High school students' perceptions of teaching, social and cognitive presences during emergency remote teaching

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Abstract: During the COVID-19 outbreak, the imposition of home restriction or quarantine led to the use of emergency remote teaching for education purposes. Adolescent students faced a challenge while trying to maintain a school experience and receive reliable information about the pandemic. This study presents the results for students' perceptions of teaching, social and cognitive presence and the relationships between them, as described in the CoI framework, during the implementation of emergency remote teaching. Data derived from the answers of 47 junior high school students to the CoI survey, after attending online courses that incorporated both asynchronous and synchronous distance learning tools. Results show that teaching presence is significantly and positively correlated to social presence and cognitive presence. Starting from the high correlation between teaching and cognitive presence, simple regression analysis was used in order to calculate a model for predicting cognitive presence.

Keywords: emergency remote teaching, CoI framework, high school

Introduction

Secondary education schools in Greece remained closed from 11 March to 17 May 2020 due to the COVID-19 pandemic. During this period, home restriction and even quarantine were also implemented, allowing citizens to leave their homes only for specific reasons. In this context, high school students faced a new challenge, as they were asked to attend their school courses using means of emergency remote teaching (ERT). According to Hodges et al. (2020) ERT differs from "online teaching" and must be considered as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances." It involves the creation of an educational environment, by the use of fully remote teaching solutions that would otherwise be delivered in classroom, and provides temporary access to instructional support in a quick and reliable way.In Greece, these online ERT courses were organized by school teachers, using simple or advancedonline tools and platforms which were provided by official education authorities. Moreover, these courses were the only available alternative for students, in order to maintain a meaningful education experience and keep up with curriculum demands.

Both asynchronous and synchronous distance learning tools were available for teachers. In asynchronous distance learning (ASDL) students study online material from their own

workplace and on their own time under the guidance of a teacher. This type of communication is supported by various computer-based tools such as emails, discussion forums, social media, blogs, wikis or learning management systems (LMS) that incorporate various essential tools. ASDL provides a time and space flexible way of communication between teacher and students and does not require physical presence in a classroom. Sometimes recorded video or images may be used to facilitate educational goals (Bernard et al., 2004). Synchronous distance learning (SDL) is mediated via chat or videoconference online platforms. Participants may be still geographically separated but students can ask questions in real time and have a more social experience. Bernard et al. (2004) point out that SDL helps students feel like participants rather than isolates.

ERT was implemented during a period of home restriction/quarantine. According to CDC (2020), quarantine is the separation and restriction of movement of people who have potentially been exposed to a contagious disease to ascertain if they become unwell, so reducing the risk of them infecting others. Despite the fact that there are potential benefits for public health out of a mandatory home restriction, it is also evident that there are also possible negative psychological effects. Various factors may result in post-traumatic stress symptoms, stressful behaviour, depression, confusion or anger for people (Brooks et al., 2020). Adolescents' wellbeing may also be affected: school closure and social distancing can challenge their growing sense of independence and search of identity which mainly evolve by connecting with peers. Moreover they may experience anxiety as they try to understand the pandemic and the threat it poses to them, their families and friends (The Lancet Child & Adolescent Health, 2020). Dalton, Rapa & Stein (2020) point out that "this anxiety can manifest in challenging externalizing behaviours, such as acting out or arguing, rather than more typically assumed tearful, sad, or worried responses".

This paper presents the results about students' perceptions of teaching, social and cognitive presences, as described in the Community of Inquiry (CoI) framework, during the implementation of ERT in the 4th Junior High School, Greece. Moreover the study aims to evaluate whether the main relationships between presences are affected during home restriction when distance learning is the only way for students to maintain a school experience.

1. The Community of Inquiry (CoI) framework

1.1 Overview

The Community of Inquiry (CoI) framework is a collaborative-constructivist process model that describes the essential elements of a successful online learning experience (Garrison, 2017). Its creators, Garrison, Anderson & Archer (1999, 2001) defined an educational community of inquiry as a group of individuals who collaboratively engage in purposeful critical discourse and reflection to construct personal meaning and confirm mutual

understanding. The theoretical framework represents a process of creating a deep, meaningful and collaborative learning experience and includes three elements called presences: Cognitive Presence (CP), Social Presence (SP) and Teaching Presence (TP). According to Garrison (2009) SP is "the ability of participants to identify with the community (e.g., course of study), communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities". TP is the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes (Anderson, Rourke, Garrison, & Archer, 2001). CP is the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse (Garrison, Anderson, & Archer, 2001). In the framework's context, it has been shown that TP, in the form of designing learning activities that require solutions and provide facilitation and direction, is a substantial influence on SP and CP (Akyol & Garrison, 2008) and finally all presences, TP, SP and CP influence student satisfaction, perceived learning, and sense of community (Garrison & Arbaugh, 2007).

Recently Castellanos-Reyes (2020) published a retrospective paper that summarized the evolution of the CoI framework and the three presences during the last 20 years. In this review, it is stated that the CoI frameworkis one of the most extensively used frameworks in online teaching and learning and this is highly attributed to its simple and reliable survey instrument. The CoI survey has been used to explore single learning environments or examine differences by observing relationships among the different elements of CoI and their relationships with other data.

1.2 The CoI survey instrument

Arbaugh et al. (2008) developed a survey instrument, which is used to measure the dimensions of the CoI framework. It consists of 34 items organized in 3 scales (corresponding to the 3 framework's presences) and 10 subscales: Design & Organization, Facilitation, Direct Instruction (TP), Affective expression, Open communication, Group cohesion (SP) and Triggering event, Exploration, Integration, Resolution (CP). The survey uses a five point Likert scale (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree). The instrument's efficiency, reliability and validity has been established through various studies: Arbaugh et al. (2008) used principle component analysis to support the construct validity of the three presences, Swan et al. (2008) statistically validated the instrument using factor analysis and Díaz, Swan, Ice & Kupczynski (2010) implemented principle component analysis of multiplicative scores by using course ratings and survey ratings.

In a systematic review of the CoI survey, Stendon (2018) refers to the main causal relationships and correlations among the presences and with other variables. Some of the main findings are that TP and SP have a significant perceived influence on CP while TP scores significantly predict CP and SP perceptions (Garrison, Cleveland-Innes & Fung, 2010; Gutiérrez-Santiuste, Rodríguez-Sabiote & Gallego-Arrufat, 2015). CP has a positive effect on

training effectiveness, while self-efficacy is positioned between SP/TP and CP (Lin, Hung & Lee, 2015). Finally Rockinson-Szapkiw, Wendt, Wighting, & Nisbet (2016) found that students with higher levels of perceived SP, CP, and TP had higher course scores.

2. Methodology

2.1 Online course

The author of this study organized two separate online distance learning courses for biology and chemistry from 23 March to 17 May 2020. All students attended both courses. During this period, school was closed so courses were held in order to maintain communication between teacher and students and keep up with curriculum demands. More importantly, there was an emphasis to provide meaningful activities for them to do while in home restriction, provide clear communication about the COVID-19 outbreak and maintain the sense of cooperation between students through online activities. Courses embedded both ASDL and SDL.

ASDL was organized using the official open e-class learning management platform (https://eclass.sch.gr). Every week one new unit was posted in the platform, containing online material (texts, videos, links for educational activities such as virtual labs or educational games and others) along with information on how to use their school books or notes. This material served both the revision of important course topics and the presentation of new information and course units. Students were asked to study the material and post questions in platform's forum or via email. Every unit was accompanied by optional or compulsory activities. These activities may range from simple multiple choice tests or posting photos from home experiments to submitting assignments. Finally, a web conference was held every week for 45 minutes using an officially recommended platform with audio, visual and chat features. During the online meetings, teacher presented the current unit's learning material and gave requested information to students.

2.2 Research questions and procedure

The research questions of this study are:

1. What are the students' perceptions for TP, SP and CP?

2. What is the relationship between the three variables: TP, SP and CP?

3. Can TP scores be used in order to predict SP and CP scores?

Answers to the last two questions will determine whether published observations for the three CoI framework presences are confirmed when ERT is implemented during home restriction. For this purpose quantitative research was used. Questions were addressed by using descriptive statistics, correlation and regression analyses on TP, SP and CP scores.

At the end of ERT online courses, students were asked to fill out an online CoI survey based on their whole experience from the two courses. The questionnaire ensured anonymity and contained information about its scope and the appropriate concept. For this research, only questionnaires, which were fully answered by students, were used. Finally prior to the data analyses two questionnaires were excluded because it were given the same answers to 100% of questions (5=strongly agree).

2.3 Data sample and research tools

Research data derive from the answers to the CoI survey of 47 junior high school students who attended the same distance learning courses (featuring ASDL and SDL characteristics). Students are 12-15 years old (18 aged 12-13, 13 aged 13-14 and 16 aged 14-15) and are 20 male and 27 female. The tool for measuring and evaluating students' perceptions is a reduced version of the CoI survey instrument translated in Greek. The questionnaire consists of 24 questions representing all scale and subscales of the original CoI survey: 9 questions regarded the TP variable, 7 questions regarded the SP variable and 8 questions regarded the CP variable. To further validate the reliability of the survey and ensure internal consistency of the questions, a Cronbach's alpha was run on the set of questions for each dependent variable. Cronbach's alpha for the 9 TP items, 7 SP items, and 8 CP items were .80, .73, and .77, respectively, indicating good internal consistency with the survey items. The IBM® SPSS® Statistics v.23.0 software was used for data descriptive statistics and statistical analyses.

3. Results

3.1 Descriptive statistics

Descriptive statistics were computed from the sample data. Table 1 presents the mean and standard error for each scale (teaching, social and cognitive presence) and their subscales.

Table 1. Mean (±St. Error) Score in presences' scales and subscales

Presence	Items	Mean	SE
Teaching	9	4.30	0.06
Design & Organization	3	4.68	0.04
Facilitation	3	3.94	0.09
Direct Instruction	3	4.29	0.08
Social	7	3.65	0.08
Affective expression	3	3.63	0.10
Open communication	2	3.87	0.11
Group cohesion	2	3.47	0.12
Cognitive	8	4.06	0.07

Triggering event	2	3.95	0.11
Exploration	2	4.04	0.10
Integration	2	4.20	0.08
Resolution	2	4.05	0.09

A review of the descriptive statistics suggests a prevalence of "agree" and "strongly agree" answers in TP and CP. In SP, answers were still mostly positive but the lower mean score indicates a lower level of presence for students.The Kolmogorov–Smirnov test was implemented in order to check the normality of each presence's scores. Tests for TP, $D(47)=0.10$, $p=.20$, SP, $D(47)=0.10$, $p=.20$ and CP, $D(47)=0.11$, $p=.099$ were not significant ($p>.05$) so their scores are approximately normally distributed.

3.2 Correlation analysis

Correlation analyses were computed in order to address the research question whether TP relates and supports SP and CP in a mixed synchronous and asynchronous online learning environment during ERT. All variables TP, SP and CP are continuous, interval and normally distributed. Firstly scatterplots were created in order to graphically evaluate the possible presence of linear or curvilinear correlation between the measured data. Figures 1a and 1b suggest a possible linear correlation between TP and SP/CP.
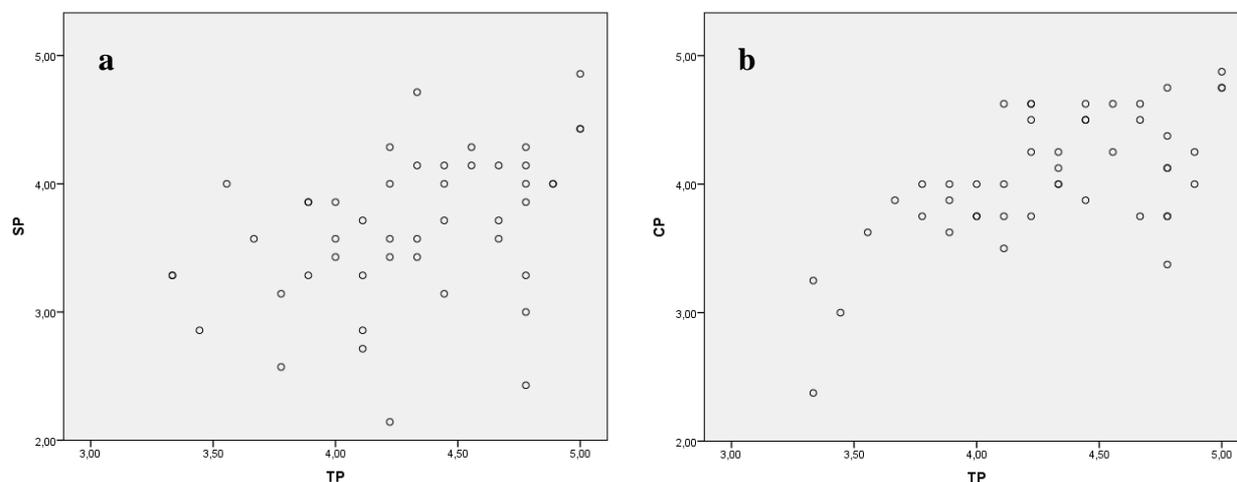

Figure 1. a. Scatterplot of SP scores vs TP scores and b. Scatterplot of CP scores vs TP scores

Secondly Pearson's correlations coefficient was calculated for each possible correlation (Table 2). Results suggest that TP is significantly ($p<.01$) positively related to SP with a coefficient of $r=0.415$ (medium effect) and TP is significantly ($p<.01$) positively related to CP with a coefficient of $r=0.624$ (large effect). According to the coefficient of determination (R^2), TP seems to account for only 17,2% of variation in SP and 38,9% of variation in CP.

Considering that many factors may affect CP during distance learning and in order to find out the size of the unique portion of variance of TP over CP, a partial correlation between these two variables was executed while controlling for SP. This partial correlation showed that TP is still significantly positively related to CP (in a more significant level, $p<.001$) with a coefficient of $r=0.550$ (large effect). This suggest that although their relationship is slightly diminished, TP accounts for 30,2% of variation in CP.

Table 2. Pearson's correlations coefficient (r) for variables TP, SP and CP (N=47).

Presence	Teaching	Social	Cognitive
Teaching	1	.415[*]	.624[*]
Social	-	1	.397[*]
Cognitive	-	-	1

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

3.3 Regression analysis

Simple regression analysis was calculated in order to determine a model for predicting CP score (outcome variable) using TP score (predictor variable). During the analysis the following assumptions were tested and successfully met: a. variables TP and CP are continuous and interval, b. relationship between the TP and CP variables is linear (Figure 1b, $r=.624, p<.01$), c. no outliers (observations that have a large overall influence) were detected using Cook's distance ($value=.051<1$) and Leverage value ($value=.01$), d. independence of observations was checked using the Durbin-Watson statistic ($value\ 1,94<2,5$), e. homoscedasticity (homogeneity of variance) was successfully checked as there is no pattern in the scatterplot (Figure 2a) and finally f. the residuals (errors) of the regression line are approximately normally distributed (Figure 2b).
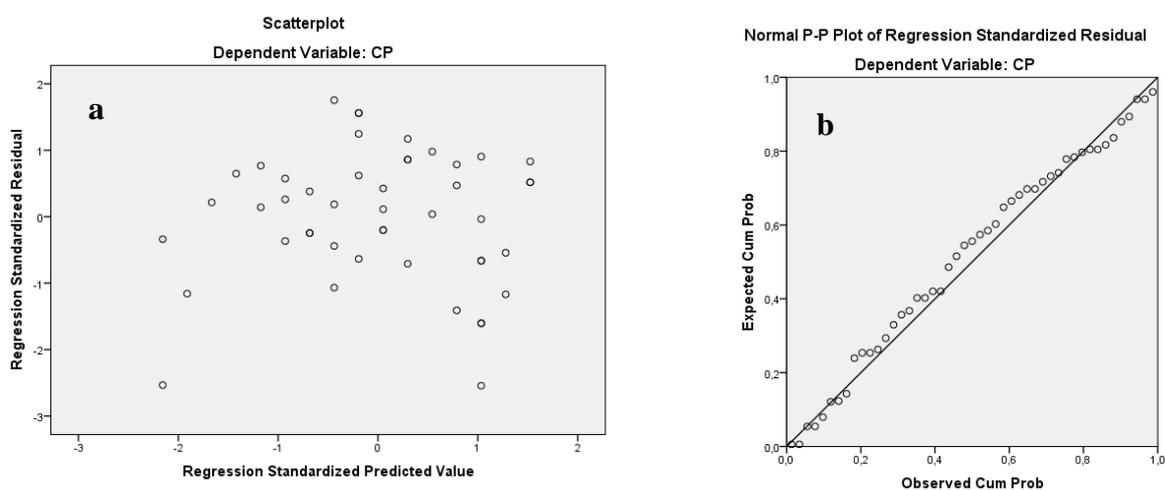
Figure 2. a. Scatterplot of standardized residuals and standardized predicted values and b. Normal P-P Plot of residuals of the regression line between TP and CP variables.

A significant regression equation was found ($F(1,45)=28.671$, $p < .000$), with an R^2 of .389. CP score is equal to *1.067 + 0.695·(TP score)*. This regression model is significantly better in predicting CP score than if the mean value of CP score was used. Finally regression results show that TP score makes a significant contribution ($p<.001$) to predicting CP score.

Discussion

The management of COVID-19 outbreak in 2020, imposed a school closure for a respected period of time in Greece. A home restriction was also implemented. High school students faced a new reality and may experience anxiety or confusion after the temporary but abrupt restriction of their independence and social interactions with peers. Under these circumstances, teachers resorted to emergency remote teaching (ERT) in order to maintain communication with their students and keep up with curriculum demands. Moreover they tried to give adequate and reliable information about public health issues and maintain the sense of cooperation between students through online activities. This study uses the CoI framework in order to record and explore the relationships between teaching (TP), social (SP) and cognitive (CP) presences' perceptions of high school students during ERT. Data derived from the answers of 47 junior high school students to the CoI survey instrument, after attending two separate online ERT courses about biology and chemistry. The courses were organized by the same teacher using an LMS and incorporated both ASDL and SDL.

Study results shows that TP, SP and CP are significantly associated in ERT and that TP and SP are a positive influence on CP. These results are consistent with the findings from previous studies (Archibald, 2010; Gutiérrez-Santiuste et al., 2015; Lin, Hung & Lee, 2015). In a study which analyses students' perception of ASDL and SDL virtual communication, Gutiérrez-Santiuste et al. (2015) conclude that cognitive elements are more strongly predicted by SP than TP. Interestingly the present study indicates that this is not the case in ERT that incorporates both ASDL and SDL features using an LMS. Results in this study show that cognitive elements are more strongly predicted by TP (*r=.624, p<.01*) than SP (*r=.415, p<.01*). This is more consistent with results from Lin et al. (2015) who measured the presences' relationship after online training using an LMS. Finally tests of appropriate assumptions indicate that the study data for TP and CP are well suited for simple linear regression analysis. A significant (*F(1,45)=28.671, p<.000*) regression equation was calculated in which CP score is equal to *1.067 + 0.695·(TP score)*, with an R^2 of .389.

Study's finding may imply that the effects of important aspects of SP on CP, such as affective and open communication and group cohesion are relatively diminished due to emergency circumstances. This may be attributed to students' anxiety, lack of information or inexperience to use online educational tools. Unfortunately the small sample size in this study, does not allow to test further assumptions and future research will help toward this direction. Moreover it is evident that promoting important TP aspects such as designing learning activities that require solutions and provide facilitation and direction, will help

students in ERT to have better cognitive experience. Main methodological limitations of this study are the small sized sample, which is also incidental, and the fact that ERT courses were held only in one school. Therefore, this study is not representative of the entire population. However, its findings may very well serve as one of the starting points for future research upon the predictive value of TP, SP and CP during ERT. Future studies may also focus on the SP factors which are mostly affected and the TP and SP relationship during ERT.

References

Akyol, Z., & Garrison, D. R. (2008). The development of a community of inquiry over time in an online course: Understanding the progression and integration of social, cognitive and teaching presence. *Journal of Asynchronous Learning Network, 12*(3), 3–23 doi:10.24059/olj.v12i3.66.

Anderson, T., Rourke, L., Garrison, D. R., & Archer, W. (2001). Assessing teaching presence in a computer conferencing context, *Journal of Asynchronous Learning Networks, 5*(2), 1–17.

Arbaugh, J. B., Cleveland-Innes, M., Diaz, S. R., Garrison, D. R., Ice, P., Richardson, J. C., & Swan, K. P. (2008). Developing a community of inquiry instrument: Testing a measure of the Community of Inquiry framework using a multi-institutional sample. *Internet and Higher Education, 11*(3–4), 133–136. doi: 10.1016/j.iheduc.2008.06.003.

Archibald, D. (2010). Fostering the development of cognitive presence: Initial findings using the community of inquiry survey instrument. *The Internet And Higher Education*, *13*(1-2), 73-74. doi: 10.1016/j.iheduc.2009.10.001

Bernard, R., Abrami, P., Lou, Y., Borokhovski, E., Wade, A., & Wozney, L. et al. (2004). How Does Distance Education Compare With Classroom Instruction? A Meta-Analysis of the Empirical Literature. *Review Of Educational Research*, *74*(3), 379-439. doi: 10.3102/00346543074003379

Brooks, S., Webster, R., Smith, L., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. (2020). The Psychological Impact of Quarantine and How to Reduce It: Rapid Review of the Evidence. *SSRN Electronic Journal*. doi: 10.2139/ssrn.3532534

Castellanos-Reyes, D. (2020). 20 Years of the Community of Inquiry Framework. *Techtrends*. doi: 10.1007/s11528-020-00491-7

CDC, Quarantine and Isolation, Quarantine. (2020). Retrieved 30 May 2020, from https://www.cdc.gov/quarantine/index.html

CoI Framework | CoI. (2020). Retrieved 28 May 2020, from https://coi.athabascau.ca/coi-model/

Dalton, L., Rapa, E., & Stein, A. (2020). Protecting the psychological health of children through effective communication about COVID-19. *The Lancet Child & Adolescent Health*, *4*(5), 346-347. doi: 10.1016/s2352-4642(20)30097-3

Díaz, S., Swan, K., Ice, P., & Kupczynski, L. (2010). Student ratings of the importance of survey items, multiplicative factor analysis, and the validity of the community of inquiry survey. *The Internet And Higher Education*, *13*(1-2), 22-30. doi: 10.1016/j.iheduc.2009.11.004

Field, A. (2009). *Discovering statistics using IBM SPSS* (3rd ed.). London: SAGE Publications Ltd.

Garrison, D. (2017). *E-learning in the 21st century: A community of inquiry framework for research and practice* (3rd ed.). Routledge. doi: 10.4324/9781315667263

Garrison, D. R. (2009). Communities of inquiry in online learning. In P. L. Rogers (Ed.), *Encyclopedia of distance learning* (pp. 352–355), 2nd ed. Hershey, PA: IGI Global.

Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. *Internet and Higher Education, 10*(3), 157–172. doi: 10.1016/j.iheduc.2007.04.001.

Garrison, D., Anderson, T., & Archer, W. (1999). Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education. *The Internet And Higher Education*, *2*(2-3), 87-105. doi: 10.1016/s1096-7516(00)00016-6

Garrison, D., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and computer conferencing in distance education. *American Journal Of Distance Education*, *15*(1), 7-23. doi: 10.1080/08923640109527071

Garrison, D., Cleveland-Innes, M., & Fung, T. (2010). Exploring causal relationships among teaching, cognitive and social presence: Student perceptions of the community of inquiry framework. *The Internet And Higher Education*, *13*(1-2), 31-36. doi: 10.1016/j.iheduc.2009.10.002

Gutiérrez-Santiuste, E., Rodríguez-Sabiote, C., & Gallego-Arrufat, M. (2015). Cognitive presence through social and teaching presence in communities of inquiry: A correlational–predictive study. *Australasian Journal Of Educational Technology, 31*(3). doi: 10.14742/ajet.1666

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The Difference Between Emergency Remote Teaching and Online Learning. Retrieved 30 May 2020, from https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Lin, S., Hung, T., & Lee, C. (2015). Revalidate Forms of Presence in Training Effectiveness. *Journal Of Educational Computing Research*, *53*(1), 32-54. doi: 10.1177/0735633115588772

Rockinson-Szapkiw, A., & Wendt, J. (2015). Technologies that assist in online group work: A comparison of synchronous and asynchronous computer mediated communication

technologies on students' learning and community. *Journal of Educational Multimedia and Hypermedia, 24*(3), 263-279

Roussos, P., & Tsaousis, G. (2002). *[Statistics in the social sciences]* (2nd ed.). Athens: Ellinika Grammata.

Stenbom, S. (2018). A systematic review of the Community of Inquiry survey. *The Internet And Higher Education*, *39*, 22-32. doi: 10.1016/j.iheduc.2018.06.001

Swan, K., Shea, P., Richardson, J., Ice, P., Garrison, D. R., Cleveland-Innes, M., & Arbaugh, J. B. (2008). Validating a measurement tool of presence in online communities of inquiry. *E-Mentor, 2*(24), 1-12. http://www.e-mentor.edu.pl/_xml/wydania/24/543.pdf

The Lancet Child & Adolescent Health. (2020). Pandemic school closures: risks and opportunities. *The Lancet Child & Adolescent Health*, *4*(5), 341. doi: 10.1016/s2352-4642(20)30105-x