



Affective Engagement of Higher Education Students in an Online Course

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Abstract

The present research studies the factors that have impacted the affective engagement of university students in an educational online course. It examines how the type of interaction (learner-learner, learner-instructor, and learner-content) and the type of engagement (behavioural, cognitive and affective) have influenced the affective engagement of the students in the online course. Nineteen university students majoring in teaching mathematics, who were enrolled in the course Mathematics Teaching Methods, participated in the present research. Two data collection tools were used: semi-structured interviews and reflections. To analyse the texts resulting from the interviews and reflections, inductive and deductive qualitative content analysis was used. The research results indicated that university students have experienced more positive than negative affective engagement in the three communicational channels used in this course to facilitate online learning, which were: synchronous lectures, forums and assignments. The results also indicated that these three types of interaction have positively influenced students' affective engagement in the three channels, with that influence being different from one channel to the other based on the interaction type taking place. We suggest that specific types of engagement need to be attended to for positive affect to occur.

Keywords:

Interaction Types;
Engagement Types;
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1- Introduction

Student engagement has attracted the attention of researchers as it can positively influence the different aspects of students' learning, such as critical thinking [1], cognitive development [2], moral & ethical development [3], student satisfaction [4], and persistence [5]. More specifically, researchers are interested in student engagement in online classrooms, as these classrooms are flourishing due to their ability to maintain a high engagement level of both the instructors and the students in the educational process in different contexts and under various circumstances. One such context is that of COVID-19 that has made the use of online classrooms a must due to imposing social distancing restrictions which turned the regular classroom into a health hazard for students and instructors.

In the case of this research, we aimed to examine the affective engagement of pre-service mathematics teachers enrolled in the course Mathematics Teaching Methods. The course covered arrange of topics and issues including critical thinking, democracy, and metacognition in the mathematics classroom. Students were asked to discuss these topics and issues, engage in writing activities that tackle them, and self-evaluate these activities. The course was delivered to students online, through the use of three main channels: synchronous lectures, online assignments, and forums. Little research has addressed students' engagement in the mentioned three channels. The present research attempts to do so.

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Unfortunately, and as with all research, this research endeavor is faced with a number of limitations. First, it is limited by its sample – nineteen students and by the discipline, as it addresses a specific type of educational courses, which is teaching methods. Second, is limited by its assumptions. One of those assumptions is that content analysis could be successful when analyzing the texts of nineteen students. This assumption relies on the high number of units of analysis that students' texts raise, which enables us to study the related phenomenon. A second assumption is that the frequencies and percentages of themes related to an educational phenomenon could give a picture about this phenomenon. This assumption relies on researchers' emphasis that frequency and percentages could give a picture of the social phenomenon [6]. A third assumption is that interactions and engagement could be studied together. This assumption relies on studies considered the two phenomena as two facets of the same phenomenon, which is engagement [7].

Following, we first present the literature review related to the present research. This literature review describes students' engagement and its different aspects: Facilitators of engagement, students' perception of their engagement, indicators of engagement, engagement and educational technology in higher education and engagement in distance learning as interaction. Second, we elaborate on the research rationale, goals and questions, and third we present the methodology of the research. Fourth we present our findings and discussion and fifth the research conclusions.

2- Literature Review

Although student engagement has attracted the attention of researchers for decades [8, 9], there is still no complete commonality on an exact definition for that term [10, 11]. In a review of studies tackling student engagement, Bond et al. [12] reported that only %7 of the reviewed studies attempted to define student engagement. On the other hand, and in an attempt to set some guidelines for defining the construct of engagement, Axselson and Fleck [13] emphasized the importance of distinguishing between two uses of the term. The first one is engagement being as a measure of the learning process, and the second as an antecedent or predictor of student behaviour during a given learning process. This indicates that engagement could be a predictor or an outcome. In this research, we consider it as being both, as one type of engagement could be the predictor of another, or the same type could be a predictor and outcome.

Despite the lack of a unified terminology, there seems to be an agreement on that engagement is a multifaceted concept [14] that goes beyond mere academic engagement time, to include the affective, behavioural, and cognitive traits of students [15]. Behavioural engagement is viewed in terms of the time and effort a student spends in learning [16] and doing activities in an effort to learn [11], utilizing attention, participation, and effort [19]. This type of engagement is deemed as a powerful indicator of students' educational outcomes [18]. Affective Engagement, on the other hand, encompasses students' emotions towards the learning process, context, peers and teachers, whether negative or positive [18], as well as their sense of belonging [19]. Finally, cognitive engagement reflects the level of students' engagement in an activity, or a task, in terms of thinking how to approach it [13]. In recent research, Bond et al. [12] has defined engagement, reflecting those 3 dimensions, as: "The energy and effort that students employ within their learning community, observable via any number of behavioural, cognitive, or affective indicators across a continuum".

Studies have shown that engagement has a positive impact on students' academic achievements [20], grades and persistence [5], as well as retention and better learning [5, 21]. Moreover, engagement gives students a sense of belonging and connectedness [22], as well as, not only decreasing the chances of dropout rates but also increasing the rates of successful school completion [15]. In online courses, student engagement is more crucial as it plays a central role in stimulating students learning [23], and establishing interaction opportunities for the students with the institution [24].

2-1- Facilitators of Engagement

In order to improve students' success, there is a need to grasp how different factors interact and influence student engagement [25]. Reschly and Christenson [15] refer to the contextual factors that affect engagement as facilitators of engagement. While Skinner and Pitzer [22], with their motivational model lens on engagement, break down these factors into personal and social facilitators. Personal facilitators include students' self-perception and self-appraisals, such as self-efficacy. Social facilitators refer to the nature of interpersonal interactions that the students have with teachers, peers, and parents. In the present research, we consider the interactions occurring in three of the communication channels of online learning; i.e. the synchronous lectures, the assignments and the forums, in order to examine their influence on students' affective engagement.

In an agreement with Skinner and Pitzer [22], Kahu and Nelson [23] have also categorized facilitators into those related to the students' themselves, such as motivation and personality, and others relating to their context such as background, culture, family and support. However, Kahu and Nelson [23] have gone beyond in proposing a framework in which they introduce the notion of an educational interface. This interface refers to the area where students (with their context), interact with their higher education institutional structural influences. An alignment in students and institutional influences will cause engagement to occur. This engagement is usually mediated by four psychosocial constructs which include students' self-efficacy, emotions, belonging and wellbeing.

2-2- Students' Perception of their Engagement

In the aforementioned framework, Kahu and Nelson [25] have recognized the active role students' play in their engagement, by drawing attention to the importance of students' perception of their own engagement and interaction with their context, and its influence on the level of engagement; students' perception of their engagement could increase or decrease their level of engagement. Haug et al. [26] reported that students' feeling of connectedness and belonging to course content is evident to enhance engagement, which increases overall student satisfaction. They have also reported that students perceive working on real-life tasks as a strategy that increases their level of engagement. This is also echoed in a study done by Martin & Bollinger [24] regarding students' engagement in online courses. They reported that students perceive the varied aspects of an online course differently, with their perception of the learner-instructor interaction ranking high on what affects their engagement with the course. Another added benefit to students' perception of their own engagement is that it allows getting a deeper insight into the reasons behind a certain activity being more or less engaging [27]. This is of importance for this present study as we are aiming to investigate how different online communication channels could affect engagement differently.

2-3- Indicators of Engagement

To measure student engagement, a number of indicators have been used in the literature. Indicators refer to the "descriptive parts inside a target construct" [22]. They are viewed in terms of their valence (positive or negative), as well as being high or low [28]. The most-reported indicators of engagement are participation, interaction, and achievement [12]. Other engagement indicators include behavioural engagement indicators, such as task involvement, effort, persistence, attention, and retention, cognitive engagement indicators such as self-regulation, and finally emotional engagement indicators such as happiness, enthusiasm, interest, confidence, enjoyment, satisfaction, and pride [29].

Other types of indicators could be used to measure disengagement, whether emotional such as negative emotions like boredom, lack of interest, frustration and anger, sadness, and anxiety ([30, 31]), or behavioural such as being passive, giving up, withdrawal, distraction, and burnout [29], and finally Cognitive disengagement which could include little use of thinking processes or self-regulation processes.

2-4- Engagement and Educational Technology in Higher Education

Lately, higher education institutions have been under significant pressure to increase retention and graduation rates from online courses [32]. This pressure has multiplied in the past few months since many higher education institutions were forced to make a sudden shift to online learning due to Covid-19 outbreak [33]. The use of educational technology in the instructional process has been linked to an increase in student engagement [34]. At the same time, measuring the level of students' engagement is necessary for online learning as evidence of its success in making learning happen and achieving its goals [24]. In a synthesis of the literature on the use of technology and student engagement in higher education, Bedenlier et al. [34] have found out that behavioral engagement plays a major role in students' engagement, while affective disengagement is the most prominent dimension leading to the student not attaining the intended learning outcomes of the course. At the same time, research has evidenced that the use of technology has been linked to an increase in some of the indicators of engagement [35] which include interest, enjoyment, improved confidence, attitudes, and enhanced relationships with peers and teachers.

With that being said, technology alone cannot promote students' engagement, it has to be accompanied with proper planning and a choice of the right technological tools to fit the course [12], otherwise it can promote disengagement and hinder learning [36]. Nevertheless, Howard et al. [36] attest that this choice is usually an outcome of the teachers' assessment of students' digital efficacy, and the tool's potentials to engage learners. However, with the course structure evidenced to influence how students deal with the content of the course and the social interactions in it [37], careful thought needs to be put in choosing the technological tools used to deliver the course content. Bond et al. [12] reported that the most used tools in online engagement studies, that have a significant impact on engagement, are text-based tools. Moreover, researchers have focused mainly on the role LMS, discussion forums, recorded lectures and chat play in students' engagement. This research adds to the literature by focusing on the role synchronous lectures play in inflecting students' engagement.

2-5- Engagement in Distance Learning as Interaction

A key factor in engaging students with these tools is the establishment of a presence in the online environment [38]. Students' perception of their presence is related to the interactions they have with the other students and their instructor. Focusing on the role interaction plays in engaging students in distance education Bernard et al., [39] have proposed 3 types of interaction: student-student interaction, student-content interaction, and student-teacher interaction. Student-student interaction includes student interaction with individual students or in small groups, in a synchronous and asynchronous manner. This type of interaction motivates students and evokes social presence; it also aims to create a sense of community for the learners [24]. Studies have reported that tools such as discussion boards, chat rooms, blogs, and group tasks, work well when aiming to enhance student-student interaction [23].

Student-instructor interaction takes place during the instructional process between the students and their teacher, and it is part of the need to establish a teaching presence [24]. It aims at keeping students interested in the content being presented and to provide them with any needed support. Instructors are recommended to utilize different channels of communication with their students [23]. However, their level of involvement with these channels needs to vary based on the level of engagement intended to be evoked from the learners. For example, online discussion forums are reported as the most effective tools used to engage learners [40, 24]. Nevertheless, it is recommended that teachers are minimally active with forum discussions [41] to give students a chance to interact with each other.

Finally, student-content interaction refers to the way students interact with the subject matter and the material being presented. The design of the content and the course is important to engage learners and establish the cognitive aspect of learning [38]. It is important for course activities to be structured and clear to understand [24, 38], and designed in a way to invoke inquiry and exploration [42].

3- Research Rationale and Goals

Engagement in online learning is an emerging variable that affects the different aspects of students' learning and thus affecting their achievement and classroom well-being. Researchers have proposed the existence of a mutual relationship between students' context and their level of engagement [43]. Specifically that students' affective engagement, such as their sense of belonging and school connectedness, could influence and be influenced by other variables of students' learning. In the present research, we study the affective engagement of university students in the three delivery channels of an online course: synchronous lectures, assignments and forums. Doing that, we address the conditions of positive and negative affective engagement by looking at two aspects of these conditions: the type of interaction (learner-learner, learner-instructor and learner-content) and the type of engagement (behavioral, cognitive and affective).

In a review of studies on the topic of the engagement of higher education students in online courses using educational technologies, Bond et al. [12] has emphasized that the reviewed studies often focused on individual facets of students' engagement, which highlights the importance relating "these individual facets to the larger framework of student engagement, by considering how these aspects are connected and linked to each other". They further emphasize that it is not enough to focus only on one facet of engagement, but also to look at facets that are adjacent to it. This is what the present research attempts to do, by considering the occurrences of interaction and engagement types as conditions for a specific engagement type.

To study the conditions of the affective engagement of university students in the online course, we use interviews and students' reflections on their experience in the three channels of delivery in the course. This enables us to target the affective engagement in online courses from a new angle. Researchers have argued that the use of quantitative methods to evaluate online learning is questionable [44, 45], making studies that follow the qualitative methods more reliable. Very little qualitative research methods were employed in engagement research [12], where the present research attempts to do so. It does that by using interviews and students' reflection texts as data collection tools, which would reveal the quality and quantity of interaction and engagement; and thus shedding more light on the relatedness of both sides. In addition, employing a qualitative method of inquiry meets the calls of researchers to consider not only the quantitative aspect of interaction but the qualitative aspects too, because of its potential to clarify the processes of interaction [46, 47]. In the present research, we use qualitative as well as quantitative research method to study university students' engagement in online learning. The qualitative method is applied to discover themes related to the phenomenon [48], while the quantitative method is applied to describe the findings through frequencies and percentages [6].

3-1- Research Questions

First Research Question:

What interaction type (learner-learner, learner-instructor, and learner-content) manifested in the communicational channels of the online course influence both positively and negatively the affective engagement of university students in the course?

Second Research Question:

What engagement type (behavioral, affective, and cognitive) manifested in the communicational channels of the online course that influence both positively and negatively the affective engagement of university students in the course?

4- Methodology

4-1- Research Paradigm

The present research lies within the content analysis paradigm, both qualitative and quantitative. The qualitative aspect lies in trying to characterize the studied phenomenon by characteristics emerging from the constant comparison

method that is applied over the data [48]. The quantitative aspect lies in finding frequencies and percentages of each category related to the studied phenomenon [6].

4-2- Research Setting and Participants

Nineteen university students participated in the present research. These students studied for their M.A. degree in mathematics teaching and were enrolled in the course ‘Mathematics Teaching Methods’. The course covered a number of topics including critical thinking in the mathematics classroom, democracy in the mathematics classroom, and metacognition in the mathematics classroom. At the beginning of the course, meetings were face-to-face in a regular classroom setting, during which the first topic ‘critical thinking’ was covered. Each one of the face-to-face meetings consisted of four parts: a very short presentation of the new topic by the instructor, answering in groups 2-4 questions given by the instructor, whole-class discussion of the answers, which begins with the group presentation of ideas raised in the group’s discussion, and finally, generalizations were drawn from the whole-class discussions and based on appropriate literature. Towards the middle of the course, the meetings had to be moved online due to COVID-19 outbreak. Both synchronous and asynchronous delivery channels were employed to facilitate online learning, however, the structure of the synchronous meeting remained the same as the face-to-face meeting with its 4 parts division.

4-3- Data Collection Tools

Two data collection tools were employed for the purpose of this research: interviews and students' reflections. The interviews were semi-structured and included questions such as: describe how you were engaged in online learning? What did you like in this type of learning? What did you dislike?

In the reflections, the students were asked to answer the following questions: (1) Reflect on your engagement in the synchronous lecture detailing both the positive and the negative experiences (3) Reflect on your engagement in the online forum detailing both the positive and the negative experiences, (4) Reflect on your engagement in the online assignments detailing both the positive and the negative experiences.

4-4- Data Analysis Tools

To analyze the data resulting from the interviews and reflections, we employed both inductive and deductive qualitative content analysis. Content analysis is a process of categorizing a text into categories/themes based on inferences and interpretations related to a social/educational phenomenon by using inductive reasoning. Deductive reasoning, on the other hand, is used to generate concepts based on a theoretical framework [49]. Employing the deductive reasoning has enabled us to look for themes related to specific engagement frameworks as that in Bolliger and Martin [50] who viewed engagement as interaction patterns, and that of Fredricks et al. [18] who identified engagement as constituting of three types: behavioural, cognitive and affective. Whereas, inductive reasoning has helped us in exploring a wider range of engagement themes/categories that were not described in the literature.

Table 1 describes the categories, themes and examples on each theme according to Bolliger and Martin [47], while Table 2 describes the categories, themes and examples on each theme according to Fredricks et al. [18].

Table 1. Categories, themes and indicators for each theme according to Bolliger and Martin.

Category	Themes	Indicators
Learner-learner interaction	Discussion	Discuss an idea with another learner, argue regarding another learner’s claim;
	Sharing of experiences and ideas	Give another learner an example from previous experience, expresses an idea to another student;
	Collaboration with peers	Collaborate with another learner in solving a problem, collaborate with another learner in presenting an idea;
Instructor-learner interaction	Instructors can support and encourage student participation	Instructor goes to the group to encourage them to continue solving the problem despite its difficulty, instructor approaches a student to advance her problem solving;
	Instructors provide timely feedback	Instructor goes to the group to give them directions that help them advance further in their discussion, instructor gives feedback to a student regarding the solving of a problem;
	Instructors set expectations for the course	Instructor describes what is expected from the group’s discussions, instructor describes what is expected from a project.
Learner–content interaction	Engages with instructional materials	Reads a paper from the course’s materials, solves a problem;
	Spends time on content	Spends time on reading a paper, spends time on solving a problem.

Table 2. Categories, themes and indicators for each theme according to Fredricks et al.

Category	Themes	Examples
Behavioral Engagement	Adhering to classroom norms	Behave according to the norms set by the teacher,
	Involvement in learning and academic tasks	Effort, contributing to class discussion
Emotional Engagement	Positive emotions	Interest, happiness,
	Negative emotions	Boredom, sadness,
Cognitive Engagement	Problem solving	Solving a problem, expresses preference for a solution of a problem;
	Understanding and mastering the knowledge	Understand the learning material, discusses the learning material,
	Acquiring skills	Develop a cognitive skill, develop a metacognitive skill

5- Results and Discussion

The present research aimed at examining the effect that online interaction and engagement types manifested in 3 different communicational channels (synchronous lectures, assignment and forums) have on students' affective engagement level. The research results indicated that interaction and engagement types influence both positively and negatively students' affective engagement manifested the three communicational channels. We elaborate more on these findings in the below section.

5-1- Synchronous Lectures

Table 1 and Table 2 show examples of occurrences that resulted in positive and negative affective engagement in the synchronous lectures, respectively.

Table 3. Occurrences in the synchronous lectures that resulted in positive affective engagement

	Interaction between the learner and other learners	Interaction between the learner and the teacher	Interaction between the learner and content
Behavioural	<i>Being happy:</i> a student praising of another student's ideas	<i>Being proud:</i> Instructor's praising of students' ideas	<i>Being content:</i> Not leaving the lecture though the content is difficult
Cognitive	<i>Being happy:</i> Other students assisting one in presenting an idea	<i>Being content:</i> Answering a question posed by the instructor	<i>Being confident:</i> Understanding the topic
Affective	<i>comfort:</i> Another student expressing enthusiasm of the topic	<i>Being interested:</i> the instructor is enthusiastic about the content	<i>Not feeling the passing of the time:</i> The content is interesting

Table 4. Occurrences in the synchronous lectures that resulted in negative affective engagement

	Interaction between the learner and other learners	Interaction between the learner and the instructor	Interaction between the learner and content
Behavioural	<i>Anger:</i> Other students sending messages to the one who presents ideas to distract her attention	<i>Discomfort:</i> Not being able to see the expressions of the instructor	<i>Anger:</i> The inability to follow the content because of technical difficulties
Cognitive	<i>Anger:</i> A student intolerance for his classmates' opposing ideas	<i>Sadness:</i> instructor's argument against a student's idea	<i>Feeling that time is not passing:</i> The difficulty of the content
Affective	<i>Anxiety:</i> Another student expressing anger because of difficulty in understanding the content	<i>Being uncomfortable:</i> The discomfort of the instructor because of the little understanding of the topic by the students	<i>Feeling that time is not passing:</i> The content is boring

Table 3 shows the percentages of units related to positive and negative affective engagement exhibited in the synchronous lectures, according to the interaction type and the engagement type.

Table 5. Percentages of positive and negative affective engagement in synchronous lectures (N= 402 units).

	Interaction between the learners		Interaction between the learner and the instructor		Interaction between the learner and the content		Overall
Positive affective engagement	Behavioural engagement	1%	Behavioural engagement	9.95%	Behavioural engagement	1.24%	12.19%
	Cognitive engagement	1%	Cognitive engagement	21.89%	Cognitive engagement	20.39%	43.28%
	Affective engagement	1.99%	Affective engagement	2.49%	Affective engagement	8.46%	12.94%
	Overall positive	3.99%	Overall positive	34.33%	Overall positive	30.09%	68.41%
Negative affective engagement	Behavioural engagement	1.24%	Behavioural engagement	1.24%	Behavioural engagement	4.48%	6.96%
	Cognitive engagement	1.99%	Cognitive engagement	1.49%	Cognitive engagement	19.90%	23.38%
	Affective engagement	0.50%	Affective engagement	0.50%	Affective engagement	0.25%	1.25%
	Overall negative	3.73%	Overall negative	3.23%	Overall negative	24.63%	31.59%

Table 3 shows that in the synchronous lectures, students experienced more positive affective engagement (68.41%) than negative one (31.59%). Butz, Stupnisky and Pekrun [51] found that emotions are significantly related to students' perceived success for both programme achievement and technology use. Hence students experiencing more positive affective engagement than a negative one shows that they considered their experience of learning through synchronous lecture successful. This indicates that online courses can be a rich environment to foster students' positive affective engagement.

Table 3 shows that the type of interaction occurring in the synchronous lectures has contributed to the students' positive affective engagement differently, with the learner-instructor interaction ranking first with (34.33%). This finding is in line with Sheridan and Kelly [52] results, who found that students were likely to be motivated if they clearly understood from the instructor what is expected of them. Coming second in giving rise to students' positive affective engagement is the learner-content interaction with (30.09%). Finally, the learner-learner interaction had the least influence on generating students' positive affective engagement with a mere (3.99%), exhibiting a significant drop from the other two types of interaction discussed earlier. These results are particularly in conformity with Martin and Bolliger [24] results, who reported having the same order for the contribution of the three types of interaction to the engagement of university students in online learning.

Although the learner-content interaction came second in contributing to the positive affective engagement of students, it came first in contributing to the negative affective engagement of the students in the synchronous lectures with (24.63%). The results indicate that the learner-content interaction gives rise to positive affective engagement, which is consistent with Nwankwo [53] who reported that students emphasized the interaction they had with course content as the most important out of the three types of interaction. This view is also echoed in Galy, Downey and Johnson [54] conclusion that learner-content interaction plays the most important role in ensuring that online students are successful. While Nistor and Neubauer [55] stated that learner-content is the most important factor in the successful implementation of an online program.

The importance that the students put on content, especially in online setting, is also behind the influence of learner-content interaction on students' negative affective engagement. When encountering difficulties with the content; which are in the present research mainly cognitive ones, students experience negative affective engagement. Researchers emphasize that it is important for course activities to be structured and clear to understand ([24], [40]), and designed in a way to evoke inquiry and exploration [42]. When the activities do not satisfy the previous characteristics, students can experience affective disengagement or negative affective engagement.

Table 3 shows that cognitive engagement was the most contributing factor to the affective engagement of students, whether positive affective engagement (43.28%) or negative one (19.90%); i.e. 63.18% overall impact of the cognitive engagement on the affective engagement. This high percentage shows the importance of facilitating content for students, even for university students, through different means. This is in line with Revere and Kovach [56] who recommend making the content come alive through using appropriate technology, which would enhance students' engagement. In the present online course, an attempt was done to facilitate content through the grouping of students through the use of Zoom's rooms. This grouping contributed to the cognitive engagement of the learner with the content and which resulted in 20.39% of the positive affective engagement of the learner in the context of the synchronous lectures. This also agrees with Khosa and Volet [57] who found that group engagement could facilitate cognitive activity and metacognitive regulation through collaborative learning. In addition to the above, this impact of the cognitive engagement and processes on their affective engagement and processes has been indicated in previous studies (e.g., [58-60]).

5-2- Assignments

Tables 4 and 5 show, respectively, examples of occurrences that resulted in positive and negative affective engagement occurring in the assignments.

Table 6. Occurrences in the assignments that resulted in a positive affective engagement.

	Interaction between the learner and other learners	Interaction between the learner and the teacher	Interaction between the learner and content
Behavioural	<i>Enjoying the solving:</i> Collaboration between the group's members	<i>Being content:</i> The instructor's explanation of the assignment conditions	<i>Being satisfied:</i> Working hard on an assignment
Cognitive	<i>Being enthusiastic:</i> Discussing the solution strategy	<i>Being confident:</i> The instructor's positive evaluation of the solution	<i>Being confident:</i> Reflecting upon the solution
Affective	<i>Enjoying the work:</i> The entertaining aspect of working in a group	<i>Being pleased:</i> the instructor humorous answer to a learner's question	<i>Being enthusiastic:</i> The assignment is intriguing

Table 7. Occurrences in the assignments that resulted in a negative affective engagement.

	Interaction between the learner and other learners	Interaction between the learner and the teacher	Interaction between the learner and content
Behavioural	<i>Frustration:</i> The group members do not listen to the ideas of one of them	<i>Sadness:</i> Instructor's responsiveness	<i>Anxiety:</i> Not being able to finish the assignment on time
Cognitive	<i>Angriness:</i> Unacceptance of one's approach to solving the assignment	<i>Sadness:</i> The instructor's negative feedback on the assignment or part of it	<i>Discomfort:</i> the difficulty to approach the solving of an assignment
Affective	<i>Discomfort:</i> One of the group's members was anxious during the solution of the assignment	<i>Being displeased:</i> the instructor sarcastic answer to a learner's question	<i>Feeling that time is not passing:</i> The assignment is not interesting

Table 6 describes the percentages of units related to positive and negative affective engagement in the assignment solution, according to the interaction type and the engagement type.

Table 8. Percentages of positive and negative affective engagement in assignment work (N= 386 units).

	Interaction between the learners		Interaction between the learner and the teacher		Interaction between the learner and the content		Overall
Positive affective engagement	Behavioural engagement	16.84%	Behavioural engagement	2.07%	Behavioural engagement	15.80%	34.71%
	Cognitive engagement	10.88%	Cognitive engagement	8.81%	Cognitive engagement	2.33	22.02%
	Affective engagement	5.44%	Affective engagement	0.78%	Affective engagement	7.25%	13.47%
	Overall positive	33.16%	Overall positive	11.66%	Overall positive	25.38%	70.20%
Negative affective engagement	Behavioural engagement	4.15%	Behavioural engagement	2.85%	Behavioural engagement	5.44%	12.44%
	Cognitive engagement	3.89%	Cognitive engagement	4.15%	Cognitive engagement	3.63%	11.67%
	Affective engagement	0.78%	Affective engagement	0.25%	Affective engagement	4.66%	5.69%
	Overall negative	8.82%	Overall negative	7.25%	Overall negative	13.73%	29.80%

Table 6 shows that while doing the assignments, the students experienced more positive affective engagement (70.20%) than negative one (29.80%). One of the main reasons for this is students working in groups on those assignments. Group work causes students to feel as being part of a community; a small one in this case. Feeling part of a community could influence students' affective engagement positively [61].

Table 6 also shows that while working on these assignments, the learner-learner interaction (33.16%) came first in contributing to the positive affective engagement of the learner, followed by learner-content interaction (25.38%). Moreover, the smallest contribution to the positive affective engagement of the students in the synchronous lectures came from the learner-instructor interaction (11.66%). These results indicate the importance and value that university students place on group work while working on assignments. The results support other studies that reported the positive role of group work in facilitating students' learning. Hammar Chiriac [62] found that the students reported that most of their experiences with group work facilitated their learning, especially in the area of academic knowledge. In addition, Shaw, Mitchell and Del Fabbro [63] reported that students found class discussions and sharing experiences have positively influenced their learning and facilitated their exchange of knowledge about international issues related to their speciality.

As a facilitator of students’ learning, group work could lessen the negative engagement of the group members, as negative engagement could occur due to the negative interaction of the group members [64]. In the present research, the negative affective engagement of the students was reported at 8.82% of the overall statements related to affective engagement in the group work on assignments; i.e. the learner-learner interaction in assignments. This percentage is relatively not high, but focusing more attention on the factors that cause it could lessen their occurrences and thus lessen the negative affective engagement of the students in their work on online assignments. This could be done by stressing the importance of negotiation and alignment in group work [65, 66], which would lead to understanding of the mechanism of group work and thus utilize this mechanism in this group work. In detail, Baya et al. [65] found that prospective teachers used negotiation, in the context of a community of practice, as an escalator that supports the decision of in-service mathematics teachers to integrate ICT in the mathematics classroom. Furthermore, Daher et al. [66] found that the negotiation processes supported the development of the prospective teachers’ meta-cognitive processes in solving mathematics-based programming problems in the Scratch environment.

5-3- Forums

Tables 7 and 8 show, respectively, examples of occurrences that resulted in positive and negative affective engagement in forums.

Table 9. Occurrences in forums that resulted in a positive affective engagement.

	Interaction between the learner and other learners	Interaction between the learner and the teacher	Interaction between the learner and content
Behavioural	<i>Being content:</i> Knowing the conditions of students’ interactions in the forum	<i>Being satisfied:</i> The instructor’s positive feedback	<i>Being content:</i> Knowing the conditions of students’ first post to the forum
Cognitive	<i>Being enthusiastic:</i> Discussing the correctness of another student’s answer	<i>Being content:</i> The instructor’s explanation why a specific answer of the student is indeed critical	<i>Being interested:</i> Multiple ideas related on the same topic
Affective	<i>Enjoying the interaction in the forum:</i> The entertaining aspect of discussing each other’s ideas according to their criticality	<i>Being content:</i> The pleasant way of the instructor in giving feedback on students’ contributions	<i>Enthusiasm:</i> The idea in the post to the forum was interesting

Table 10. Occurrences in forums that resulted in a negative affective engagement.

	Interaction between the learner and other learners	Interaction between the learner and the teacher	Interaction between the learner and content
Behavioural	<i>Discomfort:</i> Students’ negative responsiveness on comments	<i>Frustration:</i> The long time it took the instructor to respond on the students’ contribution in the forum	<i>Discontent:</i> the inability to devote enough time to read the posts to the forum
Cognitive	<i>Frustration:</i> The misunderstanding of one’s idea by another student	<i>Discomfort:</i> Requests from students in the instructor’s comments	<i>Boredom:</i> Knowledge level of students’ posts to the forum
Affective	<i>Angriness:</i> the angry way in which one learner replied to another learner	<i>Angriness:</i> the disinterest with which the instructor replied to a learner	<i>Boredom:</i> The idea in the post to the forum was not interesting

Table 9 describes the percentages of units related to positive and negative affective engagement in forums, according to the interaction type and the engagement type.

Table 11. Percentages of positive and negative affective engagement in forums (N= 364 units).

	Interaction between the learners		Interaction between the learner and the instructor		Interaction between the learner and the content		Overall
Positive affective engagement	Behavioural engagement	6.87%	Behavioural engagement	11.54%	Behavioural engagement	4.95%	23.36%
	Cognitive engagement	8.24%	Cognitive engagement	12.91%	Cognitive engagement	9.34%	30.49%
	Affective engagement	5.77%	Affective engagement	5.22%	Affective engagement	5.49%	16.48%
	Overall positive	20.88%	Overall positive	29.67%	Overall positive	19.78%	70.33%
Negative affective engagement	Behavioural engagement	5.22%	Behavioural engagement	1.37%	Behavioural engagement	5.49%	12.08%
	Cognitive engagement	3.85%	Cognitive engagement	0.84%	Cognitive engagement	6.04%	10.73%
	Affective engagement	0.82%	Affective engagement	0.55%	Affective engagement	5.49%	6.86%
	Overall negative	9.89%	Overall negative	2.76%	Overall negative	17.02%	29.67%

Table 9 shows that in the forum discussions, the students experienced more positive affective engagement (70.33%) than negative one (29.67%). This finding agrees with the view of the researchers who emphasized the role of forums in students' learning [67, 68]. Noroozi et al. [69] argued that online discussion forums could enable flexible and independent learning and knowledge construction, while Zhang [70] argued that forums could develop critical thinking. It is expected that the various potentialities of forums would cause affective response, whether negative or positive. Where positive affect would result from the potentialities of forums; potentialities that were pointed at above. In addition, Harris and Sandor [71] asserted that online forums can engage students in the online learning process, by advocating an active and central role of the students. This active and central role is evident mainly through the positive cognitive engagement in the forums (30.49%) and the positive behavioural engagement in these forums (23.36%). On the other hand, the 3 types of interaction in the forums contribute negatively to students' affective engagement mainly through cognitive (10.73%) and behavioural (12.08%) engagement.

Table 9 shows that in the discussions on the forums, the learner-instructor interaction (29.67%) came first in contributing to the positive affective engagement of the learner, then the learner-learner interaction (20.88%) and the learner-content interaction (19.78%) with almost similar percentages. These results indicate the importance and value that university students place on the learner-instructor interaction in the forum, where the facilitation of discussion is needed. These results are in conformity with Anderson et al. [72] who argued that the instructor's facilitation of discourse during the course is critical to maintaining positive affective engagement, such as interest and motivation. In addition, Shea et al. [73] found that the teaching presence contributed to students' sense of trust, collaboration, shared educational objectives, support, and learning.

6- Summary and Conclusion

Teaching and learning online courses and their relationship with other educational aspects are attracting the attention of researchers as they facilitate students' learning [74, 75], especially in COVID19 Pandemic [76-78]. In the present research, we intended to study the affective engagement of higher education students in online courses. The research results indicated that the students experienced both positive and negative affective engagement in the three communicational channels of online learning: synchronous lectures, forums and assignments. We suggest looking at the positive and negative occurrences of affective engagement in online courses as happening in a space with three dimensions: type of interaction (learner-learner, learner-teacher and learner-content), type of engagement (behavioural, cognitive and affective) and communication channel (synchronous lectures, assignments and forums).

In the present research, we considered how the combination of two dimensions (type of interaction and type of engagement) impacts students' engagement in the third dimension (communication channels). Looking at the affective engagement in online courses as occurring in a three-dimensional space has enabled us to look at specific cells in the space as they impact the occurrences of positive and negative affective engagement. The cognitive engagement in the learner-instructor and learner-content interactions in the context of synchronous lectures resulted in more positive affective engagement of the students than other combinations of conditions in the synchronous lectures. This was not the case in the assignment context, where the behavioural engagement in the learner-learner and learner-content interactions resulted in more positive affective engagement of the students than other combinations of conditions in the assignment context. The case of the forum context was similar to the synchronous lectures in that the combination of the cognitive engagement and the learner-instructor interaction has resulted in more positive affective engagement of the students than other combinations of conditions in the forum context. In addition, the combination of the behavioural engagement and the learner-instructor interaction has resulted also in more positive affective engagement of the students than other combinations of conditions in the forum context.

In the present study, we considered the learners' affective engagement as an outcome variable and examined the interaction type and the engagement type and their combination as predicting variables. This is one limitation of the study. Future studies are needed where the outcome variable could be learners' cognitive engagement or learners' behavioural engagement. The combination of the predicting variables would enrich our understanding of factors that could influence the different types of students' engagement in online settings.

A second limitation of the study is the size of sample, as the present research examined the engagement of 19 university students who participated in an educational distance learning course. Future research is needed to consider students' engagement in additional educational courses, especially courses intended for a high number of participants like MOOCs. A third limitation of the study is the type of course in which it was carried out; i.e. educational course. Future research is needed to study students' engagement in university courses in general. This future research would reveal the characteristics of engagement in three main channels of distance learning courses: synchronous lectures, assignments, and forums.

7- Declarations

7-1-Author Contributions

All authors contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

7-2-Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7-3-Funding

The author received no financial support for the research, authorship, and/or publication of this article.

7-4-Ethical Approval

Participants gave their written consent to use their anonymous data for research purposes.

7-5-Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the author.

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