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How students' autonomous and controlled motivation affects satisfaction in online courses

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How Students' Autonomous and Controlled Motivation Affects Satisfaction in Online Courses

This exploratory study aims to analyze whether and how students' motivation affects their satisfaction in online courses during covid-19 emergency in Italy. Based on the Activity Theory approach, and on the Self-Determination Theory, the study considers two types of motivation (autonomous vs controlled) and different aspects of students' satisfaction in online courses related to various types of interaction (learner-content, learner-instructor, learner-learner, learner-technology, and general satisfaction). Results confirms that students with autonomous motivation perceived greater satisfaction in all the considered aspects of online courses, independently using the Internet. Implications for designing online courses in university contexts, particularly during emergency period like covid-19 pandemic, are discussed.

Keywords: Activity Theory, Self-Determination Theory, students' motivation, students' satisfaction, online courses, functional organs

Introduction

Information and Communication Technologies (ICT) are generating important transformations in the ways of relating, interacting, and managing distance from others (Turkle, 2017). Educational contexts are particularly sensitive to this evolutionary process. Covid-19 has shown how it is important for schools (considering teachers, students, but also families) and universities, to be ready and prepared to use emerging technologies. This aspect could favor a quickly change and transform didactics during critical events by adopting non-conventional tools and solutions. In this scenario, in which online courses were needful to carry on teaching and learning activities, two important aspects need to be questioned: first, which are the students' motivations behind the participation to online courses and, second, are they satisfied by their participation to online courses?

By means of an Activity Theory perspective and based on a Self-Determination Theory point of view, this study aims to analyze how different aspects of students' motivation to participate in online courses affects their general satisfaction in the same courses, but also their satisfaction related to many types of interactions: learner-content; learner-instructor; learner-learner, and learner-technology. After a correlations analysis to understand the connections between the considered dimensions, a Cluster Analysis has been applied to explore whether data allowed to recognize the 3 types of motivation expected: Autonomous (characterized by Intrinsic Motivation and Identified Regulation); Controlled (characterized by External Regulation) and Amotivation. Finally, to answer to the research questions, the two groups revealed by the Cluster Analysis (Autonomous Motivation Group and A-motivated Control Group) were compared based on their satisfaction related to the types of interactions in online courses during covid-19 period. Discussion follows.

Digital Technologies as functional organs: the Activity Theory perspective

An important basic concept to explain the above dynamics is that of functional use of emerging technologies, particularly as regards Internet applications (Authors & Piobbico, 2019). To fully understand this concept, we refer to the Vygotskian concept of zone of proximal development (Authors, 2020; Authors, 2015; Vygotsky, 1978) and its evolution into the Functional Artifacts concept of Leont'ev (Author, Selleri & Author, 2018; Leont'ev 1981).

In the Leont'ev's perspective, functional artifacts are "tools" that are integrated in human functions, representing goal oriented external and internal resources. From this point of view, e.g., material tools such as scissors or glasses, or less material such as web applications can be considered as external tools supporting and complementing natural human skills, together (tools and human skills) evolving into a more efficient

integrated system to achieve better results. On the one hand, the human ability to move fingers integrated by a pair of scissors transforms the hands in "cutting organs" while, on the other, visual ability (sometimes impaired) integrated with glasses allows to bring vision back to optimal performances. In this last case, tools compensate for human deficiencies, while in the first case tools support specific human skills to achieve results that otherwise it would be difficult or impossible to achieve. Thus, functional artifacts means the integration between human skills and tools allowing humans to achieve performances that neither could attain without the other. For this reason, Kaptelinin (1996a; 1996b) and Zinchenko (1995) suggest speaking about functional organs, representing physical and/or mental extensions of human skills. In this view, digital technologies (the Internet and associated applications) and emerging technologies (artificial intelligence, virtual reality, robotics, etc.) can be considered the technological side of functional organs able to support and enhance many human skills (e.g., interactive and communicative skills, information search, learning, collaboration, problem solving, creativity development, etc.) in such an intuitive way to become natural (and sometimes "invisible") components supporting people in many daily activities.

Leont'ev's (1974; 1978; 1981) concept of functional artifacts, and that of Kaptelinin (1996a, 1996b) and Zinchenko (1995) of functional organs, explain how a technological tool allows to obtain better and more advanced performances, or compensatory, compared to those that could be obtained individually without the aid of specific technology. Obviously, not all tools represent functional organs, in the sense that this state is achieved thanks to an evolutionary process aimed at integrating an external tool into everyday practices. The structures that are not yet integrated within a functional organ (think of the early stages of interaction with a tool in which it is

necessary to learn how to use it) are in fact conceived as belonging to the outside world; only when they are integrated within the functional organs will they be experienced as an individual's resources. This dynamic highlights personal expertise which, from this perspective, would indicate not only whether an individual has appropriated "the ability to do a certain thing", but also if he/she has appropriated the potentially useful tool "to do that particular thing" integrating it within a functional organ". In other words, it is not only important that a person knows how to complete a certain activity, but that he/she can also master the most effective tools to carry it out in the best way.

The concept expressed by Leont'ev of functional artifact and the more recent one of functional organ (Kaptelinin, 1996a, 1996b; Zinchenko, 1995), represent a transposition to the technological field of the concept of zone of proximal development (Authors, 2020; Authors, 2015; Vygotsky, 1978). Just as an individual, thanks to the support of a more experienced partner, could achieve higher performance than those achieved individually, another individual could achieve superior performance with the help of a functional artifact. The term "functional" that characterizes the Leont'ev technological artifacts and the Kaptelinin functional organs is of relevance. Indeed, focusing attention on the function for which a technology is built, and reasoning from a human development perspective, it can be said that when the use of a technology supports a human activity (or compensates for its deficiencies) to achieve a goal or to facilitate its achievement, then, this technology is functional to development.

To conceive how emerging technologies could affect schools and university activities, we could conceive educational systems (like schools) as activity systems (Adam, Effah & Boateng, 2019; Engeström, 1990; 2014; Karanasios, 2018; Pettersson, 2020), i.e., culturally evolved systems by which humans (teachers and students) pursue their objectives (teach and learn) and achieve specific results (e.g., develop knowledge

and skills), thanks to the use of certain technological artifacts, such as emerging technologies. To give an example (fig. 1), a university student (subject) tries to learn knowledge and skills (outcome) to reach his bachelor, and for this purpose he/she studies various topics (object), following the rules and performing the required tasks that are supported by the community (characterized by different actors, for example other students, tutors, teachers, technicians, etc.) and by all tools (like digital technologies) that the context makes available.

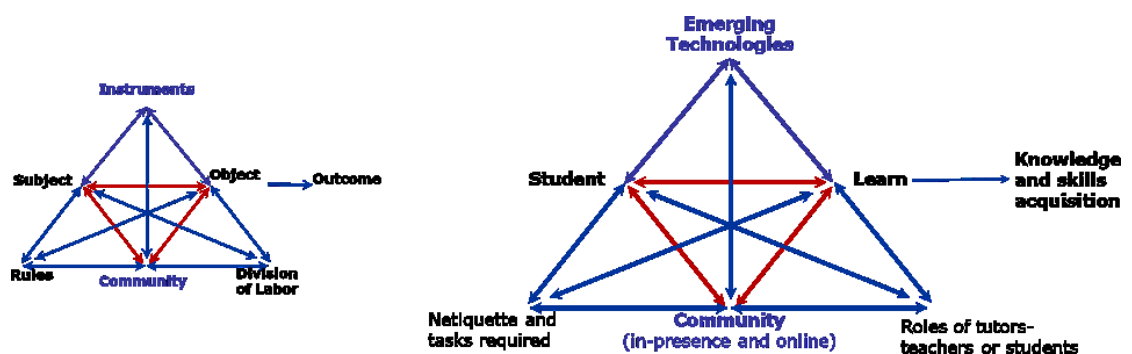


Figure 1. An example of activity system in educational context.

During the COVID-19 period, all this process has been brought on at distance thanks to many types of online applications transforming in-presence courses in online ones.

When instruments mediate the subject-object relation, they modify the way in which actions (practices) are carried out. Just refer to the evolution of human activities thanks to the integration of more and more advanced technological tools, facilitating and supporting the actions carried out, both in workplaces and in other areas such as education, training, and private life. The relevance of instruments, particularly those more technologically advanced, is really important for the system evolution as they mediate the relation between the subject and the object of the activity (e.g., simulate real activities within a virtual reality context instead of just reading a book), between subject and the community (e.g., using online platform to follow class during covid-19), and between community and object (e.g., groups of students collaborate to solve specific

tasks by means of robots or chatbots equipped by an artificial intelligence system). But also rules and division of labors need to be adequate to the new situation as, e.g., coordinate the discussions in-presence during class is very different than coordinate the same discussions within an online platform, like those used by schools during Covid-19, requiring different rules (e.g., to respect the own turn to speak, or mute microphone when interventions are not requested), and further roles in tutors-teachers, but also in students (e.g., to coordinate the online collaboration within groups).

Each activity system is oriented towards a dynamic equilibrium (Author, Selleri & Author, 2018), i.e., its elements evolve continuously, but they always tend to a balance that guarantees the better good adaptation to achieve results. New needs arise in individuals (determined by changes in society, by life needs, by fashions, etc.), as well as new technological tools (artifacts) are produced to better carry-on existing activities. The concept of “contradiction” defines these dynamics between the elements of the activities that, from the point of view of the Activity Theory, are the base for the development of the entire system that would occur only "when the contradictions are overcome" (Kuutti, 1991, p. 536). When contradictions can be overcome by easily integrable solutions into a pre-existing system (such as the implementation of a new digital application that simply replaces the previous one), borrowing Piagetian terms, we could say that after a phase of accommodation, the system returns to a state of equilibrium. But when contradictions cannot be solved by means of practices and solutions normally adopted up to that moment, for finding a new state of balance the system needs to go beyond what has been done up to that moment and find alternative solutions, not yet thought of or imagined. Engeström (2014) defines this dynamic as "expansive learning" highlighting that it can lead to a collective creative drive for relevant and sensitive change at the base affecting the entire system. Thanks to this

systemic perspective, Kaptelinin and Nardi (2006, p.62) argue that the conceptual framework of Activity Theory allows us to “bridge the gap between motivation and action (and) provides a coherent account for processes at various levels of acting in the world”. For this, the activity theory theoretical framework has been used to examine educational systems and the innovative use of ICT in teaching and learning activities (Molka-Danielsen & Deutschmann, 2009). From this point of view, what happened with Covid-19 can be seen as an important moment of expansive learning of school systems, thanks to having adopted unusual and innovative educational solutions to meet the needs of the pandemic situation.

In these critical dynamics, in which online courses become the new normality, motivation becomes particularly relevant as it defines the difference between activation and activity (Nikiforov, 1990). Activation cannot be considered activity as it lacks a well-defined objective: a person that makes a promenade shows activation but not activity. Activity is always motivated by a goal; an objective and we cannot speak of activity until a specific objective is not identified. Thus, one should ask how users' motivations to participate to online courses affected their satisfactions, and therefore the effectiveness in pursuing the objectives of the teaching and learning activities carried on during covid-19 period.

Autonomous and Regulated Motivations

We could reread what have been previously described as activation and activity in the activity theory perspective by considering the Self-Determination Theory point of view (Deci & Ryan, 2013). Self-Determination Theory proposes three dimensions to describe motivation underling human behavior: intrinsic motivation, extrinsic motivation, and amotivation. Intrinsic motivation contemplates actions that are engaged for the satisfaction and the pleasure derived from performing them (Deci & Ryan, 2013). Thus,

intrinsic motivation could be linked to what we have previously defined as activation. Extrinsic motivation is characterized by external and identified regulations, even though the first one is more related to social expectations and pressures, while the second is more related to the individual objectives and scopes. When actions are carried out to avoid negative consequences or to obtain rewards, we are in presence of external regulation, and the individual experiences a sort of obligation (e.g., for social expectations or pressures) to behave in specific ways. When actions are evaluated and perceived as personal choice, then identified regulation occurs: the motivation rests still extrinsic, because the activity is not performed for itself, however actions are performed to reach a goal. Thus, identified regulation could be seen as the motivation behind the activity. The last dimension is amotivation, i.e., a state in which individuals experience a discrepancy or, by using terms of Activity Theory, a contradiction, between their actions and outcomes.

However, more recent developments of SDT describe a more complex picture of motivation in which its value strongly depends on how autonomous or extrinsically controlled it is (Peters et al., 2018; Ryan & Deci, 2017). E.g., identified regulation is highly autonomous, even if it is part of the extrinsic motivation, and it shows to be highly effective to contribute to wellbeing similarly to intrinsic motivation (Ryan & Deci, 2000, 2017). In its classical conception, SDT suggests placing intrinsic and extrinsic motivations on a continuum from controlled to autonomous. However, concerning extrinsic motivation we have to distinguish between controlled and autonomous extrinsic motivation. While that controlled (external regulation) involves a sense of pressure or obligation, often including extrinsic rewards or penalties (Ryan & Deci, 2000a), that autonomous (identified regulation) is qualitatively similar to intrinsic

motivation regarding its ability to foster positive outcomes and wellbeing (Peters et al., 2018).

Research Hypotheses

Based on what have been previously described, this research assumes that motivation affect relevantly the way in which learners approached online courses during the pandemic period as they weren't a choice but a necessity. Could this aspect had ingenerated a shift from identified regulation, the autonomous motivation typical of activity, to the risk of controlled motivation or amotivation due to didactical and technical solutions that have been taken without having the evolutionary time needed to integrate them into the everyday practices (and into the teaching/learning activity). This should be pretty evident in the learners' general satisfaction in online courses, but particularly in the different aspects characterizing interaction in online courses (Learner-Content; Learner-Instructor; Learner-Learner; Learner-Technology). By referring to the functional organs' concept, we argue that learners' satisfaction with a technological artifact is the base for its progressive evolution into a functional organ improving and sustaining learner skills and this has direct effect on the effectiveness of online courses. Thus, by considering the SDT points of view that the value of motivation depends strongly on how autonomous it is (Peters et al., 2018; Ryan & Deci, 2000; 2017), we hypothesize that:

H1. independently by the time passed on the Internet, learners characterized by autonomous motivation should show greater satisfaction in all aspects characterizing interaction in online courses (Learner-Content; Learner-Instructor; Learner-Learner; Learner-Technology) than learners characterized by controlled motivation or amotivation.

Materials and Method

Data collection and procedure

The purpose of this study is to explore the impact of learners' motivation on their satisfaction with online courses. The study aims to examine whether autonomous motivation positively affects the learners' satisfaction in many aspects of online courses with respect to controlled motivation or amotivation. For this reason, following approval by the relevant university bioethics committee, a cross-sectional study (Shaughnessy, Zechmeister & Zeichmeister, 2014) was planned based on filling out a self-report questionnaire performed with Qualtrics via the Web. The questionnaire was administered between September and November 2021 to undergraduate students of different courses of the Department of Psychology of the University of Bologna, during the Covid-19 pandemic period.

Sample description

After data collection, only fully completed questionnaires were selected for analysis, thus the sample consisted of 261 undergraduate students. However, to have a coherent sample we have decided to consider only the younger emerging adulthood students (Arnett, 2018; Nelson, 2021) as they characterize an homogenic generation both for age (18-24) and for the transition period they are experiencing. Further, only fully completed questionnaires were selected for analysis, thus the sample consisted of 234 undergraduate students (Mean= 20.93, SD= 1.99), of which 191 were female (81.6%), 41 were male (17.5%), and 2 other (0.9%).

Measures

The aim of this study is to investigate the relationship between constructs referring to students' motivation, their Internet use, and several dimensions related to their satisfaction in online courses (Table 1).

Motivation	Internet Use	Satisfaction with online courses
Intrinsic Motivation	Hours of use per week	Learner-Content Interaction
Identified Regulation		Learner-Instructor Interaction
External Regulation		Learner-Learner Interaction
Amotivation		Learner-Technology Interaction
		General Online Courses Satisfaction

Table 1. Measures characterizing Motivation, Internet Use and Satisfaction with online courses.

Motivation

Motivation has been assessed by translating the Situational Motivation Scale – SIMS (Guay et al., 2000) into Italian, following a forward-backward translation procedure. The SIMS is composed of four scales to analyze four factors of motivation. The first assesses intrinsic motivation (e.g., “Because I think that this activity is pleasant”). The second assesses identified regulation (e.g., “Because I think that this activity is good for me”). The third subscale is devoted to external regulation (e.g., “Because it is something that I have to do”). Finally, the fourth assesses amotivation (e.g., “I do this activity, but I am not sure if it is worth it”). Each subscale consists of 4 items scored on a 7-point Likert scale (1: not at all in agreement to 7: completely in agreement). Cronbach's alpha shows that all subscales and all their factors are reliable for the sample of undergraduate students (n=234; Intrinsic Motivation=.91; Identified Regulation=.84; External Regulation=.72; Amotivation=.81).

Internet Use

Internet Use has been measured by considering the hours of use per week in a scale of 4 levels: 1 = less than 5 hours a week; 2 = 5-10 hours a week; 3 = 11-20 hours a week; 4 = more than 20 hours a week.

Student Satisfaction in Online Courses

Satisfaction in online courses has been assessed by translating the Students Satisfaction in Online Courses Scale (Strachota, 2003) into Italian, following a forward-backward translation procedure. The scale is composed of five subscales to analyze the general satisfaction in online courses (e.g., “I am very satisfied with those courses”), and the satisfaction related to four types of interaction during such courses. A subscale assesses Learner-Content Interaction Satisfaction i.e., the satisfaction of the learner based on the contents encountered during online courses (e.g., “The assignments or projects in that courses have facilitated my learning”). A subscale assesses the Learner-Instructor Interaction i.e., the learner’s satisfaction coming from the interactions with teachers during online courses (e.g., “I have received timely feedbacks from my teachers”). A subscale assesses the Learner-Learner Interaction, i.e., the learner’s satisfaction determined by the interactions with the other students during online courses (e.g., “In those courses I have been able to share my viewpoint with other students”). A last subscale assesses the Learner-Technology Interaction, i.e., the satisfaction of the learner based on the interactions of the different devices to participate to online courses (e.g., “Computers make me much more productive”). Each subscale consists of 5 items scored on a 4-point Likert scale (1: strongly disagree to 4: strongly agree). Cronbach's alpha shows that all subscales and all their factors are reliable for the sample of undergraduate students (n=234; Learner-Content Interaction=.78; Learner-Instructor

Interaction=.73; Learner-Learner Interaction=.84; Learner-Technology Interaction=.86; General Online Courses Satisfaction=.90).

Data Analysis

Correlations between the considered dimensions

After calculating the reliability of the scales as described in the previous paragraphs, table 2 shows Spearman's rank-order correlation carried out to evaluate the relationships between the considered dimensions.

Scale	1	2	3	4	5	6	7	8	9
1 Internet Use	-								
2 Intrinsic Motivation	.005	-							
3 Identified Regulation	.079	.780**	-						
4 External Regulation	.062	-.087	.006	-					
5 Amotivation	-.041	-	-	.238**	-				
		.421**	.549**						
6 Learner-Content Interaction	.122	.376**	.367**	.025	-	-			
					.355**				
7 Learner-Instructor Interaction	-.079	.280**	.176*	-.056	-.148*	.509**	-		
8 Learner-Learner Interaction	.014	.392**	.308**	.072	-	.450**	.577**	-	
					.202**				
9 Learner-Technology Interaction	.197**	.369**	.371**	.073	-	.295**	.070	.305**	-
					.346**				
10 General Online Courses Satisfaction	.065	.585**	.508**	.000	-	.457**	.419**	.526	.478
					.412**				

Note * $p \leq .05$; ** $p \leq .01$)

Table 2. Correlations between Internet Use, Motivation (from 2 to 5) and Satisfaction with online courses (from 6 to 11)

First, the analysis shows that no correlation exists between Internet Use and the other factors, except for the Learner-Technology Interaction.

Second, congruently with previous studies on SDT, Intrinsic Motivation and Identified Regulation are highly positively related, and both are negatively related to Amotivation, while this last is positively related to External Regulation.

Third, Intrinsic Motivation and Identified Regulation are positively related to all factors of students' satisfaction in online courses, while Amotivation is negatively related to the same satisfaction factors. No correlations exist between External Regulation and the five factors of student's satisfaction in online courses.

Cluster Analysis to identify students' motivation.

Given the correlations highlighted in the previous analysis between the motivation factors, and the SDT's point of view that places intrinsic and extrinsic motivation on a continuum from controlled to autonomous (Peters et al., 2018), a Cluster Analysis has been carried on to the items of the four motivation scales to explore whether data allow to recognize the 3 clusters expected: Autonomous Motivation (characterized by Intrinsic Motivation and Identified Regulation); Controlled Motivation (characterized by External Regulation) and Amotivation. We decided to not specify the number of clusters to reveal the more coherent natural groupings (or clusters) with our dataset.

Clusters	N	Intrinsic Motivation		Identified Regulation		External Regulation		Amotivation	
		M	SD	M	SD	M	SD	M	SD
		1	66	1.87	.78	2.89	.95	4.03	1.65
2	140	4.35	1.16	5.48	.93	3.73	1.29	1.66	.84

Table 3. Two-Step Cluster Analysis on the four motivation scales.

Results show the construction of two clusters (groups): the first (1) characterized by 66 students having External Regulation and Amotivation higher than Intrinsic Motivation and Identified Regulation, while the second (2) characterized by 140 students with higher

Intrinsic Motivation and Identified Regulation than External Regulation and Amotivation. We label this last as Autonomous Motivation group (based on the SDT), and the first one as A-motivated Control group since, as suggested by the correlation, on the one hand, being a-motivated, students need some external nudges, and, on the other, having external pushes in the form of social expectations or pressures, they aren't really motivated on the activity to do.

Autonomous Motivation vs A-motivated Control

The principal hypothesis of the study has been tested using a One-Way ANOVA with Internet Use and Students Satisfaction in Online Course Scales as dependent variables, and Students' Motivation (Autonomous Motivation vs A-motivated Control) as independent variable (tab. 4).

Measure	ACG		AMG		F (1, 203)	η^2
	M	SD	M	SD		
Internet Use	3,32	.90	3,37	.73	.204	.00
Learner-Content Interaction	2,81	.52	3.14	.42	22.48***	.10
Learner-Instructor Interaction	2.60	.57	2.81	.51	6.68**	.03
Learner-Learner Interaction	2.37	.70	2.77	.55	20.05***	.09
Learner-Technology Interaction	2.55	.72	3.00	.52	25.33***	.11
General Online Courses Satisfaction	2.20	.64	2.91	.59	58.78***	.23

Note * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 4. One-Way ANOVA between A-motivated Control Group (ACG) and Autonomous Motivation Group (AMG).

Results show that H1 is totally confirmed: in all dimensions of the students' satisfaction in online courses, AMG students are significantly more satisfied than ACG students. No difference exists as regards Internet Use.

Discussion

First, general Internet Use (i.e., hours of use per week) doesn't seem to play a role in the relation between students' motivation and students' satisfaction in online courses during the pandemic period since no correlations exists with considered measures, except for Learner-Technology Interaction. On the other hand, it is quite evident that those who use the Internet the most are also more satisfied with it, showing a greater satisfaction as regards Learner-Technology Interaction. This result can be understood by considering the evolutionary process of a technological device into a functional organ: the more the device is integrated into human practices the more it disappears by allowing humans to achieve better performances or the desired goal.

Turning the attention to the result of correlations showing that Intrinsic Motivation and Identified Regulation are each other related, and also to the result of the Two-Steps Cluster Analysis, we can affirm that even Identified Regulation, that in the classic SDT is a factor characterizing the extrinsic motivation, as it considers motivational aspects related to individual's objectives and scopes (I do this activity ... "for my own good"; "because I think it is good for me"; "by personal decision"; "because it is important for me"), is perceived as pertaining to an autonomous sphere of motivations, like the Intrinsic Motivation is. The correlation between the two dimensions of Autonomous Motivation is very strong. It is true that motivation remains extrinsic (I do something not because I like it but because I think I derive a benefit from it), but it is linked to a very personal evaluation of what you want to reach and achieve for your future. Therefore, it falls within a sphere of full autonomy of choice concerning whether to do something. But very interesting is also the correlation between External Regulation and Amotivation that, taken together, characterize what we labelled A-motivated Control. External Regulation is characterized by some aspect's inherent social expectations and pressures which cannot fit inside an Autonomous Motivation

sphere. External Regulation means that individual is pushed by some social pressures or expectations for involve themselves in some activity, thus, by considering their Autonomous Motivation, they are A-motivated. This explains why Cluster Analysis reveals the link between “being externally regulated” and “being A-motivated”: they pertain to the same pole of the continuum going from autonomous to controlled motivation (Peters et al., 2018). By considering the Activity Theory model, all these motivation aspects play an important role in students’ engagement in learning activities, particularly if we consider online courses in which digital technologies play a prominent role. Their effective use of technological devices or applications (thanks to a progressive expertise determined by the ongoing practice) pass through a motivation that is the bases for the evolution of a technological artifact into a functional organ.

This last aspect is deepened by the last analysis carried on testing (and confirm) the principal hypothesis of this exploratory study. Students characterized by Autonomous Motivation have greater satisfaction in all interactional aspects online courses than students characterized by A-motivated Control. From an Activity Theory perspective, human activity is different from behavior: first, behavior is not directed towards a goal or subordinated to a predefined set of goals; the behavior is situational, that is, it represents a reaction to a situation, while the activity, while depending in certain aspects on the situation, can control, modify and adapt it because it is inspired by a goal and organized in accordance with it (Nikiforov, 1990). This implies that the activity mainly characterizes those students having autonomous motivation, who have objectives to achieve and, therefore, who see online course and related digital technologies as means of support to achieve their objectives. Conversely, behavior characterizes students who have motivated control, who react to a situation where they are expected to do something, rather than having autonomous goals. The different

satisfactions in online courses perceived by the students are determined by the different motivation that means also different goals (or no autonomous goals considering students with A-motivated control). In the long run, some technological artifacts of an activity could evolve into a functional organ, while no technological artifact of a behavior will evolve into a functional organ.

Conclusion

The principal aim of the study is to analyze whether and how students' motivation affects their satisfaction in online courses. For this purpose, based on the Activity Theory approach and on the Self-Determination Theory, the study considers two types of motivation (autonomous vs controlled) and many aspects of students' satisfaction in online courses related to many types of interaction (learner-content, learner-instructor, learner-learner, learner-technology, and general satisfaction). Interestingly, the analysis undertaken confirms that autonomous motivation is a construct characterized by both intrinsic and extrinsic motivation, this last in its more personal character related to goals to reach (identified regulation). Results show that students with autonomous motivation perceive greater satisfaction in all the considered aspects of online courses.

These results have relevant implications in the design of online courses, particularly for emergency period like that of Covid-19. On the one hand, online courses should meet the students' intrinsic motivation (being interesting, pleasant, fun, and make them feel good). On the other hand, online courses should also consider important aspects of students' goals, by meeting their autonomy to be involved in learning activities. At the same time, the study puts the emphasis on the technological tools proposed to carry on online courses. Each generation has typical functional artifacts (functional organs) that meet its needs. For current emerging adults (the age group of university students considered in the study), smartphones and their applications are the

technological devices normally used for the most of their online activities. Conversely, the most of online courses in schools and university are designed to have the better effectiveness by using computers or laptops. Further, the digital applications used in university online courses follow a formal structure typical of the real university contexts, while students normally experience more informal online contexts. These aspects related to the evolution of a tool into a functional organ could have a relevant impact in the effectiveness of online courses, particularly for those students characterized by what in the study has been labelled as A-motivated control (external regulation and/or amotivation). The use of technological artifacts far from their practices could lead to the risk to further decrease their involvement, already low due both to the fact that they don't see a personal aim in the online activities proposed and to their amotivation.

Limitations and Future Directions

First, the sample is limited (234 students) to generalize results and, second, it considers a population pertaining to the same university context. However, having circumscribed the sample in this way has guaranteed that students involved experienced the same online courses conditions. A further limitation is the imbalance in gender characterizing the sample. Nevertheless, current studies suggest that the use of the Internet in general doesn't make a difference between gender: the considered generation and the undertaken online activities could be more relevant factors to consider.

Starting from this study, by considering a wider sample and different educational contexts, research should deepen the relation between external regulation and amotivation as these factors seem to play a determinant role in the students' dissatisfaction with online courses with relevant repercussions on their effectiveness.

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