial demand of virtual professional communication by interacting profusely via Facebook which was chosen as the module’s learning platform alternative. Instructions were given on the Facebook group in a form of infographic posters together with elaborate samples of assignment videos.

String of sentence construction lessons both in videos and notes were provided as deliberate guidelines. Once their user-generated content videos were uploaded on Facebook, comments and suggestions by fellow participants were posted in group discussions. Constructive feedback gained immediately and consistently as they securely used erudite expressions and phrases whilst expressing thoughts.

Stage 5

In Stage 5, Empowering Women in Terengganu (EWiT) English Module was implemented. The module took 12 weeks to complete, and the tasks and learning outcomes were listed in Table 1 above. Tasks were given weekly and feedback was given offline and online.

Prior to the given assignment, they went through the process of learning as suggested by the stakeholders during Stage 2 of SSM (see Figure 1).

Topic	In-class Task and Learning Outcomes	Post-class Task
Cook-a-Dish	to demonstrate how to a cook a dish of their choice individual task where each of them had to demonstrate how to a cook a dish of their choice	Tell me a piece of advice you've received from someone about tips and tricks in the kitchen. Why do you remember this advice till now?
Let's Promote Terengganu	to defend and voice out their opinions of topics/scenarios given	Tell me a place in Terengganu that you have visited recently. As a visitor, make a 2-minute review about the place.
Blind Dates	to interview others (roughly 15 minutes per round before they change partners); To use proper expression and phrases To use in questioning and answering session	Tell me something about yourself. Inform your current post and your job responsibilities. Tell us one experience that happened at work that means a lot to you.
T-Kitchen Fieldwork	to create a YouTube video on the main dishes by T-Kitchen for promotional purposes	Reflect on the experience of fieldwork. Did you enjoy it or not? Why?
Storyboard Mission	to create a storyboard To publish a video on promoting products in Terengganu.	What Terengganu products do you use at home on a daily basis? Why do you think it is useful to you?

Table 2: Topic of Empowering Women in Terengganu (EWiT) English Module

4. Results

Stage 6 and 7

In getting back the feedback from the students, they opined that the stages of teaching and guiding them to think better were one of the factors that they did well in the assessment. The lecturers agreed that the reason why

the majority of students were able to achieve an excellent level in the assessment was because of the strategies implemented during teaching. Some comments were as follow:

"..having a clear, current and meaningful stimulus was essential for me to feel connected with the assignment, which makes it easier to find references online."

"the lecturer thought us how to ask good questions. Love that session. Asking, mmm, rephrasing my questions will help me to find interesting answers."

"Questioning skills session should be prolonged. It helps me to think better."

"I learned that I cannot speak without substance. I need data, I need references, I need other case study that I can infer my points with. When we speak with data, then people will listen to you."

"Talking to others in a group helps me to generate creative ideas. Having academic discussions in solving real issues helps me to be tweet intelligently."

"The lecturer's feedback during our presentation was awesome, then we realise how we can do better. I mean, we thought ours was the best, but when we heard others'... we know we can definitely be more innovative."

Comments on having to talk about the issue several times with others and going through and referring to credible sources in answering the issues helped the students to strengthen their language skills.

"When we talk about the issues, it helped to get the vocabulary... you know, sometimes the words just fly from your mind, especially when we speak in public. But if you practice, it is easier."

"Finding the best graph or figure that directly related to the (assigned) issue was not easy. The good thing was I went through a lot of articles that widen my view and the readings helped me to borrow relevant phrases and some cool quotes, too."

In learning online, some faces issues in collaborating at given time because of the internet connection. Nonetheless, the tried to resolve their problems by creating other sessions which suit the group members. One also emphasised on the importance to have a committed team member in order to complete the tasks.

"I need committed friends to help me brainstorm ideas, especially when we learn

online. Sometimes we need to work at night to solve the issues given."

"Internet line is usually better at night, so we always do a lot of discussion pretty late at night."

5. Discussion and Conclusion

Collaboration in reviewing and giving feedback

In a conducive and non-threatening environment, the participants were enthralled to a set of well-documented interactive tasks which required them to communicate in English by referring to their schemata in projecting ideas. This can be observed during the first task where the participants were instructed to talk about a local dish in Terengganu of their choice and prior knowledge embedded with each own respective cultural-local background were articulated. At the beginning of the task, constant help for vocabulary to create chains of thoughts was intact as they struggled to construct their sentences and fellow participants were more than willing to give out words. Brainstorming ideas and planning out the words to say asked for short discussions amongst them and these have assisted them in projecting more recollection of experience to share with everybody. This has made them become more interactive and responsive as they gave feedback and responses to other participants' dish demonstrations.

Higher motivation because of distributed practice

This project was initially developed to cater the needs of the participants who were passionate and dedicated in tackling their anxiety in communicating in English language. Positive attitudes towards the materials laid out for them helped in ensuring the smooth execution of each and every activity planned out. Participants were focused once assigned as each task required each of them to get involved in the process of brainstorming and discussing with fellow group members in using the second language. It may have taken them aback for a while as normally anxiety took control at the beginning, however once interest and passion kicked in, they began to actively participate.

It was apparent from the data collection from the participants that the motivations for improving their communication in English language were consistent. Almost all participants stated and stressed out clearly that being able to speak in English was very significant so they could communicate with foreign delegates and fellow conference attendees, and most were enthusiastic about learning and improving their capabilities in the working environment.

It is truly found that motivation is one of the factors that affects language learning. Keeping that in mind, most activities designed in Speak English for Women's Empowerment in Terengganu (SEWEiT) were career-related and community-based so that participants would

not shy away from their scope of work. Fully aware of the significance of practising English discussing matters pertaining to work-related materials, participants actively learned and completed the tasks. Motivation could be clearly seen in cognitive perspective during the interactive activities. They attempted to integrate English language into local cultures and surprisingly global perspective. It can be seen clearly during the execution of group discussion on Leadership and Promoting Terengganu.

Furthermore, fieldwork and excursions to places of importance and related to workplace helped participants to enhance their vocabulary, especially the words used within the industry visited, and experience the process and procedures during fieldwork. This experiential learning helped the participants to be able to explain confidently in their video reflections. Since the task needed them to record themselves and post it to the social media platforms, they underwent a few speaking practice sessions, prior to the final recording. It is proven that the participants' did not show obvious anxiousness in the reflection video and they were able to explain their experience and feelings after the sessions in a comprehensible and fluent manner. Hence, this finding is in agreement with Chang's findings (Chang, 2019) whereby repeated practice will improve fluency. In addition, the familiarity and venturesome-experience of participants using Facebook also contribute to the lack of agitation and stereotyped self-inferiority complex in executing the assigned tasks.

However, a few participants tend to be irresponsive to tasks especially the ones where they were asked to do an individual presentation. They performed fairly acceptable during group discussions but retracted if eyes were upon them. This may be associated with one's introvert personality but when asked, being detached to scope of work related to foreigners contributed to this lack of interest in conversing in English. Whereas, for a number of participants that need to be constantly dealing with global out-reach networks, they performed better during tasks. Strack, Lopes, and Esteves (2015) suggested that "while some individuals experience anxiety as incapacitating ... others seem to thrive in similarly adverse circumstances" and "the latter may be driven to work harder when they experience anxiety in the face of difficult challenges" (p. 579).

After the process of re-evaluating the data the elements within the Framework for Empowering Women in Terengganu (FEWiT) was improved and finalised. From the process of face-to-face and online learning and teaching that was carried out for 12 weeks, it was discovered that to enable the women leaders' language learning and self-esteem to thrive, they need to be guided in different ways and tasks must be assigned creatively and innovatively. By giving a meaningful stimulus or assignment, participants tend to solve them by using vocabulary and language structure presented in class effectively, which is to use their language skills into fullest potential. Guiding them step by step using

FEWiT helped to improve the women leaders' self-esteem in speaking the English language. It is believed that if this framework is applied in community-based learning English courses in suburban areas of Malaysia, participants' will not be afraid of using the language in public. All in all, after reviewing the data, the improved Framework for Empowering Women in Terengganu lays out six basic elements as a guide for learning L2. FEWiT is illustrated in Figure 3 below.



Figure 3 - Framework for Empowering Women in Terengganu (FEWiT).

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References

- Ahmad Tajuddin, A.J. and Subramaniam, G. (2015) Application of Soft Systems Methodology in Defining Professional Communication Skills for Malaysian Graduates. *Journal: International Journal of Research in Education Methodology*. Vol 6(3):pp660-671
- Astawa, N.L, Artini, L.P, & Nitiasih, P.K. (2017). Project Based Learning Activities and EFL Students' Productive Skills in english. *Journal of Language Teaching and Research*, 8(6), 1147-1155.
- Boardman, A. G., Garcia, A., Dalton, B., & Polman, J. L. (2021). *Compose Our World: Project-based learning in secondary English language arts. Language and Literacy*.
- Bingle, R. G., & Clayton, P. H. (2012). Civic education through service-learning: What, how, and why? In L. McIlraith, A. Lyons, & R. Munck (Eds.), *Higher education and civic engagement: Comparative perspectives* (pp. 101–124). New York, NY: Palgrave Macmillan.
- Chang, A.C.S. (2019) *The Reading Matrix: An International Online Journal. The Effects of Repeated Oral Reading Practice on EFL Learners' Oral Reading Fluency Development*. Volume 19, Number 2.
- Checkland, P. (2000), *Soft systems methodology: a thirty year retrospective*. *Syst. Res.*, 17: S11-S58.
- [https://doi.org/10.1002/1099-1743\(200011\)17:1+<::AID-SRES374>3.0.CO;2-O](https://doi.org/10.1002/1099-1743(200011)17:1+<::AID-SRES374>3.0.CO;2-O)
- Checkland, P. and Poulter, J. (2006) *Learning for Action: A Short Definitive Account of Soft Systems Methodology and Its Use for Practitioners, Teachers and Students*. Wiley, Hoboken.
- Jaelani, A., & Afyattena, N. (2021). Promoting Students' Confidence Through Video Project-Based Learning. *Journal of English Language Learning*, 5(2).
- Masrom, U., & Yusof, D. S. M. (2013). English Games as a Constructivist Approach in Project Based Learning. *International Journal of Social Science and Humanities Research* 1.1, 21-25.
- Maulany, D. (2014). The Use of Project-Based Learning In Improving The Students' Speaking Skill (A Classroom Action Research at One of Primary Schools in Bandung). *Journal of English and Education*, 1(1), 30-42. Retrieved from <https://ejournal.upi.edu/index.php/LE/article/view/323>
- MacIntyre, P.D. and Gardner, R.C. (1991), *Methods and Results in the Study of Anxiety and Language Learning: A Review of the Literature*. *Language Learning*, 41: 85-117. <https://doi.org/10.1111/j.1467-1770.1991.tb00677.x>
- Nani, K.L & Kusumah, Y.S. (2015). The Effectiveness of ICT Assisted Project Based Learning in Enhancing Students' Statistical Communication Ability. *Depok: International Journal of Education and Research*.
- Omar, H., Embi, M.A, & Yunus, M.Md. (2012). Learners' use of communication strategies in an online discussion via Facebook. *Procedia - Social and Behavioral Sciences*, 64, 535–544.
- Ramdani, J. M., & Widodo, H. P. (2019). Student teachers' engagement in Facebook-assisted peer assessment in an initial teacher education context: speaking 2.0. *Journal of Education for Teaching*, 45(3), 348-352.
- Ruslan, A. N. H., Fatimah, A. S., & Marlina, N. (2022, July). Project-Based Learning in Online Speaking Class: Interesting or Boring?. In *ICOLLEC 2021: Proceedings of the 1st International Conference on Language, Literature, Education and Culture, ICOLLEC 2021, 9-10 October 2021, Malang, Indonesia* (p. 136). European Alliance for Innovation.
- Venters, Will & Cushman, Mike & Cornford, Tony. (2002). *Creating Knowledge for Sustainability: Using SSM for Describing Knowledge Environments and Conceptualising Technological Interventions*. Working Paper Series. London School of Economics.

- Wiersma-Mosley, J. D., & Garrison, M. B. (2022). Developing intercultural competence among students in family science: The importance of service learning experiences. *Family Relations*.
- Wells, A. (1995). Meta-cognition and Worry: A cognitive Model of Generalised Anxiety Disorder. *Behavioural and Cognitive Psychotherapy*, 23, 301-320. doi:10.1017/S1352465800015897
- Wongsa, M., & Son, J. B. (2022). Enhancing Thai secondary school students' English speaking skills, attitudes and motivation with drama-based activities and Facebook. *Innovation in Language Learning and Teaching*, 16(1), 41-52.
- Zarzycka, E., Krasodomska, J., Mazurczak-Mąka, A., & Turek-Radwan, M. (2021). Distance learning during the COVID-19 pandemic: students' communication and collaboration and the role of social media. *Cogent Arts & Humanities*, 8(1), 1953228.

Online tutoring system for programming courses to improve exam pass rate

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Abstract

University students enrolled in the first year of the Computer Science degree may have problems approaching programming, negatively affecting their study during the course. Tutoring programming projects are very important in helping students with difficulty in learning by providing the right approach to study, improving their knowledge and skills in computing. The aim of this work is to realize a new Java Programming tutoring online course that allows students to have an effective online tool to achieve the learning goals of the course and this will enhance the programming exam pass rate. The course we have designed consists of tools to help students with video tutorials, self-assessment quizzes, code evaluations and exercises to solve using an online Java editor. Because the Moodle platform lacks tools to check the quality of the code syntax, a new software was created. It performs a syntax analysis of the Java code and, as a tutor, automatically provides feedbacks and tips to the students to improve the quality. For each online tool the immediate feedback technique is used to amplify students' engagement. A Clustering Machine Learning technique is performed to identify different students' behaviors. A correlation between them and the final performance showed the most influential features of the completed activities. Quantitative analysis highlighted the effectiveness of the tutoring system and the online course designed in this work to enhance the final exam pass rate. At the end, students filled a questionnaire to report their perception and satisfaction about the course.

KEYWORDS: Tutoring, Feedback, Java Programming, Moodle, Machine Learning.

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1. Introduction

In the first year at university, starting a new programming course can be hard for computer science students. Sometimes they can also have difficulty to pass the exam. Programming courses are perceived as difficult. This can increase the student dropout rate (Robins et al., 2010) and can negatively affect student study (Ambrosio et al., 2011; Aşkar et al., 2009; Figueredo et al., 2020; Hawi, 2010). A lot of the

students that don't have any programming experience before, think that programming is difficult to learn and use. They refuse to learn programming skills unconsciously (Tan et al., 2009). Students' views regard the difficulties that they faced in programming themes that cover semantics, programming skills and programming knowledge (Özmen et al., 2014). Many students had difficulties developing computational thinking. Computational thinking is an attitude that permits problems solving using computational techniques (Wing, 2006; García-Peñalvo, 2016). Recent studies identify teaching methodology as the main reason for problems in teaching and learning programming. They rarely focused on developing the skills and knowledge acquired in the student's learning experience (Figueiredo et al., 2020).

Students must study not only theoretical concepts, but also interpret their own mistakes, find examples, and search solutions to known problems. The tutorial aspect

is important because it can allow the improvement of the quality of teaching. In fact, it can drive the student to acquire generic and disciplinary skills. Tutoring represents an action to support the different aspects of a student's learning development (De Santis et al., 2021). It helps students during their study and supports them in any difficult moments, such as the new approach to university study. The purpose of tutoring is to provide students to approach the critical steps of their studies in a good way. It is aimed at promoting academic success and avoiding university drop-out (Da Re, 2018). Sometimes it can happen that the degree courses in Computer Science are composed of many students enrolled. IT resources are often used to have a good management of classrooms with a lot of students. These resources are very effective because they allow to improve learning processes, thanks to new pedagogical approaches like e-learning courses applied in the field of Computer Science. Indeed, the use of MOOC for teaching IT in a university course with a high number of students, showed how these teaching methods have been effective, and expanded the students' computer knowledge and skills. Furthermore, the use of the online course did not reduce the teaching effectiveness and allowed the improvement of the student's learning results (Amendola et al., 2018; Guelfi et al., 2020). Blended programming e-learning courses provided some help for students to gain practical experience through the involvement of Java programming activities. They allowed students to learn more easily and are adapted to acquire programming skills (Hadjerrouit, 2008).

Virtual Laboratories are also provided in e-learning for learning techniques and knowledge relating to computer programming. These online labs provide hands-on simulations that permit the students to learn comprehensively, through face-to-face lessons. (Richter et al., 2012). In online laboratories for learning graphic programming software such as Gnuplot, Video Tutorials are often used for data collection applied to the code (Amendola et al., 2016). Given the success of e-learning courses in education, its effectiveness for student learning, and the difficulty of managing a lot of students in the classroom, a programming tutoring e-learning course is created.

An online programming tutoring course can be very useful because e-learning platforms, like Moodle, allow the integration of different tools for programming purposes. Furthermore, they give the possibility to set for each tool automatic feedback. Feedback helps students to understand both the learning outcomes of the course and their relative progress toward meeting those goals (Hattie et al., 2007). Research evidence shows how effective feedback is an important element for student learning (Shute, 2008). Feedback finds many applications in the programming field, and it is used to contribute to improving students' cognitive outcomes (Gusukuma et al., 2018; Marwan et al.,

2019). One of the fundamentals criteria that affect efficacy in feedback is the timing. Immediate feedback gives a lot of advantages, like the promoting of actively learning. It allows students' partial knowledge to be rewarded with partial credit and it is strongly preferred by students compared to other techniques (Di Battista, 2005). An example of immediate feedback is the IF-AT that provide to students' immediate feedbacks about the accuracy of their answers, as the students are completing each exercise. The Immediate Feedback Assessment Technique (IF-AT) system provides immediate affirmative feedback or corrective feedback, depending on the answer given by the students (Epstein et al., 2002). Research evidence shows how immediate feedback is more effective compare the delays feedback, on complex tasks, when students have less prior knowledge (Shute, 2008) like the new university students that approach programming. Students involved in immediate feedback got a high level of scores and correct answers then the other students. This method engages students in the process of discovering and correcting initially imprecise response strategies (Epstein et al., 2002).

Learning Management System (LMS) like Moodle permits to create an effective programming tutoring e-learning course, because it covers most of the features that allow the successful learning of java programming, like videos, online editors, and different types of multiple-choice quizzes. These tools allow the integration of video tutorials for writing code, give the possibility to perform the code and, thanks to the feedback functions, check errors in the execution of the created software, check theoretical knowledge, evaluate the code, test the functionality of the code. However, testing the quality of the syntax produced by the student is important to complete an online Programming Tutoring course.

An online editor can recognize errors at runtime; anyway, if the program runs correctly, the code may not be written optimally. It could not respect the logic of the object-oriented paradigm, or there could be an improper use of java commands that could create optimization problems. Unfortunately, in Moodle there is no automatic tool that allows the students, based on the code described, to have feedback and advice to improve the quality of the code syntax of the Java programming language. A new tool was created to analyse the syntax of the written code and its quality. The tool then, as a tutor, automatically provides feedback and tips to the students in order to improve the quality of the code.

In recent years, several students of Computer Science at the University of Camerino encountered difficulties in Java programming during the attendance of their first-year degree. These difficulties were not always overcome, and students often didn't pass the exam during their first-year degree, registering a decreasing trend of exam pass rate from 51% to 43% during the

last four years (from academic year 2015/2016 to 2018/2019). The Java programming course is one of the most important courses in the three-year degree in Computer Science, so the exam failure in the first year led often students to leave the university. We recall here that the first-year drop out from the university system is one of the most crucial problem in Italy and one of the most difficult to be solved, or at least mitigated.

The aim of this work is to realize an effective online Tutoring course that contributes to an improvement in the quality of teaching in the Java Programming course.

The research conducted aims at investigating if the online tutoring system is able to improve the students' performance and also enhance the exam pass rate in the first-year students in order to decrease the possibility of drop-out.

The final goal of our work is to demonstrate how it improves students' computer skills and knowledge and check if they can give benefits to students, in terms of performance (if they quickly pass the final exam) and in terms of satisfactions (analysing also the questionnaire based on the students' perceptions).

The online tutoring course was delivered in January 2020 and was structured in 6 modules, designed, and uploaded to the Moodle platform of the University of Camerino. Students of the first year of the degree course in Computer Science had access to the course at the end of the period in which the Java Programming lectures were held. They performed the activities of the tutoring course before the final exam. In this paper, the design of the online course and the results obtained by the students were discussed to evaluate the impact of the online tutoring course in terms of pass rate of the final exam and level of student satisfaction. In fact, we want to evaluate the effectiveness of the online tutoring course, to ensure an effective tool for improving the study approach to students.

The evaluation the course was analysed by the following research questions:

1. How did the students use the online resources?
2. Did the massive use of the platform help students pass the exam within the academic year?
3. How did the students perceive the effect of online resources in acquiring skills and passing the exam?

A teaching model was designed and adopted to obtain the answers to these research questions. Logs for the various activities were extracted from the e-learning platform and processed using Machine learning techniques. In this way it was possible to determine and compare the behaviours held by the students on the platform and how they affected the results of the final exam. Finally, the questionnaire filled by students was analysed.

2. Methods

2.1 Participants

This case study was carried out with a group of 151 first-year students of the degree course in Computer Science at the University of Camerino. The course was delivered in Italian. Participation in the online tutoring course was voluntary. The online tutoring course was available to students after the theoretical and laboratory face to face lectures, to have a basic preparation before taking the tutoring course. A professor, a tutor, and a Ph.D. student in Computer Science course at the University of Camerino prepared the teaching materials, the video tutorial and designed the online activities.

2.2 Research methods and procedures

The project of the online tutoring course was preceded by an accurate identification of the topics that the last years students found difficulties.

The main goal of teaching programming course is to acquire skills to create computer software that solve real problems, developing computational skills. The course was divided into 6 modules, each of which consists of topics that allow to achieve the learning outcomes of the programming course. These permit to implement and create simple software to solve computational problems. In particular, the following topics were explained in each module:

1. primitive data types, cast, bitwise operators;
2. vectors and cycles;
3. control flows and logical operators;
4. classes and exceptions;
5. math and Util libraries;
6. inheritance and interfaces.

For each module, activities were developed to allow effective learning of students' knowledge and skills. Each module initially consists of a video tutorial, often used in e-learning courses to stimulate student engagement (Amendola et al., 2016). The video tutorial drive students step by step in writing the programming code aimed at solving programming exercises. Video tutorials last a maximum of 20 minutes, about 40 MB in size and consist of voice and screen recording. In particular, a Java online editor is displayed, and the step-by-step explanations show the code to solve exercises. Key information on the methods and solutions are used; theoretical references are included in the video, to provide the tools to solve similar tasks. To give the opportunity to develop computational knowledge, various activities and exercises are included where students with difficulties can test their skills. The activities to be delivered in the course are based on teaching models that found a fast and effective learning of computer skills and knowledge in programming (Tan et al., 2014). These models consist

of different exercises like multiple choice and open cloze. The interactive tutor is another important tool for learning success which supports step by step the development of simple computer software (Figueiredo et al., 2020).

The following activities are included in each module:

1. multiple choice quiz;
2. text completion;
3. code evaluation;
4. exercise with solution;
5. programming exercise.

The “multiple choice quiz” consists of written java code and student must give the right answer selecting what output the code performs.

The “text completion” is composed by open cloze exercises, used for the acquisition of knowledge related to the Java syntax (e.g., logical operators, conditional operators, data types etc.).

The “code evaluation” is a multiple-choice quiz that, analysing a written code, consists of more than one alternative that students must detect. In this exercise there is the code that has anomalies. Students have to check what anomalies it presents by selecting the correct ones from a series of items. The system automatically gives feedback showing the theoretical explanation.

In the “exercise with solution” activity there is a task that describe the problem to perform and the solution, giving the complete source code. This exercise is useful for students because they can try to solve the task by themselves and later compare with the solution provided. In this way they can understand the correct way on how to solve the problem properly.

Like this activity, there is a “programming exercise” that students have to perform autonomously. Students must produce the source code on the java editor and check if it’s correct.

The Java editor used in this course is an online compiler made by “Trinket” that is embedded into the Moodle course. It runs the java code online and checks its correct execution.

When the source code is correct, students check the quality of the syntax code. The students execute the implement code using the “interactive tutoring software”, that we especially developed for this online tutoring course to overcome Moodle limits (Moodle lacks a tool that supports these features). This software provides automatically immediate feedback on the quality of the code entered, analysing criteria like “keywords”, “use of variables”, “use of methods”, “correct use of classes” to satisfy the object-oriented paradigms.

There are several studies that highlight the effectiveness of an interactive tutor in teaching computer science: i) working with an interactive tutor

who supports the making of programs is more effective than learning to program by doing the same exercise using only a compiler; ii) the use of automatic tutors requires less help from the teacher; iii) use of online tutors increases self-confidence in students; iv) immediate feedback from the tutor appears to be preferable to feedback given later in class (Gerdes et al., 2012). The interactive tutor application is developed in PHP and is installed on a Linux, Apache, MySQL e PHP (LAMP) server. It consists of an html input file, which consists of a textbox where students insert their own java code and a button for code verification and an output php file, which shows to students feedback related to the inserted code. Students receive, on output, feedback on mistakes and tips to improve the quality of the java syntax. The system consists of an accurate analysis of the text that it takes as input. It compares the written text with different criteria that the code should satisfy, set by the teacher for a given exercise. These criteria can be: i) use of specific keywords (e.g. “final”, “static”, “public”), ii) length of the code, iii) use of java classes, methods, libraries and functions.

Thanks to these tips, students can understand their mistakes and edit their code until they get positive feedback, improving their code without the human intervention. A database, connected to the interactive tutor, collects all the students’ attempts every time they try to verify the quality of the written Java code. Thanks to this mechanism the teacher, who has access to the database, can directly see each attempt and check, based on the students’ mistakes, if there are topics that are difficult for the students to understand. Monitoring the student progress checking the data collected by the tool is an important feedback for the teacher which can detect possible issues in specific topics and in case edit properly the online activities or learning materials in order to guide the students to overcome their weakness in these topics.

In addition to the 6 modules, the course has an introductory video that explains: i) aims and structure of the course; ii) how to use the editor; iii) general intro to java topics.

Finally there is a questionnaire, consisting of 24 questions aiming to acquire interest in the study and to check students’ perception and satisfaction.

2.3 Data collection and methodology

The results consisted of an analysis of student reports and a questionnaire on the use of the course, both extracted by Moodle platform.

Several aspects were analyzed to determine the effectiveness of the Programming tutoring course:

1. use of the platform activities, through online course modules logs;
2. detection of the percentage of students who passed the exam based on their behavior in the online programming tutoring course;

3. data collected from an online questionnaire aiming to extract info about students' experience and perceptions in the programming tutoring course.

Initially (point 1) we analyzed the learning analytics extracted by the e-learning platform at the end of the tutoring course. These data were organized in tables showing the number of logs to the different resources and activities, to determine the level of interaction of the students.

Then (point 2) we checked how an intensive use of the platform can increase the success rate for passing the final exam. To do this, we first determined the different students' behaviors based on the display and the use of all the activities in the modules. In online learning environments, clustering can be used to find groups of students with similar behavior and characteristics (Vellido et al., 2010; Nalli et al., 2022). Clustering is a Machine Learning technique that permits automatically to identify relationships between data in a dataset with multiple features, to group objects with similar characteristics in the same group(cluster) (Bovo et al., 2013, Nalli et al., 2021). The clusters are generated by: i) extraction of data relating to the students from the Moodle Reports used to create the dataset, ii) the input file of the clustering algorithm; iii) creation of the software to execute the clustering algorithm to

grouping students with similar characteristics and behaviors.

We selected the following data relating to the behavior of the students: total time and login frequency, number and attempts of completion exercises, number and attempts of evaluation code exercises, number and attempts of quizzes, number and attempts of exercises with java compiler and interactive tutor, number and frequency of videos. To simplify datasets, we grouped data into a few features. The feature is an individual and measurable property of an observed phenomenon (Bishop, 2006). Data belonging to the same type of activity (but also in different modules) was aggregated into the same feature.

The collected data was preprocessed. Each student was represented by a "vector of input" with features consisting of the values of the attributes associated with the student.

All the data, organized into feature vectors, one for each student, were inserted into a single Excel file, called dataset, which represents the input file of our clustering software.

The clustering software with K-Means algorithm was implemented through Python scikit learn library (Hackeling, 2014).

The software creates groups of students that have similar behaviours and characteristics on the platform.

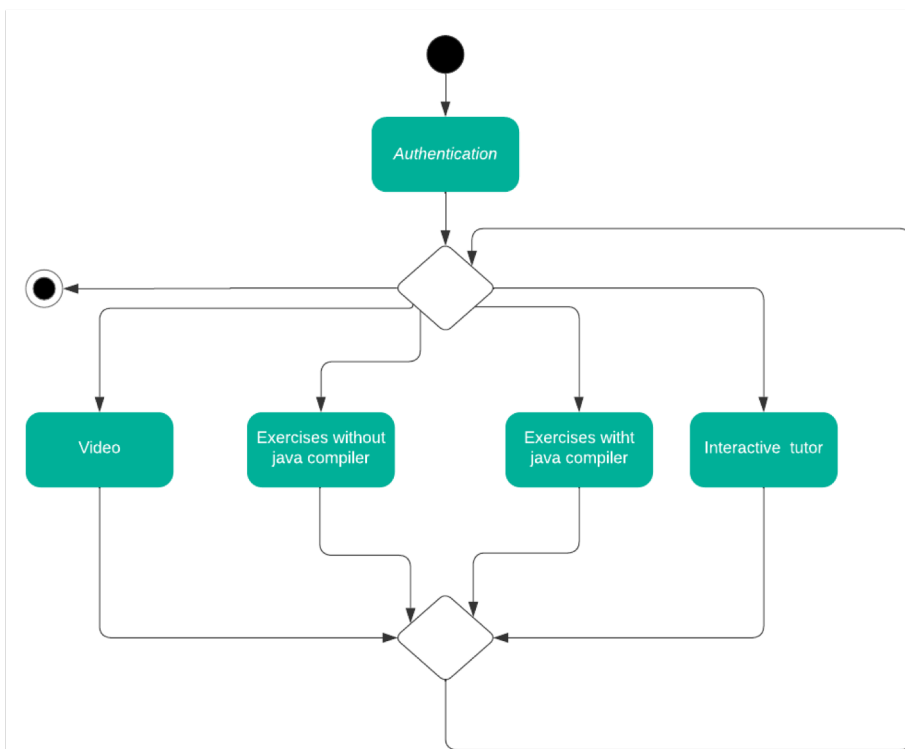


Figure 1 – Conceptual flow of online activities and software execution.

Once obtained the clusters, we compared them with the percentages of students who passed the final exam before the end of the academic year 2019/2020; thus determining the most influential behaviours and activities that allowed a fast pass exam rate.

Finally (point 3), the course provided a questionnaire consisting of 24 questions divided into 3 sections: i) behaviours, ii) intentions, preferences, opinions, iii) open questions and comments. The section “behaviours” consists of 12 questions to obtain data on the experience related to the online tutoring course. The section “intentions, preferences, opinions” consists of 9 questions, using Likert scale. These questions covered satisfaction and perception related to the online course, in particular advantages and disadvantages related to the understanding of the material and use. Section “open questions and comments” consists of 3 open questions, where students give their opinion on what they liked most and what they liked least about the course, useful as feedback. The students completed the questionnaire voluntarily and anonymously. In this paper we discuss the results related to the second section of the questionnaire to detect the students’ perception and satisfaction.

3. Results

How did the students use the online resources?

The data relating to students enrolled in the first year of the Computer Science course of the academic year 2019/2020 were analysed.

Table 1 summarizes the level of general interaction that the students had with the materials within the different modules. For each user, multiple logs occurred for the same activity.

Access to the activities of each module was unrestricted and therefore students didn’t need to follow an order for viewing the materials. Therefore, students only viewed the activities in which they had lot of difficulties or the activities useful for passing the exam.

Table 2 shows the types of activities most used in the course. From the number of accesses, we can see how the practical activities, which return an evaluation or feedback, had more success than the theoretical activities (such as videos). This happened because the students enrolled in the tutoring course needed to test their knowledge through exercises, compared to the theory carried out on face-to-face lessons. All exercises were delivered on the online course at the same time and students were able to perform the exercises with an unlimited number of attempts. The most used activity was the “Multiple choice quiz” as it is an important tool for students to fix their knowledge. Other activities widely used were “Text Completion” and “Code Evaluation”, which return an immediate evaluation based on the option selected or word entered. The

possibility of having immediate feedback allows students to check if they understood the concepts, or to identify errors with the aim of improving their programming knowledge. The “programming exercise” activity was also widely used, with 1331 accesses, which was preferred to “Exercise with solution”. This reinforces the importance of the interactive tutor to learn programming and develop computational knowledge. Using the online tutor with immediate feedback, the student is driven in writing the code with a good quality. This allows students to be more effective in learning programming than carrying out this activity by themselves or using only the compiler; it also improves their self-confidence. (Figueiredo et al., 2018).

Materials	Logs
Module 1 - Primitive data types, cast, bitwise operators	4672
Module 2 - Vectors and cycles	3708
Module 3 - Flow control and logical operators	1891
Module 4 - Classes and exceptions	2042
Module 5 - Math and Util libraries	1708
Module 6 - Inheritance and interfaces	1433

Table 1 – Number of student-logs to the materials in all Modules of the online course.

Activities	Logs
Video	987
Multiple choice quiz	8391
Text completion	2057
Code evaluation	2061
Exercise with solution	639
Programming exercise	1331

Table 2 – Most used activities in the online course.

Has massive use of the platform helps students to pass the exam within the academic year?

To determine the effectiveness of the online tutoring course, we decided to carry out a quantitative analysis on the dataset for the first-year students of the Computer Science Degree Course of the academic year 2019/2020. Initially we used the Clustering technique to determine groups of students who had similar characteristics relating to the use of the course activities. The second step was the correlation of each cluster with the performance obtained by students belonging to the same cluster, to determine which behaviours influenced passing the exam. Only exams passed within the 2019/2020 academic year were analysed.

The clusters were examined to determine the different behaviours on the platform, highlighting which features are the most influential. In this way it was possible to profile the students who belong to the different clusters. Cluster 0 (26 users) represents students with high activity in the course, Cluster 1 (40 users) represents students with average activity and Cluster 2 (85 users) reflects inactive students. This is also confirmed by the analysis of very influential features in the creation of clusters, using the K-means clustering algorithm.

The most important features were the following: *i*) number of quiz attempts, *ii*) number of views of the example performed and number of exercises to be performed with the compiler and interactive tutor.

The feature values within each cluster are represented using the average of the feature values of the students belonging to the same cluster. The average value of each feature is shown in comparison with the maximum value that the feature can represent.

Cluster 2, that represents the inactive students, showed few attempts among all the quizzes of the course with an average of 7.37 attempts, few views of the types of “exercises with solution” (0.42 / 6) and a low number of different exercises carried out with java compiler and interactive tutor (0,81 / 12). This little interaction during the course is also confirmed by the number of accesses of the students belonging to the cluster (3.42) and by the number of video views (1.8).

Students belonging to cluster 1 reflect average values in all activities. In fact, Cluster 1, compared to Cluster 2, finds a significant difference such as the number of quiz attempts (80.52), number of views of exercises with solutions (2.52 / 6) and number of different exercises carried out with java compiler and interactive tutor (4.62 / 12). The number of accesses (16.12) confirms the greater activity of these students and the video views (12.02).

Cluster 0, that represent active students, showed an high number of quiz attempts (130.26), lot of views of exercises performed (4.84 / 6) and an high number of exercises performed with java compiler and tutor (10, 23 / 12).

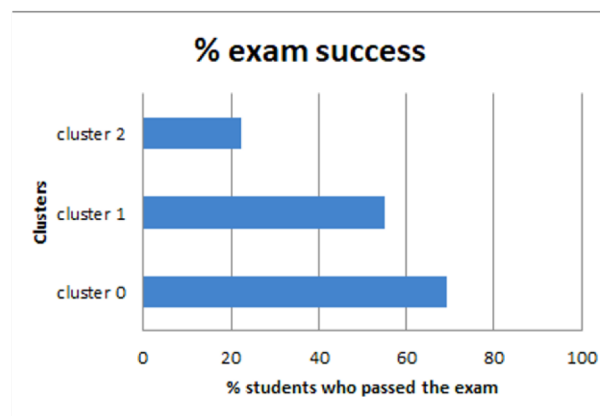


Figure 2 – Number of students per cluster who passed the final exam within the academic year 2019/2020.

To check if the behaviour carried out by students on the e-learning platform had benefits in terms of performance, we extracted from each cluster the percentage of students who passed the final exam before the end of the academic year 2019/2020.

As showed in Figure 2, the students of Cluster 0, with high activity on the platform, achieved an higher success rate than the other clusters, equal to 69%. A good success rate was returned also by the students of Cluster 1 who, with average activity, passed the exam with a percentage of 55%. Cluster 2 had a very low percentage of students who passed the final exam, equal to 22%. It confirms the tutoring course gives benefits for the students.

How did students perceive the effect of online resources in acquiring skills and passing the exam?

In this part we reported the results of the data returned by the questionnaire proposed to first year students at the end of the last exam session of the academic year 2019/2020. We wanted to analyse the perception of students on the use of the online tutoring course, and especially if this course influenced the improvement of computational knowledge and skills in addition to passing the final exam.

Most of the students believe that the use of the online tutoring course is effective for passing the exam. Figure 3 shows that 76% of students believe in the usefulness of the tools and exercises, to increase the chances of success, while only 23% think that they had little or no impact. This last part of students was represented by them that had less activity online. They, as shown by the Clusters analysis, didn't easily pass the exam.

The usefulness of the tutoring course is also confirmed in the improvement of computational skills and knowledge. 80% of students claim that the tools and exercises used in the course have improved their computational skills, while 20% believe that they had

little influence on learning skills. Regarding the improvement of the knowledge, 85% of students believe that the tools improved them, compared to 15% of students who think that they had little impact for the knowledge enhancement. 95% of students consider all online activities (Text completion, Code Evaluation, Exercise with solution, Programming exercise) useful as a teaching support tool.

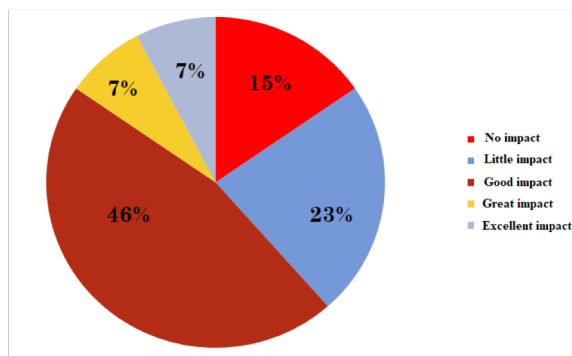


Figure 3 –Impact that the tools and exercises in the online course designed in this work had on passing the exam within the academic year 2019/2020.

The video tutorials were appreciated as support tools, with only positive judgments (50% = good, 28% = very good, 22% = excellent). This result is confirmed by the students that consider video tutorials positively for the improvement of knowledge (89%) and skills (83%). However, only 57% consider the video tutorials useful for passing the exam, while 43% consider them not very useful. This highlights the need for students to have tools that allow them to practice computation, compared to theoretical notions.

4. Conclusions

In this work, an online Java Programming tutoring course was created and delivered through the Moodle platform, which allowed the students with learning difficulties to have an effective online tool to improve their computational skills and knowledge, overcoming the weakness and critical phases of their studies.

This was also possible thanks to the possibility of using video tutorials and carrying out specific online programming exercises.

Due to the lack of a tool to check the syntax quality of the code written by the students, we implemented a new software to achieve this goal. We therefore created a new Tool (Interactive Tutor) which performed a syntax analysis of the written code and, as a tutor, automatically provided feedbacks and advice to improve quality. This tool doesn't require the teacher intervention and speeds up the learning process.

The results reported in this work showed the effectiveness of the online tutoring course and a high level of students' engagement. The comparison between the clusters obtained and the measured success rate highlighted the impact that the course had in terms of passing the exam. Cluster 0, which consists of active students in the course, had a high success rate compared to the others equal to 69%. Cluster 1, that involved students with an average activity, had a lower exam pass rate of 55%, while Cluster 2, which includes students with low activity, had a percentage of 22% exam pass rate.

The quantitative analysis, carried out by processing the data extracted from the final questionnaire filled by the students, reported excellent feedbacks in the students' perception and satisfaction.

A future development of this work can consist in testing the effectiveness of the online course here designed for other university degree courses, to check the benefits also for students of different-topic courses. Furthermore, it could be important to improve the interactive online tutor by developing a new standard plug-in that easily allows the teacher to set the code criteria, to check the quality of the code and allows interoperability between different programming languages.

References

- Ambrósio A.P., Moreira Costa F., Almeida L, Franco A., Macedo J. (2011), Identifying Cognitive Abilities to Improve CS1 Outcome, 41st ASEE/IEEE Frontiers in Education Conference, Rapid City, SD, USA.
- Amendola D., Miceli C. (2016), Online Physics laboratory for University courses, *Journal of E-Learning and Knowledge Society*, 12(3), 75-85.
- Amendola D., Miceli C. (2018), Online peer assessment to improve students' learning outcomes and soft skills, *Italian Journal of Educational Technology*, 26(3), 71-84.
- Aşkar P., Davenport D. (2009), An investigation of factors related to self-efficacy for Java programming among engineering students, *The Turkish Online Journal of Educational Technology (TOJET)*, 8(1).
- Bishop C.M. (2006), *Pattern Recognition and Machine Learning*, Springer.
- Bovo A., Sanchez S., Héguy O., Duthen Y. (2013), Clustering Moodle data as a tool for profiling students, *Second International Conference on E-Learning and E-Technologies in Education (ICEEE)*, 121-126.

- Da Re L. (2018), Promoting the academic success: the Formative Tutoring between research and intervention in the experience of the University of Padua, 16(3), 185-199.
- De Santis A., Sannicandro K., Bellini C., Minerva T. (2021), Cluster analysis for tailored tutoring system. Q-TIMES WEBMAGAZINE, 3, 265-277.
- Di Battista D. (2005), The Immediate Feedback Assessment Technique: A Learner-centered Multiple-choice Response Form, The Canadian Journal of Higher Education, 25(4), 111-131
- Epstein M.L., Lazarus A.D., Calvano T.B., Matthews K.A., Hendel R.A., Epstein B.B., Brosvic G.M. (2002), Immediate Feedback Assessment Technique Promotes Learning and Corrects Inaccurate first Responses. Psychol Record 52, 187-201.
- Figueiredo J., García-Peñalvo F.J. (2020), Intelligent Tutoring Systems approach to Introductory Programming Courses, Eighth International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM'20), Association for Computing Machinery, New York, USA, 34-39.
- Figueiredo J., García-Peñalvo F.J. (2018), Building Skills in Introductory Programming, TEEM 2018,
- García-Peñalvo F.J. (2016), What Computational Thinking Is, Journal of Information Technology Research 9(3).
- Gerdes A., Juering J., Heeren B. (2012), An Interactive Functional Programming Tutor, ITiCSE'12, 250-255.
- Guelfi M.R., Masoni M., Shtylla J., Formiconi A.R., (2020) Utilizzo di un MOOC in un corso universitario: studio dell'impatto in termini di apprendimento e gradimento, Reports on E-Learning, Media and Education Meetings, 8(1), 166-171.
- Gusukuma L., Bart A.C., Kafura D., Ernst J. (2018), Misconception-Driven Feedback: Results from an Experimental Study, Proceedings of the 2018 ACM Conference on International Computing Education Research, 160-168.
- Hadjerrouit S. (2008), Towards a Blended Learning Model for Teaching and Learning Computer Programming: A Case Study, Informatics in Education, 7(2), 181-210.
- Hackeling G. (2014), Mastering Machine Learning with Scikit-Learn, Packt Publishing.
- Hattie J., Timperley H. (2007), The Power of Feedback, Review of educational research, 77(1), 81-112.
- Hawi N. (2010), Causal Attributions of Success and Failure Made by Undergraduate Students in an Introductory-Level Computer Programming Course, Computers & Education, 54(4), 1127-1136.
- Marwan S., Williams J. J., Price W.T. (2019), An Evaluation of the Impact of Automated Programming Hints on Performance and Learning, Proceedings of the 2019 ACM Conference on International Computing Education Research, 61-70.
- Nalli G., Amendola D., Perali A., Mostarda L. (2021), Comparative Analysis of Clustering Algorithms and Moodle Plugin for Creation of Student Heterogeneous Groups in Online University Courses, Applied Sciences, 11(13).
- Nalli G, Amendola D, Smith S. (2022), Artificial Intelligence to Improve Learning Outcomes Through Online Collaborative Activities, Proceedings of the 21st European Conference on e-Learning – ECEL 2022, 21(1), 475-479.
- Özmen B., Altun A. (2014), Undergraduate Students' Experiences in Programming: Difficulties and Obstacles, 5(3), 9-27.
- Richter T., Rudlof S., Adjibadji B., Bernlohr H., Gruninger C., Munz C.D., Stock A., Rohde C., Helmig R. (2012), ViPLab: A Virtual Programming Laboratory for Mathematics and Engineering, Interactive Technology and Smart Education, 9(4), 246-262.
- Robins A., Rountree J., Rountree N. (2010), Learning and Teaching Programming: A Review and Discussion, Computer Science Education, 13(2), 137-172.
- Shute V.J. (2008), Focus on Formative Feedback, Review of Educational Research, 78(1), 153-189.
- Tan J., Guo X., Zheng W., Zhong M. (2014), Case-based teaching using the Laboratory Animal System for learning C/C++ programming, 77, 39-49.
- Tan P., Ting C., Ling S. (2009), Learning Difficulties in Programming Courses: Undergraduates' Perspective and Perception, International Conference on Computer Technology and Development, 42-46.
- Vellido A., Castro F., Nebot A. (2011), Clustering Educational Data, Handbook of Educational Data Mining, 75-92.
- Wing J.M. (2006), Computational thinking, Communications of the ACM, 49(3), 33-35.

An Exploratory Study of Learner Characteristics, Perception of Interaction, and Satisfaction in Online Consumer Finance Courses

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Abstract

This study was conducted to investigate the effect of learner characteristics on online interaction, the relationship between online interaction and learner satisfaction, and variances in online interaction across different courses. Three types of online interaction were studied: learner-instructor interaction, learner-learner interaction, and learner-content interaction. To achieve the goals of this study, a survey was sent out to students enrolled in three online consumer finance courses at a large research university. Findings reveal that females rated the instructor-student interaction higher than males. Student-content interaction correlated the most with learner satisfaction. Learner-instructor and learner-learner interaction varied significantly among the three courses, while no statistical difference was found in learner-content interaction across the courses. This study provides insights for instructors, instructional designers, and administrators to implement and improve their design of different types of interaction in online course to enhance learner satisfaction and the quality of online courses.

KEYWORDS: Online Learning, Online Interactions, Consumer Finance, Learner Satisfaction, College Students.

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1. Introduction

Online education continues to grow quickly with an increasing number of enrollments each year worldwide (Allen & Seaman, 2013, 2016). The development of technologies (e.g., learning management systems and multimedia products) has become the driving force for the fast growth of this industry. At the time of this

article, institutions of learning had transitioned from face-to-face to online learning to keep students and faculty safe during the COVID-19 pandemic (Bruggeman et al., 2022; Hodges et al., 2020; Maitra & Jain, 2023; Tang et al., 2023; Zhou et al., 2020). Aside from the pandemic, convenience and flexibility are two main features that attract a large number of learners to online courses (Cole, Shelley & Swartz, 2014; Hodges et al., 2020; Li, 2022; Song et al., 2004). Learners often have a more flexible schedule when enrolling in online courses (Gosmire, Morrison, & Van Osdel, 2009; Martin, Xie & Bolliger 2022), allowing them to study the course materials and work on assignments at their preferred time and location.

However, several issues exist with online education, including the loss of face-to-face interaction with the instructor and fellow students (Bolliger & Halupa, 2012; Cole et al., 2014; Sher, 2009), feelings of isolation, and

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insufficient instructor support (Beaudoin, Kurtz & Eden, 2009; Bruggeman et al., 2022; Kurucay & Inan, 2017; Song et al., 2004; Sher, 2009). Additionally, difficulties and anxiety incurred in using technologies could cause negative online learning experiences (Bolliger & Halupa, 2012). All of these factors could lead to high dropout rates and low learner satisfaction in online education (Parker, 2013; Sher, 2009).

To evaluate the effectiveness of an online program, several key indicators have been identified: learner satisfaction, learner performance (e.g., grades), and learner attitude (Bolliger & Halupa, 2012; Ni, 2013). Learner satisfaction is defined as the learner's perception of the instructional quality of their learning experiences (Bolliger & Halupa, 2012; Kuo et al., 2014). Sher (2009) claimed that age, gender, language, and course experiences may affect student satisfaction. Another vital predictor of learner satisfaction is online interaction (Beaudoin et al., 2009; Kuo et al., 2014; Wanstreet, 2006). Online interaction is also a determining factor of the success of online learning (Jung et al., 2002; Picciano, 2002; Swan, 2002). Garrison, Anderson, and Archer (1999) and Parker (2013) believed that learning occurs through interaction. Appropriate design and implementation of interaction in online courses could lead to positive learning experiences (Beaudoin et al., 2009), including higher learner satisfaction (Beaudoin et al., 2009; Jung et al., 2002; Shea, Richardson & Swan, 2022; Swan, 2001, 2002) and increased motivation (Parker, 2013).

According to Kuo et al. (2014), learner satisfaction should be incorporated into evaluating online courses and improving online education programs by the instructors and administrators. Ke and Kwak (2013) pointed out that learner satisfaction can be analyzed in individual online courses as well as across academic programs. To evaluate the effectiveness of online consumer finance courses at a large research university, this study investigates the design of different types of interaction and their impact on learner satisfaction, providing insights for the design of future online consumer finance courses.

2. Literature Review

Online interaction is defined as computer-mediated two-way reciprocal communication that enables information exchange and social connection in an online learning environment (Wanstreet, 2006). Wagner (1997) presented a variety of interaction outcomes, including interaction 1) to increase participation, 2) to develop communication, 3) to receive feedback, 4) to enhance elaboration and retention, 5) to support learner control/self-regulation, 6) to increase motivation, 7) for negotiation of understanding, 8) for team building, 9) for discovery, 10) for exploration, 11) for clarification of understanding, and 12) for closure.

Moore (1989) proposed three types of interaction: learner-instructor interaction, learner-learner interaction, and learner-content interaction. Different from traditional education where the interaction between the learner and instructor takes place in a physical setting (e.g., classroom or office), interaction in online education occurs via a learning management system, email, or other digital platforms. Online learners communicate with the instructor and their peers using a variety of technologies, including video chat, instant messenger, social media, and other tools. Interactive learning materials could also be created to provide instant feedback based on learner input information. Swan (2004) mapped learner-learner interaction with social presence, learner-instructor interaction with teaching presence, and learner-content interaction with cognitive presence according to the community of inquiry model (Garrison et al., 1999; Shea, Richardson & Swan, 2022).

Many empirical studies have been conducted to investigate the effects of different types of interaction on learner satisfaction. When instructor-learner interaction and learner-learner interaction were examined in online courses, both factors were identified as significant in affecting learner satisfaction (Ke & Kwak, 2013; Sher, 2009). However, when learner-content interaction was considered or implemented in the experiments, learner-learner interaction was identified as least associated with learner satisfaction or had no influence on learner satisfaction (Bordelon, 2015; Kuo et al., 2013; Kuo et al., 2014; Kuo & Belland, 2016; Marks, Sibley & Arbaugh, 2005). Regarding the most significant interaction predictor for learner satisfaction, some studies reported instructor-learner interaction was the strongest predictor (Gabrielle, 2001; Marks et al., 2005). In contrast, others found that learner-content interaction correlated the most with learner satisfaction (Kuo et al., 2013; Kuo et al., 2014; Kuo & Belland, 2016; Strachota, 2003).

3. Methodology

This study was conducted to investigate different types of online interaction (e.g., learner-instructor interaction, learner-learner interaction, and learner-content interaction) and learner satisfaction in online consumer finance courses. A mixed-method research approach was implemented to collect both quantitative and qualitative data. The findings concluded from this study provide feedback for instructors, designers, and administrators to make decisions that improve interaction design in online courses and enhance the quality of online programs.

3.1 Research questions

1. How do learner characteristics relate to different types of interaction, including learner-instructor

- interaction, learner-learner interaction, and learner-content interaction?
2. To what extent do those three different types of interaction affect learner satisfaction?
 3. Is there any difference among the three types of interaction in the three online consumer finance courses?

3.2 Data collection

A survey was distributed to a total of 122 students who were enrolled in three online consumer finance courses: *Consumer Rights* with 82 enrolled students, *Housing and the Consumer* with 32 students, and *Resource Management* with 16 students. Four of the 122 students enrolled in two courses, while two students enrolled in all three courses. The survey questions focus on learner demographics (e.g., age, gender, and ethnicity), learner-content interaction (cognitive presence), learner-instructor interaction (teaching presence), learner-learner interaction (social presence), and learner satisfaction. Students were asked to indicate their agreement with the following statements in the survey, such as “The instructor gives feedback on course submissions” (teaching presence), “Collaborating with other students as part of group assignments or discussions” (social presence), and “Interactive assignments are presented in the class” (cognitive presence). Open-ended questions were also created to collect additional feedback about the courses. The Cronbach’s coefficient alpha values as shown in Table 1 were calculated to acquire the reliability information for three types of online interaction and learner satisfaction.

Variables	Scale	Number of items	Reliability (Cronbach’s alpha)
Learner-instructor	6-point likert scale	4	0.82
Learner-student interaction	6-point likert scale	4	0.88
Learner-content interaction	6-point likert scale	3	0.75
Learner Satisfaction	5-point likert scale	5	0.74

Table 1 - Instrument Reliability.

3.3 Participants

The majority of online students enrolled in those three courses were Caucasian (76.9%), followed by African American/Black (10%), Asian (8.5%), Hispanic (3.8%), and other (0.8%). Forty-nine percent of the students were male, and 51% were female. The youngest student was 18 and the oldest student was 26, whereas most of the students were between the age of 19-22 years old.

3.4 Data analysis

Survey data was analyzed using statistical software SPSS. ANOVA and Pearson correlation were adopted to investigate the research questions. In addition, content analysis was performed to analyze students’ answers to open-ended questions. The authors of this paper examined the answers independently and checked each other’s codes afterwards.

4. Findings

4.1 Descriptive statistics

The statistical results showed that students rated learner-content interaction the highest among those three types of interaction with a mean score of 4.50 (SD=1.03), followed by learner-instructor (M=4.26; SD=1.07), and then learner-learner interaction (M=3.15; SD=1.18) based on a scale of 6. The average score of learner satisfaction in taking online courses is 3.94 (based on a scale of 5).

4.2 Learner characteristics and interaction

One-way ANOVA was used to examine the relationship between learner characteristics and interaction. Statistical results show that age and ethnicity had no effect on the three types of interaction; however, gender was linked to learner-instructor interaction.

4.3 Gender and interaction

The results shown in Table 2 indicate that gender relates closely with learner-instructor interaction ($p < .05$). The average rating on learner-instructor interaction by female participants is 4.46, whereas the average score for learner-instructor interaction for male is 4.05. In contrast, there is no significant difference between male and female regarding the ratings for learner-learner and learner-content interactions.

	Male		Female		F
	M	SD	M	SD	
Learner-instructor interaction	4.05	1.15	4.46	0.95	4.98*
Learner-learner interaction	3.28	1.11	3.03	1.24	1.48
Learner-content interaction	4.46	1.05	4.55	1.02	0.22

* $p < .05$

Table 2 - Gender and instructor-student interaction.

4.4 Interaction and learner satisfaction

Pearson correlation was utilized to identify the relationship between the three types of interaction and learner satisfaction. As shown in Table 3, the results

indicate that learner-content interaction is highly correlated with learner satisfaction ($r = .257, p < .01$). The higher students rated the learner-content interaction, the more satisfied they were with taking online courses. Learner-learner interaction and learner-instructor interaction did not have a significant relationship with learner satisfaction.

	Learner-instructor	Learner-learner	Learner-content	Satisfaction
Learner-instructor	–	.425**	.369**	.148
Learner-learner		–	.398**	.123
Learner-content			–	.257**
Satisfaction				–

Table 3 - Correlation between interaction and learner satisfaction.

To answer the third research question: Is there any difference among the three types of interaction in the three online consumer finance courses? One-way ANOVA was adopted to examine if differences exist in learner-instructor interaction, learner-learner interaction, and learner-content interaction among the three courses. The means and differences are displayed in Figure 1.

As Figure 1 shows, the three types of interaction vary among the courses, which are represented by the average scores. There are statistically significant differences between learner-instructor interaction ($F=4.07, p < .05$) and learner-learner interaction ($F=3.50, p < .05$). No statistically significant difference in learner-content interaction is found across those three courses.

4.5 Learner Feedback on Interaction

Learners were also asked to comment on the interaction design of the course in the open-ended questions of the survey.

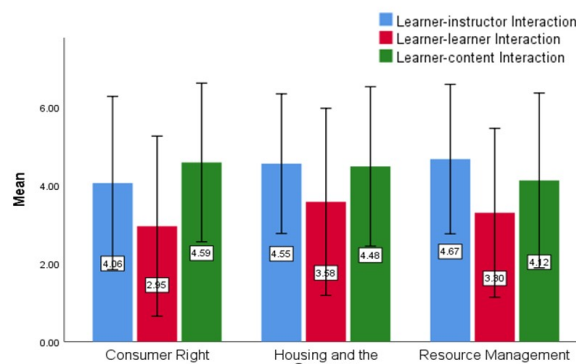


Figure 1. Interaction in three online courses.

The responses from the participants have been analyzed and presented based on the types of interaction.

Table 4 shows examples of quotes from the participants according to the three types of interaction. Learner responses indicate that participants prefer to have more learner-learner and learner-content interactions in an online course.

Discussion forum was used as the online platform for learner-learner interaction. According to participants who answered the question on their interaction preference, about 30 participants (24.39%) prefer to interact with their peers, while approximately 31 participants (25.20%) like the learner-content interaction the most. Eighteen participants (14.63%) prefer to have more interaction with the instructor.

In addition to reflecting on their experience of interacting with the instructor, peers, and course content, the learners reported on other experiences and provided suggestions for future course design including setting reminders, using projects to showcase course work, and providing live lectures periodically.

Learner- Instructor	Learner-Learner	Learner-Content
<p>“I think the most important aspect of online learning is when the instructor communicates often/responds often. Online classes almost feel more personal this way (if the instructor sends info/feedback/encouragement often) as with in-person classes issues get pushed to office hours or you HAVE to ask a question in front of the entire class....”</p> <p>“Teachers who respond quickly helps you feel engaged in the class”</p>	<p>“Talking with classmates about class topics broadens the horizon of how I think about the subject matter.”</p> <p>“We have more discussions in my online class compared to my other classes.”</p> <p>“I think an online class can be more engaging when students have to respond to other students discussion questions.”</p>	<p>“The narrated slides are very helpful.”</p> <p>“When watching recorded lectures is better for note taking because you can pause the video if the instructor talks too fast or rewatch it multiple times if the concept isn’t coming across too well.”</p> <p>“Online classes are more engaging to me when I have lecture videos to watch.”</p> <p>“The material is all presented in front of you, so it is easy to access and look back on.”</p>

Table 4 - Learner Feedback on Interaction Experiences in the Consumer Finance Courses.

5. Discussion and Conclusions

Gender was the only learner characteristic identified as influencing learner interaction in this study. Females rated learner-instructor interaction higher than males; this may be interpreted as females viewing learner-instructor interaction as more important in their learning process. According to Kuo and Belland (2016), age had an impact on learner-instructor interaction. However, participants in their studies had a wide age range, from 18 to above 56 years old. In contrast, no relationship was identified between age and learner satisfaction in this study; this may be because participants in this study were within a narrow age range (18 to 26 years old). Unlike Kwak's (2013) study indicating that minority status influenced learner-instructor interaction, the findings from this study showed that ethnicity had no effect on learner perception of the three types of interaction. Other learner characteristics not included in the current study (e.g., previous online learning experiences, education level, and instructor characteristics) may affect the interaction in addition to race. Future research could be conducted to investigate the effects of a particular variable on interaction while controlling other variables.

Despite learner-content interaction being fundamental in distance education, research on learner-content interaction has received far less attention in comparison to learner-learner and learner-instructor interaction (Xiao, 2017). The improvement in learner-content interaction design in online courses could enhance learner satisfaction (Kuo et al., 2014; Tzeng et al., 2022); thus, instructors and designers should spend more effort designing the content to improve learner satisfaction in online courses. Learner-content interaction correlated the most with learner satisfaction, whereas learner-instructor interaction and learner-learner interaction had no statistically significant effect on learner satisfaction.

One reason why the learner-content interaction is the most important factor for learner satisfaction is because high-quality and well-designed content is more effective for student learning. The three courses used in this study were initially taught face-to-face (F2F) and provided an opportunity for instructors to work with the university's instructional designers to convert the F2F course to an online course. The instructors worked with instructional designers and attended a two-and-a-half-day workshop session on course design. Instructors attended a workshop session and then worked with an instructional designer weekly to redesign or design their course into an online course. Instructional designers met to review courses, provided group feedback on the particular course, and decided if the courses met the university standards. Instructional designers met with instructors to determine if, among other things, the course activities, assessments, and content aligned with the objectives and to ensure that the course was designed to meet accessibility and universal design principles. Instructors were also provided with an opportunity to showcase

their courses to the university at an online course showcase event.

The three courses were well-designed, and all three included a variation of narrated PowerPoints and/or content videos highlighting key points in each course.

Although this study's findings are beneficial for administrators at academic institutions, online instructors, and online course developers, there are a couple of limitations worth noting.

First, the sample size was taken from one department at a large public university, limiting the generalizability of these results. In the future, the sample size could be expanded to include more disciplines and online instructional techniques. The use of larger samples of students, including undergraduate and graduate students, may help uncover more preferences and insights on the three learning interactions explored in this study. Second, the reliability could be improved. The questionnaire will be further refined based on published research and on feedback from focus groups and academic professionals to improve the reliability (Cronbach's Alpha value) of the items in the survey.

In light of the COVID-19 pandemic, systemic changes may have occurred in educational settings that may affect this study's results. A similar study could be conducted after the pandemic so that the results could be compared. The study's findings corroborate what the authors believe to be effective strategies and techniques to improve the design of different types of interactions in online courses to enhance learner satisfaction and the quality of online courses.

References

- Allen, I. E., & Seaman, J. (2013). *Changing Course: Ten Years of Tracking Online Education in the United States*. Sloan Consortium. PO Box 1238, Newburyport, MA 01950.
- Allen, I. E., & Seaman, J. (2016). Online Report Card: Tracking Online Education in the United States. *Babson Survey Research Group*.
- Beaudoin, M., Kurtz, G., & Eden, S. (2009). Experiences and opinions of e-learners: What works, what are the challenges, and what competencies ensure successful online learning. *Interdisciplinary Journal of E-Learning and Learning Objects*, 5(1), 275-289.
- Bolliger, D. U., & Halupa, C. (2012). Student perceptions of satisfaction and anxiety in an online doctoral program. *Distance Education*, 33(1), 81-98.
- Bordelon, K. (2015, April). Perceptions of achievement and satisfaction as related to interactions in online courses. *In Global Learn* (pp. 232-239). Association for the Advancement of Computing in Education (AACE).

- Bruggeman, B., Garone, A., Struyven, K., Pynoo, B., & Tondeur, J. (2022). Exploring university teachers' online education during COVID-19: Tensions between enthusiasm and stress. *Computers and Education Open*, 3, 100095.
- Cole, M. T., Shelley, D. J., & Swartz, L. B. (2014). Online instruction, e-learning, and student satisfaction: A three year study. *The International Review of Research in Open and Distributed Learning*, 15(6).
- Gabrielle, D. M. (2001). Distance learning: An examination of perceived effectiveness and student satisfaction in higher education. In *Society for Information Technology & Teacher Education International Conference* (pp. 183-188). Association for the Advancement of Computing in Education (AACE).
- Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2), 87-105.
- Gosmire, D., Morrison, M., & Van Osdel, J. (2009). Perceptions of interactions in online courses. *MERLOT Journal of Online Learning and Teaching*, 5(4), 609-617.
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*, 3.
- Jung, I., Choi, S., Lim, C., & Leem, J. (2002). Effects of different types of interaction on learning achievement, satisfaction, and participation in web-based instruction. *Innovations in Education and Teaching International*, 39(2), 153-162.
- Ke, F., & Kwak, D. (2013). Online learning across ethnicity and age: A study on learning interaction participation, perception, and learning satisfaction. *Computers & Education*, 61, 43-51.
- Kuo, Y. C., Walker, A. E., Belland, B. R., & Schroder, K. E. (2013). A predictive study of student satisfaction in online education programs. *The International Review of Research in Open and Distributed Learning*, 14(1), 16-39.
- Kuo, Y. C., Walker, A. E., Schroder, K. E., & Belland, B. R. (2014). Interaction, Internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses. *The Internet and Higher Education*, 20, 35-50.
- Kuo, Y. C., & Belland, B. R. (2016). An exploratory study of adult learners' perceptions of online learning: Minority students in continuing education. *Educational Technology Research and Development*, 64(4), 661-680.
- Kurucay, M., & Inan, F. A. (2017). Examining the effects of learner-learner interactions on satisfaction and learning in an online undergraduate course. *Computers & Education*, 115, 20-37.
- Li, D. (2022). The shift to online classes during the COVID-19 pandemic: Benefits, challenges, and required Improvements from the students' perspective. *Electronic Journal of E-Learning*, 20(1), 1-18.
- Maitra, R., & Jain, S. (2023). Judging the resilience of online learning for hospitality courses during COVID-19. In *Crisis Management, Destination Recovery and Sustainability* (pp. 137-149). Routledge.
- Marks, R. B., Sibley, S. D., & Arbaugh, J. B. (2005). A structural equation model of predictors for effective online learning. *Journal of Management Education*, 29(4), 531-563.
- Martin, F., Xie, K., & Bolliger, D. U. (2022). Engaging learners in the emergency transition to online learning during the COVID-19 pandemic. *Journal of Research on Technology in Education*, 54(sup1), S1-S13.
- Moore, M. G. (1989). Editorial: Three types of interaction. *American Journal of Distance Education*, 3(2), 1-7.
doi:10.1080/08923648909526659
- Ni, A. Y. (2013). Comparing the effectiveness of classroom and online learning: Teaching research methods. *Journal of Public Affairs Education*, 19(2), 199-215.
- Parker, R. E. (2013). Interaction Considerations. In *Redesigning Courses for Online Delivery: Design, Interaction, Media & Evaluation* (pp. 45-80). Emerald Group Publishing Limited.
- Picciano, A. G. (2002). Beyond student perceptions: Issues of interaction, presence, and performance in an online course. *Journal of Asynchronous Learning Networks*, 6(1), 21-40.
- Shea, P., Richardson, J., & Swan, K. (2022). Building bridges to advance the community of inquiry framework for online learning. *Educational Psychologist*, 57(3), 148-161.
- Sher, A. (2009). Assessing the relationship of student-instructor and student-student interaction to student learning and satisfaction in Web-based online learning environment. *Journal of Interactive Online Learning*, 8(2).
- Song, L., Singleton, E. S., Hill, J. R., & Koh, M. H. (2004). Improving online learning: Student perceptions of useful and challenging characteristics. *The Internet and Higher Education*, 7(1), 59-70.

- Swan, K. (2001). Virtual interaction: Design factors affecting student satisfaction and perceived learning in asynchronous online courses. *Distance Education*, 22(2), 306-331.
- Swan, K. (2002). Building learning communities in online courses: The importance of interaction. *Education, Communication & Information*, 2(1), 23-49.
- Swan, K. (2004). Relationships between interactions and learning in online environments. *The Sloan Consortium*, 1-6.
- Strachota, E. M. (2003). *Student satisfaction in online courses: An analysis of the impact of learner-content, learner-instructor, learner-learner, and learner-technology interaction* (pp. 1-244). The University of Wisconsin-Milwaukee.
- Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., Aldhaeabi, M., & Bamanger, E. (2023). Efficiency of flipped classroom with online-based teaching under COVID-19. *Interactive Learning Environments*, 31(2), 1077-1088.
- Tzeng, J. W., Lee, C. A., Huang, N. F., Huang, H. H., & Lai, C. F. (2022). MOOC evaluation system based on deep learning. *International Review of Research in Open and Distributed Learning*, 23(1), 21-40.
- Wagner, E. D. (1997). Interactivity: From agents to outcomes. *New Directions for Teaching and Learning*, 1997(71), 19-26.
- Wanstreet, C. E. (2006). Interaction in online learning environments: A review of the literature. *Quarterly Review of Distance Education*, 7(4), 399.
- Xiao, J. (2017). Learner-content interaction in distance education: The weakest link in interaction research. *Distance Education*, 38(1), 123-135.
- Zhou, L., Wu, S., Zhou, M., & Li, F. (2020). 'School's out, but class' on', The largest online education in the world today: Taking China's practical exploration during the COVID-19 epidemic prevention and control as an example. *But Class' On', The Largest Online Education in the World Today: Taking China's Practical Exploration During The COVID-19 Epidemic Prevention and Control As an Example (March 15, 2020)*.

Learning contradictions: does student social interaction occur in the middle of e-Learning?

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Abstract

During the period of the Covid-19 pandemic, distance learning is known to provide new numerous opportunities, in the interaction patterns between learning actors, in Indonesia. The inter-group competitive and collaborative learning methods have also been identified as options for increasing interaction, by paying attention to students' self-concepts. Based on being quantitative explanative, this research aims to determine the influence of both learning methods and the role of students' self-concept, on the interactions between members and groups. This research used non-parametric quantitative methods so moreover, 62 students were selected and divided into 2 classes, namely the control and experimental groups, each with 38 & 24 respondents, respectively. To determine the effect of competitive and collaborative methods between groups, as well as self-concept on students' social interactions, the authors use a two-way ANOVA test. The results showed that there was an influence of using collaborative learning methods on students with low self-concept towards their social interactions. However, there was no influence of students' self-concept toward their social interactions.

KEYWORDS: Collaborative Methods, Inter-Group Competitive, Self-Concept, Social Interaction.

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1. Introduction

The pandemic caused by the Corona virus (Covid 19) has reportedly brought extraordinary changes in all life sectors, including the education field. The learning process activities before the pandemic are carried out face-to-face, however, since the inception of the global disease, all process of education has been shifted online, as a form of preventing the spread of the Coronavirus (Rook, 2020). The consequences of implementing collaborative learning are found to be disturbed, due to involving peer interaction, in order to achieve project objectives as a current need in the context of higher education in Indonesia. Based on being unable to communicate and cooperate directly, technology media as a means of interaction and learning are observed to be

needed. According to Aparicio et al., (2016), E-Learning is a technology, which served as a medium or means used during educational processes. There are several considerations that helped in determining the successful usage of e-Learning in the educational sector. These includes the existence of a mindset, as well as motivation and commitment from learning actors, in order to willingly carry out online collaborative learning (García-Valcárcel & Mena, 2016). According to Santosa & Degeng (2020), using E-Learning was potentially a means to collaborate, discuss, as well as exchange information and knowledge between the educators involved. The self-concept perspective of students with online WIL (Work-Integrated Learning), also observed positive conditions in completing projects, adaptability, flexibility, and resilience (Lindgren & Suter, 1967; Manis, 1955).

Based on the idea of increasing peer collaboration, which is considered as the limitation of e-Learning, this research aims to examine the influence of interaction-based learning and students' self-concept, in a bid to improve the level of social interaction, as well as complete independent project studies while undergoing online education. This model supports the opinion that the learning process is lifelong, as the educational goals

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does not only focus on gaining value. This indicates that it also develops social interaction as a skill for students, in order to be better prepared in confronting the challenges of the 21st century (Di et al., 2020).

1.1 Interaction based e-Learning

in conveying information, latest news, and learning content. Advances in communication technology, such as LMS (Learning Management System) and cellular systems, have been found to easily encourage interaction, both with lecturers and peers (Shirin et al., 2017). In the technology 4.0 era, advances in internet and communication technology reportedly eased educators, in order to offer dynamic multi-media resources to their students (Sitompul, 2019). Based on being in line with the role of technology, pedagogical models and educational strategies, distance or online learning is also part of the e-Learning concept (Dabbagh & Bannan-Ritland, 2005; Maudiarti, 2018).

Furthermore, cooperation-based methods, such as collaborative and competitive inter-group learning, are interaction-oriented models with the aim to improve students' educational outcomes and social aspects. Moreover, both are observed to have similarities in emphasizing interaction and communication. According to Hussin et al. (2019), Johnson & Johnson (1989), Le et al. (2018), Panitz (1999), and Sarwar et al. (2019), collaborative learning was interpreted as a set of teaching strategies, which encouraged students to actively participate in acquiring knowledge through dialogues, interactions, and feedbacks within their groups, via the traditional and online learning environments. Also, in the studies of Respati (2018) and Susilowati et al. (2019), four assumptions were observed, namely,

1. Learning is when an individual is actively involved in acquiring knowledge about a material,
2. Learning depends on the context being studied,
3. Students have differences, both in terms of background, learning style, experience, and character,
4. Learning is a social activity, due to containing interactions and communications, in order to form understanding and meaning that are possibly accepted by all parties involved in the educational process.

Therefore, the essence of the collaborative learning method is basically carried out in groups, as well as working together to achieve one goal.

According to Deutsch (1949) and Homans (1961), inter-group competitive learning is more motivating, due to a higher sense of belonging to the group, although there are similarities in emphasizing interaction and communication. This in turn encourages the presence of high competition between groups. According to Bornstein et al. (2002), Goldman et al. (1977), Julian & Perry (1967), there were 4 (four) indicators that were formulated in inter-group competitive learning, namely,

1. Learning is conducted in groups, in order to achieve one goal,
2. Learning do not have inter-group dependence,
3. There are competitions between groups, in order to be the best,
4. Competition has been defined as a social situation, where an individual's performance is superior to others, with one of them emerging as the winner.

Based on this understanding, a collaboration-based learning approach that emphasized interaction in e-Learning, emerged as an interesting subject to study. The extent to which students have sufficient requirements to observe themselves as well as have the will to learn in groups through different inter-group methods, are also found to determine their level of social interaction. Therefore, it is necessary to have students' understanding, adequate facilities, and complete guidelines that are related to technological aspects, as collaboration is stated to run optimally (Yadegaridehkordi et al., 2019).

1.2 Self Concept

One of the factors found to influence interaction and communication in learning is the students' self-concept. According to Suryanto et al. (2012), self-concept was defined as a belief about the inherent attributes in an individual, which were obtained through self-perception, reflection, or social comparison. Based on Lindgren & Suter (1967) and Manis (1955), the self-concept formed due to interactions between individuals and beliefs about themselves, was appropriate or valid because of others' confirmation and agreement. This was in line with the studies of Diswantika (2019) and Nurvinta (2017), which stated that there was a positive relationship between self-concept and social interaction.

Meanwhile, when associated with cooperative learning, Garshasbi et al. (2017), found that through this model, increased belief as a self-concept had an influence on students' self-efficacy, as well as the potential for achieving educational goals. Therefore, this emphasized the importance of students' self-concept playing a role with a cooperative learning model.

The students' perspectives in the WIL transferred online, also showed results that provided opportunities for independent and innovative creative works, as well as the adaptability and flexibility in taking risks, which in turn led to the construction of their own abilities (Hodges & Martin, 2020). Research by Hodges and Martin (2020) ultimately showed that the right students' perspective provided the potential to complete online WIL, which needed development, considering the fact that the virtual learning process is likely to become an increasing alternative. Therefore, WIL is observed to be a process, which includes formal and informal learning, that occurred in the wider work world. However, the difference is that the learning is planned, as it also has the ability to achieve certain outcomes from the higher education framework being offered (Fergusson et al., 2021).

1.3 Self Concept

According to Negara et al. (2019), social interaction is the relationship between individuals, where they are observed to influence and classify each other, according to character, form, and level (Kristanto, 2020). When viewed according to the character, social interaction is divided into three parts, namely interactions between individuals, groups, as well as both (individual & group). However, when viewed according to its form, social interaction is divided into two parts, namely positive and negative with interaction patterns, leading to the formation of good cooperation and competition (dispute or conflict), respectively.

In the context of online WIL with the SCL (Student Centered Learning) approach developed by Rook and McManus (2020), it was precisely emphasized that learning development needs to be designed, in order to produce interpersonal relationships between students, in an environment of mutual trust. This was suggested by Rock and McManus (2020), through the synchronous and asynchronous increase of teachers' attendance, discussion opportunities, and current event content, which encouraged students to discuss and debate, in order to formulate the solutions.

Also, it is clear that social interaction between students, which is understood as one of the final concepts of the WIL learning model, is an important part that needs to be measured. This was in line with Kristanto (2020), which stated that the teaching process as an interaction, involved a complex procedure between learning actors, which in turn was observed to cause a positive dependence.

In the control class, students are given discussion materials with themes related to the importance of ethics in doing business, especially in taking advantage and relationships with related parties based on the values of virtue that apply in society. In obtaining material for the discussion, they can seek from various sources either through direct interviews with the business person, or from online media such as You Tube. They compete between groups to defend their respective opinions. The form for group assignment output used in the midterm exam is in the form of a Contextual Business Ethics Project Proposal and for the results of the assessment at the end of the semester in the form of a Portfolio of Group Results & Individual Reflections and peer review data from peers / the public.

In the experimental class, the theme of the discussion that will be used as study material is everything related to entrepreneurship. The groups collaborate to find sources of knowledge about entrepreneurship, and they can get it through interviews, social media, or other means.

The basis for the assessment carried out during the midterm and end of semester exams is the team's Business Plan Presentation Video (+/- 8 minutes), peer review data from colleagues / the public and the Log Book Group. However, at the end of the semester, they

must upload a track record of achieving progress on social media.

2. Purpose and hypothesis

The measurement level of the result differences on student social interaction achievement between inter-group learning methods (collaborative & competitive), is a follow-up to the importance of an SCL-based model, which is to be applied in the online WIL platform. This certainly had theoretical and practical implications on the practice of implementing online WIL, for higher educational context.

Therefore, the problem formulation in this research is to examine the influence of the interaction-based e-Learning model and self-concept, towards students' social interaction in independent project-based learning. The research questions are as follows:

H1: Is there a significant difference between the students' social interactions with the collaborative and competitive e-Learning models?

H2: Is there a significant difference between the students' social interactions with high and low self-concepts?

H3: Is there a significant interaction between the interaction-based e-Learning model and self-concept with students' social interactions?

3. Method

3.1 Design and variables

This research is a quasi-quantitative experiment, which compared the experimental and control classes. In order to ensure that this research used a collaborative learning approach based on group interaction, the two classes were conditioned to have groups that performed equally. This group formations in both types of classes were carried out using the material test measurements. Based on this test result, these groups in the control class and experimental class were formed from students whose study outcomes complemented each other. Therefore, each group had almost even performances, with an average size of four to five people.

The experimental and control classes with five & nine groups, respectively, were then ready to measure their high and low self-concept. Also, they were provided with an online pre-test, which is used to measure the social interaction level (O1 and O3). Additionally, these online interactions were certainly experienced by each individual. Therefore, online interaction learning was reportedly used in the middle of the semester before this experimental research was carried out. This was found to allow group formation and online pre-testing of social interactions to be conducted. In the middle of the next semester, the experimental and control classes were to be provided with collaborative and competitive e-

Learning treatments (X1 & X2), as an online WIL application, respectively. At the end of the semester when the independent projects carried out by the groups were over, both classes underwent a post-test, in order to measure their social interaction level (O2 and O4). The complete procedure of this research is illustrated in Table 1. Based on this research design, there were three variables involved, namely,

1. Independent variables: This includes collaborative and competitive e-Learning.
2. Moderate variables: This includes the high and low student self-concept.
3. Dependent variable: This includes the students' social interaction.

3.2 Participants

The participants were the higher education students at Widya Kartika University, Surabaya, Indonesia. Moreover, a total sample of 62 students that took the Bachelor of Management and Business Study Program in the 5th semester of the 2020/2021 period, were selected for the research. A cluster sampling technique was also used, due to the consideration of class willingness as an object of online WIL experiment, for both the experimental and control groups (Creswell, 2009).

Furthermore, based on the formula of Federer (1967), the sample size selection still met the following rules:

$$(t - 1)(n - 1) > 15$$

where t & n = number of treatments and participants, respectively.

The details of the research sample are given in Table 2.

4. Results and Discussion

4.1 Instrument test results

The self-concept and social interaction instruments consisting of 16 & 17 indicators, were observed to have produced 11 & 10 variables, respectively, as shown in Table 3.

4.2 Description of research variables

In this research, a class description was obtained when measuring the self-concept variable, as shown in Table 4. The total sample of the male students was observed to be 63% (39) more than the females, which was at 37% (23). This number consists of male students who have low self-concept as much as 15% (9), and those who have high self-concept as much as 48% (30), meanwhile for female students who have low self-concept as much as 13% (8), and those who have low self-concept high self as much as 24% (15). However, the sample with high self-concept was 72% (45) more than those that were low, which was at 28% (17).

In this study, to measure the social interaction of students, the authors used the Linkert scale with a score of 5. Tests for measuring social interaction were carried out twice, namely during the pre-test and post-test.

The lowest pre-test score for the control class was 2.1 and the highest score was 4.3, while for the experimental class the lowest score was 2.7 and the highest score was 4.2.

Group	First Middle Week of Semester			Second Middle Week of Semester							
	1-5	6-7	8	9	10	11	12	13	14	15	16
Experiment	Familiarity with e-Learning interactions	Material Test & Group Forms	Measurement of Self-Concept	O1	Collaborative e-Learning (X1)						O2
Control				O3	Competitive Inter-group e-Learning (X2)						O4

Table 1 - Research procedures.

Group	Model	Class	Students
Experiment	Collaborative e-Learning (X1)	Entrepreneurship and Business Management	24
Control	Competitive Inter-group e-Learning (X2)	Business Ethics	38
Total sample			62

Table 2 - Number of Research Samples.

Variable	Indicator	Spearman ρ	α (if item deleted)	α Total
Self-Concept	1 Good assessment of course material	0.517*	0.741	0.757
	2 Understand the lecture material compared to others	0.705***	0.716	
	3 Trying to find course material by yourself	0.431*	0.751	
	4 Have no difficulty in understanding the material	0.661***	0.723	
	5 Able to do a good job	0.586**	0.734	
	6 Able to understand assignments well	0.711**	0.718	
	7 Have high aspirations	0.421*	0.745	
	8 Trying hard to make things happen	0.421*	0.745	
	9 Feeling that people like me	0.558**	0.736	
	10 Feeling useful for many people	0.553**	0.735	
	11 Feeling accepted when in a group	0.503*	0.738	
Social Interaction	1 Have lots of friends	0.547**	0.697	0.714
	2 Easy to get along	0.441*	0.693	
	3 Understand the feelings of friends	0.707***	0.693	
	4 Respond to criticism	0.517**	0.697	
	5 Easy to adapt	0.419*	0.694	
	6 Understand other people's judgments	0.726***	0.698	
	7 Help a friend	0.505*	0.700	
	8 Be sensitive to other people's feelings	0.503*	0.699	
	9 Socialization ability	0.610**	0.684	
	10 Break up disputes	0.561**	0.693	

Note. *p < .05, **p < .01, ***p < .001

Table 3 - Test results of research instruments.

The results during the post test the lowest score for the control class was 2.3 and the highest score was 4.7, while in the experimental class, the low score obtained was 2.1 and the highest score was 4.9.

Based on the comparison of the mean scores in the two classes, the description related to the achievement of the

social interaction variable results also showed that there was a difference between the pre and post tests, as illustrated in Table 5. In the pre-test condition, there was almost no significant difference in the mean scores between the control and experimental classes, with just slight contrasts observed. However, in the post-test stage, it was found that the conditions for improvement was obtained on the results of the mean score, which was observed in the experimental class. Even though the difference in this stage's (post-test) mean score between the experimental and the control classes reached 0.16, it was still higher than that of the pre-test.

Variable	Gender		Total Sum (%)
	Male Sum (%)	Female Sum (%)	
Low Self Concept	9 (15%)	8 (13%)	17 (28%)
High Self Concept	30 (48%)	15 (24%)	45 (72%)
Total	39 (63%)	23 (37%)	62 (100%)

Table 4 - Distribution of Research Samples based on Sum of Gender and Self-Concept Variables.

Social Interaction Variables	Mean		Mean Difference
	Control Class	Experiment Class	
Pre-test	3.32	3.47	0.15
Post-test	3.59	3.75	0.16

Table 5 - Mean comparison of the social interaction variables.

4.3 Anova test results

Furthermore, the normality and homogeneity of data requirements should be met before the ANOVA or independent comparison analysis of social interaction variables. The normality test was observed to use the Shapiro Wilk with a significance value greater than 0.05, resulting in the outcome stating that the data were found to be normally distributed. Meanwhile, the Levene test that showed a significance value greater than 0.05, indicated that all data were homogeneous. Based on the initial test results, the data were found to be normally distributed and homogeneous during the pre and post test conditions, therefore, resulting in the continuity of the Anova analysis.

Homogeneity of Variances Test (Levene's)				
	F	df ₁	df ₂	p
Pre Test	0.0711	3	58	0.975
Post Test	0.504	3	58	0.681

Table 6 - Homogeneity tests.

Based on Table 6, the Levene’s Test of Error Variance Equality showed that the results of the pre and post test P-values were 0.975 & 0.681, respectively. Due to both P-values found to be greater than $\alpha = 0.05$, the data variants were then assumed to be similar or accepted (Suyanto, 2009). Therefore, this showed that the population variants were similar. Meanwhile, the results of the normality analysis also showed that both pre and post test P-values were greater than $\alpha = 0.05$, at 0.359 and 0.123, respectively (see table 7). Therefore, the data from the population were found to be normally distributed and accepted Suyanto, (2009).

Test of Normality (Shapiro-Wilk)		
	Statistic	p
Pre Test	0.979	0.359
Post Test	0.969	0.123

Table 7 - Normality tests.

Additionally, the calculation of statistical analysis was carried out via the two-way Anova test. The first and second ANOVA tests were both conducted, in order to measure the influence of self-concept towards students’ social interactions, before and after the interaction-based e-Learning treatments were to be carried out, respectively.

	Sum of Squares	df	Mean Square	F	p
Overall model	4.535	3	1.512	2.74	0.051
LEARNING METHODS	1.459	1	1.459	4.05	0.049
SELF CONCEPT	0.522	1	0.522	1.45	0.234
LEARNING METHODS * SELF-CONCEPT	2.554	1	2.554	7.09	0.010
Residuals	20.909	58	0.360		

Table 8 - Anova - Post Test Social Interactions.

The results of the Post-Hoc Test in Table 9 also some of the things below:

1. The P-value for comparison between students with low and high self-concepts in the competitive group was 0.582 ($> \alpha = 0.05$). This showed that there was no difference in social interaction, between students with low and high self-concepts in this group.
2. The P-value for comparison between students with low self-concept in the competitive and collaborative groups was 0.034 ($< \alpha = 0.05$). This

showed that there are differences in social interaction, between students with low self-concepts in the competitive and collaborative groups.

3. The P-value for comparison between students with low and high self-concepts in the competitive and collaborative groups was 0.906 ($> \alpha = 0.05$), respectively. This showed that there was no difference in social interaction, between students with low and high self-concepts, in the competitive and collaborative groups, respectively.
4. The P-value for comparison between students with high and low self-concepts in the competitive and collaborative groups was 0.198 ($> \alpha = 0.05$), respectively. This showed that there was no difference in the social interaction between students with high and low self-concepts, in the competitive and collaborative groups, respectively.
5. The P-value for comparison between students with high self-concepts in both the competitive and collaborative groups was 0.935 ($> \alpha = 0.05$). This showed that there was no difference in social interaction between students with high self-concepts, in both groups.
6. The P-value for comparison between students with low and high self-concepts in the collaborative group was 0.097 ($> \alpha = 0.05$). This showed that there was no difference in the social interaction between students with low and high self-concepts in this group.

The results showed that the interaction-based learning method at the end of the semester, had an effective influence on the outputs of student social interaction in online learning. This was in line with Apriono (2016) and Chen & Chiu (2016), which stated that there was an influence, when using the competitive and collaborative methods on students’ social interactions. As illustrated in Table 5, it was also observed that there was an increase in the results of social interaction, after being

Comparison					Value			
LM	SC		LM	SC	MD	SE	df	Sig.
C	L	-	C	H	-0.252	0.197	58.0	0.582
C	L	-	E	H	-0.806	0.287	58.0	0.034
C	L	-	E	H	-0.140	0.206	58.0	0.906
C	H	-	E	L	-0.555	0.277	58.0	0.198
C	H	-	E	H	0.112	0.191	58.0	0.935
E	L	-	E	H	0.667	0.283	58.0	0.097

Table 9 - Post Hoc Comparisons - Learning Methods * Self-Concept.

NOTE:
LM (Learning Method): C (Control Class or Competitive Group), E (Experiment Class or Collaborative Group), SC (Self Concept): L (Low Self Concept), H (High Self Concept), MD (Mean Difference), SE (Standard Error), df (degree of freedom), Sig (Significancy/P-value)

provided with the competitive and collaborative method treatments. However, there were differences in the results of the Post Test in the two methods, where the collaborative mean is higher than of the competitive. Therefore, this showed that the collaborative methods were better used in interaction-based e-Learning than the that of the competitive. The results of this research were also in line with the theory of Gutiérrez-Braojos et al. (2019) and Jordan et al. (2017), which stated that there was no benefit to be salvaged in the use of the competitive method, because there was no positive dependence on the participants, as they only wanted to collaborate with the same group of friends. Therefore, the collaborative method was better used in increasing social interaction, compared to that of the competitive. Therefore, the teaching method based on the objective structure, which emphasized the fostering of cooperative relationships, had a higher learning quality than competitive conditions. Also, collaborative learning design was considered more consistent with learning objectives, due to the fact that all students had the abilities to achieve goals, via the utilization of their respective attributes, as well as those possessed by teachers and other pupils. Similar results were also stated by Johnson & Johnson (2013) and Slavin (1996), that collaborative learning improved students' learning outcomes and social aspects. Furthermore, collaboration was a work model that required human involvement, due to being promising and becoming a trend in the twenty-first century. Moreover, the need to think and cooperate together in response to critical issues, had also increased (Austin, 2000; Welch, 1998). Therefore, it was concluded that the interaction-based learning method was carried out on e-Learning, with the success of its implementation depending on the roles of lecturers, in becoming a facilitator and mediator for students. Also, it created academic conditions, which were observed to stimulate interaction and active participation for learning participants (Alghasab et al., 2019).

Meanwhile, the role of self-concept via the use of competitive and collaborative methods, showed that there was no difference in students' social interaction. These results were supported by Yunistiati et al. (2014), which stated that there was no relationship between self-concept and students' social interaction. This was because students with high and low self-concepts do not necessarily have good and bad quality social interactions and vice versa, respectively. Based on this research, there were other several conditions that possibly caused the absence of the influences, which were related to self-concept on students' social interactions namely, lack of experience regarding online learning (Kumi-Yeboah et al., 2018), and the second is, that although students' self-concept can experience instability, but this does not change their social behavior when they interact with their peers as stated by Ellemers et al. (2004)

Finally, there was a relationship regarding the influence of learning methods and self-concept, on students' social interactions. This hypothetical results were in line with Ellemers et al. (2004), which stated that collaboration

was influenced by social Identity, as an aspect of an individual's self-concept. According to Tajfel Tajfel & Turner (1985), social Identity was an individual's self-definition, in relation to several public group memberships associated with value connotations and emotional significance. Therefore, the more individuals seek similarities in their social group, the greater it encourages them to collaborate with other members. Ellemers et al. (2004), also emphasized that due to the fact that students had backgrounds, experiences, values, perspectives related to self-concept, and diverse learning styles, the use of different tools, methods of communication, and collaboration are needed, in order to complete their task effectively.

According to Marsh et al. (1983), there were two benefits of conducting group identification, namely, Supporting collaborative efforts, because it made group members feel connected to others.

Perceiving their self-esteem, which was related to group results and performance.

Similarly, the inter-group competitive method viewed that the definition of self-concept originated from the comparison between the characteristics possessed by group members, compared to the relevance of external categories. Brewer & Gardner (1996), Johnson & Johnson (2013), Sharan (1980), and Slavin (1996), also stated that collaboration and competition were more effective in generating learning and achievement in many areas of academic subjects, attitudes, influences, and a more positive academical self-concept, compared to the interpersonal competitiveness and individualistic goal structures.

However, when using the inter-group competitive method, there was a decrease in self-concept, due to intervention or pressure to be the winner. This does not lead to the achievement of goals, as it was observed to have a negative impact on the comparison standards used for self-evaluation (Marsh et al., 1983). This was in line with a situation observed by this research, in terms of the differences related to the effective social interactions in the collaborative and competitive model treatments, with various self-concept conditions.

5. Conclusions and recommendation

5.1 Conclusion

Based on the hypothetical testing, discussions, and results, several conclusions were made as follows:

The students' social interactions using collaborative and competitive e-Learning models, showed a significant difference, therefore, supporting the first hypothesis. The results in the control and experimental groups, which used both competitive and collaborative methods, experienced an increase in social interactions, during the post-tests, respectively. However, the results of social interaction using collaborative methods were greater, compared to that of the competitive. This showed that the collaborative method was the better interaction-

based method used during e-Learning, due to no intervention or pressure to be the best, as all group members worked together to achieve similar goals.

Students' social interaction with high and low self-concepts also showed no significant difference, therefore, not supporting the second hypothesis. However, there was an influence on students in the experimental group with low self-concept, as they experienced an increase in social interaction, while using the collaborative method. Also, they had more ability to interact socially, as well as participate actively during the online learning process.

The students' social interaction via the use of the interaction-based e-Learning model and self-concept, showed a significant difference, therefore, supporting the third hypothesis. Also, the use of collaborative learning methods on students with low self-concept had an influence on their social interactions, while using e-Learning.

This indicated that the collaboration process carried out by e-Learning, was in line with the social interaction possessed by students with low self-concepts, as they were willing to participate and play an active role in carrying out this learning process. However, the use of competitive and collaborative learning methods in the control and experimental groups, does not have an influence on social interactions, as well as students with high and low self-concepts.

The results of the hypothesis that show the failure of collaborative learning through e-Learning are caused by many factors. These factors are due to their lack of knowledge and experience about collaborative learning methods, when using e-Learning. This also caused them to be reluctant in carrying out the learning process, as they do not want to actively participate in it. According to Aboagye et al. (2021), students were already attached to a conventional approach, therefore, when they have to use a new method, they possibly encountered obstacles. This was because sometimes, they were still attached to the pedagogy and propositions received. Therefore, students had fears and concerns about challenges, when adopting a new approach. Their reluctance to adopt new approaches was likely to also result in the failure to implement the entire process. Therefore, when there is no motivation from learning actors to actively involve and participate, interaction-based e-Learning does not have any influence on them.

5.2 Empirical suggestions

This research is limited by several factors, including the limitations in conditioning other influencing variables, such as students' backgrounds, experiences, values, perspectives, and the number of samples. This is found to encourage the research to lead to a quasi-experimental approach, as a form of modeling.

Further plans are also developed from this research limitations, by involving aspects of other influential variables on students. Also, it involves more systematic planning, to limit the influential variables that appear

with longer periods and similar samples, in order to obtain better results.

5.3 Practical suggestions

Based on students' interaction and motivation, it is necessary to have a technical approach through the introduction of LMS and other educational methods, in order to achieve learning objectives. Also, in order to achieve the ability and motivation of students, measurements are to be carried out regularly.

The approach adapted by teachers/lecturers should also be supported by related institutions in the form of regulations, where it possibly has an impact on budgeting, work programs, and provision of incentives.

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References

- Alghasab, M., Hardman, J., & Handley, Z. (2019). Teacher-student interaction on wikis: Fostering collaborative learning and writing. *Learning, Culture and Social Interaction*, 21, 10–20.
- Aparicio, M., Bacao, F., & Oliveira, T. (2016). An e-Learning theoretical framework. *An E-Learning Theoretical Framework*, 1, 292–307.
- Apriono, D. (2016). Implementasi “paikem” dengan “collaborative learning” (Satu alternatif memecahkan masalah belajar PPKn). *Jurnal Teladan: Jurnal Ilmu Pendidikan Dan Pembelajaran*, 1(2), 135–144.
- Austin, J. E. (2000). Principles for partnership. *Leader to Leader*, 18(2), 44–50.
- Bornstein, G., Gneezy, U., & Nagel, R. (2002). The effect of intergroup competition on group coordination: An experimental study. *Games and Economic Behavior*, 41(1), 1–25.
- Brewer, M. B., & Gardner, W. (1996). Who is this “We”? Levels of collective identity and self representations. *Journal of Personality and Social Psychology*, 71(1), 83.
- Chen, C.-H., & Chiu, C.-H. (2016). Employing intergroup competition in multitouch design-based learning to foster student engagement, learning achievement, and creativity. *Computers & Education*, 103, 99–113.
- Creswell, J. W. (2009). *Mapping the field of mixed methods research*. SAGE publications Sage CA: Los Angeles, CA.

- Dabbagh, N., & Bannan-Ritland, B. (2005). *Online learning: Concepts, strategies, and application*. Pearson/Merrill/Prentice Hall Upper Saddle River, NJ.
- Deutsch, M. (1949). An experimental study of the effects of co-operation and competition upon group process. *Human Relations*, 2(3), 199–231.
- Di, X., Zailani, M. A., & Ismail, W. M. (2020). Self-regulated learning strategies as academic self-management skills in Malaysian public universities. *Mojem: Malaysian Online Journal of Educational Management*, 8(3), 64–81.
- Diswantika, N. (2019). Relationship of self concepts with social interaction of students in high schools. *1st International Conference on Education Social Sciences and Humanities (ICSSHum 2019)*, 570–574.
- Federer, W. T. (1967). Diallel cross designs and their relation to fractional replication. *Der Züchter*, 37(4), 174–178.
- Fergusson, L., Imran, S., & Ormsby, G. (2021). The development of work-integrated learning ecosystems: An Australian example of cooperative education. 18.
- García-Valcárcel, A., & Mena, J. (2016). Information technology as a way to support collaborative learning: What in-service teachers think, know and do. *Journal of Information Technology Research (JITR)*, 9(1), 1–17.
- Garshasbi, A., Vajargah, K. F., & Arefi, M. (2017). The Impact Of A Cooperative Learning Model On Students' self-Motivation And Academic Performance In High School. *Mojem: Malaysian Online Journal of Educational Management*, 4(3), 37–51.
- Goldman, M., Stockbauer, J. W., & McAuliffe, T. G. (1977). Intergroup and intragroup competition and cooperation. *Journal of Experimental Social Psychology*, 13(1), 81–88.
[https://doi.org/10.1016/0022-1031\(77\)90015-4](https://doi.org/10.1016/0022-1031(77)90015-4)
- Gutiérrez-Braojos, C., Montejo-Gamez, J., Marin-Jimenez, A., & Campaña, J. (2019). Hybrid learning environment: Collaborative or competitive learning? *Virtual Reality*, 23(4), 411–423.
- Hodges, L. D., & Martin, A. J. (2020). Enriching work-integrated learning students' opportunities online during a global pandemic (COVID-19). *International Journal of Work-Integrated Learning*, 21(4), 415–423.
- Homans, G. C. (1961). *The Human Group*, New York 1950, S. 230-280; ders. *Social Behavior. Its Elementary Forms*, New York, 283–315.
- Hussin, W. N. T. W., Harun, J., & Shukor, N. A. (2019). A Review on the Classification of Students' Interaction in Online Social Collaborative Problem-based Learning Environment: How Can We Enhance the Students' Online Interaction. *Universal Journal of Educational Research*, 7(9A), 125–134.
- Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Interaction Book Company.
- Johnson, D. W., & Johnson, R. T. (2013a). Cooperative, competitive, and individualistic learning environments. *International Guide to Student Achievement*, 372–374.
- Johnson, D. W., & Johnson, R. T. (2013b). The Impact of Cooperative, Competitive, and Individualistic Learning Environments on Academic Achievement. 10.
- Jordan, M. R., Jordan, J. J., & Rand, D. G. (2017). No unique effect of intergroup competition on cooperation: Non-competitive thresholds are as effective as competitions between groups for increasing human cooperative behavior. *Evolution and Human Behavior*, 38(1), 102–108.
- Joyce, T. B. Y., & Yates, S. M. (2007). A Rasch Analysis of the Academic Self-Concept Questionnaire. *International Education Journal*, 8(2), 470–484.
- Julian, J. W., & Perry, F. A. (1967). Cooperation contrasted with intra-group and inter-group competition. *Sociometry*, 79–90.
- Kristanto, Y. D. (2020). COVID-19, Merdeka Belajar, dan Pembelajaran Jarak Jauh.
- Kumi-Yeboah, A., Dogbey, J., & Yuan, G. (2018). Exploring factors that promote online learning experiences and academic self-concept of minority high school students. *Journal of Research on Technology in Education*, 50(1), 1–17.
- Le, H., Janssen, J., & Wubbels, T. (2018). Collaborative learning practices: Teacher and student perceived obstacles to effective student collaboration. *Cambridge Journal of Education*, 48(1), 103–122.
- Lindgren, H. C., & Suter, W. N. (1967). *Educational psychology in the classroom* (Vol. 956). Wiley New York.
- Lopes, P. N., Salovey, P., Côté, S., Beers, M., & Petty, R. E. (2005). Emotion regulation abilities and the quality of social interaction. *Emotion*, 5(1), 113.
- Manis, M. (1955). Social interaction and the self concept. *The Journal of Abnormal and Social Psychology*, 51(3), 362.
- Marsh, H. W., Relich, J. D., & Smith, I. D. (1983). Self-concept: The construct validity of interpretations based upon the SDQ. *Journal of Personality and Social Psychology*, 45(1), 173.

- Maudiarti, S. (2018). Penerapan e-learning di perguruan tinggi. *Perspektif Ilmu Pendidikan*, 32(1), 51–66.
- Negara, I. P. B. J., Suniasih, N. W., & Sujana, I. W. (2019). Determinasi disiplin belajar dan interaksi sosial terhadap pemahaman konsep ips siswa kelas v. *Media Komunikasi FPIPS*, 18(2), 87–96.
- Nurvinta, Y. (2017). Hubungan Antara Interaksi Sosial Dengan Konsep Diri Pada Peserta Didik Kelas Viii Mts. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, 6(10).
- Panitz, T. (1999). Collaborative versus Cooperative Learning: A Comparison of the Two Concepts Which Will Help Us Understand the Underlying Nature of Interactive Learning. For full text: <http://www.https://eric.ed.gov/?id=ED448443>
- Rahmadi, I. F. (2021). Teachers' technology integration and distance learning adoption amidst the covid-19 crisis: a reflection for the optimistic future. *Turkish Online Journal of Distance Education*, 22(2), 26-41.
- Respati, Y. A. (2018). Collaborative Learning Dalam Upaya Peningkatan Keaktifan Mahasiswa Pada Proses Pembelajaran. *Efisiensi-kajian ilmu administrasi*, 15(2), 15–23.
- Rook, L. (2020). Responding to COVID-19: Enriching students' responsible leadership through an online work-integrated learning project. 20.
- Santosa, E. B., & Degeng, I. N. S. (2020). The Effects of Mobile Computer-Supported Collaborative Learning to Improve Problem Solving and Achievements. 8(1), 325-342.
- Sarwar, B., Zulfiqar, S., Aziz, S., & Ejaz Chandia, K. (2019). Usage of social media tools for collaborative learning: The effect on learning success with the moderating role of cyberbullying. *Journal of Educational Computing Research*, 57(1), 246–279.
- Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effects on achievement, attitudes, and ethnic relations. *Review of Educational Research*, 50(2), 241–271.
- Shirin, H. B., Hassan, S. S. S., & Islam, M. S. (2017). Interaction in E-Learning Environment: Does It Fulfill with Islamic Teaching? *MOJEM: Malaysian Online Journal of Educational Management*, 2(4), 36–52.
- Sitompul, N. C. (2019). Exploring the Implementation of Weblog-Based Flipped Classroom in Teaching Civics: Is It Feasible and Effective? *International Journal of Instruction*, 12(4).
- Slavin, R. E. (1996). Research on cooperative learning and achievement: What we know, what we need to know. *Contemporary Educational Psychology*, 21(1), 43–69.
- Soekanto, S. (2003). *Sosiologi: Suatu Pengantar*. Raja Graendo.
- Suryanto, Putra, M. G. B. A., Herdiana, I., & Alvian, I. N. (2012). *Pengantar Psikologi Sosial*. Airlangga University Press.
- Susilowati, D., Degeng, I. N. S., Setyosari, P., & Ulfa, S. (2019). Effect of collaborative problem solving assisted by advance organisers and cognitive style on learning outcomes in computer programming. *World Trans. on Engng. and Technol. Educ*, 17(1), 35–41.
- Suyanto, S. (2009). *Pedoman Analisis Data dengan SPSS: Edisi 3*. Yogyakarta: Graha Ilmu.
- Tajfel Tajfel, H., & Turner, J. C. (1985). The social identity theory of inter-group behavior. *Psychology of Intergroup Relations*, 6–24.
- Welch, M. (1998). Collaboration: Staying on the bandwagon. *Journal of Teacher Education*, 49(1), 26–37.
- Woszczynski, A. B., Pridmore, J. L., Bandyopadhyay, T., Godin, J., & Prince, B. J. (2021). Agile Course Design: Multi-University Faculty Collaboration to Design the MIS Course for an Online MBA Program. *Journal of Information Systems Education*, 32(1), 9-26.
- Yadegaridehkordi, E., Shuib, L., Nilashi, M., & Asadi, S. (2019). Decision to adopt online collaborative learning tools in higher education: A case of top Malaysian universities. *Education and Information Technologies*, 24(1), 79–102.
- Yorke, L. (2016). Validation of the academic self-concept questionnaire in the Vietnam School Survey Round 1.
- Yunistiati, F., Djalali, M. A. ad, & Farid, M. (2014). Keharmonisan keluarga, konsep diri dan interaksi sosial remaja. *Persona: Jurnal Psikologi Indonesia*, 3(01). A. Cichocki and R. Unbehaven, *Neural Networks for Optimization and Signal Processing*, 1st ed. Chichester, U.K.: Wiley, 1993, ch. 2, pp. 45-47.

Exploring the MOOC as a Community of Practice: developing a framework for knowledge construction

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Abstract

Massive open online courses (MOOCs) have increasingly become an important element for individuals' learning and development. However, MOOCs mainly concentrate on duplicating knowledge instead of constructing it. This research aims to explore the structure of the MOOCs for fostering the knowledge construction in which educational professional build, develop, share one another' learning and reflections. This research focused on Coursera, a particular MOOC community, by drawing on the concepts of community of practice (CoP) as a theoretical lens. Three types of data were collected. The archival data consisted of the top and selected posts from online discussion forums, and the elicited data which was derived from over 60 interviews with Coursera learners. Meanwhile, field note data was extracted from 160 days of interaction with the participants. A qualitative research method using a netnographic methodology was employed. The findings contribute to the body of knowledge construction and online communities by providing an understanding of the domain, community and practice elements. The study on other elements such as the reinforcement of identity, formation of warrants and identification of mechanisms for legitimate peripheral participation can help to interpret the constitution of CoPs in MOOC. This research developed a Coursera community framework that generally makes a MOOC community more energetic to construct knowledge.

KEYWORDS: Community of Practice, Knowledge Construction; MOOC, Coursera, Netnography.

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1. Introduction

Massive open online courses (MOOCs) have gained importance over the past ten years as a vital component of individual learning (Deng, Benckendorff & Gannaway, 2019). As a result, over the past few years, MOOC providers (such as Coursera and Udacity) have changed their business model from offering standalone MOOCs to developing micro-credential and full degree programmes that will encourage learners to engage in

more structured and intentional professional development (Pickard, Shah & De Simone, 2018). Recently, researchers have shown an increased interest in communities of practice (CoPs). A CoP is defined as

“a group of people who share an interest in a domain of human endeavor and engage in a process of collective learning that creates bonds between them” (Wenger, 2001, p. 1).

An online forum can start a community which can evolve to a CoP throughout its life. The subject of knowledge construction is one of the significant discussions in CoPs (Azali, Quaddus & Xu, 2009). While MOOCs such as Coursera are considered to be traditional teacher-oriented instruction that has become technologically enriched, adopting a knowledge transmission model has become an area of criticism for this type of MOOC (Powell & Yuan, 2013; Xu, Wang & Yu, 2018; Rathee & Bhardwaj, 2020). Even though the total number of this type of MOOCs is increasing at

exponential rate, little study has been done on issue of knowledge construction and how it could be fostered. There is a gap in the understanding of the nature of knowledge construction and CoPs in MOOCs. So far, design-related studies on MOOC focused on the effectiveness or utility of a unique design component like a specific assessment method (Bey, Jermann & Dillenbourg, 2018) or the effects of utilizing a specific type of media on satisfaction, performance, or engagement (Nguyen, 2022).

The aim of this research was to examine a particular MOOC community, namely, Coursera, by drawing on the concepts of CoP as a theoretical lens. This research aimed to investigate whether Coursera forums can be considered as CoPs in which knowledge is being constructed. The discussion forum in MOOCs is considered as a communication and learning tool which facilitates learners' interaction and engagement in its environment (Mak, Williams & Mackness, 2010; Chen & Yeh, 2021). Through this interaction, members can share and acquire experience and/or knowledge (Harasim, 1993; Chen & Yeh, 2021). In other words, knowledge construction can take place in a community of learners and instructors who have social interactions and share their experience and knowledge (Su et al., 2010). This process is called "collaborative learning". Discussion forums in MOOCs are a ground for interaction and hypothetically a platform for knowledge construction via collaborative learning.

To be more concise, the focus was to understand the state of CoP elements in Coursera forums in this particular community. Examining the Coursera community from the CoP perspective develops a CoP-based MOOC model and makes an understanding of how the MOOCs can foster knowledge construction via a MOOC community.

The findings of this research provide a sound foundation for understanding community in the context of Coursera. The community features such as identity, warrant and LPP (legitimate peripheral participation) offer a unique setting for this study. The findings also suggest how the identity of the learners and the community can be improved. The findings identify some mechanisms that serve as a warrant. The significance of these three features (identity, warrant, LPP) has been noted in this study as factors that shape a CoP. All of these findings would set a foundation for the structure of a Coursera community that would allow for future cultivation of CoPs in MOOCs. Besides, the findings provide a foundation to develop a Coursera community framework for fostering knowledge construction in MOOC discussion forums through developing a community as a CoP. The findings also suggest that MOOC providers should effectively improve its structure and cultivate community in order to be a CoP and to have a knowledge construction environment.

The work is structured as follows: an introduction section that shows the objectives of this study and a few literature studies followed by a methodology section,

data collection, data analyzing sections and result section. The discussion section elaborates on the outcome of the research. Finally, the conclusion is drawn in the last section.

2. Literature review

2.1 Community of practice

Based on the definition of CoP, a community can be built for learning reasons or learning can be the outcome of the members' interaction. It needs to be considered that not all communities are CoPs. The three characteristics that are crucial for CoPs are a domain, community and practice as discussed next. The outcome of the four forces of identity, knowledge sharing, warrant mechanism and legitimate peripheral participation (LPP) can help to interpret the constitution of CoP (Silva, Goel & Mousavidin, 2009).

The concept of CoP has advanced over time (Kimmerle et al., 2012). Much knowledge construction and sharing happens in contemporary online environments (Cress, Kimmerle & Hesse, 2009; De Wever et al., 2010; Fang & Chiu, 2010; Fields & Kafai, 2009; Held, Kimmerle & Cress, 2012). In a CoP, the main process of knowledge construction is supposed to be mediated by the experienced members who improve practices (Kimmerle et al., 2012). In fact, a community can progress from an information-sharing forum to a CoP in which knowledge is being constructed.

The World Wide Web enables virtual communities and facilitates knowledge construction and sharing for CoPs (Lin & Hsueh, 2006). Virtual CoPs are networked social groups which are gathered around "shared practices, information, and knowledge that exists for them through mainly electronic means such as online forums, bulletin boards, and email" (Wasko & Faraj, 2005). They highlight the vital role of knowledge for the upkeep of virtual CoPs and as the most important resource for the members. Wang (2010, p. 267) states that online CoPs offer a range of benefits for learners, including

"cognitive development, opportunities for growth as independent learners, opportunities to practice newly acquired knowledge in a supportive environment with peers".

2.2 Theoretical Lens

Based on literature, CoP can define such phenomena as the result of different forces which can be conceptualized as identity, knowledge sharing, warrant mechanisms and legitimate peripheral participation (LPP) (Silva et al., 2009). In addition, the three characteristics that are crucial for CoPs are a domain, community and practice.

The Domain creates a common ground and a sense of common identity. Domain of community encourages members to contribute and participate (Wenger, McDermott & Snyder, 2002). The community

encourages learners to share their ideas, ask their questions and listen to others (Wenger et al., 2002). A strong community fosters interactions based on trust. An effective CoP offers a space of exploration where it is safe to speak the truth and take hard questions (Wenger et al., 2002). Besides, a set of ideas, tools, information and documents that members share makes a practice (Wenger et al., 2002). The domain represents the topic that the community focuses on and the practice is the knowledge that the members improve, share and sustain (Wenger et al., 2002).

As members of a CoP participate in it, an identity becomes developed in that community (Lave, 1991; Wenger, 1998). Reinforcing identity is one of the motivations for participating in CoPs (Pan & Leidner, 2003). Besides, the detection of valuable and invaluable posts is problematic in the community. Establishing a warrant mechanism could help the members, especially newcomers, to distinguish the posts that are valuable. Lave and Wenger (1991) describe legitimate peripheral participation (LPP) as a phenomenon in which newcomers in a CoP firstly observe a practice from the periphery and as time passes become more engaged with those practices. LPP refers to the process of becoming an experienced member in a CoP. Indeed, there are three main levels of community participation (see Figure 1). A large portion of community members are peripheral and rarely participate (Wenger et al., 2002). Distinguishing legitimate from illegitimate participation is one of the issues faced in a community (Silva et al., 2009). Here, we posit that these concepts are able to assist us in understanding the constitute structure of emerging CoP in MOOC in addition to unraveling the social practices that form a community in MOOC.

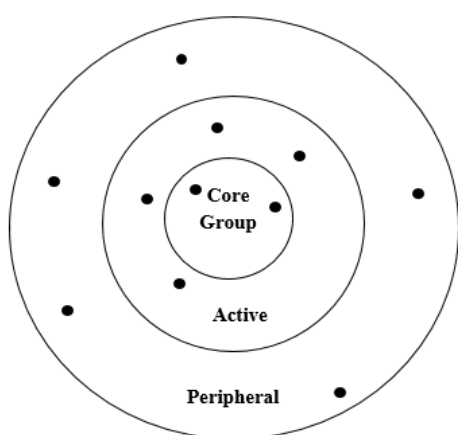


Figure 1 - Degrees of community participation (Wenger et al., 2002).

3. Methodology

It was decided that the best method to adopt for this investigation was Netnography. This method is different because it looks online communications as social interaction not as content; it pays very more attention to

context (Kozinets, 2010). Netnography looks differently to social interactions; it considers not only the words but also forum elements, member characteristics, the language, the history, the meaning, and the type of interaction (Kozinets, 2010). It observes fonts, symbols, texts, images, photos, and videos (Kozinets, 2010).

In this study, the author studied three courses in Coursera and observes the learners engaged in it and consider technology as a main factor in providing an environment in which people can be linked to one another. The main phases of this research includes: identifying and selecting the community, observing the community and collecting data, analyzing the data and making iterative interpretations of the findings, and representing and evaluating the findings. As mentioned in our previous paper, Coursera was selected as the suitable research site for this study. Coursera provides higher education courses and there are no enrollment limitations in terms of members' age or education level. Netnography as a participant observational research contains three types of data: archived, elicited and field note data.

The data collection process was started by entering the "Learn to Program: The Fundamentals" course in the <https://www.coursera.org/> (see Table 1). The researcher participated in activities as a member ranging from watching videos, taking quizzes and participating in discussion forums. In order to have thick data for research purposes and to reach saturation, the second and third rounds of data collection were conducted.

Course Name	Duration	University
"Learn to Program: The Fundamentals"	10 weeks of study	University of Toronto
"Critical Perspectives on Management"	9 weeks of study	IE Business School
"Data Analysis and Statistical Inference"	10 weeks of study	Duke University

Table 1 - Three rounds of data collection.

The second round of data collection started by the researcher entering the course "Critical Perspectives on Management". In the third round, another course from Coursera was chosen based on the data mining students' needs in UTM University. The "Data Analysis and Statistical Inference" course was chosen as a part of the data mining course. During the three rounds of data collections, archival data was captured from the discussion forums, elicited data was captured from interviews with participants in courses and field note data was captured through the researcher's participation.

In this research, as the field of study is the Coursera, the population contains people with various socio-economic and demographic characteristics. Although this can be a possible ground for selecting appropriate people who are willing to take part in this research, they might not have enough knowledge for the subject of this research. To get the best out of this context, observation was employed to have the researcher's own participation and sense of membership, in line with the interviews, to get

the use of the information of those who were willing to participate in this research.

The observation in this research contained any interesting point ranging from the quality of course videos to students' comments and discussions. While the researcher takes notes of what is observed, she also interprets it and takes note of what she experiences herself in order to understand the lived experience of a regular member in this community. The course observation focused on two things: the discussions in the discussion forums, and field notes taken during the period of data collection. Throughout the data collection period, field notes were taken based on the observations. The field notes included the observations of the community, its members, interactions and meanings, and the researcher's own participation and sense of membership.

To collect the interview data, a structured interview was prepared using the same wording and order for all of the respondents as suggested by Kumar (2005). To this end, a set of open-ended questions was prepared and an interview tool was prepared to collect data using Google Docs. The interview instrument was designed by reference to the work by Wenger et al. (2002), Saritas (2006), Keefer (2009) and Miniaoui and Halaweh (2011) and based on the guidelines proposed by Boyce and Neale (2006).

During analysis in the third round of data collection, it was found that from a certain point all the emerging codes were already extracted from the previous data. At that stage, the data had been collected from three courses and interviews had been conducted with over 60 respondents. The total number of 60 interviews is quite high for reaching the saturation since in qualitative studies, it normally happens in lower number such as 15 to 30. The reason might lie in the nature of Coursera and its various participants with different ideas and perspectives which contain more new information.

4. Data collection

The researcher selected the course "Learn to Program: The Fundamentals" for the first round of data collection due to the researcher's background. During this round, archived data for the first course was collected from the "Beginners Study Group" created by the course's teacher assistant. This was a common group with the highest points given by learners. Discussions in this group could be anything such as greetings, experiences, points of view and asking and answering questions. To enhance the quality of the collected data, the researcher discussed the subject of the research with the course's teacher assistant. He was interested in collaborating in this research. Due to his role as teacher assistant, he knew of the active learners in that course. He helped with data collection and disseminated the interview questions to those suitable to answer the questions.

Eleven responses were collected from the participants in the first course.

A second round was launched when the researcher enrolled in the "Critical Perspectives on Management" course. The decision about enrolment in this course was based on the available course start dates and the researcher's background. To gather the archived data, the researcher searched the forums and observed the most active forums and members. In the second course forums, there was a group of active learners who were creating a weekly post regarding each week's discussion. To enhance both the quality and quantity of the interviews, the researcher asked the course lecturer's to share the interview form on this course's Facebook page. It was parallel with another post that was shared in the study group. A total of 33 learners filled in and returned the interview form.

For the third round of data collection, the researcher took an opportunity to observe an online course offered by Coursera which was also taught in the UTM data mining course as a part of an evaluation process for students. The "Data Analysis and Statistical Inference" course was taken which was used as a part of the "Data Mining" course in the Faculty of Computing. In order to observe discussions among these students and as an enhanced version of what was planned in the second round of data collection, a study group was created in the discussion forum entitled "Malaysian study group". This was done to direct the discussions to a particular forum for an easier and more focused observation and analysis. The archived data in the third round of data collection consisted of the discussions in this study group. For the elicited data, the online interview form was shared through the "Malaysian study group" forum. This was the same interview form which was used in the previous rounds of data collection. In this round of data collection, the elicited data comprised the responses of these 22 students who took the "Data Analysis and Statistical Inference" course in Coursera.

5. Data analyzing

The researcher followed the bottom-up perspective (inductive approach) by coding, abstracting, checking and refining (Kozinets, 2010) while reading through the data. While doing so, the researcher applied the CoP theoretical lens in order to better understand the possible existence of a CoP in the Coursera. After coding, the coding was reviewed and discussed with a colleague familiar with qualitative research. The process of recoding was done based on agreement. Through this step, the data was coded under the six structural elements of the CoP framework, namely, domain, community, practice, identity, LPP and warrant (See Figures 2 and 3). To ensure the trustworthiness, the strategies that were used in this research were: prolonged engagement, triangulation, member checking, peer examination and the code-recode procedure.

Name	Sources	References	Created On
Merge	3	1225	4/7/2014 8:38:46 AM
LPP How beginner learner can become experienced and known as a core member in discussions	3	68	4/7/2014 8:38:46 AM
Are there any recommendations you would make to improve the discussion forum in Coursera	3	68	4/7/2014 8:38:46 AM
COMMUNITY What kind of activities generate trust in Coursera community	3	68	4/7/2014 8:38:46 AM
COMMUNITY How does discussion forum community encourage you to share your ideas and ask	3	68	4/7/2014 8:38:46 AM
DOMAIN Do you think the discussion forum influences you to have a sense of belonging to the co	3	68	4/7/2014 8:38:46 AM
DOMAIN What do you normally gained by participating in discussion forum	3	68	4/7/2014 8:38:46 AM
How would you rate ...Discussion Forum	3	70	14/7/2014 7:59:37 A
IDENTITY Please describe which factors create or reinforce identity of Coursera community	3	68	4/7/2014 8:38:46 AM
IDENTITY Do you think participating in the Coursera community help you to form an identity an	3	68	4/7/2014 8:38:46 AM
KC How is your feeling when you participate in discussion forum and provide help to other learn	3	68	4/7/2014 8:38:46 AM
KC How do you think that discussion utilizing discussion forum would enhance knowledge amon	3	68	4/7/2014 8:38:46 AM
KC What challenges did you face when participating in the discussion forums in this course What	3	67	4/7/2014 8:38:46 AM
KC Do you observe any misconception or conflicting viewpoints among the learners If yes, do you	3	68	4/7/2014 8:38:46 AM
KC What features would you like to have to support social interactions with community members	3	68	4/7/2014 8:38:46 AM
LPP How do you distinguish between people giving right or wrong answers in discussion forums	3	68	4/7/2014 8:38:46 AM
PRACTICE What kind of practices would you like to exchange with learners in discussion forum ((3	68	4/7/2014 8:38:46 AM
WARRANT Why you vote some posts in discussion forum How is your feeling if you received vot	3	68	4/7/2014 8:38:46 AM
WARRANT How do you detect useful posts in discussion forum	3	68	4/7/2014 8:38:46 AM

Figure 2 - Screenshot of NVivo showing “Interview” nodes in nodes section.

Name	Sources	References	Created On
Identity	7	51	4/7/2014 8:37:52 AM
community	1	1	4/7/2014 8:37:52 AM
global education	1	1	4/7/2014 8:37:52 AM
learner	7	50	4/7/2014 8:37:52 AM
Netiquette	5	7	4/7/2014 8:54:51 AM
Receive Positive Comment	3	17	4/7/2014 8:37:52 AM
Supportive People	2	6	4/7/2014 8:55:43 AM
Voting system	2	20	4/7/2014 8:37:52 AM
knowledge sharing	10	333	4/7/2014 8:37:52 AM
LPP	11	546	4/7/2014 8:37:52 AM
new comer	10	467	4/7/2014 8:37:52 AM
Commonality	3	12	4/7/2014 9:13:54 AM
Complaint	2	5	4/7/2014 8:37:52 AM
Discussion and Help	10	247	4/7/2014 8:37:52 AM
Need Support	2	2	4/7/2014 9:16:05 AM
Self Introduction	3	65	4/7/2014 8:37:52 AM
Social Behavior	10	136	4/7/2014 8:37:52 AM
old timer	9	79	4/7/2014 8:37:52 AM
Facilitator	9	61	4/7/2014 8:37:52 AM
Group Creation	2	2	4/7/2014 9:21:29 AM
Moderator	3	5	4/7/2014 8:37:52 AM
Obey honor code policies	2	5	4/7/2014 8:37:52 AM
Respectable	2	3	4/7/2014 8:37:52 AM
TA - T role as old timer	1	3	4/7/2014 8:37:52 AM
Warrant	9	175	4/7/2014 8:37:52 AM
Need Warrant	3	3	14/7/2014 4:38:53 AM
Receive Positive Comment from	5	18	4/7/2014 8:37:52 AM
TA	2	4	4/7/2014 8:37:52 AM
Voting System	9	150	4/7/2014 8:37:52 AM

Figure 3 - Screenshot of NVivo showing nodes related to CoP elements.

6. Results

Coursera may only be creating a crowd, and not a learning community (Gaebel, 2013). There is a dearth of research about the ability of the Coursera community to be a CoP. For this purpose, this study employed the CoP theoretical lens to investigate the possibility of CoPs being built in Coursera. This theory was applied to observe the interactions in discussion forums and identify the structural elements of the Coursera community based on the identity, warrant and LPP concepts. Through the analysis of discussion forum posts (discussion forums in Coursera last during next coming rounds of that course), the practices and mechanisms that give form to the Coursera community

were identified. The theoretical account of these concepts can help interpret the constitution of CoPs in Coursera (see Tables 2 and 3).

From our field note data we can conclude (I) any variation that attracts learners’ attention has a positive effect in following the video lectures. It can be in regard to the professors, their clothes, the background and other motivating objects. This kind of teaching with several professors might reinforce the identity of Coursera. (II) In-video quizzes provided an opportunity for learners to think about the topic and then listen to the recorded discussions about that topic. This type of teaching especially for a management course might increase learning and could reinforce the Coursera identity for this type of teaching. (III) The short length of the

Concepts	Illustrative Data	Analytical Generalizations
Domain	<p>“Find new connections...”, “participation in discussion forums was nice because I could make new friends...”, “When I did, I felt give and take was very helpful.”, “Everyone is helping each other to solve the question. Discussion forum become a platform for us to share knowledge in order to solve question.”, “I gain information...”, “increase communication.”</p>	<p>What they normally gained by participating in the discussion forum:</p> <ul style="list-style-type: none"> • Networking • Feeling of being helpful • Exchange of knowledge • Learning • Communication
	<p>“In other threads if I sense I can help others and the other people accept me this also create sense of belonging.”, “Sometimes, It does. I feel there are some people who are here to learn what I aim to learn. So we are here for same reason which gives me a sense of belonging...”, “Yes, Exchanging ideas had make me understand my classmates’ behaviors.”, “because you get to know new awesome people.”, “when you are interacting with an unknown person over the same problem or a person who gets you a solution then a sense of belonging is likely to develop.”, “because it brings the learners closer.”, “yes. It’s nice to know someone care for others ...”</p>	<p>Do you think the discussion forum influenced you to have a sense of belonging to the community with the classmates in the course (Explain why):</p> <ul style="list-style-type: none"> • Feeling of being helpful • Commonality • Knowledge sharing • Networking • Participate and communicate • Sense of intimacy • Supporting person
Community	<p>“To post without knowing your real identity.”, “It helps build conversation.”, “The community is ever willing to respond to each other’s questions. They will nudge you to think differently...”, “Stimulates thoughts and ideas.”, “Sharing helps one individual in learning.”, “It is open forum and any student can share their legitimate views.”, “there are lots of nice people there who want to help...I want to participate in the forums.”, “talking about his/her own experience, asking for help ...”</p>	<p>How the discussion forum encouraged learners to share ideas and ask questions:</p> <ul style="list-style-type: none"> • Anonymous • Communicate • Community members • Incentives • Learning • Open forum • Supportive people • Sharing of ideas leads to synergy
	<p>“If I see people share their real feeling and the experiences in learning and the problems and help, this create trust.”, “maybe online video chats”, “Academic honesty and general positivity.”, “good people taking their time to help others”</p>	<p>What kind of activities that generate trust in the Coursera community:</p> <ul style="list-style-type: none"> • Discussion • Facilitative tools • Netiquette • Sharing • Supportive community of people
Practice	<p>“Idea is the most interesting part during the discussion which is we cannot get from any sources...”, “documents that I have and can help others in this course.”</p>	<p>The following list shows the common practices that members exchange with others:</p> <ul style="list-style-type: none"> • Information • Ideas • Stories • Documents • Tools • Language.

Table 2 - Summary of findings related to domain, community and practice.

Concepts	Illustrative Data	Analytical Generalizations
Identity of Coursera	“I see this course bringing universe under single umbrella...”	<ul style="list-style-type: none"> • Global education
Identity of Coursera learners	“You’re welcome. We are all here to help each other. Take your time with it. You don’t have to complete all the steps at once. Let me know how you get on with this approach.”, “... you make a great point on the demand side.”, “There is a link to the textbook on ...”	<ul style="list-style-type: none"> • Netiquette • Receiving positive comments • Supportive people • Voting system
	“It gives free and wide variety of courses.”, “trusted information or idea given in the discussion forum will create or reinforce identity of Coursera.”, “can more interact with other people.”, “I think strong teachers help inspire the community ...”, “Active users on forums who are willing to help others understand the course they are taking”, “Language mainly. If we didn’t understand what other participants said, it will be a disadvantage”, “getting more influence and more acceptable certificate might help it to become more important in the world of teaching”	<p>The factors that create or reinforce the identity of the Coursera community:</p> <ul style="list-style-type: none"> • Being free and open • Discussion forum or Facebook groups • Communication through the Coursera discussion forum • High quality teaching • Participant behaviors that generate trust and respect in the discussion forum • System design factors (website usability and language facility) • Obtain a certificate from a top university
Legitimate peripheral participation – Newcomers	“used so much paper it was almost ridiculous - but like you... it helps me to understand.”, “things that I’ve had the most trouble with relates to the Python Visualizer. “Visualizing Function Calls” was a bit difficult; perhaps it will be worth emphasizing to your students!”, “Here are my answers for the exercise. I do not have an economics background so would be really interested to hear any ideas which can enhance my understanding of the issues.”, “We’ll have to wait to Prof. explanations on ... ! Not sure if I can wait so long”, “Hello everyone! My name is ..., greetings from Mexico!”, “So Please allow me to challenge this. (And please feel free to challenge my reply.)”	<ul style="list-style-type: none"> • Commonality • Complain • Discussions • Support from lecturers or staff • Self-introduction • Positive behavior
Legitimate peripheral participation – Old-timers	“As far as I can remember, Question 11 on Exercise 2 is asking you to decide what the Type Contract is for the example given. You don’t need to have worked through the examples in this video to understand what a Type Contract is. This is mentioned in the Function ...”, “As well as these forums, there is also a Facebook group - administered by X. It is a private group and you have to send your Facebook to be sent an invitation.”, “After my excitement subsided I thought we could do well with a thread discussing the study questions. I’m not sure if one thread would be better, or if we should have one thread for each question - this would depend on the volume of the replies”, “I cannot resolve the problems directly for you. It is against the honor code for me to do that.”, “Thanks for starting this!”, “Teaching Assistants and Staff also monitor all forum threads, so I’m sure ..., and they will be able to jump in with advice!”	<ul style="list-style-type: none"> • Facilitator • Initiate a group in Facebook or in discussion forums • Moderating role • Obey the honor code of Coursera • Receive more respect • Teachers and teacher assistants also play a role as old-timers
Warrant	“Thank you... for spear heading this thread. Outstanding contributions I must say.”, “Teaching Assistants and Staff also monitor all the forum threads, I’m sure that if no one here can help, they will be able to jump in with advice!”, “Interesting discussion. In addition to oil, the staples food market also bear similarities to the Roman grain market....” [8 up-votes received]	<ul style="list-style-type: none"> • Receives positive comments • Teacher assistant • Voting system

Table 3 - Summary of findings related to identity, warrants and LPP.

Coursera videos is a feature that might enforce its identity (See Figure 4). (IV) Providing quiz feedback to develop sufficient understanding might reinforce the Coursera identity (Figure 5). (V) Learning involves improvement in answering questions through several attempts and with, rather than without, outside assistance (Figure 6). (VI) Patronages detect what needs to be communicated in the community and they know how to present information in useful ways to help learners. Thus, through their active participation, these members can act as moderators. (VII) Members who are active in the forums or other groups improve their identity in others' minds. These people are careful about others' problems and help them to solve their doubts. We called them Samaritan who play supporters roles in the community. Role-playing, or assigning roles to discussants could be effective in promoting knowledge construction (Chen & Yeh, 2021). (VIII) In an environment with a mass of discussions and so many groups, members need some warrant in order to help them choose a group or accept information wisely. Appreciation statements are kind of warrants helps to determine relevant content. (IX) The Coursera voting system is an important feature that enables members to express their views about others' posts. This type of vote can improve the identity of the individual.

7. Discussion: theoretical and practical implications for Coursera

As discussed above the findings were organized in six subsections, each corresponding to the components of the CoP theoretical framework. A summary of the theoretical implications is presented in Table 4.

The identification of structural elements of the Coursera community helps to interpret the constitution of CoPs in MOOCs and unravel the ways that give shape to the discussion forum community. The theoretical implications are presented in the form of analytical generalizations (Lee & Baskerville, 2003; Yin, 2013). The main purpose of these analytical generalizations is to present findings of this study in a way that they could be the grounds for conducting confirmatory studies.

- xMOOC community cannot exist without facilitators and moderators.
- Fostering sense of belonging is necessary to form a community in xMOOC.
- Building trust is fundamental for xMOOC community to have more participation.
- In xMOOC community, voting system, comments on posts by someone knowledgeable (teacher, teacher assistant) become warrants for the quality of the posts.
- xMOOC community cannot exist without old-timer members; it needs to create fire in the core of the community through holding challenging discussions or assigning incentives.

- Participants netiquette, being active and supportive form the individual's identity in xMOOC.
- xMOOC community cannot exist without facilitative tools and social networking sites.

The recommendations to practitioners also are summarized in the form of main points. These points

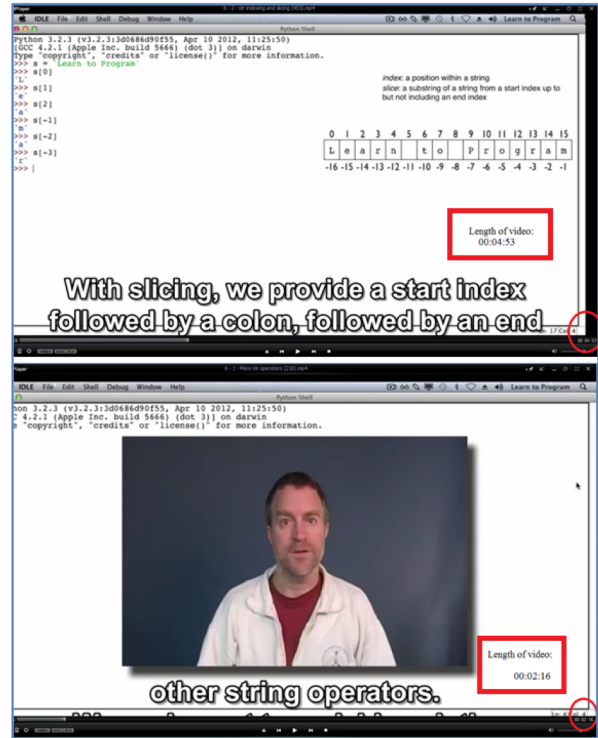


Figure 4 - Short length of Coursera video lectures
(Source: Coursera - "Learn to Program: The Fundamentals" Course).

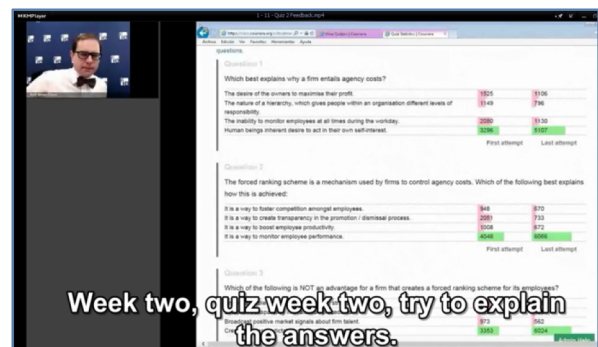


Figure 5 - Quiz feedback through video lecture
(Source: Coursera - "Critical Perspectives on Management" Course).

# of Attempts	2 / 5		
Last Attempted	Tue 20 Aug 2013 3:51 AM PDT (UTC -0700)		
Last Attempted Score	14.75 / 15.00		
Hide Previous Attempts			
Previous Attempts			
#	Time	Raw Score	Review
2	Tue 20 Aug 2013 3:51 AM PDT (UTC -0700)	14.75 / 15.00	Review
1	Tue 20 Aug 2013 3:44 AM PDT (UTC -0700)	10.75 / 15.00	Review

Figure 6 - Number of permitted attempts for quizzes and homework
(Source: Coursera).

Theoretical theme	Findings
Identity of Coursera	Identity of Coursera community is developed by being a global education provider.
	Identity of Coursera community is developed by being free and open education, creating a group on the discussion forum or Facebook. Possibility to communicate through Coursera discussion forum, participants' behavior and participation also enforce Coursera identity. High quality teaching provided by Coursera and top university certificates are other factors to develop Coursera identity.
	Availability of several professors in one course, embedding quiz before discussion in class, quizzes with several permitted attempts, the feature of Coursera videos which are divided into short length videos, providing quiz feedback to develop sufficient understanding all might reinforce the identity of Coursera.
Identity of Coursera learners	Identity of Coursera learners is developed by their netiquette, by receiving positive comments from others and being supportive. The voting system also has an effect on learners' identity.
Domain	Coursera learners gain networking skill and knowledge sharing experiences; they get helpful feeling and facilitate learning and communication through participation in discussion forum.
	Sense of belonging to Coursera community is heightened by having helpful feeling, commonality feeling and sense of intimacy. Sharing knowledge, participation, communication and networking also can create sense of belonging in discussion forum. The existence of supportive people in Coursera community also creates a sense of belonging.
Community	Coursera encourages learners to share their ideas by providing an opportunity to communicate more with others and this leads to synergy. Providing incentives for the community members could encourage some learners to share their ideas. Members of the Coursera community with various perspectives can give encouragement to learners to share their ideas. Existence of supportive people in Coursera and sense of being helpful for others in Coursera encourage learners to share their ideas. Learning through sharing ideas could be another encouragement to share ideas in Coursera community. The option to be anonymous in Coursera community and open forum characteristic of Coursera are other factors that encourage sharing ideas.
	Trust in Coursera community can be generated by discussion activity, sharing activity and following netiquette standards. Creating a supportive community of people is another way to build trust. Facilitative tools also help to generate trust in Coursera community.
Practice	The common practices that are exchanged in Coursera community are information, ideas, stories, documents, tools and language.
Warrants	Voting system in Coursera is a mechanism to create warrant in discussion forums. Coursera learners have positive feelings when they receive up-votes for their posts.
	In Coursera community, learners detect useful posts based on subject or heading of the posts, helpfulness of post and popularity of post. Reading and scanning the posts to find useful post is also used even though it is time-consuming activity. Teachers and teacher assistants' comments could be another way to detect useful posts and create warrant.
	In the Coursera community, receiving positive comments from others, teacher assistants and voting system create warrant to distinguish what is valuable and what is not in discussions.
LPP	Having commonality and positive behavior, being complainant, engaging in discussions, needing lecturer/staff supports are some Coursera newcomers' features. They also introduce themselves through their discussions.
	Being a facilitator, initiating a group, moderating discussions, receiving more respect and being compliant with the honor code are some Coursera old-timers' features. Teachers/teacher assistants could play the old-timer role in the Coursera community.
	In the Coursera community, newcomers could move to the core of community by their active participation, netiquette manner, spending more time and effort in discussion forum and reading to gain new knowledge. Low profile activities and receiving incentives could keep learners active and help them move to the core of the Coursera community.
	In the Coursera community, legitimate participation is detected through accurate and reliable posts, discussion, personal and critical reflection, using the Internet to verify others and the voting system. In addition, supportive people also can be considered as legitimate participants in the Coursera community. Believing different opinions based on different understandings have their own worth means that anyone would be considered a legitimate participant.

Table 4 - Summary of findings along with their relations to CoP theory.

could be helpful for MOOC providers or individuals interested in developing communities supported by discussion forum.

Although more research in this area is required, we propose Coursera has capability to be a CoP and these points are general guideline to develop CoP:

- Sense of belonging as another main element could be developed in xMOOC community through facilitating knowledge sharing and communication and integrating facilitative tools for creating networking and sense of intimacy (Sun, 2020, p. 602).

- xMOOC could be a strong community if it encourages learners to participate and share their ideas and concerns. The availability of various people with different ideas and their caring manner toward the problems of others could encourage learners to share ideas and concerns. Paying more attention to assigning incentives to people who are sharing their ideas and issues could also encourage learners.
- xMOOC community with large number of learners built trust to some extent because of the nature of discussion forum which is based on discussion and sharing. Integrating facilitative tools such as private messaging could develop trust through making close connection between learners.
- xMOOC community with high volume of discussion requires more warrants to detect valuable and invaluable posts. It has been solved to some extent by voting system mechanism but it could be developed more to show the meaning of each vote. Assigning more teacher assistants or someone as moderator to manage and control discussion forums could be an effective way (Drobot, 2023) (Chen & Yeh, 2021).
- Although xMOOC community is not a long time community newcomers and old timers are visible in this community because of their activities and supporting behaviors. What Coursera can do to move newcomers to the core of the community is to create a fire in the core of community through challenging discussion or assigning incentives to active participations. If the Coursera could maintain the communities for a long time helps to develop a CoP. This can occur through integrating with social networking sites or combining different sessions of one course with different start and end times.

8. A Coursera Community Framework (CCF) based on Social Theory of Learning

Having discussed the structural elements of Coursera in previous session of this paper, this study set out with the aim of fostering knowledge construction through developing a Coursera community framework based on Social Theory of Learning. The findings of the present study appear to be consistent with other research which found Coursera is not a learning community (Gaebel, 2013). However, these results on possibility of a CoP being constructed within Coursera have not previously been described.

The present phase of Coursera from the knowledge construction perspective suggested the approach of studying Coursera from the CoP lens to foster knowledge construction.

MOOC participants often feel disconnected from their peers, so generating a sense of belonging, and achieving social presence are of major challenges for MOOC platforms (Gamage & Whitting, 2021) The first layer in Figure 7 shows the structural elements of Coursera as a

CoP which helps to understand the domain of the Coursera community through understanding what learners gain through participation in discussion forums and how a sense of belonging could be created in the Coursera community. In addition, it helps to understand the Coursera community by knowing how Coursera could encourage learners to share ideas and ask questions. Furthermore, activities that generate trust in the Coursera community were identified. It also shows that the exchange of information, ideas, stories, documents, tools and language occurs in Coursera (see Figure 8).

The second layer in Figure 7 shows the results of how identity, warrant and LPP help to constitute Coursera as a CoP. We posit that the theoretical account of these elements can help us interpret the constitution of CoPs as well as unravel the important implications for developing the Coursera community as a CoP. As learners participate in Coursera, their identity becomes developed and this is one of the motivations for learners to join Coursera. Coursera's reputation as a free and open online education platform with high quality teaching and certificates could be a strong reason to join Coursera. As discussed by Ossiannilsson (2021) global organizations such as UNESCO, and WEF have highlighted the need of education to implement an open approach to achieve quality education and equality specially during COVID-19 pandemic. Besides, mechanisms such as the voting system, role of the teacher assistant and ability to add comments as warrants in Coursera help members to distinguish what is valuable and what is not. The characteristics of newcomers and old-timers in Coursera and how newcomers could become old-timers explain that Coursera learners could be divided into newcomers and old-timers even if it is a short-lived community. Newcomers could become old-timers if Coursera becomes a long-lived community and newcomers spend more time and effort on their participation. The results in regard to newcomers and old-timers explain that old-timers in the community facilitate knowledge sharing and learning (see Figure 8).

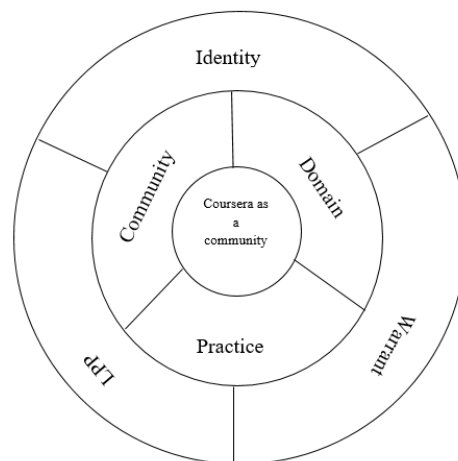


Figure 7 - Structural elements of Coursera as a CoP.

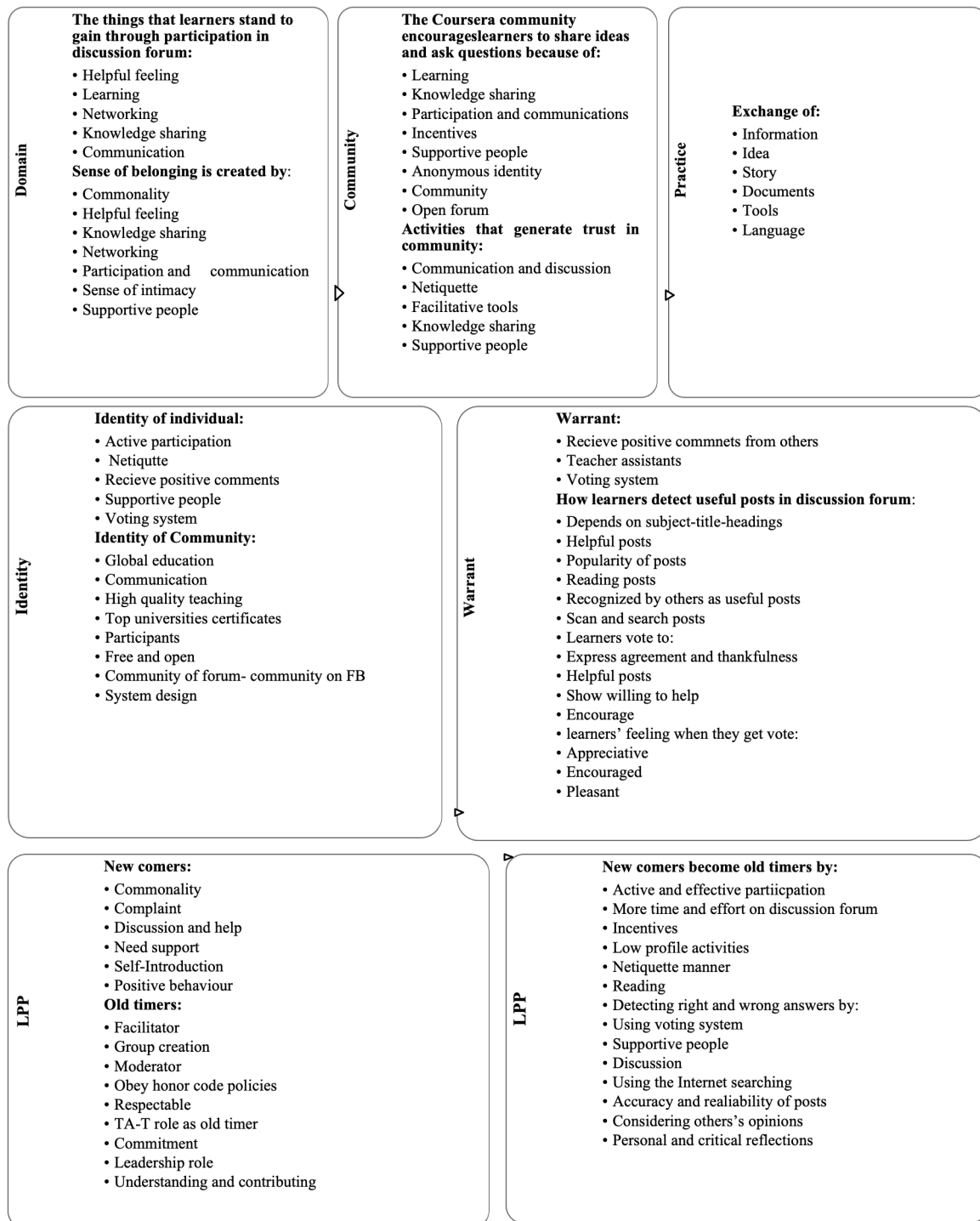


Fig. 8. Components of each structural element of Coursera as a CoP.

The rationale behind the Coursera community framework shown in Fig. 9 is that high emblematic features and their improvement are better candidates for an online MOOC CoP. This framework includes three layers. First, the inner layer consists of Wenger's main components. Second, the middle layer, as seen by Wenger as forces to form CoP. Their presence has also been studied qualitatively in this research. The third and

outer layer shows amplifying emblematic features that help forming elements of CoP. This layer generally makes a MOOC community more energetic to construct knowledge. It should be considered that these features are not grouped in a certain components of inner and outer layers. These features are: Active participation, Voting mechanism, Being free and global education, Social networking sites (Amemado & Manca, 2017),

Facilitative tools , Low level conflict , Highly focused discussion, Netiquette, Moderators (McMinn, 2021) and Positive behavior.

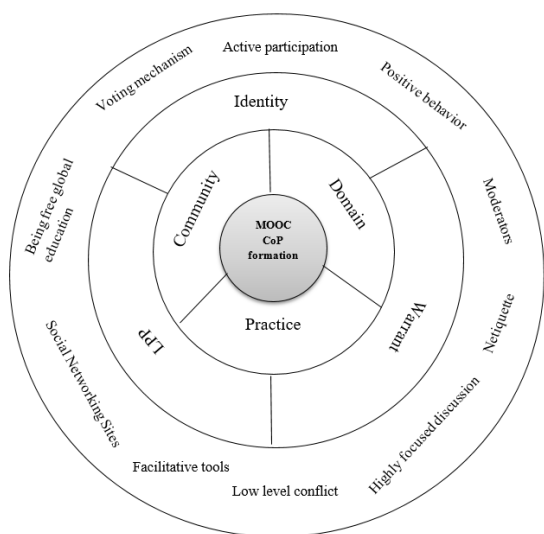


Figure 9 - Coursera Community Framework (CCF).

The Coursera community framework was developed to foster knowledge construction in Coursera’s discussion forum based on the theory of CoP. The outer layer of this framework includes several features of potential CoP that generally make a community more focused, productive and energetic. These features are presented as drive for inner and middle layers’ elements because these features’ existence can develop community’s focus, relationship and practice. It also develops elements that provide cohesion and give shape to a Coursera community. This framework emphasized the role played by outer layer. Given all structural elements in middle and inner layers through high score of outer layer’s features develop a Coursera community as a CoP where knowledge can be constructed in addition to knowledge sharing. This framework rational is that community with high scores of these features is better candidate to develop a CoP and foster knowledge construction.

9. Conclusion

Coursera was studied from the CoP lens and resulted in the finding that there is the possibility of the Coursera MOOC being a CoP and fostering knowledge construction in the Coursera community. The data was examined in terms of domain, community, practice, identity, warrant and LPP. This resulted in the identification of the structural elements of a developing community within Coursera. The three layers was proposed in order to develop a Coursera community framework and to foster knowledge construction in MOOC communities. The first and second layers include the structural elements of CoP and the third layer includes emblematic features of potential community of

practice that generally make a MOOC community more energetic to construct knowledge. It provides insights in regard to the Coursera community and the possibility of a CoP being constructed within Coursera. It means Coursera needs to move from the information sharing phase to the knowledge construction phase.

10. Limitations and future research directions

In this study, the researcher interpreted each of participants’ self-reported data. It means the researcher has described what the participants said in the interviews. In this study, the researcher analyzed the data by reference to the researcher’s own understandings, in light of the researcher’s background, experiences and social context and with consideration of the context of this community. Certainly, another researcher would conduct this study in a different way and the findings would be different because of their different experiences and understandings (Kulavuz-Onal, 2013).

This research was conducted as a netnographic study to understand the knowledge construction process and to study Coursera MOOCs by reference to the concept of CoPs. Although the results of this research cannot be generalized, they provide a rich description of the MOOC community. The result of this study cannot be generalized to other cases. Each individual in this study has their own perspectives and experiences with this community that would be difficult to generalize to all the members of this community.

There is a large volume of data available online. This study limited the data, the number of participants and the researcher’s time in the field. This limitation helped the study to provide more focused interpretations.

In qualitative research, it is ideal to use purposive sampling. There was an initial plan to use purposive sampling in this study but it became apparent that the participants were not active. Thus, the study used convenience sampling based on active participants and those who were interested in participating in an interview. In this way, learners’ familiarity with Coursera because of their participation and their interest to be involved in interviews can provide reliable data. The limitation connected with the fact that interviews were done only with active users of the Coursera forum can be explained through three rounds of data collection from three different courses. Also data saturation occurred during the analysis of data in the third round of data collection (interviews had been conducted with over 60 respondents). This study has pointed out the importance of a CoP to foster the knowledge construction and it has provided some analytical generalizations. The application of these analytical generalizations to other MOOC communities (xMOOC, cMOOC) is recommended as future work to refine and further clarify the knowledge construction phases in MOOCs.

This study has pointed out the importance of warrant mechanism in forming a CoP and also it has pointed to some mechanisms in Coursera MOOC. Another future work would be to conduct a study to establish warrant in a MOOC community.

Finally, another future topic would be to conduct a study to develop sense of belonging and trust in the MOOC community to be a CoP. Such a study would help to uncover practices in MOOCs and possibly construct knowledge.

References

- Amemado, D., & Manca, S. (2017). Learning from decades of online distance education: MOOCs and the Community of Inquiry Framework. *Journal of e-learning and Knowledge Society*, 13(2).
- Azali, R. A., Quaddus, M., & Xu, J. (2009). *Influencing Factors and the Role of Ict on Corporate Sustainability in Bahrain's Service Industry: A Field Study Approach*. Paper presented at the The 10th international conference of Social Implications of Computers in Developing Countries.
- Bey, A., Jermann, P., & Dillenbourg, P. (2018). A comparison between two automatic assessment approaches for programming: An empirical study on MOOCs. *Journal of Educational Technology & Society*, 21(2), 259-272.
- Boyce, C., & Neale, P. (2006). *Conducting in-depth interviews: A guide for designing and conducting in-depth interviews for evaluation input* (1st ed.). Watertown, MA: Pathfinder International Publications.
- Chen, K.-Z., & Yeh, H.-H. (2021). Acting in secret: Interaction, knowledge construction and sequential discussion patterns of partial role-assignment in a MOOC. *Australasian Journal of Educational Technology*, 37(6), 41-60.
- Cress, U., Kimmerle, J., & Hesse, F. W. (2009). Impact of temporal extension, synchronicity, and group size on computer-supported information exchange. *Computers in Human Behavior*, 25(3), 731-737.
- De Wever, B., Van Keer, H., Schellens, T., & Valcke, M. (2010). Roles as a structuring tool in online discussion groups: The differential impact of different roles on social knowledge construction. *Computers in Human Behavior*, 26(4), 516-523.
- Deng, R., Benckendorff, P., & Gannaway, D. (2019). Progress and new directions for teaching and learning in MOOCs. *Computers & Education*, 129, 48-60.
- Drobot, I.-A. (2023). FutureLearn and Coursera: Communication on Two MOOC Platforms.
- Fang, Y.-H., & Chiu, C.-M. (2010). In justice we trust: Exploring knowledge-sharing continuance intentions in virtual communities of practice. *Computers in Human Behavior*, 26(2), 235-246.
- Fields, D. A., & Kafai, Y. B. (2009). A connective ethnography of peer knowledge sharing and diffusion in a tween virtual world. *International Journal of Computer-Supported Collaborative Learning*, 4(1), 47-68.
- Gaebel, M. (2013). MOOCs Massive Open Online Courses. Retrieved from <https://eua.eu/resources/publications/680:moocs-massive-open-online-courses.html>
- Gamage, D., & Whitting, M. E. (2021). *Together we learn better: leveraging communities of practice for MOOC learners*. Paper presented at the Asian CHI Symposium 2021.
- Harasim, L. M. (1993). *Global networks: Computers and international communication* (1st ed.): MIT Press Publications.
- Held, C., Kimmerle, J., & Cress, U. (2012). Learning by foraging: The impact of individual knowledge and social tags on web navigation processes. *Computers in Human Behavior*, 28(1), 34-40.
- Keefer, J. (2009). Interview Questions Based on Wenger's CoP Framework. Retrieved from <http://silenceandvoice.com/2009/08/05/interview-questions-based-on-wengers-cop-framework/>
- Kimmerle, J., Thiel, A., Gerbing, K.-K., Bientzle, M., Halatchliyski, I., & Cress, U. (2012). Knowledge construction in an outsider community: Extending the communities of practice concept. *Computers in Human Behavior*, 29(3), 1078-1090.
- Kozinets, R. V. (2010). *Netnography. Doing ethnographic research online*: SAGE.
- Kozinets, R. V. (2010). Netnography: The Marketer's Secret Weapon. *How Social Media*.
- Kulavuz-Onal, D. (2013). *English Language Teachers' Learning to Teach with Technology through Participation in an Online Community of Practice: A Netnography of Webheads in Action*. (Ph.D.). University of South Florida Follow,
- Kumar, R. (2005). *Research methodology: a step-by-step guide for beginners*: Sage Publications Limited.
- Lave, J. (1991). Situating learning in communities of practice. In L. B. Resnick, J. M. Levine, & S. D. Teasley (Eds.), *Perspectives on socially shared cognition* (Vol. 2, pp. 63-82): American Psychological Association.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation* (1st ed.): Cambridge University Press Publications.

- Lee, A. S., & Baskerville, R. L. (2003). Generalizing generalizability in information systems research. *Information systems research*, 14(3), 221-243.
- Lin, F.-r., & Hsueh, C.-m. (2006). Knowledge map creation and maintenance for virtual communities of practice. *Information Processing & Management*, 42(2), 551-568.
- Mak, S., Williams, R., & Mackness, J. (2010). *Blogs and forums as communication and learning tools in a MOOC*. Paper presented at the The Seventh International Conference on Networked Learning 2010, Denmark
- McMinn, S. (2021). *The Role of Connectors in Supporting Knowledge Construction in xMOOC Learning Networks: A Mixed Methods Case Study*. Lancaster University,
- Miniaoui, S., & Halaweh, M. (2011). FACEBOOK for CoP of Researchers: Identifying the Needs and Evaluating the Compatibility. *Journal of technology management & innovation*, 6(4), 106-120.
- Nguyen, L. Q. (2022). Learners' satisfaction of courses on Coursera as a massive open online course platform: A case study. *Frontiers in Education*, 7. doi:10.3389/educ.2022.1086170
- Ossianniilsson, E. (2021). MOOCS for Lifelong Learning, Equity, and Liberation. In *MOOC (Massive Open Online Courses)*: IntechOpen.
- Pickard, L., Shah, D., & De Simone, J. (2018). *Mapping microcredentials across MOOC platforms*. Paper presented at the 2018 learning with MOOCS (LWMOOCS).
- Powell, S., & Yuan, L. (2013). MOOCs and Open Education: Implications for Higher Education. Retrieved from <http://publications.cetis.ac.uk/wp-content/uploads/2013/03/MOOCs-and-Open-Education.pdf>. from University of Bolton.
- Rathee, N., & Bhardwaj, K. (2020). Understanding MOOCs (Massive Open Online Courses) and its Pedagogy to Use it as a Potential Solution for Learning. *Voices of Teachers and Teacher Educators*, 99.
- Saritas, M. T. (2006). *Computer-mediated communication in higher education: An exploration of knowledge construction*. (PhD). Capella University,
- Silva, L., Goel, L., & Mousavidin, E. (2009). Exploring the dynamics of blog communities: the case of MetaFilter. *Information Systems Journal*, 19(1), 55-81.
- Su, A., Yang, S. J., Hwang, W.-Y., & Zhang, J. (2010). A Web 2.0 based collaborative annotation system for enhancing knowledge sharing in collaborative learning environments. *Computers & Education*, 55(2), 752-766.
- Wang, L. (2010). Integrating communities of practice in e-portfolio assessment: Effects and experiences of mutual assessment in an online course. *The Internet and Higher Education*, 13(4), 267-271.
- Wasko, M. M. L., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29(1), 35-57.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity* (1st ed.): Cambridge University Press Publications.
- Wenger, E. (2001). *Supporting communities of practice*. Retrieved from
- Wenger, E., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*: Harvard Business Press.
- Xu, L., Wang, F., & Yu, B. (2018). Social network analysis of MOOC learners' knowledge building. In *Mobile and Ubiquitous Learning* (pp. 363-377): Springer.
- Yin, R. K. (2013). *Case study research: Design and methods*: Sage publications.

Key issues and pedagogical implications in the design of Digital Educational Escape rooms

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Abstract

Educational Escape rooms are game-based environments that may involve students of all school orders in engaging learning experiences. COVID-19 pandemic has increased the proliferation of escape rooms in a digital format whose use appeared meaningful for their generative effects on knowledge acquisition and on 21st century skills development. Nevertheless, the design of educational escape rooms is an essential process requiring a deep knowledge of both game design principles and learning design approaches. Moreover, teachers and educators willing to design and to experiment escape rooms with their students need to know how to connect these principles belonging to apparently distant fields and to balance them, to make these learning environments effective from an educational point of view and, at the same time, highly and intrinsically motivating.

The aim of this contribution is to focus on the design related aspects of educational digital escape rooms, providing a pedagogical foundation and discussing implications for learning. A Design-Based Research (DBR) has been conducted, involving two cohorts of undergraduate students who attended the Game-based learning course in the last two academic years. The educational escape rooms designed by them in the two editions of the course, corresponding to two iterations of a DBR cycle, were compared to investigate if the progressive enhancement of the design approach has affected the quality of the realized educational escape rooms.

From evaluation of DEERs designed by students a taxonomy was derived that, listing the main design characteristics for the development of DEERs, can be used as a tool that can guide educational designers in the development of effective DEERs, where game aspects are closely intertwined with the educational ones.

KEYWORDS: Game-Based Learning; Educational Escape Rooms; Technology-Enhanced Learning; Learning Design; Social Constructivism.

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1. Introduction

The last years have seen an important increase in the use of escape rooms in the educational context. Escape rooms can be defined as live-action and team-based games in which players face a series of challenges aimed at completing a mission or solving a mystery within a

limited time (Nicholson, 2015). As soon as the mission is completed, achieving a combination of hands-on and minds-on activities (Fotaris & Mastoras, 2019), players may leave the room in which they were closed.

The playful character of escape rooms associated with the use of cognitive skills required for players to discover clues and solve puzzles, made some teachers come up with the idea to replicate in the classrooms the escape room model born for entertainment purposes. They individuated in this approach a novel way to involve students fostering their learning processes. Moreover, in the last two years, the COVID-19 pandemic accelerated the need for teachers, who had to quickly convert the lessons in presence into online activities, to find more engaging and effective learning approaches for digital learning environments (Heim, 2022). Thus, Digital Educational Escape Rooms

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(DEERs) can be considered the digital transposition of the classical escape rooms created for leisure or physically reconstructed in the classrooms for educational purposes. Nevertheless, this passage cannot be considered a mere transposition, because it implies to consider game aspects such as the structuration of the game, the creation of a background narrative, the construction of the puzzles; but these elements require, as underlined by Veldkamp et al. (2020), a meaningful correspondence with the learning objectives. Moreover, this alignment involves the relation between game mechanics with pedagogical approaches. Thus, it involves a design approach that should be pedagogically informed as well as be infused with game design principles.

Recent scholarship has been investigating characteristics, applications and effects of educational escape rooms, both physical and digital, experimented in different subject domains and in various formal or informal contexts. Considering the impact on the development of general skills, literature provides evidence on the value of this approach for supporting collaborative teamwork, promoting persistence on tasks, or to help learners to consider problems from different perspectives (Fotaris & Mastoras, 2019). The active role taken by learners foster the development of 21st century skills such as critical thinking (Adams et al., 2018), problem solving (Veldkamp et al., 2021) and creativity (Foster and Warwick, 2018); this kind of involvement allows them to collaboratively construct knowledge as they progress through a series of tasks. These tasks scaffold learning, while providing students with a dynamic and exciting experience (Makri et al., 2021). Some literature provides empirical evidence on the positive impact of DEERs on students' motivation and on gameful experience (Fotaris & Mastoras, 2019; Vidergor, 2021).

Little evidence has been instead reported on the effectiveness of DEERs to foster domain specific skills and knowledge mastery; only few studies examined learning achievements comparing knowledge acquired prior and post intervention (Makri et al., 2019; Berthod et al., 2020; Caldas et al., 2019). Lathwesen & Belova (2021) found in these studies the need for multiple post-tests to be undertaken at different times and the demands of further findings on which components of escape rooms influence student achievement. Similarly, Taraldsen et al. (2022) advocate further research on DEERs use and outcomes and requires the application of more complex research designs, underlying the need for defining and validating through empirical evidence a set of design principles. Moreover, As Veldkamp et al. (2020) claim, relying on their literature review, little research has been conducted on the pedagogical foundation of DEERs.

Against this background, the present study is aimed at bridging the gap underlined in these studies, focusing on design principles derived from the integration of game theory with pedagogical perspectives. A design

approach was experimented with two cohorts of undergraduate students of the Bachelor in Education who, during the third-year course on Game-based learning, were trained to develop DEERs on the basis of theories and design principles acquired in the first part of the course. The methodological approach adopted for this study was Design Based Research (DBR), with a macrocycle made of two iterations, one for each edition of the course, during which the design approach proposed to the students was continuously refined. The DEERs implemented in the former edition were compared with those created in the latter on the light of some quality criteria previously identified. Results showed that students need to be trained on a consistent design approach, appropriately integrating game-based and pedagogical principles. On the basis of the results obtained, this contribution provides a taxonomy with the main design characteristics for the development of DEERs, in which game aspects are connected with the educational ones and where the main pedagogical approach adopted - behaviorism or constructivism - permeates both the aspects.

Before focusing on the research method and on the outcomes of the present study, a background on the main learning design models adopted for DEERs development are presented in the next paragraph, in order to draw out the need of developing new design models taking greater account of pedagogical principles and approaches.

2. Learning design models of educational escape rooms

The learning design models adopted for the development of DEERs and examined in this study were three:

- the EscapED framework (Clarck et al., 2017);
- the Six-phases approach (Eukel & Morrell, 2021);
- the Star Model (Botturi & Babazadeh, 2020).

The EscapED framework developed by Clarck and his colleagues (2017) is the most common framework that is considered as a reference from teachers and educators willing to design classical or digital educational escape rooms. This model is articulated in six dimensions (Participants, Objectives, Theme, Puzzles, Equipment, and Evaluation) and can be considered an effective guideline (Grande-de Prado et al., 2020) to create escape rooms for several learning contexts. These six areas are considered as the steps of a linear and sequential process of learning design that appears comprehensive but lacks important references to pedagogical principles.

Eukel & Morrell (2021) suggest a six-phase approach to create DEERs according to a methodical and iterative process that should ensure quality and an effective learner experience. The design process is cyclic and comprises design, piloting, evaluation, redesign, re-evaluation and repetition. The strength of this model lies

in the attention for the construction of each puzzle, which is thoughtfully designed to meet learner needs and to activate deep learning. However, also this model seems not pedagogically oriented.

A third approach is the Star Model (Botturi & Babazadeh, 2020), which comprises five interdependent elements corresponding to the five points of the star within a layer and other four contextual elements in a second layer. One point of the star deals with learning, that focuses both on learning outcomes in terms of competences to develop and on the expected learning process, dealing with the arrangements under which learning can occur.

The three aforementioned design models are meaningful to identify the main characteristics of the targeted educational escape room and to plan its underlying structure according to game design principles such as narrative, rewards, level of challenges and, as suggested by Veldkamp et al. (2021), alignment of puzzles with learning objectives. Explicit references to pedagogical perspectives and a stronger connection between game design and learning design could be opportunely provided in a design learning model. This connection can be identified in two main aspects: the scenario and the flow.

The first aspect, the scenario selected for the educational escape room, is related with the experience of immersion that the player/learner lives in as the game context, inspired by real-life context (Nicholson, 2015). Scenario recalls the situated learning theory (Lave & Wenger, 1991), that is coherent with game design principles and mechanics. In fact, this learning theory states that learning takes place in an environment, the scenario of the escape room representing a story or the context of a problem, in which knowledge would be applied. Thus, pedagogy can inform game design providing more indications based on the principles of situated learning.

The latter aspect aligning game with pedagogy, the concept of flow, has a double meaning for the involvement of the player on one side and for his/her learning process on the other: in the game theory flow is a state of optimal experience for the players, who consider it motivating and fun (Csikszentmihalyi, 1990); in pedagogy, the flow corresponds to the state of Vygotskij's zone of proximal development. A balance is created between learners' skill level and the challenge presented, preventing them from becoming bored or frustrated (Fotaris & Mastoras, 2019).

In the present research, whose method and results are described in the next paragraphs, the advances provided by the learning design models herein illustrated, as well as the implications of the relationship between game theory and pedagogy were considered.

3. Research method

In order to identify meaningful design principles for the development of DEERs that, as already mentioned, should derive from the integration of game design theory with learning design perspectives, faculty adopted a Design-Based Research (DBR) methodology that involved two different cohorts of undergraduate students of the Bachelor in Education, for a total of 65 students. The participants of the first cohort were 28, while the students of the second cohort were 37. They respectively attended two editions of the Course on Game-based learning in which, after a first theoretical part devoted to acquisition of game theories and design methods, they were trained to design individually or in pair DEERs on a disciplinary or interdisciplinary topic chosen by them.

Faculty chose DBR to address the gap found in the literature (Armstrong et al, 2022) on the lack of pedagogical foundation during the design of DEERs. The objective was bridging this gap through the development and the refinement of a learning design model based on principles connecting game and pedagogical aspects. This design model was proposed to students to develop their own DEERs and was progressively refined during the DBR macrocycle, that was made of two iterations, one for each edition of the course, for a total duration of two academic years. The approach chosen for DBR was that of McKenny and Reeves (2012), who identified three core processes made of two tasks: analysis and exploration, design and construction and evaluation and reflection. The aim of each iteration, that is represented in Figure 1, was to analyze literature starting from the identified problem, build and refine a learning design model for the development of DEERs, create DEERs and evaluate them. The findings obtained in the first iteration were used to refine the second iteration that followed the same process.

In the first iteration, the first cohort of students adopted an initial version of the learning design model based on existing literature models. This preliminary version was based on a project-based scheme guiding designers in a sequential way on how to build their DEER. The first element to define was the DEER's theme, represented through a main scenario and of other connected digital environments; the theme should find its counterpart in the specific topic of a subject domain or of an interdisciplinary area. Then, the scheme guides designers in identifying a series of learning objectives and building the corresponding puzzles or digital games. Each puzzle has to be designed in order to achieve its underlying objective; the solution of each puzzle leaves a clue that, together with the other clues obtained from the respective puzzles, allow learners to overcome the escape room's challenge and, at the same time, to achieve all the learning objectives set for the targeted topic. The DEERs designed by learners were assessed by faculty, who applied an evaluation approach based on

the satisfaction of five requirements, described in the next paragraphs.

In the second iteration, on the basis of the evaluation performed in the previous cycle, a reflection process on the critical points emerged during it was carried out, actively involving student designers. Reflection was aimed at understanding the reasons why some DEERs didn't meet certain requirements. The outcomes of this reflection activated a new analysis of literature conducted by faculty, who revised the first version of the learning design model and created an updated version of it, trying to overcome the encountered criticalities. The new version of the design model incorporated more specific pedagogical principles and included precise guidelines on how to connect game design theories with the educational ones. The new cohort of students developed their DEERs according to the approach of this revised version. Faculty assessed the developed DEERs through the same criteria defined in the previous phase.

4. Results

The 41 DEERs created by students were various for disciplinary area but were quite homogeneous in terms of target audience: they were designed especially for primary school students. The main subject areas were History, Grammar, English, Geography, Science and Maths. All students used Thinglink as digital learning environment to create their DEERs and the majority of them used yet existing spherical pictures to reproduce the settings and incorporated external digital games for puzzles and cues. The pedagogical approach adopted for these DEERs was more frequently behavioral than constructivist.

The ratings obtained with the evaluation of these 41 DEERs implemented by the two cohorts of students, were compared matching the scores of the 19 DEERs developed in the former course edition with the scores obtained by the 22 DEERs in the latter edition. The five prerequisites were:

- usability;
- pedagogical soundness;
- internal coherence;
- creativity;
- engagement level.

Usability is the correct implementation of technological aspects characterizing educational escape rooms, that make it easy and intuitive for the final user navigating it, understanding the tasks to be accomplished and performing all the required actions to overcome the challenges.

Pedagogical soundness means that the designer through its DEER shows his awareness on the choices made from an educational point of view, connecting game issues with pedagogical ones and allowing an expert eye to glimpse the underlying pedagogical drawing and orientation.

Internal coherence makes the DEER consistent and effective in the sense underlined by Botturi & Babazadeh (2020): all the elements of the DEER (puzzles, clues, narratives, structure, challenges) should be consistent with each other. This means that, for instance, if a learning objective states that the learner should be able to apply a concept, the puzzle to reach that objective can't be only a quiz or a fill in the blank exercise, but rather an interactive digital game requiring decision making.

Creativity is a qualitative criterion that a novel educational environment such as that of DEERs should be always satisfied. Creativity can be traced in several aspects that make DEERs original and innovative, such as the way a structure is built, the narrative through which the topic and the challenges are expressed, the type of puzzles that are incorporated in the DEER, or the ways in which keys and codes can be obtained and assembled to escape. According to Nicholson (2018), designers are creative if they are able to exploit the features of a design process that is generative and iterative.

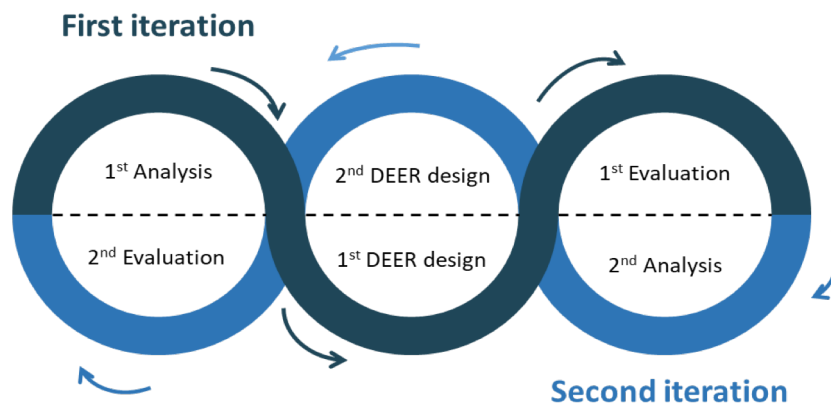


Figure 1 - The DBR macrocycle on the development of DEERs learning design model with two iterations.

Engagement level deals with the level of interest and of involvement that a DEER can potentially raise among learners. Considering the learning objectives and the needs of learners for whom a DEER is targeted, the state of flow defined in the previous paragraph can be considered an indicator of the engagement level.

These five qualitative criteria were assessed as 0 if they weren't satisfied or with 1 if they were satisfied. The total score was the sum of these five ratings, which thus could vary between 0 (minimum score) and 5 (maximum score). The Student t-test for independent samples was performed to compare the scores of the first group of DEERs with the scores of the second group. The latter group of 22 DEERs compared to the former group of 19 DEERs obtained significantly higher scores: the t -value was 2.301 and the p -value was .0134. This result was significant at $p < .05$. The effect size calculate with Hedges' g was 173.123, thus it can be considered relevant.

These results showed that students need to be trained on a consistent design approach for the development of high quality DEERs, appropriately integrating game-based and pedagogical principles.

5. Discussion

In the light of the obtained results from evaluation of DEERs designed by students, the taxonomy with the main design characteristics for the development of DEERs that was progressively created during the DBR macrocycle and that is part of the learning design model used during the study, appears an important tool that can guide designers in the development of effective DEERs. In this model, that can be considered a sort of dashboard, game aspects are closely intertwined with the educational ones, but the main pedagogical approach adopted - behaviorism or constructivism - permeates both the aspects and affects their alignment. The dashboard represents the four elements of game design and the corresponding four elements of educational design:

- structure vs. aim;
- reward vs. assessment;
- puzzles vs. feedback;
- level vs. learning strategy (see Figure 2).

The distinction between the constructivist orientation and the behaviorist one is not trivial, because it can affect the playful experience of a learner and can have an adverse effect also on the learning process itself. A hypothetical behaviorist DEER on analytical chemistry can be built as a series of exercises of growing difficulty, in which learners have to demonstrate that they have memorized chemical formulas. Nevertheless, a similar DEER created with a constructivist approach can involve students to solve an analytical problem, playing the role of forensic scientists that investigate a crime following the steps of the scientific method (Gonzalez).

Comparing the two DEERs, undoubtedly higher order skills can be reached in the latter DEER. Furthermore, a DEER that entails first-person experiential learning and elicits inquiry-based learning, which requires decision making - and not only to give correct answers, supports meaning making and makes them more effective for learning (San Chee, 2016).

These two types of DEERs described above can be considered as instances to illustrate the main elements of the dashboard and how these can be used as reference points to design effective DEERs.

A first element of the dashboard is the aim, that is meant here as the educational aim of the DEER, which triggers off a series of learning objectives. As seen in the example, while a constructivist approach supports the development of higher order skills, the behaviorist one considers information delivery as the main learning goal, stressing the importance of content knowledge. The counterpart of the aim is the structure of the DEER, that can be linear and sequential or open and reticular. In a constructivist open structure, as underlined by Nicholson (2015), learners are divided to simultaneously solve different puzzles, following diverse paths and gathering and negotiating solutions to solve the final meta-puzzle. Collaborative learning in this context, as shown by Ho (2018), promotes a deeper understanding of concepts and their transferability beyond the classroom. In a behavioral linear structure, instead, learners must solve puzzles one after the next. According to Zhang et al. (2018) learners, as soon as they solve a puzzle, obtain progression to the next puzzle as a reinforcement of their positive behavior.

A second element of the dashboard is assessment that, according to a constructivist perspective, should be formative for learners to make them more aware of their own learning processes. Formative assessment is not provided only by DEERs, but also by teachers at the end of the DEER: as Vedkamp et al. (2020) state, a debriefing afterward is essential to make a DEER more effective. Adopting a behavioral perspective, assessment is instead based on the scores obtained by learners that positively reinforce the overcoming of challenges, extrinsically motivating them. Reward is the counterpart of assessment for game design, that adopting a behavioral approach is meant as a simple recognition, usually expressed through a landing page with congratulations; a constructivist reward is something different, it can be represented as a sort of diploma or certificate which acknowledges learners' achievements and make them more aware of the meaningful experience lived through the targeted DEER.

Feedback is the third element of learning design. Adopting a constructivist approach, providing formative feedback to learners makes them more aware of their own learning processes and more able to self-regulate these processes. The feedback can be provided by the DEER itself during each challenge and is aligned with the targeted learning objective; it should be given

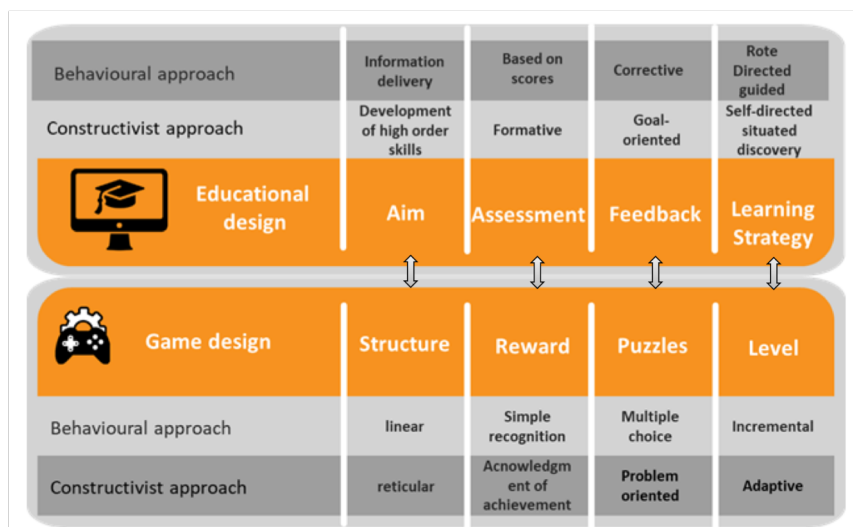


Figure 2 - The dashboard integrating game design and learning design for the development of DEERs.

whether the challenge was overcome with success, or the learner encountered difficulties. Moreover, teachers can act as facilitators during fruition of DEERs (Fotaris & Mastoras, 2019), although their scaffolding should counterbalance students’ feeling of ownership and mastery (Veldkamp et al., 2021). The feedback provided through the behavioral approach isn’t formative and gives a mere response about the rightness or the wrongness of a puzzle solution.

Puzzles are the third element of game design that, according to a constructivist approach, have to be aligned with the learning objective and with the curriculum. They are problem oriented and ensure the right level of flow for the targeted learner to prevent frustration or boredom. If well designed, they stimulate higher order thinking skills and allow learner to construct new knowledge (Zhang et al., 2018; Ouariachi & Wim, 2020). Puzzles following a behavioral scheme achieve low-order thinking skills since these use what Eukel & Morrell (2021) calls a game loop structure consisting of a challenge, a solution and a reward, such as in multiple-choice quiz.

The fourth element of learning design, the learning strategy, in a constructivist perspective includes strategies such as situated learning, discovery learning and self-directed learning. If DEERs support these learning strategies, learners construct their own knowledge living real-time and situated experiences. Instead, the behavioral approach inspires directed, guided and rote learning; in DEERs based on these learning strategies knowledge can only be transmitted and acquired (Bakker, 2018).

The corresponding fourth element of game design is difficulty level that, according to constructivism, is adaptive and tailored based on the decisions taken by learners: like in an adaptive system, a DEER can be designed to offer different learning pathways that change on the basis of learners’ choices. The behaviorist

approach fixes a unique pathway for all where puzzles and challenges are designed with an incremental difficulty.

The DEERs implemented in the second iteration were characterized by a more relevant pedagogical orientation, even if most of them mixed elements inspired by constructivism with elements designed according to behavioral principles. In any case, most students after the course were ready to design DEERs to propose to schools in their near future as educators or teachers.

6. Conclusions

DEERs appear promising and innovative learning environments for students of all ages, who can develop higher order thinking skills, strengthen their social competencies, and reach deep learning when facing complex problems and challenges. Contexts in which students play are highly situated and foster authentic learning if learning scenarios are appropriately designed.

The concept of knowledge underlying the design of DEERs is critical because considering it as a set of notions to transmit to learners is different from considering it as meanings to construct to make sense of the world. These different concepts can affect the way in which a DEER is designed and its effectiveness. Moreover, if the focus of the design process is mainly on game design aspects or mostly on learning design issues, it is to the detriment of DEER’s relevance.

The main aim of this study was to experiment a learning design model for DEERs in which game design and learning design aspects are more balanced; through this model designers become aware of learning strategies to adopt and of the consequences of their application for learning processes. The model derives from the

combination of the outcomes of the main exploratory studies in the field of DEERs and the results of experimentation carried out in the present study.

A limit of this study is the absence of the experimentation phase of the DEERs designed by undergraduate students with the targeted students for whom DEERs were conceived. This missing part would be essential to definitely validate DEERs and to assess their effects on students' learning. However, further studies could include this phase involving in-service teachers as potential designers, who could adopt the learning design model of the present study to design DEERs and experiment in the classroom with their own students.

Future research could also include the design of DEERs pedagogically grounded exploiting virtual and augmented reality, that could lead to new research interests on immersive learning environments with no spatial limitations (Lathwesen & Belova, 2021), with relevant implications at social, cognitive and educational levels.

Notes

Bruschi authored paragraphs 1 and 6; Repetto authored paragraphs 4 and 5; Talarico authored paragraphs 2 and 3.

References

- Adams, V., Burger, S., Crawford, K., and Setter, R. (2018). Can You Escape? Creating an Escape Room to Facilitate Active Learning, *Journal for Nurses in Professional Development*, Vol. 34, No. 2.
- Armstrong, M., Dopp, C., & Welsh, J. (2022). Design-based research. *Education Research*.
- Bakker, A. (2018). Discovery learning: zombie, phoenix, or elephant?. *Instructional Science*, 46(1), 169-183.
- Berthod, F., Bouchoud, L., Grossrieder, F., Falaschi, L., Senhaji, S., & Bonnabry, P. (2019). Learning good manufacturing practices in an escape room: Validation of a new pedagogical tool. *J. Oncol. Pharm. Pract.*, 26, 853-860.
- Botturi, L., & Babazadeh, M. (2020). Designing educational escape rooms: validating the Star Model. *International Journal of Serious Games*, 7(3), 41-57.
- Buchner, J., Rüter, M., & Kerres, M. (2022). Learning with a digital escape room game: before or after instruction?. *Research and practice in technology enhanced learning*, 17(1), 1-16.
- Caldas, L.M., Eukel, H.N., Matulewicz, A.T., Fernández, E.V., & Donohoe, K.L. (2019). Applying educational gaming success to a nonsterile compounding escape room. *Curr. Pharm. Teach. Learn.*, 11, 1049-1054.
- Clarke, S., Peel, D. J., Arnab, S., Morini, L., Keegan, H., & Wood, O. (2017). EscapED: A framework for creating educational escape rooms and interactive games for higher/further education. *International Journal of Serious Games*, 4(3), 73-86.
- Csikszentmihalyi, M. (1990) *Flow: the psychology of optimal experience*, New York: Harper and Row.
- Eukel, H., & Morrell, B. (2021). Ensuring educational escape-room success: the process of designing, piloting, evaluating, redesigning, and re-evaluating educational escape rooms. *Simulation & Gaming*, 52(1), 18-23.
- Ferreiro-González, M., Amores-Arrocha, A., Espada-Bellido, E., Aliaño-Gonzalez, M. J., Vázquez-Espinosa, M., González-de-Peredo, A. V., & Cejudo-Bastante, C. (2019). Escape classroom: Can you solve a crime using the analytical process?. *Journal of Chemical Education*, 96(2), 267-273.
- Foster, T., & Warwick, S. (2018). Nostalgia, gamification and staff development – moving staff training away from didactic delivery, *Research in Learning Technology* 2018, 26: 2021.
- Fotaris, P., & Mastoras, T. (2019). Escape rooms for learning: A systematic review. In *Proceedings of the European Conference on Games Based Learning* (pp. 235-243).
- Grande-de-Prado, M., García-Martín, S., Baelo, R., & Abella-García, V. (2020). Edu-Escape Rooms. *Encyclopedia*, 1(1), 12-19.
- Heim, A. B., Duke, J., & Holt, E. A. (2022). Design, discover, and decipher: student-developed escape rooms in the virtual ecology classroom. *Journal of Microbiology & Biology Education*, 23(1), e00015-22.
- Lathwesen, C., & Belova, N. (2021). Escape rooms in stem teaching and learning - prospective field or declining trend? A literature review. *Education Sciences*, 11(6), 308.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge university press.
- Lopez-Pernas, S., Gordillo, A., Barra, E., Quemada, J. (2019). Analyzing Learning Effectiveness and Students' Perceptions of an Educational Escape Room in a Programming Course in Higher Education. *IEEE Access* 2019, 7, 184221-184234.
- Makri, A., Vlachopoulos, D., & Martina, R. A. (2021). Digital escape rooms as innovative pedagogical tools in education: a systematic literature review. *Sustainability*, 13(8), 4587.

- Mckenney, S., & Reeves, T.C. (2012) *Conducting Educational Design Research*. New York, NY: Routledge.
- Nicholson, S. (2015). Peeking behind the locked door: A survey of escape room facilities. White Paper available at <http://scottnicholson.com/pubs/erfacwhite.pdf>
- Nicholson, S. (2018). Creating Engaging Escape Rooms for the Classroom. *Childhood Education* 94 (1): 44–49. doi:10. 1080/00094056.2018.1420363.
- San Chee, Y. (2016). *Games-to-teach or games-to-learn: Unlocking the power of digital game-based learning through performance*. Springer.
- Taraldsen, L. H., Haara, F. O., Lysne, M. S., Jensen, P. R., & Jenssen, E. S. (2022). A review on use of escape rooms in education—touching the void. *Education Inquiry*, 13(2), 169-184.
- Veldkamp, A., Knippels, M. C. P., & van Joolingen, W. R. (2021). Beyond the early adopters: Escape rooms in science education. In *Frontiers in Education* (Vol. 6, p. 622860). Frontiers Media SA.
- Veldkamp, A., van de Grint, L., Knippels, M. C. P., & van Joolingen, W. R. (2020). Escape education: A systematic review on escape rooms in education. *Educational Research Review*, 31, 100364.
- Vidergor, H. E. (2021). Effects of digital escape room on gameful experience, collaboration, and motivation of elementary school students. *Computers & Education*, 166, 104156.

A phenomenological study of first-grade teachers' lived experiences of major challenges facing online education

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Abstract

Recruiting a qualitative phenomenological approach, the present study aimed to reflect on the first-grade teachers' lived experiences of the major challenges facing online education in Iran's primary schools in the academic year 2020-21. The total number of participants was 10 first-grade teachers working in primary schools in the city of Yazd, Iran, selected using the purposive sampling method. The data collection tool was also a semi-structured interview, whose outcomes were analyzed via the interpretative phenomenological analysis (IPA) developed by Smith et al. (1997). To determine the validity of the data obtained, the opinions of some qualitative researchers and participants, were exploited. Coding was further performed and then compared by the researcher and one other expert in qualitative research. Ultimately, the first-grade teachers' lived experiences of online education were delineated and developed into 7 main themes and 30 sub-themes. Accordingly, the main themes of "evaluation", "uncertainties and limitations", "emerging issues", and "interactions", were established with reference to the first research question, focused on the online education challenges perceived by these teachers. Then, the main themes of "creative adaptability" and "production and exploitation" were created in response to the second research question about teachers' strategies adopted to cope with online education challenges. The main theme of "experience formation grounds", comprised of the sub-themes of "specific grounds" and "general grounds", was further achieved concerning the third research question, namely, the grounds of teachers' experience formation.

KEYWORDS: Teachers, Online Education, First-Grade, Qualitative Approach, Phenomenological Study.

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1. Introduction

Information and communication technology have wrought irreversible changes in our society today (Franco, 2022). These developments have also led to the development of new approaches in educational systems. Virtual education is one of these approaches that information and communication technology has an important role in creating and expanding it. Accordingly, online education has grown significantly in recent years (Chingos & Schwerdt, 2014). Internet access has currently provided many individuals and

communities with a great opportunity for learning development, particularly instruction tailored to learners' needs and interests as well as distance education. The use of online education is growing rapidly around the world (Macdonald & Poniatowskab, 2011). The internet here represents a means of guiding learners and teachers during educational processes (Tarus et al., 2015). Since internet use has made online education possible, some distinctive features have been created to encourage individuals to practice this mode of instruction. Unlike teacher-centered education, traditional methods are not utilized in online education and the learning environment has become of utmost importance (Kisanga & Ireson, 2015). Nevertheless, most educational centers are not making efforts to augment the effectiveness and efficiency of instruction through new technologies and the internet (Miliszewska & Rhema, 2010). Given the advantages of online education, the demands for this flexible instructional delivery system have multiplied (Zameer, 2010).

Despite online education's long-standing significance, recent societal changes have increased its popularity and

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necessity (Han et al., 2022). With the help of the Internet and information technology, teachers and students can overcome time and space constraints to learn and acquire knowledge in a more flexible and diverse way (Li & Zhang, 2020). Online education can also make extensive use of educational resources, as well as establish a system for automatically recording each student's learning progress, attendance status and personal information, to facilitate teacher management in the classroom. Despite its advantages, sometimes online education does not go as expected and faces various obstacles. For example, hardware equipment is not enough for online learning, the operating system is faulty, and the student's self-control is weak. The burden of teacher training is also heavy, and parental supervision is becoming more important (Fu & Zhou, 2020).

Coronavirus has been spreading worldwide since late 2019. In light of COVID-19's highly contagious nature, the rapid spread of the disease within a short period has disrupted people's work, lives, and educational environments globally (Cui et al., 2023). The first case of this pandemic was reported in the city of Wuhan, China, in December 2019, and a new virus called COVID-19 was declared as an infectious agent in early January 2020. According to the World Health Organization (WHO) projections, the prevalence rate of this disease is still redoubling, and it will turn into the third leading cause of death in the world by 2030. This pandemic with its own complexity as well as multidimensionality and adverse effects has also brought about significant costs and burdens in health-related, socioeconomic, and educational domains for individuals, communities, and healthcare systems (WHO, 2020). People have been forced to change many aspects of their lives due to the COVID-19 pandemic (Fujs et al., 2022). As the epidemic spread, many governments imposed severe restrictions to prevent it from spreading. The traditional teaching method, in which students were required to attend class and the teacher had to guide them, also needed to be changed (Joseph & Edmund, 2020). Eventually, taking into account many factors, different types of schools in different countries decided to suspend school to prevent the risk of this disease for many students and other people (Jordan et al., 2020). Online education has become an alternative way to engage students worldwide (Zhu et al., 2022).

Considering the impacts of stay-at-home orders and school closures (Brazendale et al., 2017), some important decisions have been thus far made in different countries for the continuation of teaching and learning processes, including online education. This mode of instruction along with distance learning has been also the basis of education in Iran. Online education had never been experienced in primary schools in this country and its occurrence in higher education had been previously very limited. Since online education was implemented, especially in primary schools in Iran for almost the first time on a large scale, it faced some major

challenges, of importance to primary school students, mainly first-graders, because of the unique developmental characteristics of this age group and the significance of learning in the first years of schooling.

Therefore, the present study aimed to reflect on the first-grade teachers' lived experiences of online education challenges using a qualitative phenomenological approach. Three research questions were accordingly addressed:

1. What are the advantages, disadvantages, and efficiency of online education for first-graders from the teachers' lived experiences?
2. What strategies can be practiced maximizing the advantages and minimize the disadvantages of online education?
3. What are the main grounds of teachers' lived experiences of online education?

2. Methods

2.1 Research Design

A qualitative approach is often adopted to describe situations and events and pay much attention to their details. Moreover, there are attempts to discover the interpretations by study participants regarding giving meanings to different situations. It is also assumed that social interactions can be a complex whole and relationships can be further understood via inductive methods (Strauss & Corbin, 2008). According to the main objective of the present study, a qualitative phenomenological approach was recruited as a strategy to discover the lived experiences of the participants and provide rich descriptions of how such experiences were made available to the researchers (Smith et al., 1997). Some tools were further provided for interpreting the lived experiences of the study participants. This process was also completed with in-depth and precise reflections as well as the use of rich descriptive language (Ajjawi & Higgs, 2007). In this study, there were more attempts to explore first-grade teachers' lived experiences of online education as a phenomenon.

2.2 Participants

The target group in this study included female first-grade teachers working in primary schools in the city of Yazd, Iran, using online education in the academic year 2020-21. The sampling method was also of purposive type and 10 first-grade teachers participated in the study. The sample size was also determined based on theoretical saturation, that is, no new data were added to the previous ones as data collection continued (Streubert & Carpenter, 2003). The sampling was also performed until no new data was included and no new themes were obtained. Accordingly, 10 first-grade teachers were interviewed. Of note, the data were saturated after the completion of seven interviews, but such interviews continued up to 10 cases for further assurance. Table 1 presents the participants' demographic characteristics.

2.3 Data Collection Tool

A semi-structured interview was implemented in this study as the main data collection tool. To prepare the questions, the domestic and international backgrounds in relation to the research topic were first examined. After obtaining comprehensive information and backgrounds in this regard, the interview questions were designed to reflect on the first-grade teachers' lived experiences of online education. In order to ensure the content validity of the semi-structured interview form, the questions were also reviewed by three experts in this field.

2.4 Data Collection

First, a call was published in some virtual groups and among first-grade teachers and they were invited to participate in this study. After explaining the purpose of the study to the volunteers, the time and manner of the interview were further decided. Due to the COVID-19 pandemic outbreak, these interviews were conducted online. All the interview meetings were also recorded upon the consent of the participants, and then each interview was transcribed verbatim and the necessary points were documented. Following each interview, the implementation process, weaknesses, strengths, and some noticeable items were identified, for further consideration in the next meetings as well as the subsequent interviews. The participants were also become informed of research ethics, and finally, signed an informed consent form.

2.5 Data Analysis

In this study, the interpretative phenomenological analysis (IPA) as a qualitative thematic approach

developed by Smith et al. (1997) was used to analyze the data, in which three stages of data generation, data analysis, and case integration had been proposed (Smith et al., 2009). In this qualitative research, the criteria of credibility (namely, internal validity), transferability (or external validity), dependability (i.e., reliability), and confirmability (viz. objectivity) were taken into account. Authenticity was another criterion for evaluation purposes in this qualitative research (Lincoln & Guba, 1986). To increase the credibility of the data in this study, long-term involvement, no jumps to early conclusions with insufficient observations, constructive discussion about the findings with unbiased and honest colleagues, progressive thinking, i.e., monitoring the developed structures and documenting the change process from the beginning to the end of the study, member checking, the participants' confirmation of data analysis findings, and the researcher's self-review were thus considered effective in the process of data collection and analysis. Besides, the transferability in this study was fulfilled through the development and rich description of the dataset during the data collection and the use of special coding methods. In the present study, all the interviews were conducted over a period of 45 minutes to an hour, and they were recorded and then transcribed verbatim to achieve dependability. Coding was also done and compared by a researcher and one other expert in qualitative research. Moreover, the review and adaptation of the opinions of some qualitative researchers, including the study supervisor and participants, were exploited. The reliability of the researcher analysis and peer review by another researcher working in the field related to the research subject was also obtained based on the Miles and Huberman formula (2016) by 0.91.

Name	Age	Marital status	Level of education	Field of study	Teaching experience	Number of children	History of first-grade teaching experience	Type of employment
A	35	Married	Master's degree	Education	7	2	5	Permanent
B	40	Single	Bachelor's degree	Education	14	-	6	Permanent
C	38	Married	Associate's degree	Education	12	-	10	Permanent
D	37	Married	Master's degree	Education	5	3	4	Contractual
E	30	Married	Master's degree	Education	3	1	3	Severance pay
F	33	Married	Bachelor's degree	Education	8	1	8	Contractual
G	42	Married	Master's degree	Education	16	3	10	Permanent
H	30	Married	Bachelor's degree	Education	5	2	5	Limited-term
I	37	Single	Master's degree	Education	10	-	8	Contractual
J	28	Married	Bachelor's degree	Education	3	-	3	Limited-term

Table 1 - Study participants' demographic characteristics.

3. Results

In the present study, the interviews were first transcribed verbatim and read repeatedly. Then, the sub-categories were identified and labeled. Afterward, the main categories were organized and clustered in the sense that general categories could be extracted by continuing to compare them and to take account of the differences and similarities of the sub-categories. Accordingly, a total number of 1060 open codes and finally seven clusters (namely, main themes) and 30 categories (viz. sub-themes) were extracted. The results obtained according to the research questions addressed are listed below. The outcomes of the first research question are also reported in Table 2.

MAIN THEMES	SUB-THEMES
EVALUATION	EVALUATION
	FEEDBACK
	ASSURANCE OF LEARNING
UNCERTAINTIES AND LIMITATIONS	DIAGNOSIS OF LEARNING DISABILITIES
	SKILLS TRAINING
	EDUCATIONAL ACTIVITIES
	ATTENDANCE (OR CHECK-IN)
	HOMEWORK ASSIGNMENTS AND THEIR REVIEW
	MOTIVATION
EMERGING ISSUES	CONCERNS
	BRINGING WORK PROBLEMS HOME
INTERACTIONS	TEACHER-PARENT RELATIONSHIPS
	STUDENT-STUDENT RELATIONSHIPS
	TEACHER-OFFICIAL RELATIONSHIPS
	PARENT-PARENT RELATIONSHIPS
	TEACHER-STUDENT RELATIONSHIPS

Table 2 - The results of the first research question.

Research question 1: What are the advantages, disadvantages, and efficiency of online education for first-graders from the teachers' lived experiences?

The first sub-theme is "evaluation". In this sense, much of the evaluation for first-graders can occur during the learning process, wherein teachers can observe and correct their mistakes through constant presence. As well, first-graders are still learning how to hold a pencil and the basic movements that need to be carefully corrected by teachers, which becomes more difficult for them in online education. Evaluation can be thus done merely by sending videos and audios, whose reviews are demanding and time-consuming. In this regard, Participant E stated that:

"Evaluation is of utmost importance for first-graders. I need to understand whether such students have gained a correct understanding of the concepts of first, non-first, middle, and last and so on or not, which can be based on some signs, but once again, much more care should be taken. If a student understands the first signs during the first sessions, they will not be encountered by a strange problem.

Now, that is why we have to be more obsessed with evaluation once online education occurs. For this reason, I use live video calls."

Feedback, as one of the sub-themes of evaluation, should also include a positive approach to provide strengths and weaknesses as well as solutions in order to deal with some limitations. Here, verbal and non-verbal feedback is not fully applicable without face-to-face interactions. In addition, giving feedback through the constant use of messages, images, audios, and videos seems difficult among teachers and often monotonous for students. In this regard, Participant G reiterated that:

"At the same time, feedback will be also verbal, or I will focus on the positive points and problems using voice messages. I will try to explain the solutions that need to be corrected. But, I think it is much harder than in-person education."

Due to the difficulties mentioned in the evaluation and feedback sub-themes, even with the help and involvement of parents and others around, assurance of learning in students can be easier said than done for teachers. For example, Participant H said that:

"In cyberspace and during online education, I asked all parents to send me a short video of how to hold a pencil and write the subtitles until their end for the assurance of learning in students, but the fact was that I was in doubt about this type of learning. I think some students may pick up the pencil correctly the moment they are filming but not later."

As highlighted in the lived experiences of the first-grade teachers, the second main theme is "uncertainties and limitations". In this respect, many of the problems that can be identified or addressed in in-person education are thus difficult to achieve during online education or fail to provide teachers with enough certainty to identify, act, and wrap up. The diagnosis of learning disabilities during preschool and primary school years, especially in lower grades, can be thus very important for the prevention and treatment of subsequent problems. Nevertheless, it does not happen properly in online education due to the lack of face-to-face interaction between teachers and students, as well as the negligence of small weaknesses and parental involvement in teaching or getting help from others to do homework assignments. In this line, Participant A stated that:

"In face-to-face education, the symptoms of learning disabilities can be identified well, but this is not easily possible in online education."

Many teaching and homework assignment activities also deal with student skills training and aim to enhance motor skills, life skills, Problem-solving, working with tools, manual jobs, and the like. However, this arises as a limitation and even difficulty in online education. For example, Participant F added that:

“The results of group experiments in classrooms and exposure to the environment and laboratory equipment look very different, and home-based tests alone fulfilled with the help of parents and their results cannot replace them. I believe that students cannot learn about some concepts such as participation, cooperation, orderliness, and responsibility because they are no longer involved in laboratory settings.”

A large part of the educational activities and the cases related to their effectiveness are also associated with attendance, interactions with students, and objective observation of these activities and involvement in them. During online education, this possibility is far reduced and the efficacy of these activities by teachers and other relevant officials as well as their use by students can be affected. Accordingly, Participant B acknowledged that:

“As children attend schools, there is a great chance to participate in some ceremonies, visits, and field trips, but now none of these events is the case. Everything else has been also removed from schools and the education system. Everything is merely done online.”

In face-to-face education, attendance is also completely objective and controlled by teachers in person, but the system is not the same and new methods are being used for this purpose in online education, such as attendance (or check-in) links, sending voice messages to student groups, and other innovative tactics developed by teachers. Despite roll calls occurring at the beginning of each online session, students may not be present during the classes, and teachers may not get informed. For example, Participant C stated that:

“A student checks in the attendance link in the early hours, but it is not clear whether he or she is really present in the rest of the class or not.”

One of the major challenges of online education is how to give homework assignments to students, which are just comprised of a review of images, videos, and audios sent by students. Examining these cases accordingly requires much mental and physical energy, and even causes fatigue in teachers. Accordingly, Participant D said that:

“Some students have to send some images many times because of the poor quality of their cameras or even their carelessness while taking them.”

Decreased motivation for many reasons such as not attending school, not meeting classmates, difficulty in establishing proper emotional communication with teachers, the impossibility of active and objective participation by students in the teaching process and classrooms, as well as the lack of extracurricular activities and scientific excursions can also take place in

online education. In this respect, Participant I reiterated that:

“In the past, children used to make some handicrafts to learn each of the signs, and we used to place them in front of the classroom to teach about them. The students also had some rich backgrounds and they were motivated to learn more and more, but, now, I myself make some kinds of stuff and the students do not, unfortunately, get involved. In fact, the teacher’s work has doubled.”

The third main theme is emerging issues. In this sense, online education has led to the creation of new issues among teachers. Concerns and bringing work problems home are two sub-themes in this regard. New concerns have thus arisen with some modifications in teaching methods. Concerns about teachers’ job performance in an environment observed by many people and the possibility of publishing and sharing their activities on virtual networks via WhatsApp, Telegram, and Instagram apps, particularly if there are some defects or mistakes, is thus one of the important mental conflicts among teachers. In this regard, participant G stated that:

“I feel worried that once a time I may say something in the voice messages that is wrong. Many teachers have this concern.”

Almost all teaching activities should be done at home. Preparing teaching content and even teaching from home in the presence of others can thus have its own troubles. The presence of other members along with some household chores can accordingly interfere with teaching and increase teachers’ workload. In this regard, Participant E added that:

“When recording films at home, a state of siege must be announced both for me as a teacher and for the children, and I should always note that no one should have a word or watch TV, which often causes tension and conflicts between family members.”

The fourth main theme is interactions, as one of the key terms raised by teachers in connection with online education challenges. Teacher-parent interactions during this mode of instruction have also become much more difficult and they have even changed. However, parents, like teachers and others, have recently encountered online education and they have little information in this respect. According to Participant D:

“Parents, like us, are also teachers with their first experiences, and especially those who have not yet had schoolchildren, do not know what to do. The meeting of the parent-teacher association is not held in a way that online education can be well justified.”

Regarding student-student relationships, most students can learn a lot through interactions with their classmates and peers. Such a great opportunity is often lost without

their attendance at schools. In cyberspace, interactions do not also take place completely and literally. In this sense, Participant B said that:

“Previously, when attendance mattered, children could interact with teachers as well as other students. They could see each other’s activities in person, and this could fuel their enthusiasm for more learning.”

Following virtualization in education, the way teachers communicate with school officials has also changed. In online education, teachers more benefit from the supervisory control of officials due to the possibility of their membership in class groups. Beyond school officials, some education office authorities can also join class groups by chance or for other reasons in order to supervise and transfer experience and guidance. For example, Participant F maintained that:

“I once told one of the parents that her child had a speech problem and needed to visit a therapist, but she got upset, went to the education office, and reported that the teacher was strict and so on. After some time, the head of the educational group joined my online class for a week to see what was going on there.”

Parents are not also able to interact face-to-face in online education. In previous years, in parent-teacher association meetings, parents and teachers can get to know each other, talk, and share their lived experiences. Nevertheless, such relationships in online education have sharply declined. In this regard, Participant D declared that:

“Last year, I mean, every year we had a few meetings of the partner-teacher association, wherein parents used to convene, and teachers could talk about whatever they liked. Besides, parents themselves could talk with each other. I saw a lot of people consulting with each other or helping each other in some cases.”

The most challenging part of teachers’ lived experiences of online education is their interactions with students. The biggest negative experience and in fact the undesirable feature of this mode of instruction is the lack of face-to-face teacher-student relationships, as expressed by the first-grade teachers, wherein students have not yet gained enough experience of school, teacher, and education. Teaching the rules, reflecting on correct signs, and talking about many of the topics in the first-grade of primary school are thus best done through face-to-face interactions between teachers and students, which are not possible in online as much as face-to-face education. In this regard, Participant A affirmed that:

“One of the most important lessons in the first-grade of Persian language is in-person communication and seeing the teacher’s face and lips when demonstrating each sign, which is very important to recognize the differences

for some letters such as d, b, n, k, g. The same goes for teaching signs. It is crucial in face-to-face conversations and group discussions. The same goes for writing. Holding a pencil and controlling the movements of the child’s hand when writing is also of significance and should be directly supervised by teachers. None of these happens in online education. The main drawback is that teachers cannot interact with them in person.”

The results of the second research question are also presented in Table 3.

Research question 2: What strategies can be practiced to maximize the advantages and minimize the disadvantages of online education?

MAIN THEMES	SUB-THEMES
CREATIVE ADAPTABILITY	CREATIVITY
	ADAPTABILITY
PRODUCTION AND EXPLOITATION	CONTENT PRODUCTION
	READY-MADE CONTENT EXPLOITATION
	COLLEAGUE EXPERIENCE EXPLOITATION

Table 3 - Results of the second research question.

Online education has been further associated with some difficulties whose increase requires special arrangements by teachers in terms of instruction, homework assignment, and evaluation. Teachers should thus make use of creative methods to augment adaptability to online education. Creating new conditions also demands new strategies for their implementation. It is also necessary to devise and choose some solutions to better fulfill the responsibilities assigned. Many of the shortcomings, challenges, and weaknesses of online education also need to be addressed and compensated by some methods. Therefore, teachers should exploit the strategies appropriate to online education during their instruction, feedback provision, homework assignment reviews, roll calls, and other related issues, and this is of importance because there has been no online education background for first-graders in Iran. In this regard, Participant I added that:

“The power of using poetry and impromptu storytelling techniques to teach some concepts and working with software and content development is one of the positive experiences I have gained during online education.”

Facing this new situation, i.e., online education accordingly requires adaptability. This new experience has also changed some characteristics of individuals in accordance with this new environment. Teachers’ effective activity in cyberspace has further increased and they have become highly proficient in some areas such as content production, in which they had no experience before. In this regard, Participant C asserted that:

“I myself used to not be very active in cyberspace. Now, I feel less embarrassed and I work at ease. We often exchange ideas in partner groups, and I even send voice messages.”

The new mode of instruction necessitates appropriate content more than anything else to do the job well. Therefore, teachers have to produce educational content. This main theme consists of three sub-themes of content production, exploitation of ready-made content, and exploitation of colleague experiences. Due to the absence of teachers and students, all educational content, in fact, audios, images, and videos must be prepared beforehand. This content can be in the form of videos as well as various clips prepared and used by teachers. Much of the teachers’ time and energy are thus spent producing such content, which may empower many teachers in this field. In this sense, Participant H said that:

“As it was not possible to do all the experiments at home, I had to learn to work with different software and create relevant educational content.”

As content production is a specialized job and requires time and money, it is more cost-effective to use high-quality content developed by other colleagues, so most teachers try to use the best content produced with multiple searches but mere focus on the content they produce does not suffice. For example, participant J declared that:

“Some colleagues make good videos and clips and share them with the teacher group, and I use them.”

Teachers have also tried to use some strategies to increase their productivity and that of students in online education. In addition, content preparation in this mode of instruction has not been done before and they have little experience in this field. Content production also takes too much time. Therefore, teachers work together to provide the necessary tools, in a way to broaden their experience through substitution and benefit other colleagues’ experiences. In this line, Participant B stated that:

“I had to be more serious about using content production software and apps and try to learn to work with them and build much more content. One of my colleagues is very helpful in this domain.”

Table 4 shows the results of the third research question. *Research question 3:* What are the main grounds of teachers’ lived experiences of online education? Some factors have also led to the formation of the special experiences of online education among first-grade teachers, including specific and general ones, composed of their own sub-themes. In this sense, the general grounds consist of socio-cultural conditions, economic

issues, and obligations. Some areas are thus closely related to teachers and the characteristics of online education, forming some experiences in teachers. Such experiences are referred to as special experiences. These specific grounds also include infrastructures, rules and regulations, timing, emergence, education and culture-building, and flexibility.

MAIN THEMES		SUB-THEMES
EXPERIENCE FORMATION GROUNDS	SPECIFIC GROUNDS	INFRASTRUCTURES
		RULES AND REGULATIONS
		TIMING
		EMERGENCE
		EDUCATION AND CULTURE-BUILDING
		FLEXIBILITY
	GENERAL GROUNDS	SOCIO-CULTURAL CONDITIONS
		ECONOMIC ISSUES
		OBLIGATIONS

Table 4 - Results of the third research question.

The context of online education and the tools by which it takes place is thus of utmost importance. Online education accordingly requires basic facilities and infrastructures without which instruction will seem difficult or impossible. According to the first-grade teachers, lack of proper infrastructures such as high-speed internet, smartphones or personal computers, an interactive program dedicated to lower-grade students in primary schools, together with the inability of some students to have access to such facilities have thus far led to some problems in online education. Participant A stated that:

“Some students have a poor economic status and even do not have a smartphone at all to install the required programs and attend the online sessions.”

Since online education is still in its infancy in Iran and has become recently widespread, especially in primary schools due to the prevalence of COVID-19, rules and regulations in this area have not been so far established to facilitate education for teachers and students or prevent some possible problems. Accordingly, Participant E said that:

“There are no rules and regulations for online education in order to specify the rights of teachers and students. Now some students do not have a smartphone. What is the law in this regard for teachers? For some students, parents do not even feel responsible for whatever you practice. What is their duty? I think they may claim that the teacher did not act well.”

Timing is another sub-theme related to the formation of lived experiences. The amount of time devoted to education, more time to consolidate some concepts and teach them, or to prepare educational content and tools

can be thus cited as an experience in online education. In this line, Participant H affirmed that:

“In online education, we are constantly under the pressure of time. Previously, teaching and learning were in accordance with textbook planning during students’ attendance at schools and there was enough time, but more time needs to be spent in cyberspace.”

Online education had not been widely used around the world, especially in Iran, before the COVID-19 pandemic outbreak. Thus, many education systems, countries, schools, teachers, students, and parents currently have no previous or extensive experience in this field. This has accordingly created special conditions for first-graders, who have no experience of schooling and face-to-face interactions in addition to online education. For example, Participant E stated that:

“It is very difficult for me as a teacher who had no experience with online education at all. I have to spend a lot of time preparing some content. I do not know about the best method to teach and what to do. It is an experience I have never had before.”

Education and culture-building is another sub-theme. Teachers have no previous experience in online education. The education system has not had this experience so far, so teachers need to practice in this area to be able to provide their best teaching activities. One of the most important parts of online education is content production, which must be done with special tools, which requires specialized training for the majority of teachers. The culture of using online education and activities is also vital. Some students are afraid of being scorned once playing their videos and audios. This concern also goes for teachers. Therefore, culture-building in this field is of importance to create security and help use cyberspace for education in a proper manner. Lack of education and culture-building can thus lead to some special experiences among teachers and other users. For example, Participant C affirmed that:

“Another thing that exists in online education is that neither teachers nor students were previously seeking to laugh at unfortunate slips made by children in their relationships and they were not abused. Unfortunately, culture-building has not taken place in this respect in online education. There is a big concern, and it is now happening.”

Participant J also stated that:

“It is now essential for teachers to take in-service educational content production courses. Education office must also take training for this purpose into account.”

Flexibility in online education also allows students to view and save videos and educational content multiple

times and refer to them whenever they need. For example, Participant F said that:

“The good thing about videos is that students can watch them whenever they want, can even save them and access them forever, and that is very helpful if they need to repeat them.”

Some grounds according to the conditions of society have also led to the formation of some special experiences during teachers’ online educational activities. Socio-cultural conditions, economic issues, and obligations are some of the sub-themes in this regard.

From this perspective, socio-cultural conditions affect teachers’ methods and behaviors. This becomes even more important for female teachers, whose fear of misconduct and playing their videos or audios in cyberspace are among major concerns. For example, Participant D stated that:

“I am a female teacher, and if I want to record a video training exercise and some of the workouts that clearly show the limbs and perform them for my students, I will face many restrictions and abuse.”

Economic issues and insufficient financial resources are also effective in shaping the first-grade teachers’ lived experiences of online education. Students with low financial capacities are thus not able to provide some facilities for homeschooling, and as a result, the quality and quantity of education is impaired. In face-to-face education, it was possible to use school facilities, which is currently not possible for students during online education. For example, Participant A acknowledged that:

“Another very important issue is the economic problems and the lack of a smartphone for some students.”

The obligations of the conditions during the COVID-19 pandemic have also left the world with no choice but online education. The whole world has decided that social distancing should be intensified, and schools should be closed down to manage the disease. In this line, Participant F reiterated that:

“COVID-19 and the unchanging situation as well as the fact that children should not be at schools in these circumstances compelled us to keep to online education.”

4. Discussion

The main purpose of this study was to reflect on the first-grade teachers’ live experiences of online education challenges in the academic year 2020-21, which was examined in the form of three main questions. The main themes of “evaluation”, “uncertainties and limitations”, “emerging issues”, and “interactions” were thus

developed in response to the first research question regarding the online education challenges perceived by teachers. The main themes of “creative adaptability” and “production and exploitation” were further obtained in regard to the second research question about the teachers’ strategies adopted to cope with online education challenges. Moreover, the main theme of “experience formation grounds”, including the sub-themes of specific and general ones, were raised with reference to the third research question, namely, the teachers’ experience formation grounds.

The results related to evaluation in this study were thus consistent with the findings reported by Abbasi et al. (2012), Haji et al. (2021), Karimi (2021), Rezaei (2013), Belair (2012), and Yuan (2009), exploring online education challenges. Since the main objective of education is to promote the community, the teaching and learning process must be enriched; therefore, part of education development takes place through measurement and evaluation. Evaluation is an integral part of the education system and has a special place. In assessment, in addition to gathering information and evidence to measure the achievement of educational goals, conditions also occur to help reinforce and facilitate learning (Pavri, 2012). It also fosters responsible, responsive, committed, self-assessed, and critical thinking students (Shermis & Di Vesta, 2011). In virtual education, many of these goals cannot be achieved in practice, because e-learning limits the tools needed to achieve it and some necessary elements such as interaction in this training are lost. As conventional methods for evaluating the quality of teaching are no longer appropriate, it is imperative to develop methodologically sound evaluations (Liu et al., 2022).

Feedback was also another sub-theme of evaluation, whose impact had been so strong that it had been cited as a fundamental in learning and motivation among students. Organizing the learning process and increasing motivation are thus two important impressions of feedback. In the new evaluation system, not only the fulfillment of learning objectives is considered, but also the discovery of needs, explanation of objectives, identification of strengths and weaknesses, and continuous improvement and enrichment of learning by giving feedback. Feedback also paves the grounds for learners’ comprehensive growth by removing shortcomings (Pavri, 2012).

In virtual education, when evaluating, the student does not perceive some leverage to participate in the evaluation, and even some follow-ups do not work in this regard. As a result, the extent and quality of student participation in assessment is, also affected and the learning curve cannot be assured (Belair, 2012).

Regarding the diagnosis of learning disabilities, Mohammadi et al. (2012) had accordingly confirmed that it was not possible to reflect on learning speed and power in students specifically with high quality in online education. The first and most important practical method for diagnosing learning disabilities is student observation, which can appropriately provide

information about them in different situations and places.

In line with the theme of skill training, Muthuprasad et al. (2020) also stated that the possibility of practical experience for learners is reduced. This is especially true in relation to some courses and units where the practical aspect is more important, which has a greater impact on the quality of education.

In agreement with the sub-theme of educational activities, Kian (2014) had further maintained that instruction was one of the major challenges facing online education. In the virtual environment, there are no face-to-face interactions, and as a result, the possibility of modeling is diminished. For this reason, the grounds for education are not completely ready. These findings can be cited by respecting the aspects of educational activities in schools. Attendance was another sub-theme. In this context, some studies had reported disorders in students’ presence in classrooms and impossible supervision in online education (Haji et al., 2021; Karimi, 2021), which was somehow related to the issue of attendance or check-in. Discussing the readiness of students for online education is also one of the major challenges in this field. Entering online education as well as persisting and continuing activities in this type of education have been and are still controversial for students, i.e., the time a student exactly checks in and leaves the classroom is not always clear to teachers (Cavanaugh et al., 2004). In addition, many primary school students do not currently have strong learning knowledge and a clear understanding of this situation. Such lower-grade students often consider online classes as a hobby at home. Therefore, they do not feel obliged to attend the classes and have much absenteeism once there is no family supervision (Yuan et al., 2020). Regarding the theme of homework assignment presentation and reviews, Yuan (2009) had additionally shown that Assessing homework in web-based learning has its own difficulties and it is more difficult to give feedback to the student. Student fatigue and monotonous training and lack of parental supervision, some misconceptions about virtual education in the minds of parents and the difficulty for the teacher in reviewing homework and fatigue of the teacher’s eyes and hands are some of the factors that affect the quality of homework presentation and review.

Motivation was another sub-theme related to uncertainties and limitations. These findings were also consistent with the reports in the studies by Belair (2012) and Wahyuningsih (2020). In virtual education due to lack of proper attitude to this education, the novelty of this experience and the lack of skills of students and parents in this type of education as well as inexperience of the teacher, difficulty in resisting the temptation of online games and electronic products for students and reduced student participation in teaching. And student learning motivation decreases (Yuan et al, 2020).

With online education in the context of information and communication technology (ICT), teachers are scared of some activities in cyberspace, which can lead to derision

and damage to their reputations (Haji et al., 2021). Several factors thus contribute to job stress and burnout. High workload, poor work skills and performance, low pay, no social connections, discrimination in the workplace, and conflicts between individuals and workplace values are some of the factors that redouble job worries (Maslach, 2003). Work-family conflict has been further cited, particularly for women, as a cause of stress and fatigue. According to the listed factors, it can be argued that the teachers' workload increases by staying in and the need to do all educational activities at home, despite all their house chores. In addition, online education involves content preparation, which itself takes much time. Homework assignments that were previously reviewed in classrooms or during breaks, all must be done at home during online education.

The fourth main theme related to the first research question is interaction, whose findings were consistent with the reports by Belair (2012) and Rao (2012). The student's extensive interaction with the teacher prepares him or her fully to play a social role and to receive and present a successful behavioral model. It also acts as a very strong source of support. This interaction and the quality of their activities and educational experiences in this context, leads to student success outside and inside the school. The more positive and interactive this interaction is, the more important the teacher's educational role becomes (Hurst et al., 2013). Interaction between learners and each other is also very effective in students' learning. They encourage and facilitate each other's efforts to accomplish tasks and duties. Not only cooperation in this interaction but also positive interdependence with each other, progressive face-to-face interaction, learning social skills and other group processes are elements that enhance students' learning in the form of interaction (Asha & Al Haw, 2016). Because of COVID-19, traditional learning methods have been redefined, keeping kids at home, and engaging in online education (Alwadei & Alnanih, 2022). All through the interaction between teachers and students, the factors of interpersonal behavior bring positive effects. Creating and organizing groups and classes, how to get help from each other, how to interact and behave to achieve some goals, seeing teachers' behaviors and verbal encounters, and even learning from them to aid others, respond, and guide, as well as being sensitive to the needs of others and listening much more can thus result in the impact of the interaction. The interaction between students with their own different needs and abilities also paves the grounds for their cooperation and makes them better understood. Students with special characteristics, such as shyness during interactions, also learn about constructive behaviors and are further given a great opportunity to experience new situations. Rules and regulations, which are explicitly/implicitly defined in students' interaction and cooperation, can even have an educational aspect. Teachers using interactive approaches in teaching and classroom management can similarly shape students' learning behaviors more deeply, depending on their

commitment and expertise (Dxemidzic et al., 2019). Interaction between colleagues in the educational system correspondingly occurs in different manners. This type of communication can be simultaneous, asynchronous, textual, audio-based, or visual. The ease of establishing this interaction can thus boost the quality of education and the levels of motivation in teachers and students (Jolliffe, 2015). In online education, teacher-official interactions can also take a different form. In this sense, face-to-face communication decreases but it is facilitated due to the virtual communication platform. Likewise, some officials join class groups and get informed regarding educational activities. At the same time, teachers gain a valuable opportunity to communicate more closely with officials in cyberspace. The themes of creative adaptability and production and exploitation were further obtained in answer to the second research question. Teaching as one of the influential professions has been always an important platform for the emergence of professional and individual creativity, particularly by teachers who are more interested and motivated. Creativity in teaching, especially in situations wherein appropriate facilities and tools are not available and teachers cope with shortcomings and limitations in resources they need to do their professional work can be thus a very effective driving force and a tool in achieving educational goals and fulfilling learning practice (Henriksen & Mishra, 2013).

In new modes of instruction, teachers play a facilitating role in teaching and learning processes. The acceleration, facilitation, and consolidation of the learning process accordingly require different tools, but today, due to technological development as well as ICT, electronic content production has become one of the most powerful educational tools applied for this purpose. Using this content has also generated a new experience for teachers and students in classrooms. Besides, content has an informational function, so loads of information can be presented in various forms such as texts, images, and videos. These tools produce some situations. Electronic content can be also exploited to process information, build knowledge, and objectify student perceptions. It additionally allows communication between teachers and students despite the physical barriers of time and place (Hamdi & Hamtini, 2016). However, since content production is assumed as a specialized activity and many teachers lack experience in this field, and they have not been even obliged to work in this regard at a high level, many teachers use the content prepared and produced by other colleagues. The relationships between colleagues in the educational system can also enhance the quality of education and motivate teachers and students, especially in complicated and new situations (Jolliffe, 2015). Likewise, sharing experiences makes the emerging path easier and adds to the experience of teacher substitution. In response to the third research question, the main theme with two sub-themes was also developed. Here, experience formation grounds included two sub-themes

of specific and general grounds. These findings accordingly confirmed the reports by Childs et al. (2005), Rao (2012), Wahyuningsih (2020), and Akabayashi et al. (2023). A significant factor contributing to the digital divide during COVID-19 is ICT skills among students, which closely correlate with their socioeconomic status (van de Werfhorst et al., 2022). No internet access, especially in disadvantaged areas, and educational inequality have been thus reported as the challenges experienced by teachers in online education. Some families cannot even afford internet use. The slow speed of the internet is also one of the factors related to infrastructures, inducing problems for teachers and students. Improper access to the virtual network in different parts of Iran as well as the cost of the internet and its slow speed have been further reported as infrastructural and technical challenges. Iran's Ministry of Education operationalized the Shad Social Network (owned and administered by the Ministry of Education) in March 2020 (Bahmani et al., 2022). The policies of the ministry forced teachers across Iran to present their teaching only through Shad Social Network. However, according to teachers and parents, the program initially suffered a lot of issues like problems in sending voice messages and files (especially files with larger sizes and higher quality) and constant freezes, and this made education very challenging during the first year after the COVID-19 pandemic; however, over time when the program was updated, issues got alleviated, though it never fulfilled users' expectations of an efficient interactive program for effective virtual education. According to teachers, being forced to implement Shad Social Network and depriving them of using more interactive and efficient social networks and technologies were among the most significant challenges concerning virtual education.

As a result of the Covid-19 pandemic, distance education was observed to have negative effects on students' social literacy skills, but it can still provide valuable advantages (Alsubaie, 2022). The flexibility and freedom of action in virtual education and the creation of a new experience in education and training, the need to provide the necessary hardware to participate in virtual classes and low Internet speed are among the factors that have affected people's experience of virtual education. The possibility of holding classes at different times and places is an example of the flexibility of virtual education (Asmara & Wu, 2020).

The high costs associated with planning and facilitating online education, especially in virtual schools as well as access to facilities and the internet are thus among important issues (Barbour & Cooze, 2004). Discussing the culture of families in terms of the acceptance of online education is also of great magnitude. In various surveys, many parents and students do not want to educate their children virtually. Although the possibilities of this type of education have been improving, the opinions of families to use and replace traditional education have not changed and there is still not much desire to use it, as mentioned in different

surveys (Cavanaugh et al., 2004). Piskurich (2004) also cited the difficulties of this training, the lack of time, the lack of managerial support, the possibility of definitively creating a training process, limited understanding of the virtual learning environment and its problems, lack of necessary infrastructure, especially in homes, incorrect beliefs in virtual education, and the lack of access to the necessary technology in some areas.

On the subject of obligations, with the outbreak of the COVID-19 pandemic in China, many governments have further imposed severe restrictions to prevent its spread. Traditional education, in which students were required to attend classes and instructed by teachers, also needs some changes (Joseph & Edmund, 2020). Taking account of many factors, governments have decided to implement a school closure policy in order to prevent the risk of this disease for many students and other people (Jordan et al., 2020).

At the moment, in-person classes are resumed in Iran as the pandemic has subsided, though factors like air pollution in industrial hubs, floods, intense rain and snow, and the breakout of diseases like influenza and COVID-19 sometimes force schools to offer their education in an online mode. Experience gained through the education offered during the COVID-19 pandemic has increased the quality of virtual education during the present era, though some challenges like slow internet rates and infrastructure shortcomings still exist.

5. Implications

According to the findings of the present study, it is necessary to consider the limitations of online education facing teachers. In addition, families, students, and teachers need to be trained to make the best use of cyberspace and online education. In order to empower teachers to produce educational content, it is of utmost importance to hold training courses. Moreover, it is not possible to make the most of online education without creating technological and socio-cultural infrastructures. Considering the characteristics of the courses and the content that first-graders should learn as well as the significance of teacher-student interactions, it is also essential to design more interactive and comprehensive software for online education.

6. Limitations

The present study was obtained only from the data of some semi-structured interviews, as the only tool, with female first-grade teachers working in primary schools, so the lived experiences of other teachers in other grades, as well as the experiences of male counterparts, can be examined in further research.

References

- Abbasi, F., Hejazi, E., Hakimzade, R. (2020). Lived Experience of Elementary School Teachers about The Opportunities and Challenges of Teaching in the Educational Network of Students (SHAD): A Phenomenological Study. *Research in Teaching*, 8(3), 24-1.
- Ajjawi, R., & Higgs, J. (2007). Using hermeneutic phenomenology to investigate how experienced practitioners learn to communicate clinical reasoning. *The Qualitative Report*, 12(4), 612-638.
- Akabayashi, H., Taguchi, S., & Zvedelikova, M. (2023). Access to and demand for online school education during the COVID-19 pandemic in Japan. *International Journal of Educational Development*, 96, 102687.
- Alsubaie, M. A. (2022). Distance education and the social literacy of elementary school students during the COVID-19 pandemic. *Heliyon*, 8(7), e09811.
- Alwadei, A., & Alnanih, R. (2022). Designing a Tool to Address the Depression of Children During Online Education. *Procedia Computer Science*, 203, 173-180.
- Asha, I. K., & Al Hawi, A. M. (2016). The impact of cooperative learning on developing the sixth grade students decision-making skill and academic achievement. *Journal of Education and Practice*, 7(10), 60–70.
- Asmara, A., & Wu, T. T. (2020, November). Study on Development of Mobile App Design as Learning Media in Student Internship Support: Toward Strengthening Tie and Realistic Feedback in University-Industry Cooperation. In *International Conference on Innovative Technologies and Learning* (pp. 59-68). Springer, Cham.
- Bahmani, S., Bagheri, M., & Pirek, M. (2022). Analyzing the experiences of teachers and students of Lorestan province regarding virtual education in Shad network (qualitative study with data base theory method). *Iranian Journal of Social Studies*, 16(2), 3-27.
- Barbour, M. K., & Cooze, M. (2004). All for one and one for all: Designing web-based courses for students based upon individual learning styles. *Staff and Educational Development International*, 8(2/3), 95–108.
- Barbour, M. K., & Reeves, T. C. (2009). The reality of virtual schools: A review of the literature. *Computers and Education*, 52(2), 402–416.
- Belair, M. (2012). An investigation of communication in virtual high schools. *International Review of Research in Open and Distributed Learning*, 13(1), 105-123.
- Brazendale, K., Beets, M. W., Weaver, R. G., Pate, R. R., Turner-McGrievy, G. M., Kaczynski, A. T., . . . Von Hippel, P. T. (2017). Understanding differences between summer vs. school obesogenic behaviors of children: the structured days hypothesis. *International Journal of Behavioral Nutrition and Physical Activity*, 14(1), 100-109.
- Cavanaugh, C., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K-12 student outcomes: A meta-analysis*. Naperville, IL: Learning Point Associates.
- Cavanaugh, C., Gillan, K. J., Kromrey, J., Hess, M., & Blomeyer, R. (2004). *The effects of distance education on K-12 student outcomes: A meta-analysis*. Naperville, IL: Learning Point Associates.
- Childs, S., Blenkinsopp, E., Hall, A., & Walton, G. (2005). Effective e-learning for health professionals and students—barriers and their solutions. A systematic review of the literature—findings from the HeXL project. *Health Information & Libraries Journal*, 22, 20-32.
- Chingos, M. M., & Schwerdt, G. (2014). *Virtual schooling and student learning: Evidence from the Florida Virtual School*. Cambridge, MA: Harvard Kennedy School. Retrieved Oct, 25, 2014.
- Cui, Y., Ma, Z., Wang, L., Yang, A., Liu, Q., Kong, S., & Wang, H. (2023). A survey on big data-enabled innovative online education systems during the COVID-19 pandemic. *Journal of Innovation & Knowledge*, 8(1), 100295.
- Dzemidzic Kristiansen, S., Burner, T., & Johnsen, B. H. (2019). Face-to-face promotive interaction leading to successful cooperative learning: A review study. *Cogent Education*, 6(1), 1- 19.
- Franco, D. C. (2022). Gamification as an engagement, learning and interaction strategy for distance education in Mozambique. In *Academic Voices* (pp. 71-81). Chandos Publishing.
- Fu, W., Zhou, H. (2020). Challenges brought by 2019-nCoV epidemic to online education in China and coping strategies. *Journal of Hebei Normal University of Science & Technology*, 22(2), 14–18.
- Fujs, D., Vrhovec, S., Žvanut, B., & Vavpotič, D. (2022). Improving the efficiency of remote conference tool use for distance learning in higher education: A kano based approach. *Computers & Education*, 181, 104448.
- haji, J., Mohammadi Mehr, M., Muhammad azar, H. (2021). Describing the Problems of virtual Education via Shad application in Corona Pandemic: This is a phenomenological study. *Information and Communication Technology in Educational Sciences*, 11(43), 153-174.

- Hamdi, M., & Hamtini, T. (2016). Designing an Effective e-Content Development Framework for the Enhancement of Learning Programming. *International Journal of Emerging Technologies in Learning*, 11(4), 131-141.
- Han, H., Lien, D., Lien, J. W., & Zheng, J. (2022). Online or face-to-face? Competition among MOOC and regular education providers. *International Review of Economics & Finance*, 80, 857-881.
- Hurst, B., Wallace, R. R., & Nixon, S. B. (2013). *The impact of social interaction on student learning*. Reading Horizons.
- Jolliffe, W. (2015). Bridging the gap: Teachers cooperating together to implement cooperative learning. *Education*, 43(1), 70-82.
- Jordan, R., Erik, M., Wolfswinkel, J.N. (2020). COVID-19 video conferencing: preserving resident education with online meeting platforms. *Plastic and Reconstructive Surgery*, 146(1), 110-111.
- Jordan, R., Erik, M., Wolfswinkel, J.N. (2020). COVID-19 video conferencing: preserving resident education with online meeting platforms. *Plastic and Reconstructive Surgery*, 146(1), 110-111.
- Joseph, T., Edmund, T. (2020). Assessment of the readability, availability, and quality of online patient education materials regarding uveitis medications. *Ocul. Immunol. Inflamm.*
- Joseph, T., Edmund, T. (2020). Assessment of the readability, availability, and quality of online patient education materials regarding uveitis medications. *Ocul. Immunol. Inflamm.*
- Karimi, M. (2021). Phenomenological analysis of the lived experiences of professors and students of virtual education in the Iranian higher education system. *Information and Communication Technology in Educational Sciences*, 11(44), 153-174.
- Kian, M. (2014). Challenges of Virtual Education: A Report of What Are Not Learned. *Interdisciplinary Journal of Virtual Learning in Medical Sciences*, 5(3), 11-21.
- Kisanga, D., & Ireson, G. (2015). Barriers and strategies on adoption of elearning in Tanzanian higher learning institutions: Lessons for adopters. *International Journal of Education and Development using ICT*, (2) 11. 126-137.
- Li, M., Zhang, H. (2020). A random talk on teaching during the epidemic. *China Educ. Technol.* 86, 8-15.
- Lincoln, Y. S., & Guba, E. E. (1986). Research, evaluation, and policy analysis: Heuristics for disciplined inquiry. *Review of Policy Research*, 5(3), 546-565.
- Liu, P., Wang, X., Teng, F., Li, Y., & Wang, F. (2022). Distance education quality evaluation based on multigranularity probabilistic linguistic term sets and disappointment theory. *Information Sciences*, 605, 159-181.
- Macdonald, J., Poniatowskab, B. (2011). Designing the professional development of staff for teaching online: an OU (UK) case study. *Distance Education*, (32) 1, 119-134.
- Maslach, C. (2003). Job burnout: New directions in research and intervention. *Current directions in psychological science*, 12(5), 189-192.
- Miliszewska, L., & Rhema, A. (2010). Towards e-learning in higher education in Libya. *Informing Science and Information Technology*, 1 (7), 437-423.
- Mishra, P., Henriksen, D., & Deep-Play Research Group. (2013). A NEW approach to defining and measuring creativity: Rethinking technology & creativity in the 21st century. *TechTrends*, 57(5), 10-13.
- Mohammadi, M., Keshavarzi, F., Naseri Jahromi, R., Naseri Jahromi, R., Hesampoor, Z., Mirghafari, F., et al . Analyzing the Parents' Experiences of First course Elementary School Students from the Challenges of Virtual Education with Social Networks in the Time of Coronavirus Outbreak. *erj*. 2020; 7 (40) :74-101.
- Muthuprasad, T, Aiswarya, S, Aditya, K.S, Girish K. (2020). Students' Perception and Preference for Online Education in India During COVID -19 Pandemic. *Social sciences & humanities*, 17 (54), 1-38.
- Pavri, S. (2012). *Effective Assessment of Students; Determining Responsiveness to Instruction*. New Jersey Upper Saddle River, Pearson Education, Inc.
- Piskurich, G. M. (Ed.). (2004). *Preparing learners for e-learning*. John Wiley & Sons.
- Rao, S. R. (2012). *Global e-learning: a phenomenological study* (Doctoral dissertation, Colorado State University).
- rezaei, A. (2020). Student learning evaluation during the Corona: Challenges and Strategies. *Educational Psychology*, 16(55), 179-214.
- Shermis, M. D., & Di Vesta, F. (2011). *Classroom Assessment in Action*. Rowman & Littlefield Publishers, Inc.
- Smith, D. (1997). Phenomenology: Methodology and method. In J. Higgs (Ed.), *Qualitative research: Discourse on methodologies* (pp. 75-80). Sydney, New South Wales, Australia: Hampden Press.

- Smith, J. A., Flowers, P., & Larkin, M. (2009). *Interpretative phenomenological analysis: Theory, method and research*. Sage.
- Strauss, A. & Corbin, J. (2008). *Basics of Qualitative Research*, Second Edition, London: Sage Publications
- Streubert Speziale, H. J., & Carpenter, D. (2003). *Qualitative research in nursing*. Third Edition. Philadelphia: Williams & Wilkins Co.
- Tarus, J.K., Gichoya, D., & Muumbo, A. (2015). Challenges of Implementing ELearning in Kenya: A Case of Kenyan Public Universities. *International Review of Research in Open and Distributed Learning*, (16) 1. 120-141.
- van de Werfhorst, H. G., Kessenich, E., & Geven, S. (2022). The digital divide in online education: Inequality in digital readiness of students and schools. *Computers and Education Open*, 3, 100100.
- Wahyuningsih, E. (2020). The EFL Learners' Perspectives on the Online English Course Conducted through WhatsApp Group Interactions. *Culture, Literature, Linguistics, English Teaching*, 2 (1), 83-101.
- Wahyuningsih, E. (2020). The EFL Learners' Perspectives on the Online English Course Conducted through WhatsApp Group Interactions. *Culture, Literature, Linguistics, English Teaching*, 2 (1), 83-101.
- World Health Organization. (2020). WHO statement regarding cluster of phenomena cases in Wuhan, China. Beijing; WHO: 9 Jan 2020.
- Yan, M., Li, Z., Yu, X., Jin, C. (2020). An end-to-end deep learning network for 3D object detection from RGB-D data based on hough voting. *IEEE Access* 8, 138810–138822.
- Yuan, H., Yan, M., & Li, Z. (2020, November). Effect Analysis and Method Suggestions of Online Learning under the Public Epidemic Crisis. *International Conference on Innovative Technologies and Learning* (pp. 419-427). Springer, Cham.
- Yuan, Y. (2009). Taiwanese elementary school teachers apply web-based virtual manipulatives to teach mathematics. *Journal of Mathematics Education*, 2(2), 108-121.
- Zameer, A. (2010). Virtual education system: Current myth & future reality in Pakistan. *Informing Science and Information Technology*, 1 (7), 1-8.
- Zhu, W., Liu, Q., & Hong, X. (2022). Implementation and Challenges of Online Education during the COVID-19 Outbreak: A National Survey of Children and Parents in China. *Early childhood research quarterly*, 61, 209-219.

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