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The university teaching during the COVID-19 pandemic lockdown: cognitive and motivational factors promoting the sense of community in university online courses

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Article info

Abstract

Restrictions to contain the COVID-19 pandemic in spring 2020 led to the closure of schools and university. To meet learning outcomes, most of academic courses were abruptly adapted to a digital format, and different online deliveries were given in at-home educational setting in absence of physical social interactions with teachers and peers. As the sense of community has demonstrated to improve student persistence in courses, emergency remote learning could impact engagement of students in online learning.

Here, we examined three dimensions of sense of community (i.e., Membership, Fulfilment of needs and goals achievement and Mutual influence of the individuals) in Synchronous, Asynchronous and Lab classes and analyzed the concurrent contribute of cognitive and motivational characteristics of students involved.

We found higher scores of Fulfilment of needs and goals achievement in students attending a Synchronous class, and higher Mutual influence of the individuals scores in students attending the Lab class. Moreover, results revealed a significant role of group membership, intrinsic motivation, and problem-solving self-efficacy in explaining the sense of community dimensions across groups.

In conclusion, our results outlined the importance of considering both motivational and self-regulation variables in different kind of university online class in fostering the sense of community, that is well-known to promote students' persistence and engagement.

Keywords: emergency remote learning; sense of community; student persistence.

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Introduction

Italy was the first European country to impose harsh measures to contain the COVID-19 pandemic in spring 2020, including closure of schools and universities. Whilst millions of students were forced to move on emergency remote learning, schools and universities were challenged to increase dramatically the use of web-based teaching to meet learning outcomes – without being prepared for it. Indeed, most of activities that were originally devised for an academic community environment have been abruptly translated in a digital format, in absence of face to face interaction between teacher and students and among students themselves. There is ample evidence that online learning – especially when it is blended or hybrid, that is combining online and face-to-face instruction – provides learning enhancement (Bock et al., 2021; Smart & Cappel, 2006; McCutcheon et al., 2015; McEwen, 1997; Means, 2009). However, evidence that purely online learning, i.e., in absence of interpersonal interaction, is as much efficient as face-to-face traditional programs is still inconsistent.

Studies conducted during COVID-19 pandemic showed that students' course performance and satisfaction were equivalent or better as compared to pre-pandemic attendance to traditional pre-pandemic courses (Camargo et al., 2020; Giovannella, 2022; Rossettini et al., 2021; Zheng et al., 2021). On the other hand, it has been shown that learning in virtual environment is associated with negative feelings, such as sense of isolation (Brown, 1996), frustration and anxiety (Hara, 2000; Piccoli et al., 2001), and higher dropout rates (Bernard & Amundsen, 1989; Frankola, 2000; Laine, 2003). Critically, improving the *sense of belonging* to the student community has been suggested to reverse the effects of social isolation and stress-related feelings, such as alienation and confusion, related to the learning at a distance (Rovai, 2002; Tinto, 1993). Sense of community has been defined as the feeling that individuals have in being part of a stable structure, while emphasizing interindividual differences and acknowledging that members needs will be met through their commitment to be together (McMillan & Chavis, 1986; Sarason, 1974). Across definitions, either mutual interdependence among members, connectedness, trust, interactivity, and shared values and goals have been defined as key aspects of the sense of community construct (Rovai, 2002). Sense of community has been proven to increase persistence in distance education (Royal & Rossi, 1996), and increase members' subjective perception of cognitive learning in online educational environment (Rovai & Wighting, 2005). Balboni and colleagues (2018) described three related dimensions of the sense of belonging to an online community articulated in the relationship among students, the role of each student in influencing the course activities, and the students' need fulfilment. It may be suggested that these dimensions of community sense are differently weighted in different online educational settings. For instance, in synchronous classes, where students are allowed to interact with the instructor and get instantaneous answers to their questions, it can be hypothesized that engagement with the topic improve fulfilling students' needs compared to asynchronous classes. Additionally, online Lab classes that emphasize student-student interaction and commitment to the class activities/

assignments, could be expected to increase personal feeling in influencing students' activities.

Intriguingly, several studies suggest that other individual dimensions modulate both the engagement and the persistence of students in university courses, along with the sense of community. For instance, following the Self-Determination Theory (Deci & Ryan, 1985, 2002), Chen and Jang (2010) found that contextual support (i.e., support from the instructor, social interaction, etc.) predicted intrinsic motivation to participate to online activities, but only if mediated by satisfaction of learning needs (Chen & Jang, 2010). Furthermore, Laux and colleagues (2016) showed that sense of community predicted the campus connectedness, the organizational affective commitment – but not the students' turnover intention – only in the presence of high levels of active participation and engagement in virtual collaborative learning environments. Finally, a study conducted by Vayre and Vonthron (2017) focused on the role of academic self-efficacy (including self-regulated learning and problem-solving skills) in the promotion of the sense of belonging to the academic community. In particular, they elaborated a model in which academic self-efficacy mediates the relationship between sense of community and student engagement to the e-learning activities, in terms of perseverance, enthusiasm and reconciliation.

Given these considerations, here we assessed the sense of community in university online classes extemporized to fulfill learning outcome during COVID-19 pandemic. In this context, students that were attending courses as a part of a community were thrown into online classes wherein the interpersonal interaction was minimized or eliminated. Critically, remote learning emergency entailed an abrupt transition from face-to-face to distance learning, being the students scarcely motivated to attend classes in a virtual modality, but rather forced to do it. Hence, it is conceivable to hypothesize that the sense of community that accompanied students to transition into online classes has been fostered depending on class typology. Therefore, we investigated three dimensions of sense of community according with Balboni et al. (2018) in 1) synchronous, 2) asynchronous and 3) Lab online classes. Furthermore, we explored motivational and cognitive variables that predict sense of community and persistence in these class typologies.

Aims

The objective of this study was three-fold. First, we aimed at exploring how the three dimensions of sense of community – namely, Membership, Fulfilment of needs and goals achievement and Mutual influence of the individuals – are differently weighted depending on attending online synchronous, asynchronous or lab classes. Specifically, we expect that both the presence and the quality of interpersonal interaction among the members, as well as the opportunity to collaborate or discuss together on a course topic foster the sense of community of individuals in a class. Thus, participation to synchronous and Lab classes could be expected increasing membership among students compared with asynchronous classes. Furthermore, participation to Lab classes,

that emphasize student-student interaction through assignments and in-class activities, can foster the feeling of influencing other students' activities (i.e., Mutual influence of the individuals), whereas synchronous class attendance, preserving teacher-student interaction, is expected to fulfil learning needs (i.e., Fulfilment of needs and goals achievement) to a greater extent than other form of virtual education.

As a second aim, we explored the relationship between the three dimensions of the sense of community and variables that have been described to be implied in the engagement of the students within the traditional face-to-face as well as online learning community, such as motivation, autoregulation in learning, academic self-efficacy and drop-out intentions. According to previous literature, we expect that the presence of three dimensions of the community sense is related to self-regulated learning but threatened by the intention of interrupting the university course.

Finally, we were interested in understanding which variables predict the sense of community – as a promoting factor of persistence – within virtual environment learning. We hypothesize that motivational and cognitive factors, well-known to promote success and reduce student attrition, such as intrinsic motivation and self-regulation in learning, foster the three dimensions of community sense, promoting persistence in e-learning course.

Method

Participants

Three hundred and fifty-one students attending courses at the Roma Tre University, Department of Education during the lockdown period for the Covid 19 pandemic (March-May 2020), took part to the study based on their participation to one of three classes: 1) Synchronous Class comprised 147 students (mean age 22.74(± 6.33), 99.3% females) attending the General Psychology course (98% attending the first year of course); 2) Asynchronous Class comprised 71 students (mean age 25.56(± 7.46), 100% females), attending the Developmental and Educational Psychology course (75% attending the second year of course); 3) Lab Class comprised 133 students (mean age 27.45(± 6.80), 96.2% females) attending the Developmental Psychology for Inclusion Lab (98% attending the fourth or fifth year of course).

Online courses' typology

Synchronous Class. Students attending this class had the same weekly commitment as in traditional face-to-face class. Students were allowed to ask questions (receiving instantaneous answers from the teacher), to participate in the discussions, and to show presentations to other students. The concept of "group" in this class was preserved and active participation was encouraged.

Asynchronous Class. Students used an e-learning platform to consult different multimedia materials: power-point presentations with audio commentary and links to public videos with explanations and examples; textbooks and handouts; discussion forums between students and with the teacher. For each topic there was a streaming meeting in which the teacher offered clarifications on some aspects starting from the students' questions or conceptual maps. The active participation in the use of forums and in seeking clarifications was encouraged.

Lab Class. The purpose of the Lab Class was to design teaching units and labs aimed at primary school. The Lab Class took place online, in two ways: a) a synchronous and recorded videoconference initial meeting for the presentation of the aims and methodologies; b) the use of the e-learning platform to consult the online materials available and participate in the discussion forums (each group consisted of four students). Each student, after discussing their ideas and receiving feedback from the group, carried out their own project work.

Procedure

Data were collected between the eighth and the tenth week from the beginning of the course using the online platform Lime Survey. Participants completed an online battery of tests taking approximately 15–20 minutes. Before starting the survey, participants were asked to read information about the study nature and gave their consent to participate. The study was conducted following the requirements of privacy and informed consent laid down by the Italian law (General Data Protection Regulation (EU) 2016/679; Italian Legislative Decree DL-101/2018) and was approved by the Ethics Committee of the Roma Tre University. Participation in the study was voluntary, and no compensation was offered to participants.

Instruments and measures

The following questionnaires were used to assess measures of sense of community, motivational and cognitive characteristics of the considered sample:

Scale of Sense of Community in University Online Courses (SSC-UOC: Balboni et al., 2018). This questionnaire consists of 36 items, rated on a four-point Likert scale (1 = "Strongly disagree" to 4 = "Strongly agree") and divided into three subscales: Membership (19 items; Alpha = .91), Fulfilment of needs and goals achievement (11 items: Alpha = .85), Mutual influence of the individuals and the community (6 items Alpha = .77).

Academic Motivation Scale (AMS; (Alivernini & Lucidi, 2008; Vallerand et al., 1992), consists of 28 items rated on a 7-point Likert scale (1 = "Does not correspond at all" to 7 = "Corresponds exactly"), divided in 5 subscales: Amotivation, External regulation, Introjected regulation, Identified regulation and Intrinsic motivation. Following the scoring method by Grolnick and Ryan (1989), we calculated the Relative Autonomy Index[1] (RAI), as a single score indicating whether a student is predominantly self-determined or non self-determined.

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[1]   RAI = (Intrinsic motivation * 2) + Extrinsic motivation identified + Extrinsic motivation introjected + (Extrinsic motivation external regulation * -1) + (Amotivation * -2).

Questionnaire on Study Strategies (AMOS-QSS: Cornoldi, et al., 2005) consists of 39 items assessing the frequency of different study strategies, rated on a seven-point Likert scale (1 = "Never" to 7 = "Always"). The total score provides an Index of use of the different study strategies (Alpha = .88).

University Self-efficacy Scale (Bandura, 1990; Pastorelli et. al., 2001b), consists of 10 items measuring the perceived efficacy in university learning, rated on a 5-point Likert scale (1 = "not at all well" to 5 = "very well") and divided into two subscales: Self-efficacy in regulating university learning (6 items: Alpha = .72) and Self-efficacy in organizing and planning the study (items: Alpha = .76).

Problem Solving Self-Efficacy Scale (Pastorelli et al., 2001a), consists of 14 items measuring the perceived efficacy in critical and creative thinking and problem solving (Alpha = .85), rated on a 7-point Likert scale (1 = "not at all well" to 7 = "very well").

Intentions to persist/drop out of university (Hardre & Reeve, 2003; Vallerand et al., 1997), consists of 3 items measuring rated on a 7-point Likert scale (1 = "Not at all" to 7 = "Very much so"). An item example is: "I sometimes consider dropping out of university" (Alpha = .84).

Statistical Analysis

Differences in the sense of community in the three online class typologies were assessed through a model of Multivariate Analysis of Variance (MANOVA) considering "Group" (Synchronous, Asynchronous and Lab Class) as a between-subjects factor and the three dimensions of the SSC-UOC as dependent variables.

The relationship between the sense of community and the cognitive and motivational characteristics of the students attending the three online class typologies were assessed through correlational analysis (Pearson's coefficient) and Fisher's transformations.

Finally, hierarchical multiple regression models were performed to explore factors that explain the three dimensions of sense of community as defined by Balboni and colleagues (2018). After controlling for group membership (step 1),

we considered motivation, study strategies, self-efficacy and intentions of drop out university (step 2) as predictors of each of the three sense of community dimensions considered.

Results

Differences in sense of community between online classes
The MANOVA model showed a difference in the three dimensions of sense of community as a function of the typology of online class attended (λ=.840; $F_{(6,692)}$=10.535; p<.001, $\eta p2$ = .084). Univariate ANOVAs revealed significant differences in Influence [$F_{(2,348)}$ = 9.315, p < .001, $\eta p2$ = .051] and Fulfilment of needs and goals achievement [$F_{(2,348)}$ = 10.810, p < .001; $\eta p2$ = .058]. The analysis did not show any difference in Membership among groups. Tukey's b corrected post-hoc tests showed higher levels of Influence in the Lab Class than in the Asynchronous and Synchronous classes. In addition, higher levels of Fulfilment of needs and goals achievement were found in the Synchronous class than in the Asynchronous and Lab classes. Means and standard deviations are shown in Table 1.

Tab. 1. Means and standard deviations for groups

Variables			Groups (Type of course)			
			Synchronous Class	Asynchronous Class	Lab Class	Total
SSC-CUO Membership	N	range	147	71	133	351
	Mean	1 - 4	3.19	3.04	3.15	3.14
	St.dev.		0.44	0.49	0.47	0.46
SSC-CUO Influence	Mean	1 - 4	2.92	2.81	3.12	2.97
	St.dev.		0.54	0.54	0.50	0.54
SSC CUO Fulfilment of Needs	Mean	1 - 4	3.30	3.06	3.06	3.16
	St.dev.		0.40	0.50	0.51	0.48

Tab. 2. Bivariate correlations between study variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. SSC-CUO Membership	1								
2. SSC-CUO Influence	.631**	1							
3. SSC CUO Fulfilment of Needs	.674**	.458**	1						
4. AMS RAI INDEX	.333**	.292**	.431**	1					
5. AMOS-QSS Use of study Strategies	.274**	.264**	.265**	.395**	1				
6. Self-efficacy in organizing and planning the study	.193**	.189**	.224**	.345**	.434**	1			
7. Self-efficacy in regulating university learning	.259**	.162**	.294**	.397**	.478**	.728**	1		
8. Problem Solving Self-efficacy	.292**	.374**	.231**	.271**	.541**	.439**	.477**	1	
9. Intentions to drop out	-.130*	-.210**	-.159**	-.384**	-.176**	-.272**	-.213**	-.217**	1

Note. ** p = .01* p = .05

Relationship between sense of community and motivational/ cognitive students' characteristics
Membership, Influence and Fulfillment of needs and goals achievement were positively and significantly correlated with intrinsic motivation, use of study strategies, self-efficacy in organizing and planning the study, in regulating university learning and in problem solving. Instead, they were negatively and significantly correlated with the intention to drop out of university. Pearson correlation coefficients and p-values are reported in Table 2.

Predictors of sense of community in online classes

After controlling for the group membership, hierarchical multiple regression analyses showed a significant effect of the group only for Influence and Fulfillment dimensions of the sense of community. In particular, the Influence is explained by the Lab Class, while the Fulfillment by the Synchronous Class. Furthermore, the significant role of intrinsic motivation and self-efficacy in problem solving emerged as predictor of all the three SSC-UOC dimensions. We found a significant effect of group membership for Fulfilment of needs and goals achievement and Influence, however further analysis revealed non-significant interaction effects group by intrinsic motivation, and group by problem solving self-efficacy (p> .05).

The results of the multiple hierarchical regression analyses are shown in Table 3.

Discussion and conclusion

In this study we explored the determinants of the sense of community in three online class typologies during the emergency remote learning due to COVID-19 lockdown restrictions: Synchronous, Asynchronous and Lab classes. Specifically, we explored three distinct dimensions of the community sense in online courses, as described by Balboni et al. (2018), i.e., the feeling of being part of a community, the feeling of fulfilment of learning needs or achievement, and the feeling of influencing activities of other members in an online course.

Consistently with previous literature (Rovai et al., 2005; Rovai et al., 2002), findings of our study revealed that the opportunity to interact synchronously with other members of the online class fosters the sense of community in distance learning. Accordingly, we found that in Synchronous class - where students were encouraged to interact with the teacher and the classmates, having their questions instantaneously answered, giving presentations to classmates, discussing topics together, etc. – participants exhibited higher levels of fulfilment of needs and goals achievement than other online classes. Furthermore, students attending Lab class revealed higher perception of mutual influence of the individuals and the community compared to other classes, due to the mutual commitment to tasks and lab assignments. Unexpectedly, we found that Membership was equally perceived in all the three typologies of online classes. It is worth noting that, due to the abrupt interruption of face-to-face classes in March 2020, students could have developed an initial sense of belonging to the academic community during the first weeks of traditional programs, while more specific dimensions of the sense of community could have been developed later in the course program.

Findings of our study also revealed that, as expected, the emergence of a sense of community among students is strongly associated with variables that are implicated in student retention, such as intrinsic motivation and academic self-efficacy (Chen & Jang, 2010; Vayre et al., 2017). Specifically, our results confirmed that intrinsic motivation is strongly

Tab. 3. Hierarchical multiple regression models

		D.V. (Sense of Community in University Online Courses dimensions)								
Step	Variable	Membership			Influence			Fulfilment of Needs		
		B	SE B	β	B	SE B	β	B	SE B	β
1	Groups (class typologies)	-.020	.028	-.038	.100	.032	.167**	-.118	.028	-.221**
2	Groups (class typologies)	-.020	.029	-.039	.084	.032	.140**	-.106	.028	-.199**
	AMS RAI INDEX	.030	.007	.243***	.031	.008	.220***	.042	.007	.334***
	AMOS-QSS Use of study Strategies	.042	.042	.063	.028	.047	.037	.029	.041	.043
	Self-efficacy in organizing and planning the study	-.041	.046	-.068	-.041	.051	.070	-.051	.044	-.081
	Self-efficacy in regulating university learning	.063	.056	.087	-.092	.063	-.109	.068	.055	.092
	Problem Solving Self-efficacy	.161	.056	.192**	.260	.062	.269**	.135	.054	.157*
	Intentions to drop out	.005	.019	.015	-.029	.021	-.071	.005	.019	.015
	R2 (adjusted)	.146			.193			.227		
	F	11.044			13.087			14.587		

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

related to the sense of belonging and commitment to the online academic community, irrespective of the typology of class – synchronous, asynchronous or Lab -attended. Moreover, higher levels of students' self-efficacy in organizing and regulating learning, as well as problem-solving strategies, are associated with higher engagement to the online classes, suggesting that both metacognitive and regulation learning strategies contribute to promoting a sense of community in virtual environments. Consistently, students who intend to drop-out of university appeared poorly engaged in online activities across all the typologies of classes considered. Taken together, these results support the idea that a positive attitude towards studying is critically linked to persistence at learning activities and the sense of community (Laux et al., 2016).

Among individual characteristics that sustain the engagement to online learning activities, it emerges the significant contribution of the subjective feeling of having good problem-solving skills. Indeed, problem-solving self-efficacy, namely the perception of be able to identify a problem, propose new solutions, choose the best strategy to solve the problem and implement it, appears to improve student engagement significantly. Taken together, these results suggest that some proactive individual dimensions such as intrinsic motivation and positive cognitive beliefs about self are indices of study engagement and persistence in online courses, irrespective of typology.

Some limitations concern the cross-sectional design of the study and the specific geographic area of participants (i.e., metropolitan area of Rome). Moreover, due to the emergency remote learning setting, the considered groups were not balanced for important characteristics as year course, that can differently affect motivation and development of a sense of belonging to the academic community. Other limitations concern the inhomogeneity of both the sample - that was composed mostly by female students -, and the three courses/groups that were about different topic and held by different instructors. On the other hand, it is worth noting that we adopted a questionnaire that was specifically designed to measure the sense of community in online university courses, thus unaffected by previous attendance of traditional face-to-face programs.

In conclusion, on the one hand the Italian university inherited COVID 19 opportunities of integrating different online deliveries, on the other hand our results suggest the need of promoting the sense of community of students through the implementation of targeted online classes, with the ultimate goal of increasing the students' persistence and reduce the risk of attrition.

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The authors contributed equally to this manuscript.

Compliance with Ethical Standards

Conflict of interest
The authors declare that they have no competing interests.

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All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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