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Relational and psychological factors affecting exam participation and student achievement in online college courses

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Abstract: This study aims to understand and model the effects of relationship factors and intra-individual psychological factors on exam participation and achievement of students enrolled in an online university course. The results of a survey of 506 students enrolled in university online courses showed that our initial theoretical model only partially fit the data. In fact, data analysis revealed that the relational factors studied exerted only indirect effects on whether online students completed the course. Perceived social support from teachers and peers, as well as the feeling of belonging to the learning community, were antecedents of the psychological processes studied. As for academic self-efficacy and engagement in learning, they allowed us to directly predict taking and successfully passing exams. The knowledge gained from this study helps us makes sense of the ways in which the various factors are related and the specific effect of each factor on the outputs considered.

Keywords: online course, perceived social support, feeling of belonging to a community, self-efficacy, psychological engagement, successful completion of the course

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1. Introduction

Sociotechnical changes of the past 50 years have greatly changed the way educational courses are designed in content, teaching methods, end goals, and the students themselves. A significant change occurred in the 21st century with the increasing push by the European Community to support the use of ICT in higher education, including in France (programs *eLearning* 2004-2006 and then Horizon 2020; initiatives *Opening up Education* and *European Higher Education in the World* in 2013). In higher education, virtual campuses, regional digital universities, thematic digital universities and MOOCs have appeared successively. However, in practice, there have been obstacles to reaching the policy objectives for online and distance university education (e.g. improve the quality and the efficiency of education): the levels of drop-out and failure in these kinds of courses are worrying and substantially higher than in face-to-face teaching (Hu & Hui, 2012; Martinez, 2003; Park, 2007; Park & Choi, 2009). Despite these findings, few empirical studies have sought to understand and systematically explain how and why online students drop out of degree programs or fail their exams (Park & Choi, 2009).

The aim of our research is to identify to what extent and in what way certain psychological relational (perceived social support and sense of belonging to a community) and intra-individual factors (self-efficacy and engagement) affect the achievement of students enrolled in *e-learning* courses. Thus, this study seeks to contribute to and deepen the knowledge in the literature of the field by modeling the respective effects of these psychosocial processes on whether online students complete their education (taking and passing final exams). In this perspective, following the literature review, we will present the empirical study we conducted among 506 online students at university, which enabled us to refine our understanding of the links between these variables. In terms of practical application, the results provide knowledge that can be disseminated to and used by those involved in developing and / or teaching online courses, in order to implement practices that support the achievement, wellbeing and quality of life of online students.

2. Literature review

2.1. Relational processes in distance and online learning

The relational difficulties frequently experienced and reported by online students (lack of interaction and feedback, difficulty in establishing and maintaining discussions, ambiguity of messages posted, technical problems disrupting conversations, etc.) are mentioned recurrently in the literature on issues in distance and online learning (e.g. Smith, 2005 ; Pena-Shaff, Altman, & Stephenson, 2005). Indeed, many studies stress the need to reduce the feeling of isolation, disconnection, loneliness, and the lack of personal attention and support reported by online students, because they are recognized as being the main causes of drop out and failure in these programs (Contreras-Castillo, Favela, Pérez-Fragoso & Santamaría-del-Angel, 2004 ; Faerber, 2002 ; Kim, Liu & Bonk, 2005 ; Liu, Gomez, & Yen, 2009 ; Mullen & Tallent-Runnels, 2006 ; Young, 2006).

Although these processes are reinforced by physical distance, these findings concur with studies on face-to-face learning that show the significant and positive role of relationships with others (often referred to as "social context") in education. The results in this field indicate that social support (from teachers, peers and close friends and family), as well as social integration within the peer group and the educational institution, foster engagement (in general as well as in its behavioral, affective and cognitive components), efficacy, retention and achievement (Appleton, Christenson, Kim & Reschly, 2006; Fredricks, Blumenfeld & Paris, 2004; Lee, 2012; Wang & Eccles, 2013; Zimmer-Gembeck, Chipuer, Hanisch, Creed & McGregor, 2006). Conversely, feelings of loneliness and isolation are associated with disengagement and drop out (Osterman, 2000). As outlined in the following paragraphs, these results are exactly the same in studies on online learning (here, students in higher education).

2.1.1. Perceived social support

Since the 2000s, studying the effects of interpersonal relationships in technology-mediated learning has given rise to a number of studies and continues to generate interest. Shin (2002) insists on the fact that, more than a mere quantitative analysis of social interactions that seems to support the idea ‘the more the better’, it is indispensable to understand the nature of relationships in distance learning. Following this line, a large number of studies have focused on analyzing perceived social support in e-learning. They show that those online students who frequently received messages they considered personalized, who felt emotionally supported and respected by teachers, were also those

who managed to cope with difficult moments in the course of their education (periods of feeling unmotivated, doubt, lack of confidence) and persevered to the end of their degree (Stein & Glazer, 2003).

In line with this work, Kim et al. (2005) show that help and information provided by teachers facilitate learning, increase student engagement, and decrease dropout intentions. Bradford and Wyatt (2010) report that lack of support and discussion with teachers leads to low engagement (lack of enthusiasm) among online students. In addition, Mullen and Tallent-Runnels (2006) found that perceived emotional support from teachers was positively correlated with e-learners' academic self-efficacy. Their study is all the more interesting because it shows, in a comparative perspective, that online students perceive less support from their teachers than those enrolled in face-to-face university courses, but also that the link between perceived emotional support and self-efficacy was stronger in the online courses. Relational processes involving teacher figures thus appear to be of particular importance in online education.

Other studies also mention the positive effects of perceived social support from peers, and even their friends and family, in online learning. Taplin and Jegede (2001) and Castles (2004) note, moreover, that social support (i.e. advice, help and emotional support) from family members (partners, parents) and others in academia (teachers and peers) is one of the most important perseverance factors and promotes the success of students enrolled in online learning. Park and Choi (2009) concur and suggest that family social support promotes student retention in online learning.

From this literature review, therefore, social support (i.e. material help, emotional and cognitive support) has a positive effect on various aspects related to online students' education (such as self-efficacy, engagement, retention and achievement). In addition, in the literature other people are identified as significant (family members, teachers, and peers in class), even though some studies mention the specific importance of social interactions with teachers and peers in online learning situations.

Hence, it can be assumed that perceived social support from teachers and peers encourages self-efficacy (Hypothesis 1a), engagement (Hypothesis 1b) and the success (Hypothesis 1c) of students enrolled in e-learning courses. It should be noted that depending on how we conceptualized and operationalized the variables examined in this study (see figure 1 and section 3.4.) these hypotheses (such as the following) may refer to multiple relationships.

2.1.2. The Feeling of Belonging to a Community

In addition to research focusing on inter-individual relationships in learning, some studies have paid particular attention to the sense of community felt (or not) by online students, even though such studies are less numerous than the former.

In a review of the literature focusing on the concepts of community and sense of community and regardless of the technical system considered (face-to-face, distance alone, and distance and online), Rovai (2001, 2002a, 2002b, 2002c, 2002d) characterizes the "classroom community" as having four key dimensions: a certain state of mind associated with a group identity; mutual trust; task-driven interaction and socio-emotional-driven interaction; and the correspondence between students' expectations/goals and what the community can contribute. The author further specifies that the feeling of belonging to an (online) classroom community refers to: a mutual recognition of belonging; the development of friendly feelings, cohesion, and relationship ties; considering the importance of each member of the community and more broadly the group as a whole; mutual trust, being able to rely on each other, and caring for the wellbeing of each person; being aware of having duties and obligations towards each other (as well as to the educational institution); and finally, the shared hope that the educational needs of each student will be met by engaging in shared goals (Rovai, 2001, 2002a, 2002b; Rovai, Wighting & Lucking, 2004).

Some empirical studies on university online learning have examined the effects of belonging to a community. They found that this concept is strongly and positively related to students' behavioral engagement (i.e. participation in technologically-mediated discussions and level of investment in collaborative online work; Rovai, 2001; Rovai & Barnum, 2003; Wegerif 1998). In Bourdages and Delmotte's (2001) literature review, they also mention the positive influence of group affiliation and social integration of online students on their engagement in studying and perseverance. More recently, Hu and Hui (2012) and Oncu and Cakir (2011) have shown that the sense of belonging to a learning community is essential for supporting the engagement of online learners. In addition, the results of Vayre and Vonthron (2017) indicate that this process increases emotional engagement and self-efficacy beliefs of online students. It also has a positive and significant effect on the level of perceived learning, retention and successful outcomes (Liu, Magjuka, Bonk & Lee, 2007; Rovai & Barnum, 2003, Rovai 2002c, 2002d). Kim et al. (2005) also found that this feeling is negatively correlated with intention to dropout.

We thus expect that the feeling of belonging to a community positively affects online students' self-efficacy (Hypothesis 2a), engagement (Hypothesis 2b) and successful completion of a course (Hypothesis 2c).

2.2. Self-efficacy and Engagement in Online Learning

Although few studies have explored the effects of academic efficacy beliefs or engagement empirically for online learning, the results are very similar to those obtained for traditional educational programs, in which these intra-individual psychological processes are widely recognized as promoting student achievement.

2.2.1. The Feeling of Self-efficacy

Belief in personal self-efficacy (SE) is a concept that has given rise to a large amount of research. Bandura (1997) defines SE as an individual's belief regarding his/her ability to perform at a high level or to accomplish with success an activity in a particular domain. According to social-cognitive theory, beliefs in self-efficacy are at the very foundation of human behavior (Bandura, 1993; 1997; 2003): they influence what individuals choose to do (or avoid doing), their level of engagement in activities (among other things), the amount of energy invested, and the efforts provided to reach goals that have been set, as well as the level of perseverance when encountering obstacles or difficult situations and their resilience to adversity.

The few studies on distance and online education (Bandura & Locke, 2003; Boudrenghien, Frenay, & Bourgeois, 2011; Brown et al., 2008; Close & Solberg, 2008; Diseth, 2011; Robbins et al., 2004; Torres & Solberg, 2001) concur with those on face-to-face learning. They also point out the significant and positive role of the feeling of self-efficacy on student engagement and achievement at university.

The study by Hu and Hui (2012) mentioned above also examined the effects of self-efficacy on the use of computers. It showed that the latter favored the engagement of online students (at the behavioral level) whereas it did not have a significant effect on students enrolled in more traditional course programs. The work of Bates and Khasawneh (2007) points in the same direction and indicates that self-efficacy beliefs in online learning positively influenced online students' time investment in learning (i.e. behavioral engagement). In their comparative study, Francescato et al.

(2006) found that an increase in academic self-efficacy, for both problem solving and social interactions, was associated with increased learning and better performance, whether students take online or face-to-face classes. The study by Wang and Newlin (2002), which also examines the self-efficacy beliefs on learning and its technical aspects, showed that these beliefs favor student success in examinations. Finally, Vayre, Vonthron and Vannereau (2014) also highlighted the positive role of personal academic self-efficacy on engagement (i.e. enthusiasm, perseverance, reconciliation) and on passing exams for online students. This study also showed that their beliefs about Internet self-efficacy fostered their enthusiasm.

Thus, although the studies described address self-efficacy beliefs in relation to a variety of activities (education, learning, ICT use, etc.), they repeatedly show that self-efficacy beliefs intervene favorably in learners' study programs, however the course is taught (online or traditional) or the type of students.

Therefore, we posit that academic self-efficacy promotes online students' engagement (Hypothesis 3a) and successful completion of a course (Hypothesis 3b). We also suspect that Internet self-efficacy encourages academic self-efficacy (hypothesis 3c) and online learners' engagement (Hypothesis 3d).

2.2.2. Learning Engagement

Learning engagement has also given rise to a great deal of research because it is recognized as promoting student retention and achievement (test performance, obtaining a degree, acquiring knowledge / skills) while protecting students from absenteeism and drop out (Appleton et al., 2006; Fredricks et al., 2004; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Lee, 2012; Zimmer-Gembeck et al., 2006).

Despite this enthusiasm, a lack of consensus on its definition persists (Brault-Labbé & Dubé, 2008; Wang, Willett & Eccles, 2011). However, while there are marked differences in the indicators chosen and their combination when studying this variable (unidimensional or multidimensional design), some consensus has emerged. In their review, Fredricks et al. (2004) identified three components of engagement that they believe are interdependent. In its behavioral aspect, engagement conveys the idea of action, participation, involvement and persistence in academic but also social activities. Emotionally, engagement encompasses the positive and

negative affects related to others in the educational sphere (teachers, peers, etc.) as well as the affects that characterize the inclination to study. As for the cognitive aspect of engagement, it is based on the idea of investment and refers to efforts made to understand complex ideas or concepts, develop self-regulation skills and metacognitive strategies.

Taking an integrative approach, Brault-Labbé and Dubé (2008; 2009; 2010) also consider engagement as a three-dimensional concept. The affective component corresponds to enthusiasm, meaning the interest or attraction felt by an individual towards the object of engagement, as well as to the dynamism and energy characterizing engagement. The behavioral dimension refers to perseverance and is also associated with pursuing actions and making efforts that engagement requires despite the obstacles encountered. The cognitive component refers to reconciliation, which is defined as the ability to understand and to accept that engagement implies giving up certain things and that there will be difficulties that one must put up with to fully benefit from the advantages of engagement.

Concerning online learning environments, several authors believe that if we want to develop and improve their effectiveness, it is essential to take into account learners' engagement (Oncu & Cakir, 2011). In addition, trying to understand engagement in online learning, as well as to identify its effects, is all the more relevant as the students enrolled in these courses are more responsible for managing their activities and their progress in their degree program (Hu & Hui, 2012).

Although studies are relatively few and mainly focus on a unidimensional design of this construct, the results on e-learning are in line with those on traditional education in the classroom (see for example Appleton et al., 2006; Fredricks et al., 2004; Lee, 2012; Zimmer-Gembeck et al., 2006). Indeed, as Oncu and Cakir (2012) point out in a brief review of the literature, engagement is a significant predictor of both online student retention and achievement.

In their experimental, comparative and longitudinal study, Hu and Hui (2012) found that learning engagement, as measured by the level of voluntary participation in the pedagogical activities proposed (behavioral component) had a positive impact on online students' perceived learning. The findings of Kim et al. (2005) indicate that academic engagement is negatively correlated with the intention to drop out of online students. Finally, Vayre et al. (2014) highlight the positive role of engagement in online student retention and achievement. They find, in fact, that online students reporting a high degree of perseverance at the beginning of their studies are more

likely to complete their year of study and less likely to fail exams. They show, finally, that enthusiasm protects online students from failure.

Finally, it is important to note that engagement (i.e. emotional, behavioral, and cognitive) is a psychological process that plays a major role in students' course of study, and this is true regardless of the socio-technical organization of the courses considered.

We thus hypothesize that academic engagement is positively related to the success of students enrolled in online learning (Hypothesis 4).

2.3. Research Objectives

Based upon our literature review of four key relational and psychological constructs (i.e. social support, feeling of belonging to a community, self-efficacy, engagement), we developed a general theoretical research model that describes the relationships among these four constructs and successful completion of a course. As shown in figure 1, we hypothesized that perceived social support and the feeling of belonging to a learning community would foster online students' self-efficacy beliefs, psychological engagement in learning, as well as taking and passing final exams (Hypotheses 1a, 1b, 1c and 2a, 2b, 2c). Taken together, the feeling of academic self-efficacy and engagement should support the successful completion of a course (Hypotheses 3b and 4). Additionally, we posit that academic self-efficacy would lead to students' engagement (Hypothesis 3a). As for beliefs about Internet self-efficacy, we expected these to have a more targeted effect and be positively associated with academic self-efficacy (Hypothesis 3c) and learning engagement (Hypothesis 3d).

This model has been validated to some extent in several earlier studies in online learning environments. Studies have shown the positive impact of perceived social support on self-efficacy (Mullen & Tallent-Runnels, 2006), engagement (Bradford & Wyatt, 2010; Stein & Glazer, 2003; Vayre & Vonthron, 2017), retention and achievement (Kim et al., 2005; Taplin & Jegede, 2001; Castles 2004; Stein & Glazer, 2003). Other researches established positive associations between the sense of belonging to a learning community and efficacy beliefs (Vayre & Vonthron, 2017), engagement (Hu & Hui, 2012; Oncu & Cakir, 2011; Rovai, 2001; Rovai & Barnum, 2003), retention or achievement (Kim et al., 2005; Liu, Magjuka, Bonk & Lee, 2007). Moreover, previous literature stated that self-efficacy can be linked to students' engagement (Bates & Khasawneh,

2007; Hu & Hui, 2012; Vayre et al., 2014) and success (Francescato et al., 2006; Vayre et al., 2014; Wang & Newlin, 2002). Several authors also indicated that engagement positively influenced students' retention and achievement (Kim et al., 2005; Oncu & Cakir, 2011; Vayre et al., 2014).

These studies are helpful in laying out a connection between relational or psychological processes and students' successful completion of a course. But they are limited in how well they capture all the components of social support, feeling of belonging to a community, self-efficacy and engagement. Consequently, a multidimensional approach that combine several aspects of key factors that affect online students' success is needed to complement and consolidate existing researches.

Furthermore, although these studies examined the effects of the four targeted key constructs in isolation, the findings support a general theoretical framework that describes the relationships among social support, feeling of belonging to a community, self-efficacy, engagement, exam attendance and passing exams (as shown in Figure 1). Nevertheless, given that few studies have examined the links in online education between the set of variables included in our model, this model was only partially supported by existing research.

In this study, we therefore aim to test an integrative and general theoretical model in order to precisely identify the respective effects of certain relational and psychological factors on online students' successful completion of a course.

- Insert Figure 1 here -

3. Material and methods

3.1. Data collection methods

In order to test our model, we conducted a questionnaire survey of adult students enrolled in a university distance and online learning department. This department offers bachelor's degree programmes in the humanities and social sciences. Lectures take place exclusively online, although some optional face-to-face meetings were proposed during the academic year to students who were willing and able to attend. After obtaining the teachers' agreement, an online questionnaire was sent to the students via the educational platform three to four months after the start of lessons (i.e.

in the 12th to 15th week after the start and before the close of the first semester). Second, information was collected on attendance at and results of the final exams (i.e. at the end of the academic year, knowing that exam sessions exclusively take place during this period). All information collected was anonymized and confidential.

3.2. Participants

506 online students volunteered to participate in this study and duly completed the proposed questionnaire. Concerning their year at university, 235 students were enrolled in the first year of the bachelor's degree, 147 in the second year and 124 in the third year. Interestingly, half of the respondents (49.8%) had already obtained a bachelor's or higher level degree (master's or doctorate). In addition, all the subjects offered by the program were represented in our sample: 175 students were studying languages (foreign languages and civilizations or applied foreign languages), 153 in history and 178 in letters, philosophy or humanities. The majority of respondents were female (71.70%), traditionally more represented in this type of study program. The age of participants ranged from 18 to 68 (mean = 32.32, standard deviation = 11.14). Slightly more than half (56.90%) reported being in a couple and just under a third had children (31.20%). As might be expected, a significant proportion of students were employed (70.90%) and this was the main reason mentioned by students (50.20%) for their choice of enrollment in this type of program.

3.3. Data Analysis

Statistical analyses were performed using SPSS and AMOS 21 software. In this study, we primarily used confirmatory factor analyses (in order to validate the structure of our measurement scale) and path analysis (to test the model). For this purpose, we used the maximum likelihood estimation, supplemented as needed by bootstrapping (1000 samples and confidence intervals at 95%), which enabled us to eliminate hypotheses of (multi)-normality. Several fit indices were used to assess each measurement tool and research model: relative chi-square goodness of fit (called CMIN/df in AMOS), the comparative fit index (CFI), goodness-of-fit Index (GFI), adjusted goodness-of-fit Index (AGFI), and the root mean square error of approximation index

(RMSEA). The levels of good model fit were set at: CMIN/df <3 (Kline, 1998), CFI ≥0.95 (Hu & Bentler, 1999), GFI ≥0.95 (Schermelleh-Engel, Moosbrugger & Müller, 2003), AGFI ≥0.90 (Schermelleh-Engel et al., 2003), RMSEA <.06 (Hu & Bentler, 1999).

3.4. Measures and instruments

According to the literature review and the aims of this study, we systematically focused on instruments available in French-language that can provide in-depth and multidimensional assessment of the processes considered in our research model.

3.4.1. Perceived social support

In order to evaluate the perception of social support, we used the scale developed in French by Vayre and Vonthron (2017). Based on the literature on this topic, we selected two categories of others as potential sources of social support in online education: teachers and peers. For each of these sources, three items were proposed about the nature of that support (material, e.g. "... gave me tangible, material help (loans of books, class notes, handouts, etc.) for my class"; emotional, e.g. " ... gave me psychological support, motivated me, boosted my morale or reassured me about the class "; cognitive, e.g. " ... gave me advice, explanations, provided me with information in relation to my class"). Each component was evaluated by an item (answer on a 5-point scale ranging from "not at all agree" to "strongly agree"). Perceived social support was thus measured using 6 items.

In order to validate the structure of this scale, we performed a CFA (see Table 1). The results confirmed the original structure of this scale and offered two sub-dimensions related to the sources of social support (and not its nature of either material, affective or cognitive). Two perceived social support scores were thus calculated (see Table 5).

Table 1.
Adjustment of the initial structure of the perceived social support scale

	CMIN	df	CMIN/df	CFI	GFI	AGFI	RMSEA
Perceived social support (PSS)	7.35	5	1.47	99	99	98	.03

3.4.2. Feeling of Belonging to a Community

The sense of belonging to an online learning community was measured using the index developed by Rovai (2002a; Rovai et al., 2004) in its French version (Vayre & Vonthron, 2017). This instrument consists of 20 items (response scale in 6 points ranging from "not at all agree" to "strongly agree"). It captures the sense of community in two sub-dimensions (10 items each). The first, the degree of connectedness, refers to the feeling of being connected to each other within the learning community ("in this course, I feel that I can rely on others"). The feeling of learning within a community refers to the degree of cohesion about creating and meeting educational objectives (e.g. "I feel that I am given ample opportunities to learn").

To achieve a structure satisfying the thresholds for each index (see Table 2), we had to remove 6 items (3 items related to the feeling of learning and 3 items related to the feeling of connectedness). The results confirmed the two-dimensional structure of the tool (Rovai, 2002a; Rovai et al., 2004). A score reflecting the feeling of learning and a score for feeling connected were therefore calculated (see Table 5).

Table 2.
Fit Indices: Adjustment of the Initial model and the Final Model: The feeling of belonging to a learning community

	CMIN	df	CMIN/df	CFI	GFI	AGFI	RMSEA
IM	815.03	156	5.22	.80	.85	.80	.09
FM*	129.72	69	1.88	.99	.97	.98	.04

Note. IM = initial model; FM = final model; * 14 items

3.4.3. Academic Self-efficacy and Internet self-efficacy

To measure academic self-efficacy, we relied on French scale developed by Vonthron, Lagabrielle and Pouchard (2007). Students had to indicate the extent to which the proposed statements (8 items) matched their own beliefs on a 5-point scale from "not at all" to "completely" (e.g. "I think I can overcome any difficulties in this class").

Regarding beliefs in Internet ability, we adapted the previous scale on self-efficacy (Vonthron et al., 2007). This tool is also composed of 8 items (e.g. "I think I can adapt to the requirements associated with the using the Internet") with a 5-point scale.

The confirmatory factor analyses confirmed the unidimensional structure and the quality of each of these scales (see Table 3). Therefore, we calculated two self-efficacy scores: one for academic self-efficacy, the other for Internet self-efficacy (see Table 5).

Table 3.
Fit Indices for the initial self-efficacy belief model

	CMIN	df	CMIN/df	CFI	GFI	AGFI	RMSEA
Academic Self-efficacy (SE)	10.59	8	1.32	.99	.99	.97	.02
Internet Self-efficacy (SE)	8.61	8	1.07	.99	.99	.98	.01

3.4.4. Psychological Engagement in learning

Student engagement in their learning was measured by the French academic engagement scale developed by Brault-Labbé and Dubé (2008). This instrument consists of 14 items that assess three dimensions of psychological engagement. Enthusiasm is evaluated through 6 items (e.g. "in general, I feel very energetic about this class"); perseverance from 4 items (e.g. "even when this class requires a lot of effort, I do not give up before reaching my goal"); reconciliation from 4 items (e.g. "I believe the benefits to be gained from this class well justify overcoming the difficulties it entails"). Each item is rated on 9-point a scale ranging from "does not describe me at all" to "describes me perfectly." The CFA results (see Table 4) validated the three-dimensional structure of this scale in 14 items (Brault-Labbé & Dubé, 2008). Therefore, we calculated three scores for student engagement in online learning: an enthusiasm score, a perseverance score, and a reconciliation score (see Table 5).

Table 4.
Adjustment of the initial structure of the psychological engagement in learning scale

	CMIN	df	CMIN/df	CFI	GFI	AGFI	RMSEA
Engagement	109.49	61	1.79	.99	.99	.97	.04

3.4.5. Completing the course

To assess whether students successfully completed their course, we obtained information related to their final exams. In the participants' college course, the examinations that validate the course credits take place at the end of the academic year in two sessions (a first session followed by a 'second-chance' session in case of absence or failure in the first session). From the data collected, we calculated two indicators associated with the completing the class (see Table 5): the rate of attendance at final exams and the rate of how many passed these exams (varying from 0 to 100%; e.g. a student who attended five in ten exams obtain a score of 50%). We found that 16.4% of students were potentially dropping out (did not come to take their exams), and 22.3% failed completely (did not pass a single exam).

Table 5.
Reliability of measurement scales, characteristics of scores, and variables studied

	Final Model	α	M	SD
PSS-Teachers	3 items	.80	2.74	1.21
PSS-Peers	3 items	.84	2.73	1.17
Feeling of learning	7 items	.70	4.09	0.64
Feeling of connectedness	7 items	.83	2.42	0.75
Academic-SE	8 items	.82	3.61	0.71
Internet-SE	8 items	.83	4.17	0.67
Enthusiasm	6 items	.89	5.94	1.43
Perseverance	4 items	.86	5.99	1.49
Reconciliation	4 items	.76	6.46	1.25
Rate of exam attendance	1 item	-	60.76	39.44
Rate of passing exams	1 item	-	61.81	41.35

4. Results

The purpose of this study is to assess the extent to which relational factors (perceived social support and sense of belonging to the community) and psychological factors (self-efficacy and psychological engagement) may explain whether online learners successfully complete their courses.

Prior to testing the theoretical model (see Figure 1), we evaluated the potential effects of socio-demographical and situational characteristics on both exam participation and achievement and, secondly, on the relational and psychological factors examined. The characteristics considered (degree program, year at university, sex, age, having one or more child, employment status) had little significant effect. Only the year at university had an effect on attending exams ($F(2.503) = 6.091$; $p < .01$) and passing them ($F(2.503) = 6.813$; $p < .01$). Indeed, our results indicate (Tukey tests $p <.01$) that first-year students in a bachelor's program had a lower exam attendance rate and achievement (respectively $M = 54.27$ and $M = 54.61$) than second-year students ($M = 65.63$ and $M = 67.00$) and third-years ($M = 67.76$ and $M = 68.39$). This is consistent with trends in higher education in France (regardless of system used for learning), where the drop out/failure rate is high in the first year of undergraduate studies, then gradually decreases in the following years.

Moreover, only sex ($F_{I\text{-}SE}(1,504) = 6,710$; $p <.05$; $F_{A\text{-}SE}(1,504) = 5,885$; $p <.05$) and age ($F(1,504) = 10,964$; $p <.01$) acted on perceived self-efficacy. We noted that women ($M_{I\text{-}SE} = 4.12$; $M_{A\text{-}SE} = 3.56$) had weaker self-efficacy beliefs than men ($M_{I\text{-}SE} = 4.30$; $M_{A\text{-}SE} = 3.73$). Perceived Internet self-efficacy was also lower among older students ($\beta = -.146$).

Finally, given that we wanted to use path analysis, we also checked that there was a significant relationship among the variables included in the theoretical model.

Table 6.
Correlations between various aspects of social support, feeling of belonging to a community, self-efficacy, engagement, exam attendance, passing exams

	1	2	3	4	5	6	7	8	9	10
1. PSS-Teachers	-									
2. PSS-Peers	.506**	-								
3. F-Learning	.309**	.248**	-							
4. F-Connect.	.365**	.571**	.287**	-						
5. Academic-SE	.227**	.151**	.422**	.190**	-					
6. Internet-SE	-.065	.055	.121**	.031	.215**	-				
7. Perseverance	.216**	.180**	.299**	.245**	.519**	.081	-			
8. Enthousiasm	.331**	.243**	.434**	.306**	.576**	.116*	.726**	-		
9. Reconciliation	.237**	.205**	.377**	.198**	.529**	.131**	.638**	.666**	-	
10. E-Attendance	.024	.028	-.014	.035	.199**	.040	.184**	.127**	.108*	-
11. Passing-E	-.019	.001	.029	.012	.202**	.069	.179**	.144**	.121**	.852**

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

As the correlation matrix shows (see Table 6), certain factors were not significantly associated with completing the online learning course (exam attendance and passing exams).

To assess the fitness of the theoretical model (see Figure 1), we performed path analyses. The bootstrapping procedure refined the results by examining the significance of direct and indirect effects of the factors studied. As shown in Tables 7 and 8, the data did not fit the model well and it included nonsignificant betas. Therefore, we revised the theoretical model and developed an alternative model containing only the significant paths between the model variables (see Table 8 and Figure 2). After removing the nonsignificant paths, we arrived at the final model with good fit (see Table 7 and Figure 2).

Table 7.
Adjustment of the theoretical model and the final model determined

	CMIN/df	CFI	GFI	AGFI	RMSEA
TM	5.318	.99	.99	.87	.09
FM	1.322	.99	.99	.97	.02

Note. TM = theoretical model; FM = final model

Table 8.
Betas of path analysis

	SE (Hyp.)	Rate of exam attendance *SE (Hyp.)*	Rate of passing exam *SE (Hyp.)*
PSS-Teachers → Internet-SE	-.06 (H1a)	-	-
PSS-Teachers → Academic-SE	.13** (H1a)	-	-
PSS-Teachers → Enthusiasm	.14** (H1b)	-	-
PSS-Teachers → Perseverance	.05 (H1b)	-	-
PSS-Teachers → Reconciliation	. 06 (H1b)	-	-
PSS-Teachers →	-	-.01 (H1c)	-.02 (H1c)
PSS-Peers → Internet-SE	.08 (H1a)	-	-
PSS-Peers → Academic-SE	-.03 (H1a)	-	-
PSS-Peers → Enthusiasm	-.01 (H1b)	-	-
PSS-Peers → Perseverance	.01 (H1b)	-	-
PSS-Peers → Reconciliation	.10* (H1b)	-	-
PSS-Peers →	-	.02 (H1c)	.02 (H1c)
Feeling-Learning → Internet-SE	.04 (H2a)	-	-
Feeling-Learning → Academic-SE	.38** (H2a)	-	-
Feeling-Learning → Enthusiasm	.17** (H2b)	-	-
Feeling-Learning → Perseverance	.05 (H2b)	-	-
Feeling-Learning → Reconciliation	.16** (H2b)	-	-
Feeling-Learning →	-	-.02 (H2c)	-.04 (H2c)
Feeling-Connect. → Internet-SE	-.01 (H2a)	-	-
Feeling-Connect. → Academic-SE	.06 (H2a)	-	-
Feeling-Connect. → Enthusiasm	.13** (H2b)	-	-
Feeling-Connect. → Perseverance	.13** (H2b)	-	-
Feeling-Connect. → Reconciliation	.02 (H2b)	-	-
Feeling-Connect. →		.01 (H2c)	-.01 (H2c)
Academic-SE → Enthusiasm	.48** (H3a)	-	-
Academic-SE → Perseverance	.50** (H3a)	-	-
Academic-SE → Reconciliation	.46** (H3a)	-	-
Academic-SE →	-	.15** (H3b)	.19** (H3b)
Internet-SE → Academic-SE	.18** (H3c)	-	-
Internet-SE → Enthusiasm	.01 (H3d)	-	-
Internet-SE → Perseverance	(H3d)	-	-
Internet-SE → Reconciliation	.03 (H3d)	-	-
Enthusiasm →	-	-.02 (H4)	.03 (H4)
Perseverance →	-	.17** (H4)	.10* (H4)
Reconciliation →	-	-.03 (H4)	-.02 (H4)

Note. Standardized Estimates (betas); Hyp. = Hypothesis; *p < .05; **p < .01

- Insert Figure 2 here -

This model suggests, first, that engagement (but only perseverance) and efficacy beliefs about learning supported online students' participation in exams and passing them, confirming partially hypotheses 4 and 3a. As expected (H3b), academic self-efficacy contributed to improve student engagement. Results also showed that Internet efficacy beliefs played a positive role, but was limited to academic efficacy beliefs (providing support for H3c but not for H3d).

Secondly, according to hypotheses 1a and 1b, we found that perceived social support fostered perceived academic self-efficacy and engagement: social support from teachers strengthened the efficacy beliefs and enthusiasm of online students, while social support from peers enhanced their reconciliation. Against expectations (H1c), perceived social support had no effect on successful completion of the course.

Thirdly, consistent with hypotheses 2a and 2b, the sense of belonging to the community also played a significant role in these psychological processes: the feeling of connectedness promoted engagement in learning (i.e. enthusiasm and perseverance); the feeling of learning also supported engagement (i.e. enthusiasm and reconciliation) as well as the feeling of academic self-efficacy. However, the sense of belonging to the community was not a predictor of exam attendance rate and achievement (H2c was not supported).

Finally, note that the results from bootstrapping attest to the direct and indirect effects of perceived social support from teachers on enthusiasm ($p > .05$ and the calculated confidence intervals exclude the value 0). However, the weight of this factor's indirect effect was lower than its direct effect.

5. Discussion

According to our expectations, the results show that the relational and psychological factors examined support engagement and the successful completion of the class. These results are in line with studies in this field and they attest to the relevance of the process considered in our research model.

However, some of the findings contradict the studies on which our model was based. These results thus deepen and refine our knowledge of the influence of the factors considered and their sub-dimensions.

Regarding perceived social support (i.e. material, emotional and cognitive), and contrary to what has been advanced in previous studies (Taplin & Jegede, 2001; Castles 2004; Stein & Glazer, 2003) and hypothesized (H2c), it does not explain successful completion of the course (i.e. attendance rate and exam success). Our results show, nevertheless, that it had beneficial effects on online students' perceived self-efficacy and engagement (see Hypotheses 2a and 2b; Bradford & Wyatt, 2010; Kim et al., 2005; Mullen & Tallent-Runnels, 2006; Vayre & Vonthron, 2017). We should,

however, differentiate these effects depending on the source of support: social support from teachers positively affected engagement (but only enthusiasm) as well as on efficacy beliefs (but only academic); social support from peers meanwhile only acted on reconciliation. They therefore show complementary effects on intra-individual psychological processes.

Regarding the sense of belonging to a community, its effects are more subtle and targeted than previous research would seem to predict. First, contrary to the literature of the field (Bourdages & Delmotte, 2001; Liu et al., 2007; Rovai 2002c, 2002d; Rovai & Barnum, 2003), the feeling of belonging to a community had no direct influence on whether online students completed the class (H2c was rejected). Although both sub-dimensions of the feeling of community fostered online students' enthusiasm, the feeling of connectedness also supported perseverance, while the sense of learning rather promoted reconciliation (H2b was confirmed). In addition, only the feeling of learning had a positive effect on academic self-efficacy (H2a was partially supported). These two sub-dimensions thus acted separately (as well as being complementary) on efficacy beliefs and engagement in online learning. These results concur with others in the field (Hu & Hui, 2012; Oncu & Cakir, 2011; Rovai, 2001; Rovai & Barnum, 2003; Vayre & Vonthron, 2017), but also invite us to qualify them.

They are several possible explanations for why, in this study, relational processes do not significantly explain whether online learners successfully complete their courses, contrary to what has been found in earlier researches. One would be the differences in the operationalization of constructs (i.e. perceived social support, sense of belonging to a community and successful completion of the course) and statistical analysis performed. A related potential explanation revolves around the limited number of previous studies in this field as well as the fact that they are relatively old, sometimes going back more than fifteen years (since then, technical and pedagogical environments, online teaching practices, e-learner profiles, expectations, aspirations or behaviors, have been evolving).

As for academic efficacy beliefs, they had a significant positive effect on the three components of engagement as well as on participation and achievement in examinations (Hypotheses 3a and 3b were confirmed). These results confirm those put forward in the literature review and emphasize the key role of perceived self-efficacy among online students in completing their course (Bates & Khasawneh, 2007; Francescato et al., 2006; Hu & Hui, 2012; Vayre et al., 2014; Wang & Newlin, 2002). However, internet self-efficacy did not explain the other processes and behaviors examined

in our model, particularly learning engagement (see Hypothesis 3d; Hu and Hui, 2012). It is interesting to note that, as expected (Hypothesis 3c), it did promote academic self-efficacy: we therefore found a strengthening of efficiency beliefs relating to two distinct areas of activity.

Regarding learning engagement, only perseverance supported online students completing their courses (Hypothesis 4 was partially confirmed). Although this effect was much more targeted than previous studies have suggested (Kim et al., 2005; Oncu & Cakir, 2012; Vayre et al., 2014), these results enable us to identify the specific role of this sub-dimension of engagement in whether online students participate in and pass their exams.

Finally, we must underscore the benefits of examining specific psychosocial processes in a multidimensional perspective, which is the sole way to account for the respective and specific effects of the relational and psychological factors involved. Nevertheless, these findings must be interpreted cautiously because they are not always directly comparable with the results of previous studies (i.e. they can vary according to their methodological approach, conceptualization and measurement of the constructs, data analyses, etc.). While they consolidate and complement existing researches they need to be supplemented by studies using multidimensional approach of targeted relational and psychological processes.

6. Conclusion

6.1. Study Contributions

These findings allow us to develop a model for interaction of certain relational and psychological factors, in order to predict whether online students attend their final exams and pass them. First, perceived social support (from peers and teachers) as well as the sense of belonging to a community (sense of connectedness and sense of learning) positively affected self-efficacy beliefs and learning engagement. In other words, the relational factors studied here were the antecedents of the intra-individual psychological factors examined in this study. Second, academic self-efficacy promoted learning engagement (i.e. enthusiasm, perseverance, reconciliation) as well as the completion of the course (i.e. presence and passing final exams). In addition, persistence positively influenced online students' completion of their courses. Intra-individual psychological processes thus occupy a central position between the relational processes mentioned and the

successful completion of the online class. The psychosocial processes analyzed here are thus essential intra-individual relationship and psychological factors, if we want to predict and promote the successful completion of online courses.

It is important to note that while only perseverance explained the completion of university online courses, studies on psychological engagement in learning led us to examine this variable from another angle. Indeed, engagement (i.e. emotional, behavioral and cognitive) is frequently considered in research as a predictor variable because it is recognized as a factor for student well-being (i.e. academic satisfaction, life satisfaction, meaning of life, perceived happiness and positive affects; Brault-Labbé & Dubé, 2008; 2010). In other words, our research model, which sought to assess the role of psychological relationship factors supporting online students' completion of courses, can also be used to understand and explain (from a theoretical point of view) as well as promote (from a practical point of view) student engagement and as a consequence student well-being and quality of life.

6.2. Practical Implications

These findings provide a glimpse of what can be done to avoid drop out and failure in distance and online education, which are at worrying levels (Hu & Hui, 2012; Martinez, 2003; Park 2007; Park & Choi, 2009). In fact, these results point to the interest of implementing educational programs that strengthen relational processes and efficacy beliefs in order to promote online students' engagement and, ultimately, their course participation and achievement.

In this perspective, it would be useful to design and implement social learning environments that foster the establishment of close relations among students, to support them in their learning process (materially, cognitively, emotionally), to highlight their progress (feedback, social interactions and rewards), to design and supervise educational activities in small groups and also encourage them to participate in online discussions in order to increase their sense of belonging to a community (Rovai 2002b) and to promote peer social support. In other words, the studies mentioned clearly reinforce the recommendations made in the early stages of e-learning programs about the need for online teachers to perform the functions of resource person, facilitator, mediator and advisor, which that are more broad than those required in face-to-face teaching (Albero, 2003 Conceição, 2006; Marchand & Loisier, 2004).

To support online students' efficacy and engagement, we should jointly develop programs to support them in their mastery of knowledge / skills, which means we need to view skills acquisition as gradual and long-term. This would enable students to have several experiences of success (rather than failures), by completing appropriate learning activities (optimal level of requirements, reaching intermediate milestones, etc.). Moreover, this would highlight their progress (feedback, social interactions and rewards) that would enable them to develop the feeling that they control their environment (as well as freedom and autonomy). It would also encourage them to see that they are responsible for reaching the outcomes they desire (Bandura, 1993, 2003; Ryan & Deci, 2000).

Finally, the design, development, and teaching of e-learning courses deserve equal attention from researchers and practitioners, since these programs represent, in contemporary society, a tremendous opportunity for career development and self-development as part of lifelong learning.

6.3. Limits and Future Avenues of Research

Although this study enables us to grasp the complexity of the effects of relational and psychological processes on completing online courses, this model should be tested and supported with further empirical evidence from extensive complementary studies, in particular with students enrolled in other university programs than those considered here (e.g. in science and technology programs). More research is also needed on the completion of online courses. Indeed, the indicators used in our study should be expanded to broaden our definition of achievement in online learning (e.g. more precise measurements, more subjective measurements, or even longer-term measures).

Furthermore, given the observations in the introduction, it would be useful to examine participation throughout the school year to account more fully for online students' learning outcomes (e.g. tracking online participation behavior). Indeed, our study includes only attendance at final exams. Future studies meeting these requirements would lead to a reliable and generalized modeling of the interaction of psychosocial influences on retention/dropout and success/failure of students in distance and online learning.

Finally, longitudinal research (with repeated measurements) would allow us to better understand how each of these factors guides the progression of online students and how their study program unfolds through to the end. Such research should gather data throughout the school year and not be

confined to a single collection three to four months after the start of the course (as we have done here). Qualitative, comprehensive and developmental approaches would be ideal for grasping the conditions influencing why people dropout and the related factors (even temporary) during the academic year.

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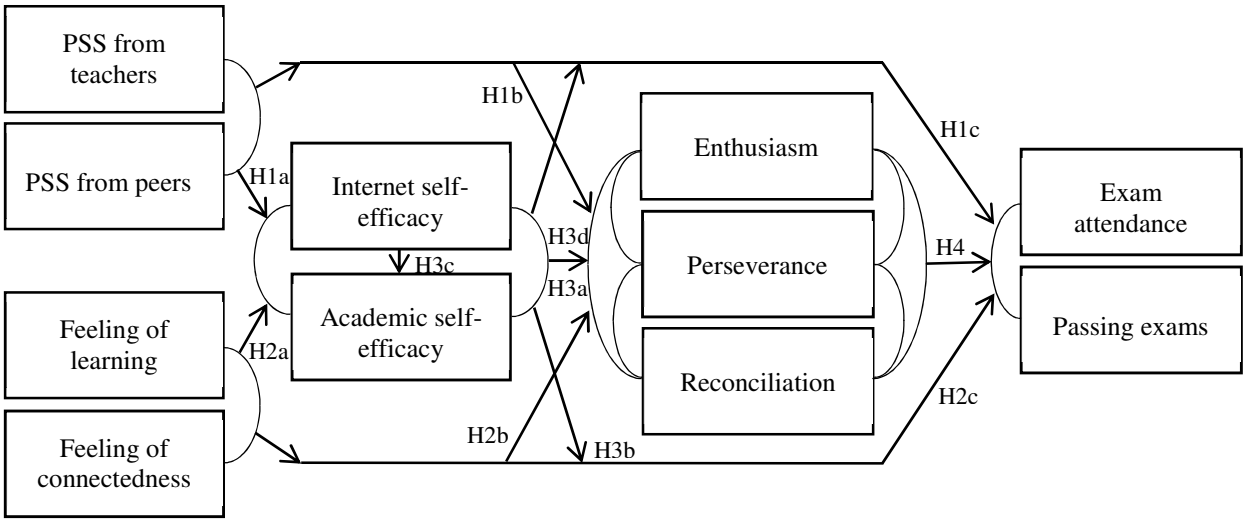

Figure 1. Theoretical model

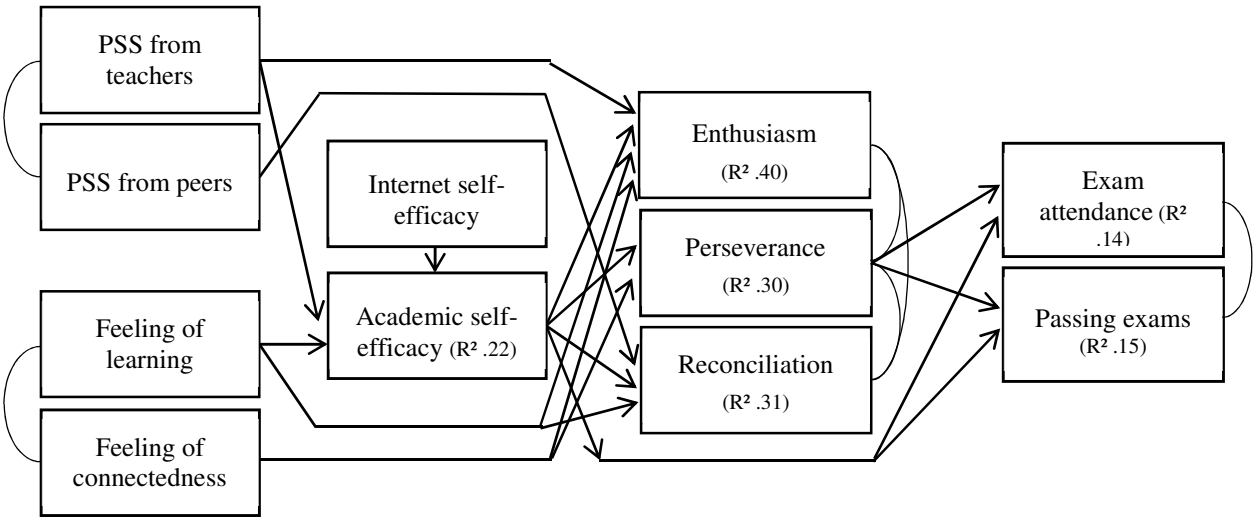

Figure 2. Final model