

## **Should emotions be taken into consideration within online learning environments ? A systematic review study**

### **Abstract**

The aim of this study is to reveal the tested hypotheses and the obtained results about emotion and technology studies in online learning environments in the literature through a systematic literature review. 27 research articles that meet the inclusion criteria and were published in the Web of Science database between 2015 and 2020 in the category of "Education and Educational Studies" were analyzed. The results from the analysis is that the number of accepted and rejected hypotheses regarding emotion were similar; this could be due to various reasons. These reasons could be; difficulties in measuring emotion, external factors such as the characteristics of the online learning environment, the technology used, and the approach of the instructors. It was concluded that emotion has a non-negligible role in online learning environments, and therefore should be considered as a variable. However more studies are needed in terms of both environment design and variables to be tested so that the role of emotions can be understood.

**Keywords:** emotion, online learning, systematic review

### **Introduction**

Emotions are one of the most important elements in online learning environments (Imani & Montazer, 2019) and also emotions are affected by the learning context in these environments (O'Regan, 2003). In addition to these, it is also stated that emotions are a part of learning activities in these environments (D'mello, 2013). However, it is claimed that the interaction between student-student and student-teacher cannot be achieved in online learning environments, so that the learners are isolated in these environments and this situation triggers the negative emotions of the learners and prevents the study activities in these environments (Holbrey, 2020; Kim, Park & Cozart, 2014; Mazer, McKenna- Buchanan, Quinlan & Titsworth, 2014). In addition, it is emphasized that emotions cannot be fully revealed in online learning environments (Noteborn et al., 2012), so relationships between different emotions (Artino & Jones, 2012) and action tendencies arising from different emotions should be revealed. Because in face-to-face learning environments emotions can be noticed, but students' feelings in the context of online learning are ambiguous (Marchand & Gutierrez, 2012). In these environments emotions can be revealed, changed or regulated (D'mello, 2013) so it is worth to study emotions. Also the pandemic crisis has brought about the inevitability of online learning

environments and the transition of physical education environments to a completely online environment.

Despite the increasing number of studies on factors affecting students' learning and satisfaction in online learning environments (Ghaderizefreh & Hoover, 2018), little is known about the emotional and cognitive experiences of students in this environment. The question of how students emotionally experience online learning environments has not been adequately answered (Stephan et al., 2019). However, it is claimed that emotions contribute to learning, self-regulation and academic achievement in online environments (Artino & Jones, 2012; Mega, Ronconi & De Beni, 2014; Wosnitza & Volet, 2005). For this reason, it is recommended that instructors and designers take into account the emotion and emotional factors when designing online courses (Ghaderizefreh & Hoover, 2018). On the other hand, for students it can be said that to regulate and manage their own learning is a process that includes emotional aspects as well as cognitive (Taub et al., 2019) and it will be beneficial to understand the emotions they experience in online learning environments in order to help them participate more actively in their own learning (Lee & Chei, 2019). In the context of emotion and learning in online environments, it is stated that there are three challenges: determining key emotions in e-learning, measuring these emotions, and examining the causes and consequences of emotional state during learning (Mayer, 2019). For example, Scherer (2005) stated that a claim such as a single method is superior in terms of measuring emotion is wrong and added that convergent measurement would be consistent by evaluating the changes in all components related to emotion, but this was also very difficult. However, understanding how teaching leads to emotional and cognitive processes during learning and how these processes interact to produce learning results can be considered as the main problem of emotion research (Mayer, 2019). The focus on online learning in studies on one hand and due to the pandemic on the other, the issue of the effectiveness of online learning process has gained a special importance. In a systematic mapping study (Ozturk et al., 2021) in which 75 articles on education and educational research category addressing emotion and technology together in the were examined, it was determined that the studies mostly focused on online learning. So in this study it was aimed to reveal the hypotheses (or dependent and independent variables) and the results about technology and emotion studies in online learning environments. Thus, while determining potential research areas for the effectiveness of online learning environments that will be increasingly needed in the upcoming period, it is aimed to make suggestions for instructional designers and system developers working in online learning environments.

For this purpose, the studies using the experimental and correlational method about emotion in the context of online learning were analyzed and following research questions were formulated:

1. What are the research trends in terms of their objectives and demographics?
2. Which theoretical models are the studies based on?
3. What are the findings about the tested hypotheses and dependent- independent variable relationships?

## **Method**

Systematic Literature Review (SLR) was conducted in this study. SLR aims to synthesize the results of studies that may be related to research questions (Budgen, Brereton, Drummond, & Williams, 2018). In SLR studies, the search process is guided by research questions, which indicates that a variety of SLRs can be performed in a single subject area (Petersen, Vakkalanka, & Kuzniarz, 2015). In this study, it was decided to use 3 keywords within the scope of the search strategy: (a) related to emotion (b) related to the method of studies, (c) related to technology. Keywords in the phrases are presented in Appendix A. In search query, AND operator between the keywords group and OR operator among the words in each keyword group was used. While determining the keywords about emotion, using Basic Emotion Theory (Ekman & Cordaro, 2011; Izard, 2011; Levenson, 2011) and 20 emotions in the Geneva Emotion Wheel created by Scherer (2013), were included. Also general terms - emotion, affect - have also been added. Thus, it is aimed to include all the emotions discussed in both Basic Emotion Theories and Appraisal Theory so to expand the scope of the studies.

In the Web of Science database, 3655 records were reached in the category of "Education and Educational Studies" published between 2015 and 2020. The titles, abstracts and, if necessary, the full text of the article was examined and it was decided whether to include in the systematic review according to inclusion and exclusion criteria. Inclusion and exclusion criteria used in the study are presented in Appendix B.

When the studies were evaluated by the researchers according to the inclusion and exclusion criteria, it was determined that the number of correlational or experimental studies on technology and emotion was 70, 27 of them were about online learning. The 27 articles included in the review were coded according to seven characteristics: the year, the purpose of the study,

the method, the theory on which the study was based, the dependent and independent variable, and the status of supporting the hypotheses put forward.

## **Findings and Discussion**

Of the 27 studies examined, four studies were published in 2020, seven studies in 2019, 11 studies in 2018, four studies in 2017, no study in 2016, and one study in 2015. Twenty studies tested a model and seven studies were conducted in order to examine the effect of an experimental process on students' emotions. It was determined that five of the seven experimental studies did not refer to a theoretical framework. In this context, in a study examining the theoretical frameworks of the studies published in the field of instructional technology, it was found that no theoretical foundations were found in most of the studies, on the other hand, it was determined that more than half of the studies using the correlational method were related to a theory and contributed to the development of a theory (Hew, Lan, Tang, Jia & Lo, 2019). Findings about the theoretical framework in this study also support this situation. The fact that the theoretical basis is evident in correlational studies is that researchers define the theories they will use and accordingly, a theoretical diagram is created to assist the researchers (Hew et al., 2019).

When the theoretical frameworks in studies were examined, it was seen that Control Value Theory (CVT) ( $n = 5$ ), and Social Cognitive Theory (SCT) ( $n = 3$ ) were the most referenced theories. The fact that CVT is based on both motivational theories and appraisal theories about emotion and expresses itself as a social cognitive theory can be shown as the reason for its use in educational studies (Pekrun, 1992; Pekrun, 2006). In addition, The Achievement Emotion Questionnaire was developed by Pekrun et al. (2002) based on the Control - Value Theory. Providing ease of measurement for researchers can also be considered as another reason. It was found that five studies referred to more than one theoretical framework. L2 Motivational Self System, Online Learning Emotional Participation Theory Model, Willingness to Communicate Model, GETAMEL, Emotional Response Theory, Flow Theory, Multidimensional Facebook intensity Approach are also used.

In the 27 studies, 194 hypotheses were tested, and it was determined that 97 hypotheses were related to emotion. Fifty-three hypotheses were supported and 44 were rejected. In these hypotheses, emotion is examined according to the status of being treated as a dependent and

independent variable. Twenty-eight of the hypotheses where emotion was the dependent variable were accepted and 21 were rejected. In studies where emotion was considered as an independent variable, it was observed that 25 hypotheses were accepted and 23 were rejected. Data related to the hypotheses tested in correlational studies are included in Appendix C.

In both cases, it was determined that the number of accepted and rejected hypotheses regarding emotion was close to each other. It can be said that this situation has various reasons. Difficulties in measuring emotion can be given as the reason for this situation. In addition, it can be stated that external factors such as the characteristics of the online learning environment, the technology used, the approach of the instructors may also have an effect.

It has been determined that anxiety (n = 34) and enjoyment (n = 25) are the most common hypotheses about emotion. Also, pride (n = 8), interest (n = 8), frustration (n = 5), boredom (n = 4), excitement (n = 3), shame (n = 3), anger (n = 3), fear (n = 3), disgust (n = 3), sadness (n = 3), annoyance (n = 2) are other emotion-related variables in the hypotheses. However, it was noteworthy that a specific emotion was not defined in five hypotheses, instead positive affect (n = 4) and negative affect (n = 1) were used. These findings show that studies about online learning and emotion focus more on achievement emotions.

When variables other than emotion are examined in the hypotheses, achievement (n = 28), engagement (n = 23), motivation (n = 12), perceived usefulness (n = 9), participation (n = 7), satisfaction (n = 6) were tested frequently. It can be stated that this may have led to the selection of achievement emotions in predicting variables such as performance and interest in online learning. One of the possible reason of this finding may be the most measurable indicator of learning is achievement. Therefore, it can be said that there is a need to have different indicators in addition to academic achievement regarding learning processes. In this regard, an approach that focuses on the individual rather than seeing emotions as a tool to increase success can provide an approach to the emotion-learning relationship from different perspectives and a more in-depth understanding of the subject. The second most tested variable in hypotheses related to emotion was determined as engagement. In the literature, it was stated that emotions in face to-face learning environments affect students' engagement during learning (Pekrun, 2019; Schrader & Kalyuga, 2020). It is also stated that emotions in online learning environments are also related to student engagement (Mayer, 2019; Recshly et al., 2008). It was observed that some of the hypotheses examining the effect of emotion on engagement were confirmed and some of them were not. Although it has been suggested that there is a relationship between

emotion and engagement, it has emerged from the hypotheses in this study that this relationship is open to discussion. From this point of view, it can be said that more evidence is needed on studies in which emotion predicts engagement as an independent variable. In addition to engagement and achievement, the effect of emotion on variables such as satisfaction, participation, confirmation and intention to use was also tested. This result can be considered as an indication that the effect of emotion-related structures has begun to be examined in correlational studies conducted to predict adoption and diffusion in online learning.

In studies where emotions were considered as independent variables and learning strategies were predicted as dependent variables, it was noted that hypotheses about negative emotions (frustration and anxiety) were supported among these hypotheses, in which both positive and negative emotions were tested. From this point of view, it can be said that the effects and consequences of negative emotions in educational settings should be carefully examined.

It was concluded that emotion is a variable to be taken into account in online learning environments, but more studies are needed in terms of both variables to be tested and environment design to understand its role. In addition, the researches included in this study are examined in more detail and the process of presenting suggestions for future studies continues.

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## Appendix - A.Keywords used in the search string

<b>Keyword Group</b>	<b>Keywords</b>
Emotion	happiness, sadness, fear, anger disgust, surprise, contempt, interest, enjoy, amusement, pride, joy, pleasure, contentment love, admiration, relief, compass, guilt, regret, shame, disappointment, hate, emotion, feeling, mood, affect, state, flow
Method	regression, multi-level, sem, structural, path, factor, model, predict, experiment
Technology	online, blended, LMS, learning management system, social media, social networking, MOOC, e-learning, distance, mobile, augmented, virtual, video, wiki, web-based, programming, coding, robotics, computer, media, technology, ICT, animation, simulation, game, gaming, 3D

## Appendix B. Inclusion & Exclusion Criteria

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<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
Emotion and online learning together in an educational context Studies using the correlational or experimental design Full text access and publication in English	Not including online learning The study which is not a correlational or experimental design Not including a variable related to emotion in the study

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**Appendix C.** Tested hypotheses in correlational studies

Reference	Theory	Independent Variable	Dependent Variable	Proved/ Unproved
Lee, J. S. & Lee, K. (2020). The role of informal digital learning of English and L2 motivational self system in foreign language enjoyment. <i>British Journal of Educational Technology</i> , doi:10.1111/bjet.12955. BRITISH JOURNAL OF EDUCATIONAL TECHNOLOGY	L2 Motivational Self System	Age	Foreign language enjoyment	x
		Gender	Foreign language enjoyment	x
		Length of studying English	Foreign language enjoyment	✓ (for middle schhol)
		international experience	Foreign language enjoyment	✓ (for middle schhol & undergraduate)
		ideal L2 self-image	Foreign language enjoyment	✓
		ought to L2 self	Foreign language enjoyment	✓ (for middle school)
		informal digital learning	Foreign language enjoyment	✓
Ding, Y., & Zhao, T. (2020). Emotions, engagement, and self-perceived achievement in a small private online course. <i>Journal of Computer Assisted Learning</i> , 36(4), 449-457.	Control Value Theory	Boredom	Assignment engagement	✓
		Boredom	Video engagement	✓
		Annoyance	Assignment engagement	✓
		Annoyance	Video engagement	✓
		Enjoyment	Video engagement	✓
		Excitement	Assignment	✓
		Excitement	Video engagement	✓
		Excitement	Achievement	✓

		Video engagement	Assignment engagement	✓
		Video engagement	Achievement	✓
		Assignment engagement	Achievement	✓
Kim, M. Y., & Ketenci, T. (2020). The role of expressed emotions in online discussions. <i>Journal of Research on Technology in Education</i> , 52(1), 95-112.	Control-Value Theory of Achievement Emotions	Motivation	Shame	X
		Motivation	Anxiety	X
		Motivation	Enjoyment	✓
		Motivation	Anger	X
		Motivation	Fear	X
		Motivation	Disgust	X
		Motivation	Sadness	X
		Motivation	Engagement	X
		Motivation	Final Score	✓
		Enjoyment	Engagement	X
		Enjoyment	Final Score	X
		Anxiety	Engagement	X
		Anxiety	Final Score	X
		Shame	Engagement	X
Shame	Final Score	X		

		Anger	Engagement	X
		Fear	Engagement	X
		Disgust	Engagement	X
		Sadness	Engagement	X
		Anger	Final Score	X
		Fear	Final Score	✓
		Disgust	Final Score	X
		Sadness	Final Score	X
Heckel, C., & Ringeisen, T. (2019). Pride and anxiety in online learning environments: Achievement emotions as mediators between learners' characteristics and learning outcomes. <i>Journal of Computer Assisted Learning</i> , 35(5), 667-677.	Control Value Theory + Social Cognitive Theory	Self-efficacy	Control	✓
		control	interest	✓
		interest	pride	✓
		pride	satisfaction	✓
		interest	satisfaction	✓
		interest	Competence gain	✓
		pride	Competence gain	✓
		anxiety	Competence gain	X
		interest	anxiety	X
		Competence gain	satisfaction	✓

		anxiety	satisfaction	✓
Abdous, M. (2019). Influence of satisfaction and preparedness on online students' feelings of anxiety. <i>Internet and Higher Education</i> , 41, 34-44.	social cognitive theory	Gender	online learning anxiety	✓
		Academic Year	online learning anxiety	(freshman & sophomore <b>supported</b> ; junior, senior <b>NOT supported</b> )
		Enrollment status	online learning anxiety	✓
		Online learning experience	online learning anxiety	✓
		Online student satisfaction	online learning anxiety	✓
		Online student preparedness	online learning anxiety	✓
		Ramirez-Arellano, A., Bory-Reyes, J., & Manuel Hernandez-Simon, L. (2019). Emotions, Motivation, Cognitive-Metacognitive Strategies, and Behavior as Predictors of Learning Performance in Blended Learning. <i>Journal of Educational Computing Journal</i> , 57(2), 491-512.	Control Value Theory	Missing learning activities
Self-efficacy	Student's overall grade			✓
Text-anxiety	Student's overall grade			✓
Emotional disaffection	Student's overall grade			✓
Organization	Student's overall grade			✓
Metacognitive self-regulation	Student's overall grade			✓
Gao, J., Zhao, B., Xiong, Y. (2019). Optimization design of the online learning environment for ethnic	online-learning emotional	Self-efficay	Learning interest	✓
		Self-worth	Learning interest	X

college students: the perspective of the emotional participation. <i>Interactive Learning Environments.</i>	participation theory model,	Self-worth	Self-efficacy	✓
		Sense of belonging	Learning interest	X
		Sense of belonging	Self-worth	✓
		Sense of belonging	Self-efficacy	X
Im, T., & Kang, M. (2019). Structural Relationships of Factors Which Impact on Learner Achievement in Online Learning Environment. <i>International Review of Research in Open and Distrubuted Learning, 20(1)</i> , 111-124.	Social cognitive theory	Achievement Goal Orientation related to AApproach	Participation	X
		Achievement Goal Orientation related to AVoidance	Participation	✓
		Self-regulated learning	Participation	✓
		Text-anxiety	Participation	✓
		Self-efficacy	Participation	✓
		Text-anxiety	Learning achievement	✓
		Participation	Learning achievement	✓
		Participation	Learning satisfaction	✓
		Learning satisfaction	Learning achievement	✓
Lee, J. S., & Drajadi, N. A. (2019). Affective variables and informal digital learning of English: Keys to willingness to communicate in a second language. <i>Australasian</i>	Willingness to communicate model	receptive informal digital L2 activities	willingness to communicate L2	X
		productive informal digital L2 activities	willingness to communicate L2	✓
		grit	willingness to communicate L3	✓

Journal of Educational Technology, 35 (5), 168-182		motivation	willingness to communicate L4	✓
		self-confidence	willingness to communicate L5	✓
		L2 speaking anxiety	willingness to communicate L6	X
Ramirez-Arellano, A., Acosta-Gonzaga, E., Bory-Reyes, J., et al. (2018). Factors affecting student learning performance: A causal model in higher blended education. <i>Journal of Computer Assisted Learning</i> . 807-815 ), 6(34 .	Control Value Theory	Value	Emotions(Frustration, Anxiety, Enjoyment, Pride, Interest)	X
		Expectancy	Emotions(Frustration, Anxiety, Enjoyment, Pride, Interest)	Supported for negative emotions
		Value	cognitive strategies	X
		Value	metacognitive strategies	X
		Value	learning strategies	✓
		Expectancy	cognitive strategies	X
		Expectancy	metacognitive strategies	✓
		Expectancy	learning strategies	X
		learning strategies	learning outcomes	✓
		cognitive strategies	learning outcomes	✓
		emotion	learning strategies	Supported for negative emotions
		emotion	cognitive strategies	X

		emotion	metacognitive strategies	X
Chen, C-P. (2018). Understanding mobile English-learning gaming adopters in the self-learning market: The Uses and Gratification Expectancy Model. <i>Computers &amp; Education</i> , 126, 217-230.	Uses and Gratifications Theory (UGT) ve Expectation Confirmation Theory (ECT)	perceived mobile computer anxiety	confirmation	X
		perceived second language anxiety	confirmation	✓
		confirmation	perceived usefulness	✓
		confirmation	perceived playfulness	✓
		confirmation	gratification	✓
		perceived usefulness	gratification	✓
		perceived playfulness	gratification	✓
		gratification	continuance intention	✓
Makransky, G., Lilleholt, L. (2018). A structural equation modeling investigation of the emotional value of immersive virtual reality in education. <i>ETR&amp;D</i> , 66(5), 1141-1164.	Control Value Theory	VR features	affective factors	Partially supported (NOT supported for enjoyment)
		VR features	usability	✓
		VR features	cognitive factors	✓
		usability	affective factors	✓
		usability	cognitive factors	Partially supported (NOT supported for reflective thinking)

		affective factors	perceived learning outcomes	Partially supported (NOT supported for presence)
		cognitive factors	perceived learning outcomes	Partially supported (NOT supported for reflective thinking)
<p>Datu, J. A. D., Yang, W., Valdez, J. P. M. (2018). Is facebook involvement associated with academic engagement among Filipino university students? A cross-sectional study. <i>Computers &amp; Education</i>, 246-253 , 125 .</p>		overuse	engagement (agentic, behavioral, cognitive and emotional)	Partially supported (supported for agentic engagement and behavioral engagement)
		self-expression	engagement(agentic, behavioral, cognitive and emotional)	Partially supported (supported for agentic engagement)
		boredom	engagement (agentic, behavioral, cognitive and emotional)	Partially supported (Supported for behavioral engagement)
		persistence	engagement (agentic, behavioral, cognitive and emotional)	X
<p>Tsai, Y-H., Lin, C-H., Hong, J-C., et al. (2018). The effects of metacognition on online learning interest and continuance to learn with</p>		metacognition	liking	✓
		metacognition	enjoyment	✓
		metacognition	engagement	✓

MOOCs <i>Computers &amp; Education</i> , 121,18-29		liking	CIU	✓
		enjoyment	CIU	✓
		engagement	CIU	✓
Touati, A., Baek, Y. (2018). What Leads to Player's Enjoyment and Achievement in a Mobile Learning Game? <i>Journal of Educational Computing Research</i> , 56 (3), 344-368.	Cognitive Evaluation Theory (CET), Bandura's Social Cognitive Theory (SCT), and Harter's Theory	prior game experience	perceived competence	✓
		perceived competence	game attitude	✓
		perceived competence	intensity of use	✓
		perceived competence	enjoyment	✓
		perceived competence	achievement	X
		game attitude	enjoyment	✓
		intensity of use	achievement	X
		enjoyment	achievement	✓
Kuo, Y-C. (2018). An Exploratory Study of Minority Students' Technology Usage and Perceptions of Technology: Nontraditional Adult Students in Technology-Based Environments. <i>Journal of Research on Technology In Education</i> . 50(4), 352 -366.	Social cognitive theory	computer self-efficacy	attitude	✓
		computer self-efficacy	computer anxiety	✓
		internet self efficacy	attitude	X
		internet self efficacy	computer anxiety	X