A Work Project, presented as part of the requirements for the Award of a Master's degree in Management from the Nova School of Business and Economics.

STUDENT SATISFACTION AND STUDENT INTERACTION IN ONLINE LEARNING

ANDRÉ CARDOSO PIRES

Work project carried out under the supervision of:

Ana Paula Amaro

12-05-2021

Abstract

This work project aims to study what factors can best predict student satisfaction in online learning. A survey was designed based on existing research and distributed among Masters students. The predictor variables were student-content, student-instructor, student-student and student-technology interactions. The data was analyzed using multiple regressions and ANOVAs. The results confirm that student-content and student-instructor interactions are a focal point of online learning while suggesting the opposite for student-technology interaction and being inconclusive for student-student interaction. The conclusions should be analyzed with the study limitations in mind, namely the sample used and the COVID-19 pandemic situation.

Keywords: Education; Online; Predictability; Student Satisfaction

Contents

Introduction

Learning is a fundamental process in the life of an individual, providing acquisition of knowledge and development of skills (Selwyn, 2011). Although these characteristics belong to every learning experience there are differences in the way that education is provided.

Earlier studies, occurring during the 20th century and the beginning of the 21st, focused on comparing two types of education: face-to-face and online (Bernard et al., 2004). Face-to-face is the traditional one where students and teachers meet in the classroom at a predetermined time period. As so, this is a synchronous learning experience. Online is categorized by the use of technology, whether it be to provide web-based classes, study materials or to enhance interaction, and by the time element, meaning that there can be a synchronous (e.g. real-time classes or conferences) and an asynchronous component (e.g. study materials found in a web platform) (Singh & Thurman, 2019).

More recent studies introduce another type to those comparisons: blended learning. Blended is a combination of the interactive, personal and social experience of face-to-face with the technology of the online education that provides access to easily available study content and more flexibility (Dziuban et al., 2004; Bonk & Graham, 2006).

These studies are relevant in the context of a constantly evolving education sector. Almost every aspect of society is changing and developing in accordance with technology. As so, education is also conditioned to progress with it to fulfill the demands of a technological society (Selwyn, 2011). The impact of technology can be seen when comparing modern with old classrooms: in developed countries most institutions already give students access to internet, electronic devices and online platforms to improve their studies. Furthermore, some colleges and universities already offer fully online courses to their students. Governments can also improve the availability of quality instruction to their population by offering web-based courses (Selwyn, 2011). The development of the education system and the increase in online learning seems to be backed up by statistical evidence: in the EU (including the United Kingdom) an annual survey is carried out each year to people aged 16 to 74 to report if an individual has done an online course in the last 3 months prior to the survey. The percentage who answered positive to the previous question increased from 3 in 2007 to 10 in 2019. Finland, Iceland and the United Kingdom lead the group with 21%, 20% and 19% respectively (Eurostat, 2020). In the USA distance education enrollments grew annually from 2002 to 2016, even when the overall enrollments declined from 2012 to 2016 (Allen & Seaman, 2018).

Although online learning rose steadily until 2019 it is proving to be even more important in 2020. Following the World Health Organization (WHO) timeline, in December 2019 a new coronavirus, COVID-19, was identified in China. In the following months this virus would prove to be highly contagious between humans, infect every country on Earth and be declared as a pandemic by the WHO. As a consequence, every aspect of the society started to adapt, work places and services shut down and the world economy was severely hit. It is expected for the pandemic to have large and long-term negative effects on the global economy (Chudik et al., 2020). Education institutions, being gatherings hot spots and high human interaction locations, were also affected: around the world governments opted to either close or partially close schools (UNESCO, 2020), hoping to flatten the infection curve and reduce the daily death count. Following the United Nations Educational, Scientific and Cultural Organization (UNESCO) and Organization for Economic Cooperation and Development (OECD) advices and frameworks, many education organizations turned to online learning to ensure that students would still have access to quality instruction. Although the transition was abrupt and unexpected, students were still satisfied with their teachers and the support given by their universities competent bodies (Aristovnik et al., 2020).

Considering that students are being forced to online learning instead of face-to-face and that online education is growing at a high rate, it is important to examine if it is a suitable alternative. When it comes to teaching effectiveness and students' academic results, research indicates that there is no significant difference between online and face-to-face (Sitzmann et al., 2006; McFarland & Hamilton, 2005; Johnson et al., 2000; Bernard et al., 2004; Zhao et al., 2005). Sitzmann et al. (2006) and Clark (1994) even suggest that what influences learning outcomes are the teaching methods employed and not the delivery media used. However, academic results are not the only measurement to evaluate the viability of an education system. Student satisfaction influences students' retention, loyalty and the word-of-mouth reputation of an institution (Alves & Raposo, 2007; Schreiner, 2009; Herbert, 2005). As so, studying what influences students' satisfaction and analyzing what education system yields a higher student happiness is a valid concern.

When it comes to satisfaction, Johnson et al. (2000) and Allen et al. (2002) conclude that face-to-face students are slightly happier with their experience, with the later pointing out that satisfaction is equal in both student groups if the methods used for both formats are similar. However, Sitzmann et al. (2006) did not found a difference in satisfaction between face-to-face

and online students. Therefore, it seems as face-to-face and online learning differ very little in terms of student satisfaction.

This research project aims to build upon previous studies and analyze what factors influence student contentment in online learning.

Literature Review

Student satisfaction influences important academic features such as an institution reputation and student performance (Eom et al., 2006; Oja, 2011; Dhaqane & Afrah, 2016). Therefore, knowing what factors impact it is vital to understand how schools and universities can improve their students' satisfaction and raise their levels of retention and loyalty.

In 1989, Moore proposed that distance educators should agree on three types of interaction: student-content interaction, student-instructor interaction and student-student interaction. Following studies discussed Moore's three types of interaction and in 1994 Hillman et al. proposed a new type of interaction in addition to the previous three: student-interface interaction.

Student-Content Interaction

The first of Moore's (1989) three types of interaction, he calls it a "defining characteristic of education" (p. 1). It is defined as "the process of intellectually interacting with content that results in changes in the learner's understanding, the learner's perspective, or the cognitive structures of the learner's mind" (p. 1). Student-content interaction differs from student-instructor and student-student as there is only one agent present in this type, engaging with the course material and reflecting on it. This interaction has transformed as a result of technological evolution: In times when books were the only course material, a learner engaged with the content by reading and contemplating about what he assimilated. In modern times, due to the internet and new devices such as computers, face-to-face and, mainly, online education introduced new tools. Marks et al. (2005) linked student-content interaction in online education with tools such as PowerPoint and video presentations and assignments, for instance, individual and group projects. As of 2020 students have access to videos, audio files, quizzes, online lectures, online rooms and many other tools.

Student-content interaction is associated with higher success in online courses (Zimmerman, 2012). In Zimmerman's study students who employed more time with the course materials had a higher frequency of passing grades and spent less time to complete a quiz.

Furthermore, student-content interaction seems to be a strong predictor of student satisfaction. In Chang (2013), Kuo et al. (2013) and Strachota (2003), when analyzing Moore´s three types of interaction as predictors of learner satisfaction, student-content interaction was the strongest and had a significant effect on satisfaction. Kuo et al., based on these findings, suggested that "the design of online content may be the most important contributor to student satisfaction." (p. 30).

Student-Instructor Interaction

This interaction is the communication between the learner and the teacher who prepares the course content. Moore (1989) seems to describe it as a three part process. First, the learning phase in which instructors look to motivate and transmit knowledge to students "First having planned or been given a curriculum, a program of content to be taught, they seek to stimulate or at least maintain the student's interest in what is to be taught, to motivate the student to learn, to enhance and maintain the learner's interest, including self-direction and self-motivation." (p. 2). Second, the application of knowledge and evaluation phase "Next instructors try to organize students' application of what is being learned, either the practice of skills that have been demonstrated, or manipulation of information and ideas that have been presented. Instructors organize evaluation to ascertain if learners are making progress, and to help decide whether to change strategies. (p. 2). Third, the feedback phase "Finally, instructors provide counsel, support, and encouragement to each learner…" (p. 2). Moore emphasizes especially the feedback phase, since a student may be able to learn by himself and apply his knowledge but without an instructor advice and response he will not be fully sure that his understanding and application of the subject material is correct.

Instructors have many tools at their disposition to guarantee an efficient student-instructor interaction in online courses. For Martin (2019) teachers should use both interactions present in face-to-face courses and technological tools to enhance the learning experience. He considers that traditional methods such as sharing personal experiences, showing interest in the lives of students, establishing course expectations on the first day of class and tutorials are still very relevant in the online setting. Moreover, in order to fully utilize the online scenario Martin refers tools like Zoom, Skype and Google Hangouts for videoconference calls and personalized video feedback, FlipGrid for web-based video message boards and Remind for student-teacher communication. As online education becomes a bigger reality it is expected that new tools arise to complement it.

In the social learning theory Bandura (1977) describes learning as a cognitive process that takes place in a social context. Vicarious reinforcement is also a focal point of Bandura's theory, meaning that learning can occur by observing the actions of a role model and the consequences of said actions. Applying the social learning theory to schools suggests that student-instructor interaction plays a major role in education.

Research projects studying predictors of student satisfaction on an online setting are in line with the social learning theory and mostly conclude that learner-instructor interaction is a significant factor to determine student satisfaction (Chang, 2013; Kuo et al., 2013; Marks et al., 2005; Yukselturk & Yildirim, 2008). More specifically, Dennen et al (2007) and Yukselturk & Yildirim (2008) found that timely feedback boosts learner satisfaction, supporting Moore (1989).

Student-Student Interaction

The last of Moore's (1989) three types of interaction, he explains it as the communication "between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor." (p. 2).

When compared with the other two types mentioned above, studies report student-student interaction as the weakest predictor of student satisfaction in online courses (Chang, 2013; Kuo et al., 2013; Marks et al., 2005). Kuo et al. (2013) argue that this outcome was reasonable as during the study the students did not have many opportunities to communicate with each other. They suggest that the importance of student-student interaction on satisfaction increases with the amount of collaborative tasks on online learning. Marks et al. (2005) share a similar view: they state that this result may not reflect the importance of this interaction and give the example of when a group of students is given an assignment they may opt to distribute the tasks to each student instead of collectively solving it and, as so, reducing the amount of student-student interaction.

In the study conducted by Yukselturk & Yildirim (2008), in which was reported a low level of student-student interaction, some of the reasons mentioned by the participants that explained this result included "having different responsibilities and various occupations, lack of time, interacting only with participants with common background or preferring to study alone, not enough possible interaction in Internet based education environments…" (p. 61) among others. For Woo & Reeves (2007), meaningful interaction includes "responding,

negotiating internally and socially, arguing against points, adding to evolving ideas, and offering alternative perspectives with one another while solving some authentic tasks" (p. 23).

The importance of student-student interaction on learner satisfaction on online courses appears to be more difficult to quantify when compared with the effects of student-content and student-instructor interaction. Analyzing this variable in learning settings that employ different student-student interaction levels may yield new and interesting outcomes.

Student-Technology Interaction

A complement to Moore´s (1989) three types of interaction, Hillman et al. (1994) considered that the effect of technology on interaction during online courses was overlooked. Due to the increase in technological devices and also their complexity, Hillman et al. (1994) introduced the concept of learner-interface interaction. For them "This interaction is accomplished by means of high-technology devices that serve as the interface—the point or means of interaction—between the learner and his or her content, instructor, and fellow learners." (p. 32) as is simply defined as "a process of manipulating tools to accomplish a task." (p. 34).

As discussed during the introduction, some authors, as Clark (1994), argue that the relevant factors for the learning experience include only the content and the intervenient, disregarding the delivery mechanism and opposing the idea that student-interface interaction is relevant in online courses. However, multiples studies conclude that learner-interface interaction is indeed a significant predictor of student satisfaction in online learning (Chang, 2013; Kuo et al., 2013; Shee & Wang, 2008), contradicting Clark (1994) and supporting Hillman et al. (1994).

Consequently, possessing the knowledge and skills to efficiently use technology is an important concern. A learner without these expertise faces the challenge of having to assimilate the course materials and also understand how to interact with the interface (Hillman et al., 1994). Another concern with the students' lack of technological skills lies in the fact that using these interfaces may induce fear and reduce achievement and satisfaction. (Doronina, 1995; Hillman et al., 1994). To answer this obstacle Hillman et al. (2014) and Kuo et al. (2013) suggest that institutions may provide training sessions for learners to experience and feel at ease with the technological tools used during online learning.

Research Questions

Based on the literature review, most studies conclude that interaction during online courses influences student satisfaction. However, while some authors determine that student-content interaction is the most important predictor of student satisfaction (Chang, 2013; Kuo et al., 2013; Strachota, 2003), others reach different outcomes, for example that student-instructor interaction is the most important (Marks et al., 2005). Furthermore, the effect of student-student interaction on student satisfaction in online courses is usually difficult to quantify due to the low interaction levels between students during these courses (Kuo et al., 2013; Marks et al., 2005; Yukselturk & Yildirim, 2008). Student-technology interaction is an ever-changing factor considering that new tools arrive quickly during this new technological driven world.

Therefore, this study aims to analyze what factors best predict student satisfaction in online environments and their respective weights. Considering the studies reviewed:

Question 1: Does student-content interaction have a significant effect on student satisfaction in online courses?

It is expected that student-content interaction has a significant effect on student satisfaction in online courses.

H_0: Student-content interaction does not have a significant effect on student satisfaction.

H_1: Student-content interaction has a significant effect on student satisfaction.

Question 2: Does student-instructor interaction have a significant effect on student satisfaction in online courses?

It is expected that student-instructor interaction has a significant effect on student satisfaction in online courses.

H_0: Student-instructor interaction does not have a significant effect on student satisfaction.

H_1: Student-instructor interaction has a significant effect on student satisfaction.

Question 3: Does student-student interaction have a significant effect on student satisfaction in online courses?

It is expected that student-student interaction has a significant effect on student satisfaction in online courses.

H_0: Student-student interaction does not have a significant effect on student satisfaction.

H_1: Student-student interaction has a significant effect on student satisfaction.

Question 4: Does student-technology interaction have a significant effect on student satisfaction in online courses?

It is expected that student-technology interaction has a significant effect on student satisfaction in online courses.

H_0: Student-technology interaction does not have a significant effect on student satisfaction.

H_1: Student-technology interaction has a significant effect on student satisfaction.

Question 5: Do sociodemographic factors have a significant effect on student satisfaction in online courses?

Students' sociodemographic factors (age, gender and even distance to physical campus site), depending on the study, have different effects on student satisfaction (Kuo et al., 2013; Strachota, 2003). This work project also aims to examine if gender, age, student status, the average number of hours spent on the internet per day and the number of online courses attended have a significant effect on the student satisfaction.

Methods

Student Interaction and Satisfaction Survey

The study was carried out during the COVID-19 pandemic, through 2020 and 2021, when most students in Portugal attended online classes. To evaluate how the four types of student interaction affected their satisfaction on online learning a survey was structured. The survey is composed by 6 sections: Demographics, Student-Content Interaction, Student-Instructor Interaction, Student-Student Interaction, Student-Technology Interaction and Satisfaction. Overall the 6 sections totaled for 37 questions with a 38th open optional question to provide feedback. The first sector, demographics, features multiple choice and number entry items. The following 5 sectors, the student interactions and satisfaction, are Likert scales composed by 5-levels Likert items. The answers for the Likert items ranged from "Strongly Disagree" to "Strongly Agree", being "Neither Agree or Disagree" the middle point. The items were constructed and based on the overall literature review, with a special attention to Chang (2013), Strachota (2003) and Kuo et al. (2013). The complete survey is available in the annex (Student Interaction and Satisfaction Survey).

Based on the sample of this study, the Cronbach's alpha values were calculated (Table 1). Although some scales are more consistent than others, all scales have a value greater than 0,7, which is the standard threshold. Thus, the items are reliable and consequently, so is the survey used.

Table 1 - Reliability Statistics

Scale	Cronbach's Alpha	Number of Items
Student-Content Interaction	0,75	8
Student-Instructor Interaction	0,83	6
Student-Student Interaction	0,83	6
Student-Technology Interaction	0,70	7
Student Satisfaction	0,94	5

Sample

In order to guarantee trustworthy data, ensuring that the respondents took their time and thought about their answers was a top priority. As so, the decision was made to only distribute the survey to masters' students. The survey was distributed using 2 channels: An anonymous link sent to individual Masters students at different Portuguese universities and posted on NOVA SBE Masters WhatsApp group and NOVA SBE Masters Facebook group and also through individual emails sent to NOVA SBE Masters in Management students.

85 students answered to the survey. Of these 85 answers, 27 were incomplete, which could have been respondents that started the questionnaire but abandoned before completing it. As a result, the number of complete responses that were used for analysis and for this study were 58. 60% of the respondents are female with the remaining 40% being male (Table 2). The age ranged from 21 to 25, with an average of 22,7 (Graphic 1). 90% are full-time students and only 10% are working-students (Table 3). The maximum approximate number of hours spent on the internet per day is 17 and the minimum 2, with an average of 8,5 (Graphic 2). The number of online courses attended stretched from 1 to 50 with an average of 6,5. Looking at the demographics, the respondent group has a good representation from both genders, is young,

mostly does not work yet, spends a considerable time of their days online and has a semester to a year worth of experience with online courses.

Data Analysis

The analysis of the data obtained was performed with SPSS. In order to test the hypothesis proposed, the interaction and student satisfaction scales' items were condensed in two different ways. The first option was using principal component analysis, reducing the number of items in each scale only to its principal components. The alternative was calculating the mean score of each scale for each individual, obtaining a single value for each scale. Calculating the average scores of the items that make up a scale or just adding those scores is the most used method in the literature review consulted and also the most suggested (James & Perla, 2008; Boone & Boone, 2012). The alternative method of dimensionality reduction using principal component analysis serves as a complement to the analysis performed and also as a comparison to the previous method, which is useful to determine the robustness of the results obtained. The hypothesis were tested by carrying out analysis of variance and multiple regression analysis.

Results

Obtaining the scores for the Likert scales for the mean method was simple. The answers for the survey items were encoded from 0 to 4, being 0 "Strongly Disagree" and 4 "Strongly Agree". The scales, as the individual items, range from 0 to 4 with the midpoint being 2 ("Neither Agree or Disagree"). In Table 4 it can be observed a summary of these scales.

Table 4 – Scales Summary

	Minimum	Maximum	Mean	Std. Deviation
Student_Content	1,25	3,63	2,74	,53
Student_Instructor	,17	3,67	2,36	,67
Student_Student	,00	3,33	2,07	,80
Student_Technology	1,29	4,00	3,03	,53
Student_Satisfaction	,00	4,00	2,41	,89

Table 4 shows that student-instructor, student-student and student-satisfaction interactions tend to the midpoint with a mean close to 2, while student-content and in particular student-technology interactions have a mean closer to 3, which is a full point above the midpoint.

For the principal components method, a principal component analysis was conducted for each scale, analyzing the correlation matrix and extracting factors based on eigenvalues greater than 1.

Looking at Table 5, Kaiser-Meyer-Olkin measure of sampling adequacy ranges from 0,70 to 0,90. This values are greater than 0,6, which is the standard threshold used to determine if a dataset is suitable for factor analysis. The significance level for Bartlett's test is smaller than 0,05 for all scales, meaning that the null hypothesis (the variables are unrelated and unsuitable for structure detection) is rejected. It can therefore be assumed that factor analysis is appropriate for this dataset.

Table 5 – KMO and Bartlett's Test for the 5 Scales

Scale		Student-Content	Student-Instructor	Student-Student	Student-Technology	Student Satisfaction
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,70	,77	,74	,83	,90
Bartlett's Test of Sphericity	Approx. Chi-Square	120,31	123,86	171,36	135,48	280,67
	df	28	15	15	21	10
	Sig.	<,001	<,001	<,001	<,001	<,001

Table 6.3 presents a resumed version of Tables 6.1 and 6.2 in the annex. In this table it is presented for each scale their principal components, eigenvalues and the cumulative percentage of variance explained. Kaiser's rule for retaining factors suggests that components are significant if their eigenvalues are greater than 1. Based on this rule, student-content, student-student and student-technology interactions retain 2 components while student-instructor interaction and student satisfaction retain only 1. The percentage of total variance explained by these retained factor ranges from 55% (student-instructor interaction) to 82% (student satisfaction). However, further assessment is needed to complement this test. Table 6.3 shows that some of the components preserved have an eigenvalue very close to 1 and for some scales the percentage of variance explained by these components is relatively low.

Table 6.3 – Components and Total Variance Explained for the 5 Scales										
Component	Student-Content Eigenvalues		Student-Instructor Eigenvalues		Student-Student Eigenvalues		Student-Technology Eigenvalues		Student Satisfaction Eigenvalues	
	Total	Cumul %	Total	Cumul %	Total	Cumul %	Total	Cumul %	Total	Cumul %
1	3,13	39,17	3,30	55,06	3,32	55,25	3,40	48,47	4,11	82,21
2	1,33	55,84	,77	67,89	1,01	72,14	1,07	63,69	,42	90,65
3	,87	66,69	,70	79,60	,83	85,92	,85	75,88	,21	94,91
4	,83	77,03	,61	89,70	,43	93,00	,61	84,59	,15	97,90

With the intention of corroborating the previous results, another assessment was carried out. Inspecting the Scree plots (Graphics 3 to 7), using the Scree test ("elbow" method), it is easily confirmed that an "elbow" is present after the first component for student-instructor interaction and student satisfaction. For student-content interaction the change in behavior is also noticeable after the second component. When it comes to the remaining 2 interactions, student-student and student-technology, it is more difficult to identify the "elbow" since there is a drop after the first component but it continues with a substantial decrease in eigenvalue after the second and third components. Considering this information obtained from the Scree plots and the Kaiser's rule for retaining factors, 1 component will be retained for student-instructor interaction and student satisfaction and 2 components for the other 3 interactions.

The following analysis, the ANOVAs and multiple regression analysis, were performed with a 10% significance level.

ANOVAs

The impact of some demographic factors was tested on student satisfaction. The student satisfaction score used was the one obtained through the "mean" method. Since most participants were from the same age group, age was excluded from this test. Student status was also excluded due to only 6 participants being working-students while the remaining 52 were full-time students. The approximate number of hours spent on the internet per day category was divided into two groups: less than 10 hours and 10 or more hours. Regarding the number of online courses attended the approach was the same, with the two groups being: less than 5 courses and 10 or more courses.

Examining Table 7, it is noticeable that the mean score of student satisfaction is almost the same for both male and female participants. Table 8 shows a p-value greater than 0,1, implying that gender does not have a statistically significant impact on student satisfaction.

Table 7 – Descriptives for Gender

Student_Satisfaction

	N	Mean	Std. Deviation	Std. Error
Male	23	2,41	1,07	,22
Female	35	2,42	,77	,13
Total	58	2,41	,89	,12

Table 8 – Gender ANOVA

Student_Satisfaction

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,001	1	,001	,001	,97
Within Groups	45,19	56	,81		
Total	45,19	57			

Tables 9 and 10 demonstrate the same result for the approximate number of hours spent on the internet per day: the mean score of student satisfaction for the group that spends less than 10 hours online per day is very close to mean of the group that spends 10 or more hours. The p-value is again greater than 0,1, indicating that the approximate number of hours spent on the internet per day does not have a statistically significant impact on student satisfaction.

Table 9 - Descriptives for Hours Online

Student_Satisfaction

	N	Mean	Std. Deviation	Std. Error
<10	33	2,41	,91	,16
>=10	25	2,42	,88	,18
Total	58	2,41	,89	,12

Table 10 - Hours Online ANOVA

Student_Satisfaction

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,005	1	,005	,006	,94
Within Groups	45,18	56	,81		
Total	45,19	57			

For last, the number of online courses attended displays the same outcome. By inspecting Tables 11 and 12 it can be perceived that the mean score of student satisfaction for the group that has attended less than 5 online courses is very close to mean of the group that has attended 5 or more online courses. The p-value is once more greater than 0,1, indicating that the number of online courses attended does not have a statistically significant impact on student satisfaction.

Table 11 - Descriptives for Online Courses Attended

Student_Satisfaction

	N	Mean	Std. Deviation	Std. Error
<5	27	2,28	,89	,17
>=5	31	2,53	,89	,16
Total	58	2,41	,89	,12

Table 12 - Online Courses Attended ANOVA

Student_Satisfaction

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,88	1	,88	1,12	,30
Within Groups	44,31	56	,79		
Total	45,19	57			

Considering that neither of the demographic factors had a statistically significant impact on student satisfaction, none of them were included in the multiple regression analysis.

Multiple Regression Analysis

Focusing on testing the hypothesis proposed in the research questions, 2 multiple regression analysis were executed. For the first regression the independent variable was the Student Satisfaction and the independent variables were the 4 types of student interaction, with these scales being calculated with the "mean" method. For the second regression the independent variable was the principal component extracted for the student satisfaction while the independent variables were the principal components extracted for the 4 types of student interaction.

Analyzing Table 13, the R^2 for the regression model obtained with the "mean" method is 0,67, which means that 67% of the variation in student satisfaction can be explained by the independent variables. The significance value is smaller than 0,1, meaning that the model is statistically significant.

Table 13 - Mean Method Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig.
1	,82[a]	,67	,64	,53	,67	26,49	4	53	,00

a. Predictors: (Constant), Student_Technology, Student_Instructor, Student_Student, Student_Content

Table 14 displays how the independent variables affect the dependent variable using this model. Looking at the significance value, all independent variables except student-technology interaction report a p-value smaller than 0,1. As so, only student-technology interaction does not have a statistically significant effect on student satisfaction while the other types of interaction do. Observing the standardized coefficients, the predictor that has the biggest impact on student satisfaction is student-content interaction, followed by student-instructor and student-student. The unstandardized coefficients indicate that a 1 unit increase in the student-content, student-instructor and student-student interactions results in 0,74, 0,29 and 0,23 units increase respectively in the student satisfaction scale. As indicated in the tolerance, all variables have a value greater than 0,1, which is the standard threshold used to indicate multicollinearity between the variables (Dormann et al., 2012). As so there is no multicollinearity between the independent variables.

Table 14 - Mean Method Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1,23	,46		-2,69	,01		
	Student_Content	,74	,23	,44	3,27	,002	,35	2,89
	Student_Instructor	,29	,16	,22	1,84	,07	,45	2,22
	Student_Student	,23	,12	,21	1,97	,05	,56	1,80
	Student_Technology	,15	,16	,09	,92	,36	,71	1,42

a. Dependent Variable: Student_Satisfaction

Table 15 shows the model summary for the principal components method, which will be used to compare with the previous method and provide a better interpretation of the results. The R^2 for this regression model is 0,67, which means that 67% of the variation in the student satisfaction principal component can be explained by the independent variables. The significance value is smaller than 0,1, meaning that the model is statistically significant.

Table 15 – Principal Components Method Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig.
1	,82[a]	,67	,63	,61	,67	14,57	7	50	,00

a. Predictors: (Constant), PC_2_Technology, PC_1_Technology, PC_2_Student, PC_2_Content, PC_1_Content, PC_1_Student, PC_1_Instructor

The impact of the independent variables (principal components extracted from the 4 types of student interaction) on the dependent variable is visible in Table 16. Looking at the significance value, the first principal component, that explains the most variance, related with student-content and the principal component associated with student-instructor interaction report a p-value lower than 0,1. Consequently, student-content and student-instructor interactions have a statistically significant effect on student satisfaction while student-student and student-technology interactions do not. Observing the standardized coefficients, the predictor that has the biggest impact on student satisfaction is once more student-content interaction. Again, all independent variables have a tolerance value greater than 0,1, indicating that there is no multicollinearity between them.

Table 16 – Principal Components Method Regression Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	7,19E-18	,08		,00	1,00		
	PC_1_Content	,45	,14	,45	3,23	,00	,33	2,99
	PC_2_Content	,07	,09	,07	0,84	,41	,90	1,11
	PC_1_Instructor	,24	,12	,24	1,93	,06	,44	2,30
	PC_1_Student	,18	,11	,18	1,56	,13	,52	1,94
	PC_2_Student	,06	,08	,06	,67	,51	,96	1,05
	PC_1_Technology	,06	,10	,06	,61	,54	,71	1,41
	PC_2_Technology	,06	,09	,06	,65	,52	,88	1,14

a. Dependent Variable: PC_1_Satisfaction

Discussion

The work project aimed to analyze what factors impact student satisfaction in online learning in order to complement previous studies conducted on this area and to answer some of the differences in their outcomes. The factors were designed based on Moore's (1989) and Hillman et al. (1994) 4 types of student interaction.

Table 4 presents intuitive results for the 4 types of student-interaction and student satisfaction. All scales are close to the midpoint, possibly indicating the existence of central tendency bias in the data. Within the context of online courses, the social component of classes and out of class activities is more restricted when compared to face-to-face courses. The means for student-instructor and student-student interactions hint at that, with these 2 means being the lowest of the 5 scales. To compensate for the lack of social factors students seems to demonstrate a bigger interaction with the courses contents. The mean for student-content interaction (2,74) is close to 3, which is a significant improvement over the 2 other scales mentioned before. Not surprisingly, the scale that presented the greatest mean (3,03) was student-technology interaction. Since learners are required to use computers, tablets and other devices in order to assist live classes and to access the course content this is a predictable result.

Looking back at the research questions, the following can be deducted:

Question 1: Does student-content interaction have a significant effect on student satisfaction in online courses?

The significance value of the student-content interaction independent variables in both regression models ("mean" method and the principal components) is smaller than 0,1 (Tables 14 and 16) except for the second principal component in the principal components method (which explains 16,67% of the total variance in the sample when it comes to student-content interaction), meaning that the null-hypothesis that student-content interaction does not have a significant effect on student satisfaction can be rejected. Therefore the expected outcome that student-content interaction has a significant effect on student satisfaction in online courses is confirmed. This results backs up Moore's (1989) claim that student-content interaction is a "defining characteristic of education" (p. 1) and Chang (2013), Kuo et al. (2013) and Strachota (2003) studies.

The questions in the survey for the student-content interaction section focused on how much a learner interacts with the content and also the quality of this interaction. With the effect of this variable on student satisfaction being significant it can be stated that within this sample group, students that had bigger levels of interaction with the course content also had a more positive learning experience. It can be possible that a bigger level of interaction with content leads to better grades and therefore to an increase in student satisfaction. Students may also be more satisfied with their learning experience if they feel that they have actually learned something and that the quality of the content available is good.

The regression coefficients for both methods (0,74 for the student-content interaction scale in the "mean" method multiple regression and 0,45 for the first student-content interaction principal component in the principal components multiple regression), as seen in Tables 14 and 16, are high, meaning that not only student-content interaction has a significant effect on student satisfaction but also that effect is big.

Question 2: Does student-instructor interaction have a significant effect on student satisfaction in online courses?

The significance value of the student-instructor interaction independent variables in both regression models ("mean" method and the principal components) is smaller than 0,1 (Tables 14 and 16), meaning that the null-hypothesis that student-instructor interaction does not have a significant effect on student satisfaction is rejected. As so the results agree with Chang (2013), Kuo et al. (2013), Marks et al. (2005) and Yukselturk & Yildirim (2008) studies in that student-instructor interaction has a significant effect on student satisfaction in online courses, confirming the predicted outcome.

Given the context of online education and the possibility of asynchronous learning and studying without social interaction, the role of the instructor on teaching a student can be somewhat diminished by the interaction a student has with content. However, the content that the students will interact with is still prepared and, in the case of live classes, delivered by the professor. For this work project the items in the survey for the student-instructor interaction section were related with how much the instructor provides individual attention and support for a student. This results can be interpreted as individual support being important for student satisfaction and further proof that even though in online learning the social components are diminished, they still are important for the learning experience. The regression coefficients for both methods (0,29 for the student-content interaction scale in the "mean" method multiple regression and 0,24 for the student-content interaction principal component in the principal components multiple regression), as seen in Tables 14 and 16, are rather small when compared with the ones from student-content interaction, although they still are relevant.

When interpreting these findings it must be taken into consideration that for different investigations the student-instructor interaction scale can be built differently and that the sample size for this study was relatively small.

Question 3: Does student-student interaction have a significant effect on student satisfaction in online courses?

The significance value of the student-student interaction independent variables differs in the two regression models ("mean" method and the principal components). It is greater than 0,1 (Tables 14 and 16) in the "mean" method regression but it is greater than 0,1 for both principal components in the principal components regression. As so, the outcome is conflicting and the null-hypothesis that student-student interaction does not have a significant effect on student satisfaction is rejected for the first method but not for the second. It is inconclusive if student-student interaction has a significant effect on student satisfaction in online courses.

In previous studies that were carried out (Chang, 2013; Kuo et al., 2013; Marks et al., 2005), this variable has been the weakest predictor of student satisfaction. Marks et al. (2005) and Yukselturk & Yildirim (2008) state that this result (the low impact of student-student interaction on student satisfaction) does not reflect its importance. They suggest that due to the low amount of interaction between students during their researches it is difficult to have a meaningful conclusion. For this work project, the student-student interaction section in the survey distributed focused on the quantity of interaction rather than the quality. The outcome

obtained can suggest different ideas: it can be indicative that the social component of education, particularly the interactions with other colleagues, may not be as important in an online setting when a student has access to asynchronous learning and can easily study without interaction with its colleagues. It can also point towards the quality of student-student interaction in online learning being not very good, and having greater levels of interaction with other learners will not impact a student satisfaction with the course. Alternatively, in a similar fashion as in the student-instructor topic, the outcome can symbolize that although there is no personal contact and in person socialization with other students, talking with them and interacting online is still relevant for the satisfaction of a learner. Again, these findings can only be interpreted while having in mind that the sample size for this study was small and since the investigation occurred during the COVID-19 pandemic, the quality of online learning and consequently student-student interaction may be different than in normal circumstances.

Question 4: Does student-technology interaction have a significant effect on student satisfaction in online courses?

The significance value of the student-technology interaction independent variables in both regression models ("mean" method and the principal components) is greater than 0,1 (Tables 14 and 16), meaning that the null-hypothesis that student-technology interaction does not have a significant effect on student satisfaction is not rejected. Consequently it is not possible to affirm that student-technology interaction has a significant effect on student satisfaction in online courses, contradicting the predicted outcome and Chang (2013), Kuo et al. (2013) and Shee & Wang (2008) studies. On the other hand this outcome supports Clark's (1994) position that the relevant factors for the learning experience include only the content and the intervenient, disregarding the delivery mechanism.

For this work project, the items on the student-technology section of the survey inquired about the level of technological proficiency of a learner. It is important to note that the sample was composed of Masters students with an age ranging from 21 to 25 years old and expectedly the student-technology scale recorded the highest mean, since these young students interact often with new devices and tools and are very proficient at using them. The result that student-technology interaction does not have a statistically significant effect on student satisfaction can suggest that the technology used to provide online courses is easy enough to use that no modern student will have many difficulties using it and as so it will not impact their satisfaction with

that course. The result can also be a consequence of the sample described above, where most students are tech savvy.

Question 5: Do sociodemographic factors have a significant effect on student satisfaction in online courses?

Inspecting Tables 7 to 12, none of the models for the demographics factors tested (gender, average number of hours spent online per day and the number of online courses attended) had a significance value lower than 0,1, meaning that none of these models were statistically significant. Therefore neither of the demographics factors had an effect on student satisfaction.

The result regarding the gender factor is logical in that gender should not affect how satisfied a student is with online learning. The average number of hours spent online per day not being significant for student satisfaction can be explained with some of the arguments used for the student-technology interaction result: the participants of this survey are tech sharp and spending more or less hours online will not drastically impact how they interact with the online course and accordingly how satisfied they are with it. The number of online courses attended not having a significant effect on student satisfaction points that having more experience with online learning is not linked with having a more joyful experience and that online education is experienced the same by both groups.

Following these findings regarding the proposed research questions it is opportune to leave some suggestions to enhance student satisfaction in online courses. Student-content interaction is the most important variable in this study. Hence, instructors and education institutions should focus on providing students with quality and easy to access content. Students should not only be supplied with the content available in face-to-face courses but also with class recordings, online discussion forums, online quizzes and many other tools available. Considering the results from both student-instructor and student-student interaction, the social component has a significant impact on student satisfaction in online courses and online programs should be designed in order to maximize the communication opportunities between learners, their peers and instructors. Professors and institutions should also provide easy to use interfaces in online courses so that a modern student with some technology knowledge would not have any difficulty in attending a fully online study program and consequently his satisfaction with it would not depend on his technological ability.

Limitations and Future Improvements

This work project was subjected to a number of limitations. Starting with the most obvious described during the introduction, this research was carried out during the COVID-19 pandemic. The sample used was composed of many students that had their first contact with online learning during the pandemic. The quality of the online courses offered to these students might also not have been ideal due to the lack of time for universities to prepare and adjust for the sudden change from face-to-face to fully online education. As so the answers to the survey might reflect a biased experience that may not reflect the reality of online courses during normal times.

The sample size used for this study was also a limitation. Over 700 links to the survey were distributed but a low response rate dictated that only 58 complete answers could be used for the research. Consequently the findings discussed previously are not very robust and could change with an increased sample size and further research should be conducted to ensure more definitive results.

Regarding the construction of the survey, although it was heavily influenced by existing surveys used in previous research, the Cronbach alphas (Table 1) for student-content and student-technology interactions in particular are not satisfactorily high. This means that it might exist some incoherence between some items in the same scale. The same conclusion can be reached by observing Tables 6.1 and 6.2. If the scales used were 100% coherent and reliable each student-interaction would only be represented by 1 principal component that would explain a very large percentage of the total variation. This is not the case in this study and is a point that should be improved in future research.

Online education is heavily influenced by technological advances. Thus, future investigations on this topic need to make sure that the instruments used to measure student satisfaction and its predictors (which might include the 4 types of student interaction used in this work project) reflect the present reality and adjust the instruments accordingly.

One last note in specific for student-student interaction, since its impact in student satisfaction was still inconclusive in this work project and as so it should be further explored.

Conclusion

Technology is ever evolving and in this modern world every sector changes accordingly. Education is not different. Online learning is becoming more preeminent, with new students

joining this new way of education. Knowing what makes these students satisfied with their learning experience is a focal topic.

This work project tried to explain what factors influence student satisfaction and improve upon existing research. In most outcomes it agrees with the previous studies, namely on the importance of student-content and student-instructor interactions in student satisfaction on online learning. In other topics such as the influence of student-technology interaction it goes against the established results, considering that this interaction does not have a significant impact on student satisfaction in online courses. The verdict for student-student interaction was divided in the existing research and this work project is not different, obtaining different answers with each method used. This analysis also concludes that the demographic factors used did not influence student satisfaction attending online courses.

All the results should be analyzed with the limitations discussed previously in mind. These conclusions are still useful and new insights can be derived from them. Instructors and education institutions can also learn from these results and consider to adopt some of the recommendations suggested in this study. Future research is encouraged to better understand this complex topic of student satisfaction in online learning and to better prepare instructors and institutions.

References

Selwyn, Neil. 2011. *Education and Technology: Key Issues and Debates*. Continuum International Publishing Group Ltd.

Bernard, Robert M., Philip C. Abrami, Yiping Lou, Evgueni Borokhovski, Anne Wade, Lori Wozney, Peter Andrew Wallet, Manon Fiset, and Binru Huang. 2004. "How Does Distance Education Compare With Classroom Instruction? A Meta-Analysis of the Empirical Literature." *Review of Educational Research* 74 (3): 379–439. https://doi.org/10.3102/00346543074003379.

Singh, Vandana, and Alexander Thurman. 2019. "How Many Ways Can We Define Online Learning? A Systematic Literature Review of Definitions of Online Learning (1988-2018)." *American Journal of Distance Education* 33 (4): 289–306. https://doi.org/10.1080/08923647.2019.1663082.

Dziuban, Charles D., Joel L. Hartman, and Patsy D. Moskal. 2004. Rep. *Blended Learning*. EDUCAUSE. https://www.educause.edu/~/media/files/library/2004/3/erb0407-pdf.pdf?la=en.

Bonk, Curtis Jay., and Charles R. Graham. 2007. *The Handbook of Blended Learning: Global Perspectives, Local Designs*. San Francisco, Calif: Pfeiffer.

2020. People Expanding Their Knowledge by Learning Online. Eurostat. 2020. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20200517-1.

Seaman, Julia E., I. Elaine Allen, and Jeff Seaman. 2018. Rep. *Grade Increase: Tracking Distance Education in the United States*. Babson Survey Research Group. https://onlinelearningsurvey.com/reports/gradeincrease.pdf.

"Archived: WHO Timeline - COVID-19." 2020. World Health Organization. World Health Organization. 2020. https://www.who.int/news/item/27-04-2020-who-timeline---covid-19.

Chudik, Alexander, Kamiar Mohaddes, M. Hashem Pesaran, Mehdi Raissi, and Alessandro Rebucci. 2020. "Economic Consequences of Covid-19: A Multi-Country Analysis." VOX, CEPR Policy Portal. 2020. https://voxeu.org/article/economic-consequences-covid-19-multi-country-analysis.

"Education: From Disruption to Recovery." 2020. UNESCO. 2020. https://en.unesco.org/covid19/educationresponse.

"Distance Learning Solutions." 2020. UNESCO. 2020. https://en.unesco.org/covid19/educationresponse/solutions.

Reimers, Fernando M., and Andreas Schleicher. 2020. "A Framework to Guide an Education Response to the COVID-19 Pandemic of 2020." OECD. 2020. https://read.oecd-ilibrary.org/view/?ref=126_126988-t63lxosohs.

Aristovnik, Aleksander, Damijana Keržič, Dejan Ravšelj, Nina Tomaževič, and Lan Umek. 2020. "Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective." *Sustainability* 12 (20). https://doi.org/10.3390/su12208438.

Sitzmann, Traci, Kurt Kraiger, David Stewart, and Robert Wisher. 2006. "The Comparative Effectiveness Of Web-Based And Classroom Instruction: A Meta-Analysis." *Personnel Psychology* 59 (3): 623–64. https://doi.org/10.1111/j.1744-6570.2006.00049.x.

McFarland, Daniel, and Diane Hamilton. 2005. "Factors Affecting Student Performance and Satisfaction: Online versus Traditional Course Delivery." *Journal of Computer Information Systems* 46 (2): 25–32. https://www.tandfonline.com/doi/abs/10.1080/08874417.2006.11645880.

Johnson, Scott D., Steven R. Aragon, and Najmuddin Shaik. 2000. "Comparative Analysis of Learner Satisfaction and Learning Outcomes in Online and Face-to-Face Learning Environments." *Journal of Interactive Learning Research* 11 (1): 29–49. https://www.learntechlib.org/primary/p/8371/.

Clark, Richard E. 1994. "Media Will Never Influence Learning." *Educational Technology Research and Development* 42 (2): 21–29. https://doi.org/10.1007/bf02299088.

Alves, Helena, and Mário Raposo. 2007. "Conceptual Model of Student Satisfaction in Higher Education." *Total Quality Management & Business Excellence* 18 (5): 571–88. https://doi.org/10.1080/14783360601074315.

Schreiner, Laurie A. 2009. "Linking student satisfaction and retention." Research study: Azusa Pacific University. http://learn.ruffalonl.com/rs/395-EOG-977/images/LinkingStudentSatis0809.pdf

Herbert, Michael. 2006. "Staying the Course: A Study in Online Student Satisfaction and Retention." *Online Journal of Distance Learning Administration* 9 (4). https://eric.ed.gov/?id=EJ1108805.

Allen, Mike, John Bourhis, Nancy Burrell, and Edward Mabry. 2002. "Comparing Student Satisfaction With Distance Education to Traditional Classrooms in Higher Education: A Meta-Analysis." *American Journal of Distance Education* 16 (2): 83–97. https://doi.org/10.1207/s15389286ajde1602_3.

Zhao, Yong, Jing Lei, Bo Yan, Chun Lai, and Hueyshan Sophia Tan. 2005. "What Makes the Difference? A Practical Analysis of Research on the Effectiveness of Distance Education." *Teachers College Record* 107 (8): 1836–84. https://doi.org/10.1111/j.1467-9620.2005.00544.x.

Moore, Michael G. 1989. "Editorial: Three Types of Interaction." *American Journal of Distance Education* 3 (2): 1–7. https://doi.org/10.1080/08923648909526659.

Hillman, Daniel C., Deborah J. Willis, and Charlotte N. Gunawardena. 1994. "Learner-Interface Interaction in Distance Education: An Extension of Contemporary Models and Strategies for Practitioners." *American Journal of Distance Education* 8 (2): 30–42. https://doi.org/10.1080/08923649409526853.

Dhaqane, Mahad Khalif, and Nor Abdulle Afrah. 2016. “Satisfaction of Students and Academic Performance in Benadir University.” *Journal of Education and Practice* 7 (24): 59–63. https://files.eric.ed.gov/fulltext/EJ1112855.pdf.

Oja, Michelle. 2011. “Student Satisfaction and Student Performance.” *Journal of Applied Research in the Community College* 19 (1): 47–53. https://www.questia.com/library/journal/1P3-2783288791/student-satisfaction-and-student-performance.

Eom, Sean B., H. Joseph Wen, and Nicholas Ashill. 2006. “The Determinants of Students' Perceived Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation.” *Journal of Innovative Education* 4 (2): 215–35. https://doi.org/10.1111/j.1540-4609.2006.00114.x.

Marks, Ronald B., Stanley D. Sibley, and J. B. Arbaugh. 2005. “A Structural Equation Model of Predictors for Effective Online Learning.” *Journal of Management Education* 29 (4): 531–63. https://doi.org/10.1177/1052562904271199.

Zimmerman, Tekeisha Denise. 2012. “Exploring Learner to Content Interaction as a Success Factor in Online Courses.” *International Review of Research in Open and Distributed Learning* 13 (4): 152–65. https://doi.org/10.19173/irrodl.v13i4.1302.

Chang, Kuang-Yu. 2013. “Factors Affecting Student Satisfaction in Different Learning Deliveries.” *Illinois State University*. Dissertation. Illinois State University. . https://ir.library.illinoisstate.edu/etd/26.

Kuo, Yu-Chun, Andrew E. Walker, Brian R. Belland, and Kerstin E. E. Schroder. 2013. “A Predictive Study of Student Satisfaction in Online Education Programs.” *International Review of Research in Open and Distributed Learning* 14 (1): 16–39. https://doi.org/10.19173/irrodl.v14i1.1338.

Martin, Jeffrey. 2019. “Building Relationships and Increasing Engagement in the Virtual Classroom: Practical Tools for the Online Instructor.” *Journal of Educators Online* 16 (1): 1–8. https://doi.org/10.9743/jeo.2019.16.1.9.

Bandura, Albert. 1977. *Social Learning Theory*. *Department of Economic Cybernetics*. Vol. 1. Englewood Cliffs, NJ: Prentice-Hall. http://www.asecib.ase.ro/mps/Bandura_SocialLearningTheory.pdf.

Yukselturk, Erman, and Zahide Yildirim. 2008. “Investigation of Interaction, Online Support, Course Structure and Flexibility as the Contributing Factors to Students' Satisfaction in an Online Certificate Program.” *Educational Technology & Society* 11 (4): 51–65. https://www.jstor.org/stable/jeductechsoci.11.4.51.

Dennen, Vanessa P., A. Aubteen Darabi, and Linda J. Smith. 2007. “Instructor–Learner Interaction in Online Courses: The Relative Perceived Importance of Particular Instructor Actions on Performance and Satisfaction.” *Distance Education* 28 (1): 65–79. https://doi.org/10.1080/01587910701305319.

Woo, Younghee, and Thomas C. Reeves. 2007. “Meaningful Interaction in Web-Based Learning: A Social Constructivist Interpretation.” *The Internet and Higher Education* 10 (1): 15–25. https://doi.org/10.1016/j.iheduc.2006.10.005.

Shee, Daniel Y., and Yi-Shun Wang. 2008. “Multi-Criteria Evaluation of the Web-Based e-Learning System: A Methodology Based on Learner Satisfaction and Its Applications.” *Computers & Education* 50 (3): 894–905. https://doi.org/10.1016/j.compedu.2006.09.005.

Doronina, O. V. 1995. “Fear of Computers.” *Russian Education & Society* 37 (2): 10–28. https://doi.org/10.2753/RES1060-9393370210.

Strachota, Elaine M. 2003. “Student Satisfaction in Online Courses: An Analysis of the Impact of Learner-Content, Learner-Instructor, Learner-Learner and Learner-Technology Interaction.” *Learning & Technology Library*. Dissertation. The University of Wisconsin. . https://www.learntechlib.org/p/119146/.

Carifio, James, and Rocco Perla. 2008. “Resolving the 50-Year Debate around Using and Misusing Likert Scales.” *Medical Education* 42 (12): 1150–52. https://doi.org/10.1111/j.1365-2923.2008.03172.x.

Boone, Harry, and Deborah Boone. 2012. “Analyzing Likert Data.” *Journal of Extension* 50 (2). https://archives.joe.org/joe/2012april/tt2.php.

Boone, Harry, and Deborah Boone. 2012. “Analyzing Likert Data.” *Journal of Extension* 50 (2). https://archives.joe.org/joe/2012april/tt2.php.

Annex

Student Interaction and Satisfaction Survey

Thank you for participating in this survey!

This survey is part of a work project regarding student satisfaction in online courses and your answers will be very valuable for this study.

The following questions concern student satisfaction and 4 types of interaction in online courses: Student-Content, Student-Instructor, Student-Student and Student Technology.

Demographics

1. Gender (M/F/Other)
2. Age

3. Student status (Full-Time Student/Working Student)
4. Approximate number of hours spent on the internet per day
5. Number of online courses attended

For the following 5 topics (the 4 types of student interaction and also student satisfaction) you will be asked how much you agree with the sentences displayed.
Each question will have 5 options, ranging from "Strongly Agree" to "Strongly Disagree".
If you have participated in multiple online courses, answer to the statements with your opinion regarding only the course that you remember the best.

Student-Content

6. The course content was well organized and easily accessible.
7. The live online classes contributed to my learning.
8. The recorded video materials contributed to my learning.
9. The documents/files available contributed to my learning.
10. The assignments/projects contributed to my learning.
11. I needed to use my problem solving skills during the course.
12. I was well prepared for the evaluation tests.
13. I actively interacted with the course content (taking notes, clarifying doubts, doing own research).

Student-Instructor

14. I was provided with timely and useful feedback from the teacher.
15. I was given individual attention from the teacher.
16. The teacher noticed my presence in class.
17. The teacher encouraged communication and participated in discussions during the course.
18. The teacher was accessible and available to clarify any doubts.
19. It was clear and easy to understand the content lectured by the teacher.

Student-Student

20. I was encouraged to interact with other students.
21. Group projects/assignments contributed to my learning.
22. I interacted with other students using online forums/discussion boards.
23. I helped other students with doubts and difficulties regarding the course content.

24. I was helped by other students to clarify doubts and difficulties regarding the course content.
25. I felt that I was a part of a group.

Student-Technology

26. I enjoy using computers.
27. I am confident using a computer to attend online classes.
28. I find it easy to access the course content online.
29. I can search for and find information online to help me during my studies.
30. I am confident using a computer to talk/meet with the teacher and other students online.
31. I know how to use and work with presentation software (i.e. PowerPoint, Prezi).
32. I get frustrated when dealing with technical problems while using a computer.

Satisfaction

33. The course satisfied my expectations.
34. The course met my learning goals.
35. I would recommend the course to other students.
36. Based on my experience I would take another online course.
37. Overall, I enjoyed the course.

Do you have a comment that you want to make about online courses, student satisfaction or the survey that you just completed?

Table 2 – Students' Gender

Gender	Frequency	Percentage
Male	23	40%
Female	35	60%

Graphic 1 – Students' Ages

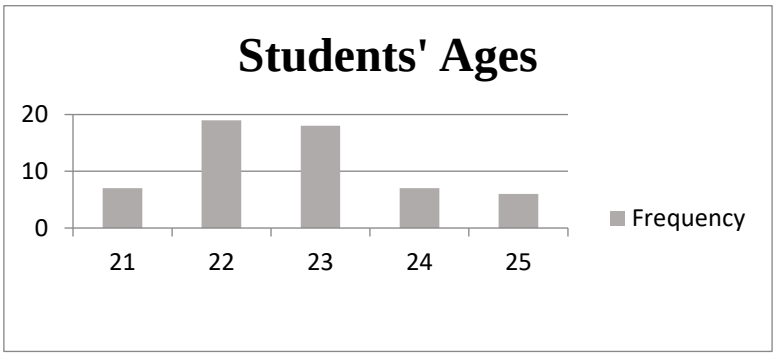


Table 3 – Students' Status

Status	Frequency	Percentage
Full-Time Student	52	90%
Working Student	6	10%

Graphic 2 – Students' Hours Spent Online

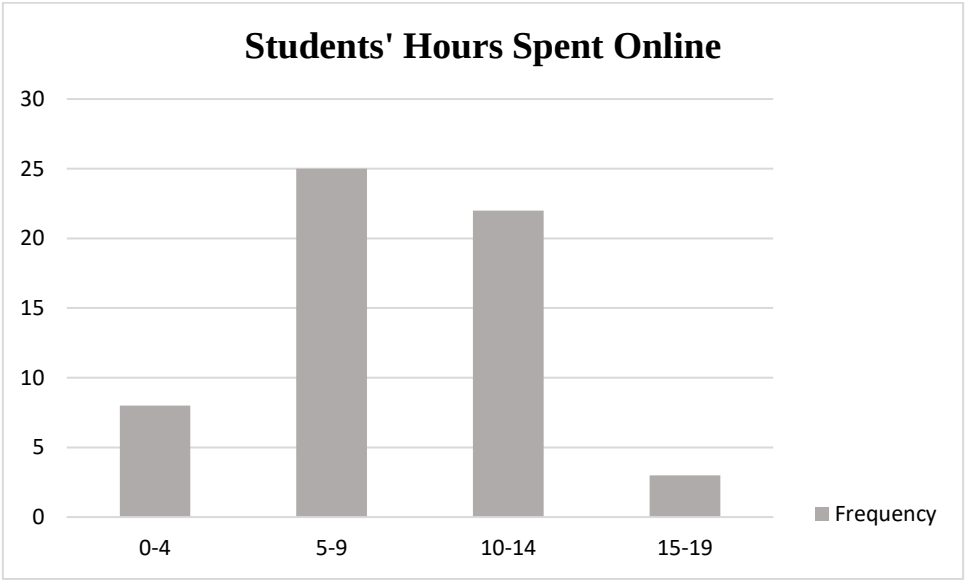
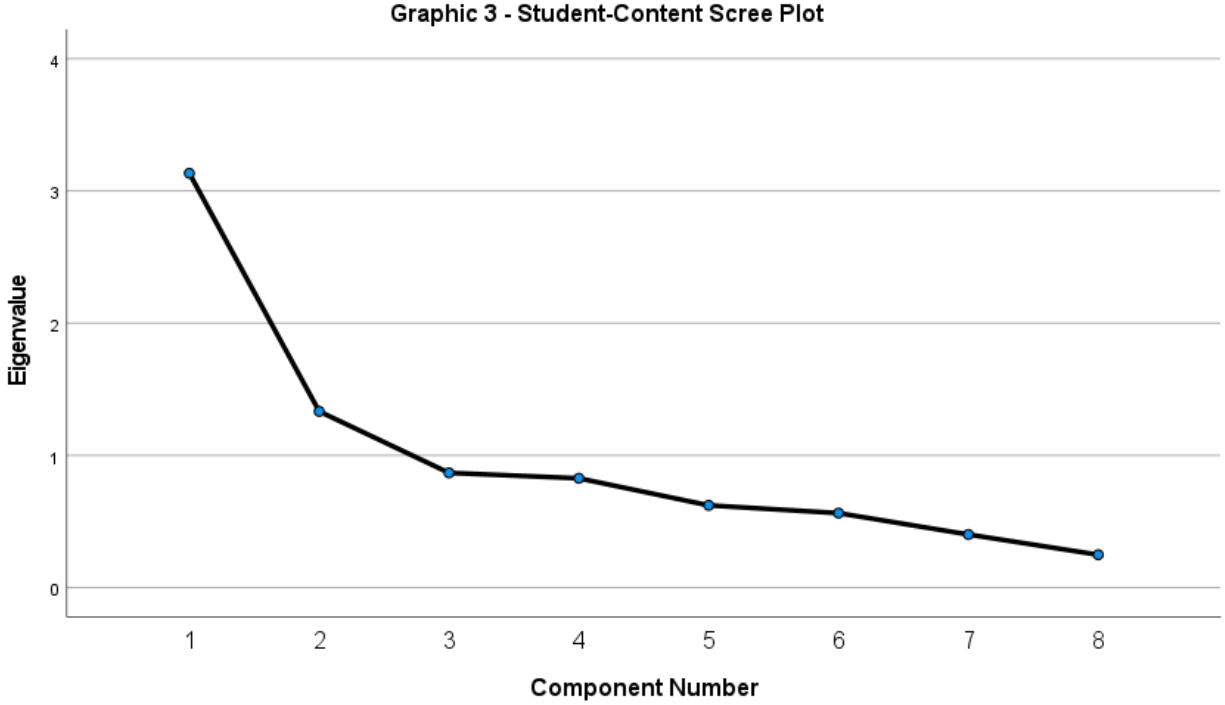


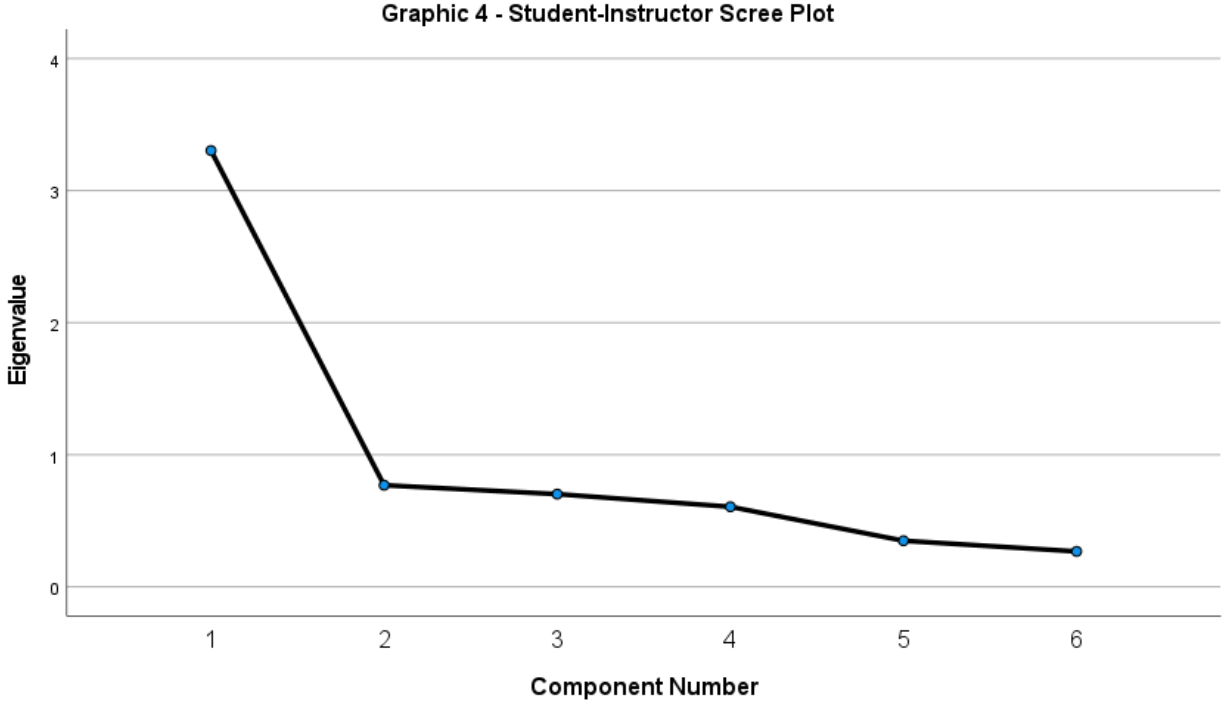
Table 6.1 – Components and Total Variance Explained for the 5 Scales									
Component	Student-Content Eigenvalues			Student-Instructor Eigenvalues			Student-Student Eigenvalues		
	Total	% of Variance	Cumul %	Total	% of Variance	Cumul %	Total	% of Variance	Cumul %
1	3,13	39,17	39,17	3,30	55,06	55,06	3,32	55,25	55,25
2	1,33	16,67	55,84	,77	12,83	67,89	1,01	16,89	72,14
3	,87	10,85	66,69	,70	11,71	79,60	,83	13,78	85,92
4	,83	10,34	77,03	,61	10,11	89,70	,43	7,09	93,00
5	,62	7,78	84,81	,35	5,82	95,53	,30	5,01	98,02
6	,56	7,05	91,86	,27	4,48	100,00	,12	1,99	100,00
7	,40	5,03	96,89						
8	,25	3,11	100,00						

Table 6.2 – Components and Total Variance Explained for the 5 Scales						
Component	Student-Technology Eigenvalues			Student Satisfaction Eigenvalues		
	Total	% of Variance	Cumul %	Total	% of Variance	Cumul %
1	3,39	48,47	48,47	4,11	82,21	82,21
2	1,07	15,22	63,69	,42	8,45	90,65
3	,85	12,19	75,88	,21	4,26	94,91
4	,61	8,71	84,59	,15	2,99	97,90
5	,46	6,53	91,12	,11	2,10	100,00
6	,36	5,18	96,30			
7	,26	3,70	100,00			

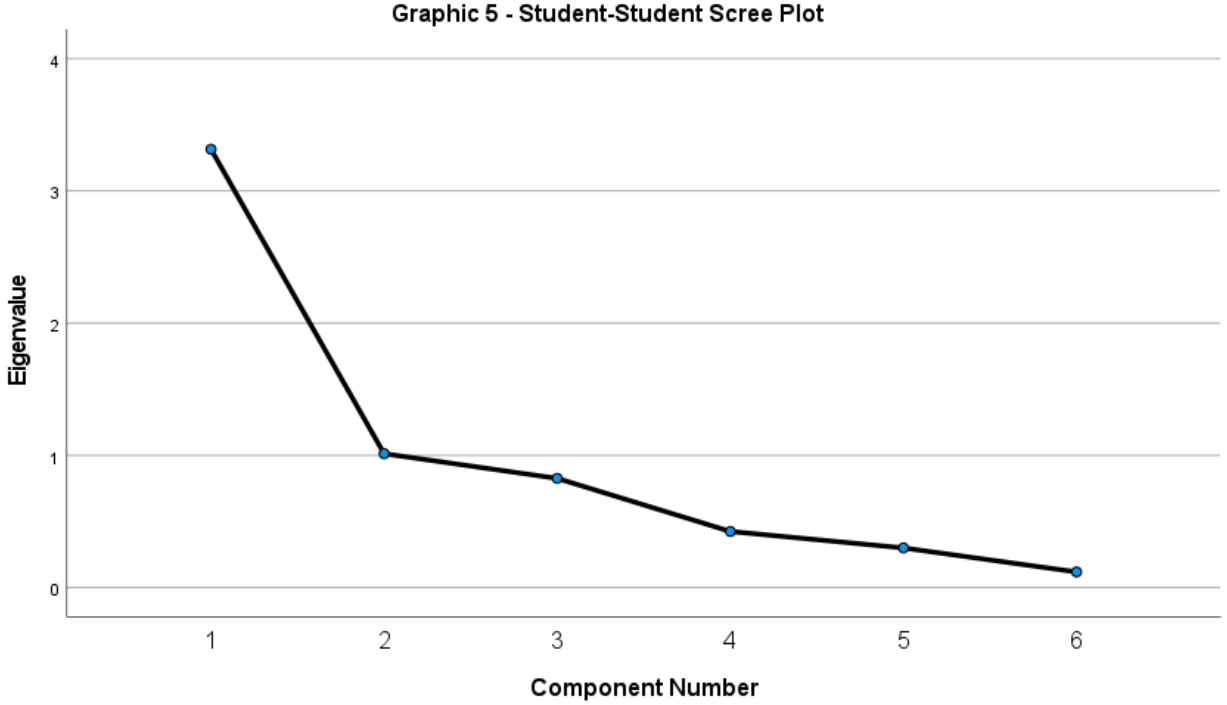
Graphic 3 - Student-Content Scree Plot



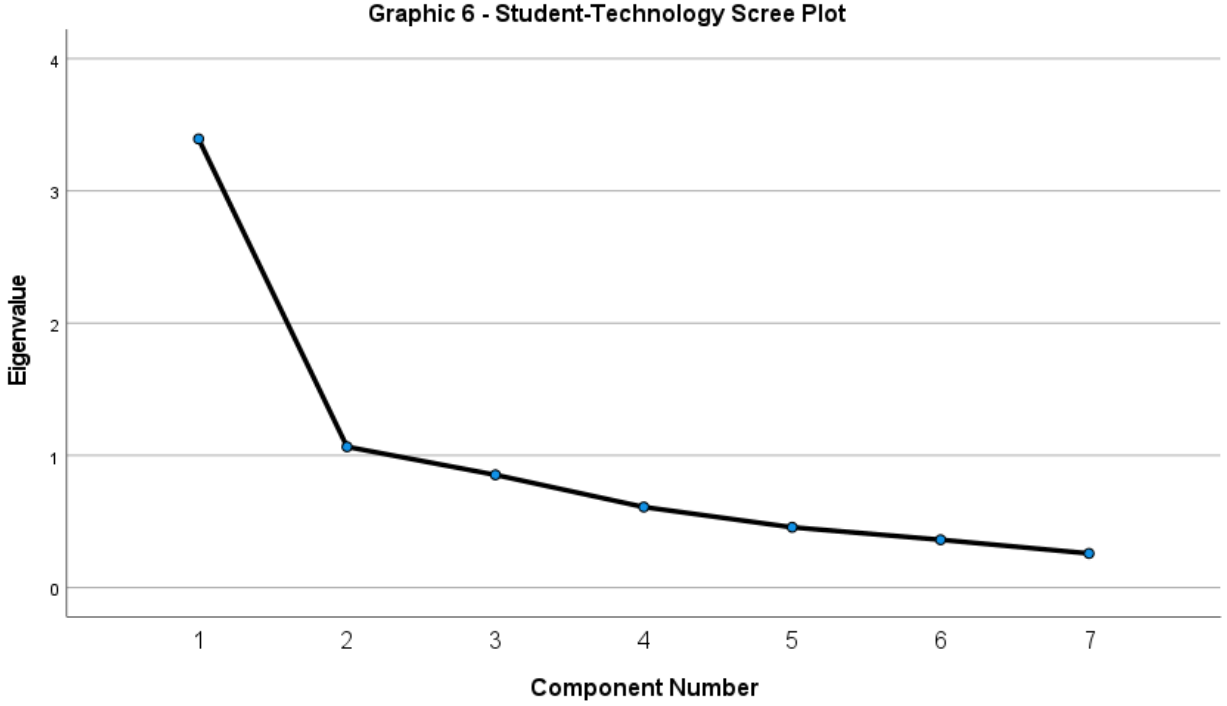
Graphic 4 - Student-Instructor Scree Plot



Graphic 5 - Student-Student Scree Plot



Graphic 6 - Student-Technology Scree Plot



Graphic 7 - Student Satisfaction Scree Plot