Clicking with Confidence: Influence of a Student Co-Designed MOOC on Students' Emotions and Online Learning Self-Efficacy

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Abstract
The COVID-19 pandemic has taught us that being able to learn online is now a crucial life skill and cannot be left to chance. Pedagogical interventions are critical to support students in building their digital skills and confidence, given identified links between online learning readiness and academic success. Based on this premise, the purpose of this study is to investigate the influence of an online learning preparatory MOOC on students' emotions and levels of online learning self-efficacy (OLSE). The paper begins by illustrating how the design and delivery of the MOOC had the potential to provide participants with the necessary mastery experiences, vicarious experiences, verbal persuasion, and affective regulation opportunities to evaluate and develop their online learning self-efficacy beliefs. Students starting or continuing their higher education online because of COVID-19 were encouraged to take the MOOC as part of their development. Students' self-reports of their emotion and OLSE were compared pre- and post-MOOC. Paired sample t-tests found significant differences in all four dimensions of OLSE following participation in the MOOC. Participants reported higher levels of Self-Efficacy Navigating Technology, Self-Efficacy Managing Time, Self-Efficacy Learning at a Distance, and Self-Efficacy Communicating Online. Additionally, changes in learners' emotions were observed post-MOOC. Most participants reported feeling anxious about online learning before the MOOC. This changed, however, post-MOOC, with the majority feeling positive and hopeful about online learning following the two-week course. The paper concludes by discussing the implications for practice.

Keywords: Online learning, self-efficacy, emotion, MOOC, self-efficacy beliefs

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While most educators want to *click* beyond the COVID-19 pandemic, it remains a challenging and valuable learning experience. The pandemic tested our resilience and contributed to renewed interest in the role of emotion in teaching, learning, and assessment. The need to support learners with a "pedagogy of care" has been paramount throughout the pandemic (Buckley-Marudas & Rose, 2021; Burke & Larmar, 2020). However, a kinder and softer form of online pedagogy by itself does not address the anxiety, trepidation, and very real challenges students face in becoming effective online learners. Learning online is not the same as learning in a traditional classroom and requires mastery of a different skill set. The pandemic has taught us that these skills cannot be assumed, and that carefully designed interventions are required to acknowledge and support students' affective experiences as they move to a new modality and develop their digital capacity to be successful online learners. This paper reports the impact of a MOOC co-designed with students to support the development of online learning self-efficacy (OLSE) in response to the COVID-19 crisis. The findings demonstrate how the MOOC as a support intervention, anchored in a wider life-skill framework, played a valuable role in the context of the pandemic where most students learned online out of necessity rather than by choice.

Literature Review

In the past, education research has focused primarily on the role of cognition and the rational brain in learning at the expense of affect (Beirne, 2020). Fortunately, in more recent years, research has taken an "affective turn" (Zembylas, 2021). In this section, a scoping review will briefly explore the current understanding of the role of emotion and self-efficacy in educational contexts, and previous intervention research in these areas will also be examined.

Emotions in Education

Awareness of the role emotions play in academic settings (i.e., academic emotions) has been growing for several years (O'Regan 2003; Pekrun et al., 2002). However, the global health pandemic has produced greater interest and created more questions about the relationship between emotions and learning in higher education contexts (Raccanello et al., 2022; Katzman & Stanton, 2020). An expanding body of literature overwhelmingly recognises academic emotion as a crucial factor that can constrain or facilitate the learning experience. Studies have shown that emotion can have an impact on the learning process through attention, memory, motivation, and self-regulation (Pekrun, 2011).

Emotions are frequently classified by their valence as either positive (e.g., hope, excitement) or negative (e.g., anxiety, frustration) and generally, positive emotions are seen to be more conducive to learning (Tan et al., 2021). However, the situation is often more complex and can depend more on whether the emotion is activating or deactivating (Pekrun, 2006). In some cases, negative activating emotions such as frustration or anxiety can enable learning and achievement (Pekrun & Perry, 2014; Rowe & Fitness, 2018).

The current study aligns with a dynamic perspective of emotions, which views emotions to be under constant change, varying situationally and over time (Dörnyei, 2009), and emerging from person-environment interactions (Pekrun et al., 2011; Schutz et al., 2006). It can thus be deduced that a change in the mode of learning, especially under the unique external conditions of the COVID-19 pandemic, had the potential to be emotionally overwhelming, eliciting strong emotional responses among students that may influence their participation and performance.

Previous research indicates that anxiety is a problem faced by online learners, especially first-time online students (St Clair, 2015) and that other negative emotions such as fear, anger, and helplessness have been found to be higher in online students compared to students in traditional classes (Butz et al., 2015).

Understanding learners' emotions under the unique and challenging conditions of transitioning to higher education and an online mode of delivery is an important step in supporting students during and after this process. Studies focusing on emotion and well-being in higher education contexts during the pandemic are not uncommon (e.g., Raccanello et al., 2022; Visser & Law-van Wyk, 2021), however, the current study seeks not only to identify students' emotions but also track how they change following participation in an online learning preparatory MOOC.

Self-Efficacy in Education

Self-efficacy is posited to be an important component of learning success. As a key element of social cognitive theory, self-efficacy "refers to beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Notably, it is an individual's *belief* in their own ability and does not necessarily equate to the reality of actual ability. Self-efficacy is hypothesised to play a key role in human agency, affecting decision making, effort, perseverance, and resilience (Bandura, 1997). People with high self-efficacy for a task are more likely to participate, expend more effort, and persist at that task in the face of difficulties (Bandura, 1997).

The current study focuses more specifically on online learning self-efficacy (OLSE) which refers to one's confidence to perform academic tasks successfully in an online environment. While less advanced than research in relation to self-efficacy for face-to-face learning, existing studies indicate that OLSE is associated with successful online learning experiences. Studies have shown that OLSE can be a predictor of achievement (Ergul, 2004; Joo et al., 2013), retention (Holder, 2007; Yukselturk et al., 2014), perceived learning (Alqurashi, 2019; Wright et al., 2006), satisfaction (Artino, 2008; Landrum, 2020; Shen et al., 2013), and engagement (Pellas, 2014; Prior et al., 2016). The ability to self-regulate and motivate oneself to engage in the learning process is important for all students, independent of the learning environment. The importance, though, is amplified in an online or distance learning environment where the instructor is not always visually or synchronously present and learners have to take greater responsibility for the management and control of their own academic progress (Milligan & Littlejohn, 2014; Stephen et al., 2020; Terras & Ramsay, 2015).

Like emotion, self-efficacy beliefs are not fixed traits but vary across activity domains and situational conditions (Bandura, 1997). The multifaceted nature of online learning suggests that OLSE will vary across the different tasks or situations associated with the online learning context. Many researchers, however, have noted that a large proportion of studies have focused on computer self-efficacy or self-efficacy in relation to technology use, disregarding other aspects of the online learning experience (Alqurashi, 2019; Shen et al., 2013; Zimmerman & Kulikowich, 2016). Shen et al. (2013) demonstrated that OLSE is multi-dimensional by identifying five dimensions: (i) self-efficacy to complete an online course, (ii) self-efficacy to interact socially with classmates, (iii) self-efficacy to handle tools in a Course Management System (CMS), (iv) self-efficacy to interact with instructors in an online course, and (v) self-efficacy to interact with classmates for academic purposes. Similarly, Zimmerman and Kulikowich (2016) developed the Online Learning Self-Efficacy Scale (OLSES) which includes

other aspects of online learning, such as self-directedness, communication skills, time-management skills, and technology use. An adapted version of the OLSES is the scale used in the current study because it was deemed to be more holistic and relevant to the learning context.

Developing Self-Efficacy Through Pedagogical Interventions

The important links between self-efficacy and learning success has meant that improving self-efficacy via teaching, learning support, and curriculum design has been the focus of several studies. For example, Bartimote-Aufflick et al. (2016) identified 17 intervention studies published since 2000 that compared self-efficacy under different conditions or monitored self-efficacy over time. Findings from the studies identified showed that self-efficacy could be improved because of completing a course, participating in a particular learning activity, or when certain teaching strategies were employed. The studies were conducted among postgraduate and undergraduate students across a wide range of countries. Strategies used to promote self-efficacy included drawing on the affordances of multimedia and e-learning material, facilitating peer-interaction, providing additional resources for challenging concepts, and encouraging students to share personal experiences (Bartimote-Aufflick et al., 2016). Collectively, the findings of this review indicate the potential of pedagogical or learning interventions in enhancing self-efficacy among higher education students.

A few studies have looked specifically at the impact of study skills courses on self-efficacy (Macaskill & Denovan, 2013; Rodriguez & Armellini, 2017; Wernersbach et al., 2013). Rodriguez and Armellini (2017) report on the role of a study skills MOOC in increasing self-efficacy among a sample of undergraduate and professional learners. Albeit a small sample (n = 32), they found statistically significant increases in both general self-efficacy and self-efficacy in relation to specific study skills upon completion of the MOOC. This raises the question of whether similar results can be found in larger scale interventions. While limited research exploring this question is available, in a brief analysis of the components of MOOCs, Hodges (2016) indicates that MOOCs can play a role in enhancing self-efficacy at scale. However, the potential of MOOCs in terms of supporting learner self-efficacy needs further investigation, which the current study seeks to address.

Underlying many of these studies is the proposition from Bandura (1986), as part of the social cognitive theory, that individuals develop self-efficacy beliefs by interpreting information regarding their own capabilities and that this information can stem from several sources. In the next section we will look more closely at these information sources and how the design of the MOOC facilitated each one.

The Learning Context

The MOOC

A Digital Edge: Essentials for the Online Learner is a MOOC developed by Dublin City University's (DCU) National Institute of Digital Learning (NIDL) in collaboration with the Irish Universities Association (IUA). The MOOC was rapidly developed and first offered in September 2020 to address the challenges faced by college and university students as they began or continued their higher education online during COVID-19. Hosted on the FutureLearn platform, the two-week course requires approximately 3 hours of learning per week. The content is structured around four main themes: Ways of Thinking and Ways of Working (Week 1), and Tools for Working and Tools for Thriving (Week 2). For a more detailed breakdown of each week's themes see Table 1 and Table 2. The course is open to learners all over the world and aims to support them to learn how to learn online. A distinctive feature of the course is the co-design and facilitation by students who share their tips, advice, and first-hand experiences about effective online learning.

Table 1

Overview of Course Week 1

Week 1					
Ways of Thinking *Explore different ways of thinking to become a successful online learner*			**Ways of Working** *Develop better ways of working online*		
1.4	Know thyself	ARTICLE	1.11	How do I work?	POLL
1.5	What type of thinker are you?	ARTICLE	1.12	Where will I work?	ARTICLE
1.6	What type of online learner are you?	ARTICLE	1.13	How can we work together?	DISCUSSION
1.7	Seven habits of highly effective learners	VIDEO (02:04)	1.14	How can I stay on track?	POLL
1.8	Steer your own course	ARTICLE	1.15	How do I work purposefully	ARTICLE
1.9	Message in a bottle	ARTICLE			
1.10	Press pause	DISCUSSION			

Table 2

Overview of Course Week 2

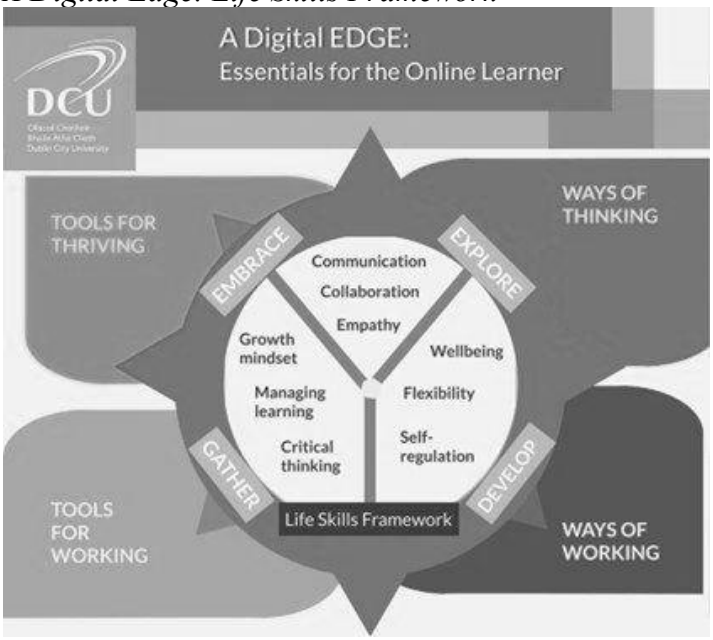
Week 2					
Tools for Working *Gather the tools needed to work online*			**Tools for Thriving** *Embrace the mindset to thrive online*		
2.3	Get connected	ARTICLE	2.11	Balancing act	ARTICLE
2.4	Get your toolkit	ARTICLE	2.12	Your wellbeing	ARTICLE
2.5	Get exploring	ARTICLE	2.13	Dynamics of space	VIDEO (01:43)
2.6	Get planning	VIDEO (02:04)	2.14	Juggling and connecting	VIDEO (01:27)
2.7	Get working	ARTICLE	2.15	Think, reflect, think!	ARTICLE
2.8	Get backed-up	EXERCISE	2.16	Beware!	ARTICLE
2.9	Get specific	DISCUSSION	2.17	A worry shared…	POLL

2.10	Press pause	ARTICLE	2.18	Press pause	ARTICLE

Learning Design. The design and development of curricula and learning activities in the MOOC are aimed at improving the lifelong learning competences of students. To achieve this, the course is anchored in the LifeComp Framework (Sala et al., 2020) and the Learning Compass 2030 (OECD, 2019). Figure 1 presents a visual representation of how these models were synthesised. The instructional approach adopted in the MOOC was influenced by the design principles underlying the FutureLearn platform, which promote visual learning and learning through conversation and storytelling (FutureLearn, 2018).

Figure 1

A Digital Edge: Life Skills Framework



Central to the design of the MOOC was the need to facilitate the four information sources posited by Bandura to influence self-efficacy: i) enactive mastery experiences, ii) vicarious experiences, iii) verbal persuasion, and iv) physiological and affective sources. Table 3 describes each of these four information sources and details how the course format and content and the corresponding learner experience over the two weeks could potentially facilitate each one.

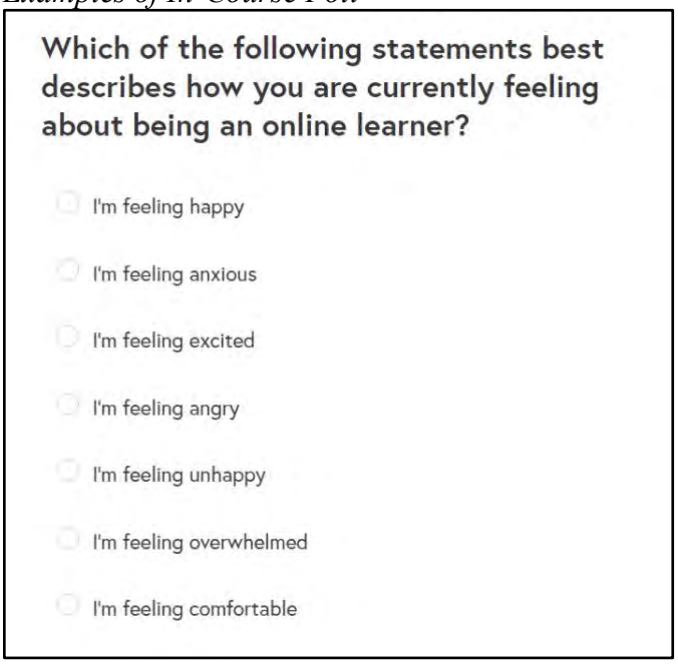
Table 3
Sources of Self-Efficacy Development in the MOOC

Information Source	Description	Relation to MOOC
Enactive Mastery Experiences	An individual's prior experiences with the task at hand, or a similar task, which can serve as an indicator of capability. Past successes can build confidence, while failures can weaken it. The difficulty of a task and the amount of effort required also contribute to a person's sense of self-efficacy. Enactive mastery experiences are determined to be the most influential source of efficacy information as they are accomplishments that we have experienced ourselves, for which we have tangible experiential evidence of success (Bandura 1997).	The MOOC was an authentic online learning experience. Participation in an online course can give students tangible evidence that they can learn successfully online. It was expected that the non-formal, low risk nature of the course would encourage participation, even among less experienced learners.
Vicarious Experiences	Social comparisons, which allow individuals to perceive their abilities in relation to the successes or failures of others, such as peers and role models. Observing others, with whom they can identify, succeed at a task can provide individuals with a sense of confidence in their own ability to perform similar tasks (Bandura 1997).	The MOOC was co-designed and co-facilitated by students who had prior experience learning online. Participant's vicarious experience was encouraged through the use of real-life examples and testimonials from these students. Testimonials were included in the course content as quoted text and audio clips. Student facilitators were also available for the 2 weeks to answer questions and share their experiences in the discussion forums at the end of each step. Participants were encouraged to ask questions and draw on the knowledge and experience of the student facilitators. By observing the successes of their peers, learners can generate efficacy beliefs that they too can obtain success through persistence and effort.

Verbal Persuasion	Positive encouragement and feedback from others. Realistic affirmations from others can boost self-efficacy perceptions. Often considered a weaker source of self-efficacy as compliments can often be given loosely without substantiation (Bandura 1997).	Positive verbal persuasion was provided through the discussion forums by both the instructors and the student mentors to help participants believe that they can cope with difficult situations when learning online.
Physiological and affective states	The influence of our body's physical and emotional reactions to certain situations and tasks on self-efficacy. Experiences of anxiety, stress, arousal, fatigue, for example, and their accompanying physical manifestations, can leave a student with a low perception of their ability to persist in a task.	Well-being, emotional regulation and co-regulation were key components of the pedagogical framework of this MOOC. Polls incorporated at four points throughout the course encouraged learners to reflect and share how they were feeling about learning online (See Fig 2.). The polls supported self-regulation among the learners and raised awareness of emotion in online learning. The poll format allowed participants to respond anonymously while also being able to see how their peers were feeling.

Figure 2

Examples of In-Course Poll



Methodology

Research Questions

The following research questions were examined in this study:

1. Can an online learning preparatory MOOC improve OLSE among learners?
2. Do students' emotions toward online learning change following participation in the MOOC?

Participants

Participants were individuals enrolled in the first iteration of the MOOC, *The Digital Edge: Essentials for the Online Learner*, in September 2020, who completed both a pre-course and post-course questionnaire. In total, 135 participants completed both questionnaires, forming the sample for this study. Among this sample, 98 were females (73%), 34 were males (25%), 1 person responded as "other" (0.7%), and 2 chose the option "prefer not to say" (1%). Over two-thirds of participants were entering their first year of college or university but undergraduates in subsequent years and postgraduates were also included in the pool of respondents.

Overall, 6,598 individuals enrolled in this first iteration of the MOOC, but it was not possible to determine how the study's sample compared to this wider population of learners due to European data privacy rules and platform data sharing limitations.

Research Design and Procedure

A repeated measures design was adopted, using pre- and post-course questionnaires to i) identify initial levels of OLSE and emotional responses to online learning, and ii) trace changes in learners' self-efficacy beliefs and emotions related to their learning experience. Two online surveys were administered. Both surveys were embedded in the course for voluntary student response.

The pre- and post-course questionnaires were designed to capture data pertaining to participants' demographics, emotional states, and online learning self-efficacy.

Demographic Variables

Participants were asked to self-report demographic information, including gender and academic status. For academic status, participants were asked to report whether they were a new student (i.e., entering their first year of college or university) or a continuing student (i.e., in subsequent years of college or university).

Emotional States

A list of six discrete emotion states was used to collect data pertaining to student affect. The list was derived from previous studies on learning-centric emotions (Beirne, 2020; D'Mello, 2013; Pekrun et al., 2011). Participants were asked to select the emotion they experienced most strongly. Responses were subsequently used to generate a new binary variable with the categorically positive emotions coded as 1 and categorically negative emotions coded as 0.

Online Learning Self-Efficacy

Self-efficacy was measured using a scale adapted from Zimmerman and Kulikowich (2016). Adaptation involved the removal and re-wording of items to facilitate a global audience and the learning context in question. Participants were asked to rate 20 online learning-related tasks using a 5-point Likert scale. A rating of 1 signified that they believed that they would not

be able to perform the task at all; a rating of 5 signified that they believed that they could perform the task extremely well.

Results

The Dimensions of Online Learning Self-Efficacy

An exploratory factor analysis was conducted to identify the dimensions of OLSE. An oblique rotation method was applied because each self-efficacy dimension was assumed to be correlated with one another. Factor loadings below .30 were suppressed. Four factors with eigenvalues > 1 were extracted from the factor analysis. The four-factor solution accounted for 67% of total variance and the four factors were internally consistent yielding Cronbach Alpha's of .878, .892, .848, and .900, respectively. None of the four subscale reliability analyses revealed items whose removal would increase the subscale's alpha coefficient. The Kaiser-Meyer-Olkin measure of sampling adequacy (.893) and Bartlett's Test of Sphericity (p=.001) both indicated that factor analysis is appropriate.

Table 4

Results of Exploratory Factor Analysis

	Factor Loadings			
	1	2	3	4
Navigate online course materials efficiently	.996			
Find the course syllabus online	.857			
Overcome technical difficulties on my own	.849			
Learn to use new online tools	.692			
Submit assignments online	.685			
Use the library's online resources efficiently	.442			
Search the Internet to find or gather information for online learning	.334		.329	
Manage time effectively		.929		
Develop and follow a plan for completing all required work on time		.845		
Complete all assignments on time		.803		
Focus on coursework when faced with distractions		.719		
Meet deadlines with very few reminders	.418	.570		
Communicate effectively with other students online			.974	
Communicate effectively with my instructor online			.842	
When a problem arises, promptly ask questions in the appropriate forum			.710	
Communicate using asynchronous technologies			.708	
Use synchronous technology to communicate with others			.582	
Complete a group project entirely online			.479	
Learn without being in the same physical room as other students				.995
Learn without being in the same physical room as the instructor				.935
Cronbach Alpha	.878	.892	.848	.900

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.

Items loading on component 1 predominantly relate to using and navigating technology for learning. Items loading on component 2 are mainly associated with self-motivation and time management. Items loading on component 3 concern communicating using technology. The items loading on component 4 relate to learning at a distance. The component correlation matrix is shown in Table 5.

Table 5

Component Correlation Matrix

Component	1	2	3	4
1	-			
2	.494	-		
3	.587	.529	-	
4	.569	.432	.552	

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.

The components resulting from this factor analysis were used to create four subscales: Component 1, *Navigating Technology*; Component 2, *Time Management* (this includes items relating to motivation); Component 3, *Communicating Online*; Component 4, *Learning at a Distance*. Evidence of convergent and divergent validity was examined using correlational techniques. The results of these correlation analyses are shown in Table 4 and 5.

Can a Preparatory MOOC Improve OLSE Among Learners?

To answer this research question, paired samples t-tests were conducted to compare changes between pre-and post-MOOC scores for each of the four dimensions of OLSE. Results from these analyses, presented in Table 6, reveal that there are significant differences between the means for each dimension of OLSE. The post-MOOC scores are significantly higher than the pre-MOOC scores in all cases. Effect sizes for these findings range from moderate to large (Cohen, 1988). The standardised difference between the pre- and post-course means for self-efficacy to communicate online is notably large.

Table 6

Paired T-Tests and Cohen's d Statistics for the Four OLSE dimensions

Variable		*N*	*M*	*SD*	*T*	*p*	*Cohen's d*
	Pre	135	3.732	0.694	-5.124	<.001	0.441
Navigating Technology	Post	135	3.973	0.649			
Time Management	Pre	135	3.656	0.833	-5.076	<.001	0.437

	Post	135	3.933	0.699			
	Pre	135	3.415	0.762	-9.667	<.001	0.832
Communicating Online	Post	135	3.936	0.643			
	Pre	135	3.374	0.916	-5.485	<.001	0.472
Learning at a Distance	Post	135	3.767	0.745			

Do Students' Emotions Toward Online Learning Change Following Participation in the MOOC?

To answer this research question, descriptive statistics collected pre- and post-MOOC were analysed. Before the MOOC, frequency counts for each emotion revealed that "anxiety" was the emotion felt most strongly by most participants (54%) and approximately 62% of the participants reported negative emotion overall (see Table 7).

Table 7

Emotion Descriptive Statistics

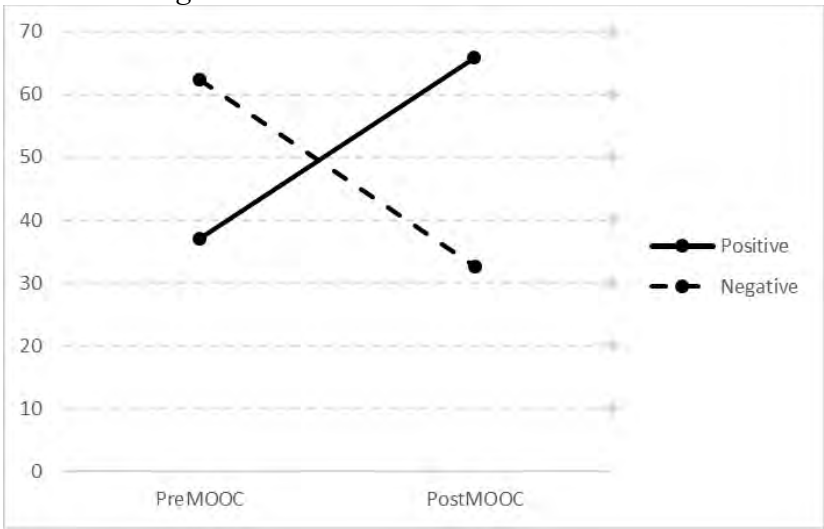
	Pre-MOOC		**Post-MOOC**	
Emotion	N	%	n	%
Positive Sentiment	54	37.0	91	65.8
Excitement	23	17.0	33	24.4
Happiness	7	5.2	11	8.1
Hope	20	14.8	45	33.3
Negative Sentiment	81	62.3	44	32.6
Anger	4	3.0	2	1.5
Anxiety	73	54.1	40	29.6
Hopelessness	7	5.2	2	1.5
Blank	1	0.7	2	1.5
	135	100.0	135	100.0

However, the distribution changed among the post-MOOC data. "Hope" was the emotion felt most strongly by the plurality of learners (33%) on completing the MOOC and nearly two-thirds of participants reported positive emotion overall (66%). Figure 3 further illustrates the change in participants' overall sentiment (positive or negative) towards online learning pre- and

post-MOOC.

Figure 3

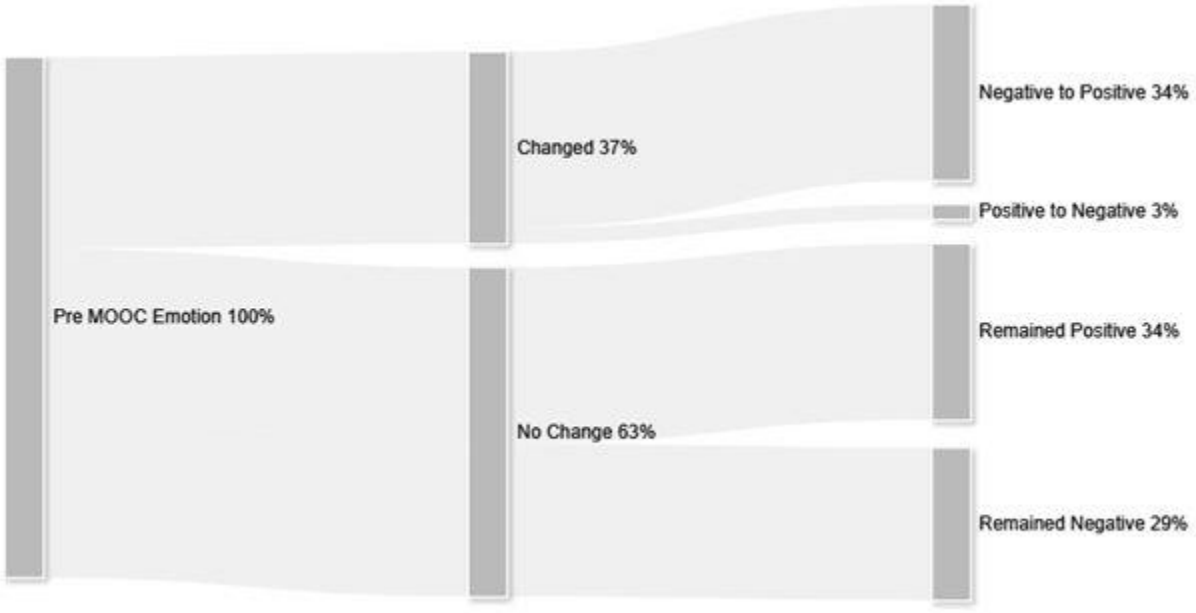
Overall Changes in Sentiment Pre- and Post- MOOC



Drawing on the binary sentiment data, Figure 4 presents a more detailed breakdown of individual sentiment changes following MOOC participation. These results show that 37% of participants changed their sentiment towards online learning post-MOOC. Nearly all these people changed from negative to positive sentiment.

Figure 4

Distribution of Sentiment Changes from Pre to Post-MOOC



Discussion

The purpose of this study was to explore emotion and OLSE among higher education students in the context of COVID-19 and examine the influence of an online learning preparatory MOOC on these variables.

All four dimensions of OLSE were enhanced after experiencing a two-week online learning preparatory MOOC. Following participation in the MOOC, participants reported feeling more confident in their ability to i) navigate the technological aspects of learning online, ii) communicate in an online environment, iii) manage their time while learning online, and iv) learn without being in the same room as their instructor or peers. The biggest increase was for self-efficacy to communicate online. Notably, learning through conversation is a key design principle underpinning the course and the wider FutureLearn platform (FutureLearn, 2018). These findings align with existing research that has shown that OLSE can be improved over time (Bartimote-Aufflick et al., 2016) as well as the notion that competence and confidence can be improved through authentic mastery experiences (Pajares, 1997). The question remains, however, as to whether the improvement can be attributed to participation in the MOOC. Nevertheless, the findings can be seen to extend the previous narrative exploring the potential of MOOCs (Hodges 2016) or online orientations more generally (Abdous, 2019) in enhancing self-efficacy at scale.

When reflecting on the move to online learning because of the pandemic, students experienced the full range of emotions listed. While nearly a third of students reported feeling hopeful and excited about learning online, anxiety was the strongest emotion for the majority. Other negative emotions such as hopelessness and anger were also reported, but by fewer people. The prevalence of anxiety at this time is not surprising and was also found in other studies which focused on students' emotions during the pandemic (Chien et al., 2022; Novara et al., 2022). A comparison with post-MOOC emotion reports indicates a shift in students' emotions after the two weeks. Following the MOOC, most students reported feeling positive about online learning, with hope being the emotion participants felt most strongly. For over a third of participants, their strongest emotion changed from a categorically negative emotion before the MOOC to a positive one after. These findings contribute to existing research that explores how situational factors such as course content and design can impact emotion (D'Mello et al., 2014) and, more specifically, indicate the potential of MOOCs in scaffolding the online learning experience.

Overall, these findings are important, given that higher self-efficacy and positive emotion are associated with learning success (Bartimote-Aufflick et al., 2016; Tan et al., 2021).

Implications for Online Teaching and Learning

Interventions to foster positive emotion and self-efficacy constitute an area of interest for higher education institutions and practitioners as they endeavour to encourage and support student well-being, confidence, and, ultimately, learning success. Cleveland-Innes et al. (2016) highlight the important role of online learning preparatory courses stating that:

> … there is a need to pay attention to the skills students need to develop to become successful online learners. It also underscored that prior levels of education and even previous course attempts may not have helped students to develop these essential skills (p. 596).

While other MOOCs and short courses exist, it is important to note that our findings are interpreted in the context of COVID-19 and the MOOC described in this paper, and we would caution against making broader generalisations. In that regard, based on the findings in the

current study, we recommend that the MOOC, *The Digital Edge: Essentials for the Online Learner,* be used as a pedagogical intervention to improve OLSE among higher education students when aiming to enhance learner's confidence communicating when learning online. Notably, since the MOOC's development, it has now become a core feature of Dublin City University's student induction program, with over 2500 students having completed the course. While there is merit to embedding or contextualising such interventions at an institutional level, the MOOC with its co-facilitation by students also shows the value of more learner-driven and self-directed initiatives. In this respect, there are two key lessons from the MOOC experience. First, the MOOC demonstrates the value and importance of incorporating a strong student voice in the learning design process. Students need to be part of the design team as co-authors rather than simply the end audience. Second, the MOOC confirmed that students should not be left to their own devices in learning how to learn online and in developing their self-regulatory dispositions and positive emotions towards studying in digital environments. Such interventions as described in this paper can play a valuable role, especially when intentionally designed and anchored in a framework to support emotion, digital well-being, and online learning readiness.

Limitations

This final section highlights some limitations that should be considered. First, as in other studies with similar themes, there is a limitation in using self-reported instruments as they are subject to measurement errors and personal biases. Second, this investigation was non-experimental in nature which limits the interpretation and generalisability of the results. While the post-course questionnaire was embedded at the end of the MOOC, the researchers have no indication of the extent to which participants completed the MOOC. Similarly, we cannot account for any other interventions or student experiences that could have influenced their self-efficacy between completing the pre- and post-course questionnaires. Most institutions developed new resources to support their students throughout the crisis and the impact of this material is impossible to determine. In addition, the effect of the pre-test as an intervention could have had a bearing on the score of the post-test. Also, low response rates, attributable to the longitudinal nature of the study and high dropout rates in MOOCs more generally, along with the self-selecting sample, limit the representativeness and generalisability of the findings. Finally, it was not possible to track the *stickiness* of the positive changes reported by students over the first few weeks and beyond of their online study, which raises a methodological challenge for future researchers.

Conclusion

There is every indication that online and hybrid learning options in higher education will become more prevalent in the post-pandemic era. Furthermore, digital literacy and the ability to learn online will become increasingly relevant to life-long learning in the workplace as well as assisting students to become active contributors to society. It is our responsibility as educators to support and care for students as they strive to negotiate the demands of learning in an ever-evolving digital society. The strong association established in the literature between learning success and both emotion and self-efficacy indicates that these variables are important to consider in helping students be successful and persevere in the face of challenges. This study, therefore, sought to examine the effect of a MOOC on students' emotions and OLSE beliefs and the results indicated positive changes for both constructs post-MOOC.

Investigating the effects of a learning intervention on students' OLSE and emotion extends knowledge in both fields but also provides actionable learnings from the pandemic for higher education educators and policy makers. A systematic review of pandemic-related online learning readiness literature conducted by the authors in conjunction with the current study highlighted the need to bridge theory and research with practice. It showed limited knowledge of the literature and that, while many studies arising from the pandemic had headline recommendations for practice, well-designed interventions to support student success for online learning were scarce (Beirne et al., 2022).

Overall, this study offers positive new insights for practice, but there is still much to be done in this area. More longitudinal research is needed to investigate self-efficacy and emotion in online learning contexts. Understanding the temporal dynamics of these constructs and related learner and situational variables could hold important insights for pedagogical interventions. The inter-relationships between these variables and online learning readiness also warrants further inquiry (Chien et al., 2022).

Declarations

Ethical approval for the study was granted by the Research Ethics Committee in Dublin City University. The authors have no conflicts of interest to declare.

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References

Abdous, M. (2019). Well begun is half done: Using online orientation to foster online students' academic self-efficacy. *Online Learning, 23*(3). doi:http://dx.doi.org/10.24059/olj.v23i3.1437

Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. *Distance Education*, *40*(1), 133-148. https://doi.org/10.1080/01587919.2018.1553562

Alyami, M., Melyani, Z., Al Johani, A., Ullah, E., Alyami, H., Sundram, F., Hill, A., & Hennig, M (2017). The impact of self-esteem, academic self-efficacy and perceived stress on academic performance: A cross-sectional study of Saudi psychology students. *European Journal of Educational Sciences*, *4*(3), 51-63. https://doi.org/10.19044/ejes.v4no3a5

Artino Jr, A. R., & Jones II, K. D. (2012). Exploring the complex relations between achievement emotions and self-regulated learning behaviors in online learning. *The Internet and Higher Education*, *15*(3), 170-175. http://dx.doi.org/10.1016/j.iheduc.2012.01.006

Artino Jr, A. R., & Stephens, J. M. (2009). Academic motivation and self-regulation: A comparative analysis of undergraduate and graduate students learning online. *The Internet and Higher Education*, *12*(3-4), 146-151. https://doi.org/10.1016/j.iheduc.2009.02.001

Artino, A. R. (2008). Motivational beliefs and perceptions of instructional quality: Predicting satisfaction with online training. *Journal of computer assisted learning*, *24*(3), 260-270. https://doi.org/10.1111/j.1365-2729.2007.00258.x

Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), Annals of child development. Vol. 6. *Six theories of child development* (pp. 1-60). Greenwich, CT: JAI Press

Bandura, A. *(*1997*). Self-efficacy: The exercise of control. New York: Freeman.*

Bartimote-Aufflick, K., Bridgeman, A., Walker, R., Sharma, M., & Smith, L. (2016). The study, evaluation, and improvement of university student self-efficacy. *Studies in Higher Education*, *41*(11), 1918-1942. http://dx.doi.org/10.1080/03075079.2014.999319

Beirne, E. (2020). *What a feeling! A multistage, multimethod investigation of emotions and their antecedents in an Irish Language MOOC* (Doctoral dissertation, Dublin City University).

Beirne, E., Mac Lochlainn, C., Brown, M., & Nic Giolla Mhichíl, M. (2022). *Student readiness for online learning: A systematic literature review.* Report published for DigiTel Pro, European Association for Distance Teaching Universities (EADTU), Maastricht, The Netherlands.

Buckley-Marudas, M.F. & Rose, S. (2021). Collaboration, risk, and pedagogies of care: Looking to a postpandemic future. *The Journal of Interactive Technology and Pedagogy,* 19.

Buonomo, I., Fiorilli, C., & Benevene, P. (2019). The impact of emotions and hedonic balance on teachers' self-efficacy: testing the bouncing back effect of positive emotions. *Frontiers in Psychology*, *10*, 1670. https://doi.org/10.3389/fpsyg.2019.01670

Burić, I., Slišković, A., & Sorić, I. (2020). Teachers' emotions and self-efficacy: A test of reciprocal relations. *Frontiers in Psychology*, *11*, 1650. https://doi.org/10.3389/fpsyg.2020.01650

Burke, K., & Larmar, S. (2020). Acknowledging another face in the virtual crowd: Reimagining the online experience in higher education through an online pedagogy of care. *Journal of Further and Higher Education*, 1-15. https://doi.org/10.1080/0309877X.2020.1804536

Butz, N. T., Stupnisky, R. H., & Pekrun, R. (2015). Students' emotions for achievement and technology use in synchronous hybrid graduate programmes: A control-value approach. *Research in Learning Technology*, *23*. https://doi.org/10.3402/rlt.v23.26097

Chemers, M. M., Hu, L. T., & Garcia, B. F. (2001). Academic self-efficacy and first year college student performance and adjustment. *Journal of Educational Psychology*, *93*(1), 55. https://doi.org/10.1037/0022-0663.93.1.55

Chien, H., & Yeh, Y., & Kwok, O. (2022). How online learning readiness can predict online learning emotional states and expected academic outcomes: testing a theoretically based mediation model. *Online Learning, 26*(4), 193-208. http://dx.doi.org/10.24059/olj.v26i4.3483

Cleveland-Innes, M., Wilton, D., Ostashewski, N., & Parker, N. (2016, October). Learning to learn online: A MOOC with a difference. In G. Ubachs & L. Konings (Eds), *The Online, Open and Flexible Higher Education Conference* (p. 589). EADTU.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.), Erlbaum.

D'Mello, S. (2013). A selective meta-analysis on the relative incidence of discrete affective states during learning with technology. *Journal of Educational Psychology*, *105*(4), 1082. https://doi.org/10.1037/a0032674

D'Mello, S., Blanchard, N., Baker, R., Ocumpaugh, J., & Brawner, K. (2014). I feel your pain: a selective review of affect-sensitive instructional strategies. *Design Recommendations for Intelligent Tutoring Systems: Volume 2-Instructional Management*, *2*(35).

Dörnyei, Z. (2009). Individual differences: Interplay of learner characteristics and learning environment. *Language Learning*, *59*, 230-248.

Ergul, H. (2004). Relationship between student characteristics and academic achievement in distance education and application on students of Anadolu University. *Turkish Online Journal of Distance Education*, *5*(2). https://dergipark.org.tr/en/pub/tojde/issue/16932/176770

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39-50. https://doi.org/10.2307/3151312

FutureLearn (2018) The pedagogy of FutureLearn: How our learners learn [online]. https://www.futurelearn.com/info/press/research-insights/pedagogy-futurelearn-learners-learn

Hodges, C. (2016, April). The development of learner self-efficacy in MOOCs. In *Global Learn* (pp. 517-522). *Association for the Advancement of Computing in Education* (AACE).

Holder, B. (2007). An investigation of hope, academics, environment, and motivation as predictors of persistence in higher education online programs. *The Internet and Higher Education*, *10*(4), 245-260. http://doi.org/10.1016/j.iheduc.2007.08.002

Huang, C. (2013). Gender differences in academic self-efficacy: A meta-analysis. *European Journal of Psychology of Education*, *28*(1), 1-35. https://doi.org/10.1007/s10212-011-0097-y

Hung, M. L., Chou, C., Chen, C. H., & Own, Z. Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers & Education*, *55*(3), 1080-1090. http://doi.org/10.1016/j.compedu.2010.05.004

Jan, S. K. (2015). The relationships between academic self-efficacy, computer self-efficacy, prior experience, and satisfaction with online learning. *American Journal of Distance Education*, *29*(1), 30-40. https://doi.org/10.1080/08923647.2015.994366

Joo, Y. J., Lim, K. Y., & Kim, J. (2013). Locus of control, self-efficacy, and task value as predictors of learning outcome in an online university context. *Computers & Education*, *62*, 149-158. https://doi.org/10.1016/j.compedu.2012.10.027

Joosten, T., & Cusatis, R. (2020). Online learning readiness. *American Journal of Distance Education*, *34*(3), 180-193. https://doi.org/10.1080/08923647.2020.1726167

Karsten, R., & Roth, R. M. (1998). Computer self-efficacy: A practical indicator of student computer competency in introductory IS courses. *Informing Science*, *1*(3), 61-68. https://doi.org/10.28945/615

Katzman, N. F., & Stanton, M. P. (2020). The integration of social emotional learning and cultural education into online distance learning curricula: Now imperative during the COVID-19 pandemic. *Creative Education*, *11*(9), 1561-1571. https://doi.org/10.4236/ce.2020.119114

Kim, B., & Park, M. J. (2018). Effect of personal factors to use ICTs on e-learning adoption: comparison between learner and instructor in developing countries. *Information Technology for Development*, 24(4), 706-732. https://doi.org/10.1080/02681102.2017.1312244

Kreth, Q., Spirou, M. E., Budenstein, S., & Melkers, J. (2019). How prior experience and self-efficacy shape graduate student perceptions of an online learning environment in computing. *Computer Science Education*, *29*(4), 357-381. http://doi.org/10.1080/08993408.2019.1601459

Landrum, B. (2020). Examining students' confidence to learn online, self-regulation skills and perceptions of satisfaction and usefulness of online classes. *Online Learning, 24*(3). https://doi.org/10.24059/olj.v24i3.2066

Latchem, C. (2015) Gender issues in online learning. In Jung, I., & Gunawardena, C. N. (Eds.). (2015). *Culture and online learning: Global perspectives and research*. Stylus Publishing, LLC

Lee, Y., Choi, J., & Kim, T. (2013). Discriminating factors between completers of and dropouts from online learning courses. *British Journal of Educational Technology*, *44*(2), 328-337. https://doi.org/10.1111/j.1467-8535.2012.01306.x

Lehman, B., D'Mello, S., & Graesser, A. (2012). Confusion and complex learning during interactions with computer learning environments. *The Internet and Higher Education*, *15*(3), 184-194. http://dx.doi.org/10.1016/j.iheduc.2012.01.002

Macaskill, A., & Denovan, A. (2013). Developing autonomous learning in first year university students using perspectives from positive psychology. *Studies in Higher Education*, *38*(1), 124-142. https://doi.org/10.1080/03075079.2011.566325

Martin, K. (2005). Self-efficacy as an evaluation measure for programs in support of online learning literacies for undergraduates. *The Internet and Higher Education*, *8*(4), 307-322. https://doi.org/10.1016/j.iheduc.2005.09.004

Mega, C., Ronconi, L., & De Beni, R. (2014). What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, *106*(1), 121. https://doi.org/10.1037/a0033546

Milligan, C., & Littlejohn, A. (2014). Supporting professional learning in a massive open online course. *International Review of Research in Open and Distributed Learning*, *15*(5), 197-213.

Novara, C., Guazzini, A., Cardinali, P., Arcidiacono, C., Agueli, B., De Piccoli, N., & Esposito, C. (2022). Distance learning during the COVID-19 pandemic: Resources, obstacles, and emotional implications for Italian students in higher education. *World Futures*, 1-18. http://dx.doi.org/10.1080/02604027.2022.2133529

OECD 2019. OECD Future of Education and Skills 2030, http://www.oecd.org/education/2030-project/

Pajares, F. (1997). Current directions in self-efficacy research. In H. W. Marsh, R. G. Craven, & D. M. McInerney (Eds.), International advances in self research (pp. 1– 49). Information Age Publishing Inc.

Pekrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research and practice. *Educational Psychology Review*, *18*(4), 315-341. https://doi.org/10.1007/s10648-006-9029-9

Pekrun, R., & Perry, R. P. (2014) 'Control-value theory of achievement emotions' in Pekrun, R. and Linnenbrink-Garcia, L. (eds.) International handbook of emotions in education. Routledge/Taylor & Francis Group, pp. 120-141.

Pekrun, R., & Perry, R. P. (2014). Control-value theory of achievement emotions. In *International Handbook of Emotions in Education* (pp. 130-151). Routledge.

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The Achievement Emotions Questionnaire (AEQ). *Contemporary Educational Psychology*, *36*(1), 36-48. https://doi.org/10.1016/j.cedpsych.2010.10.002

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist*, *37*(2), 91-105. https://doi.org/10.1207/S15326985EP3702_4

Pellas, N. (2014). The influence of computer self-efficacy, metacognitive self-regulation and self-esteem on student engagement in online learning programs: Evidence from the virtual world of Second Life. *Computers in Human Behavior*, *35*, 157-170. https://doi.org/10.1016/j.chb.2014.02.048

Perkowski, J. (2013). The role of gender in distance learning: A meta-analytic review of gender differences in academic performance and self-efficacy in distance learning. *Journal of Educational Technology Systems*, *41*(3), 267-278. https://doi.org/10.2190/ET.41.3.e

Prior, D. D., Mazanov, J., Meacheam, D., Heaslip, G., & Hanson, J. (2016). Attitude, digital literacy and self-efficacy: Flow-on effects for online learning behavior. *The Internet and Higher Education*, *29*, 91-97. https://doi.org/10.1016/j.iheduc.2016.01.001

Putwain, D., Sander, P., & Larkin, D. (2013). Academic self-efficacy in study-related skills and behaviours: Relations with learning-related emotions and academic success. *British Journal of Educational Psychology*, *83*(4), 633-650. https://doi.org/10.1111/j.2044-8279.2012.02084.x

Raccanello, D., Balbontín-Alvarado, R., da Silva Bezerra, D., Burro, R., Cheraghi, M., Dobrowolska, B., & Aristovnik, A. (2022). Higher education students' achievement emotions and their antecedents in e-learning amid COVID-19 pandemic: A multi-country survey. *Learning and Instruction*, *80.* https://doi.org/10.1016/j.learninstruc.2022.101629

Rodriguez, B. P., & Armellini, A. (2017). Developing self-efficacy through a massive open online course on study skills. *Open Praxis*, *9*(3), 335-343. http://doi.org/10.5944/openpraxis.9.3.659

Rowe, A. D., & Fitness, J. (2018). Understanding the role of negative emotions in adult learning and achievement: A social functional perspective. *Behavioral Sciences*, *8*(2), 27. https://doi.org/10.3390%2Fbs8020027

Sala, A., Punie, Y., Garkov, V., & Cabrera Giraldez, M. 2020. *LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence*, EUR 30246 EN, Publications Office of the European Union.

Schutz, P.A., Hong, J.Y., Cross, D.I., & Osbon, J.N. (2006). Reflections on investigating emotion in educational activity settings, *Educational Psychology Review*, 18(4), pp. 343-360. https://doi.org/10.1007/s10648-006-9030-3

Shen, D., Cho, M. H., Tsai, C. L., & Marra, R. (2013). Unpacking online learning experiences: Online learning self-efficacy and learning satisfaction. *The Internet and Higher Education*, *19*, 10-17. https://doi.org/10.1016/j.iheduc.2013.04.001

St Clair, D. (2015). A simple suggestion for reducing first-time online student anxiety. *Journal of Online Learning and Teaching*, *11*(1), 129-135.

Stephen, J. S., Rockinson-Szapkiw, A. J., & Dubay, C. (2020). Persistence model of non-traditional online learners: Self-efficacy, self-regulation, and self-direction. *American Journal of Distance Education*, *34*(4), 306-321. http://dx.doi.org/10.1080/08923647.2020.1745619

Tan, J., Mao, J., Jiang, Y., & Gao, M. (2021). The influence of academic emotions on learning effects: A systematic review. *International Journal of Environmental Research and Public Health*, *18*(18), 9678. https://doi.org/10.3390%2Fijerph18189678

Terras, M. M., & Ramsay, J. (2015). Massive open online courses (MOOCs): Insights and challenges from a psychological perspective. *British Journal of Educational Technology*, *46*(3), 472-487. https://doi.org/10.1111/bjet.12274

Visser, M., & Law-van Wyk, E. (2021). University students' mental health and emotional wellbeing during the COVID-19 pandemic and ensuing lockdown. *South African Journal of Psychology*, *51*(2), 229–243. https://doi.org/10.1177/00812463211012219

Wernersbach, B. M., Crowley, S. L., Bates, S. C., & Rosenthal, C. (2014). Study skills course impact on academic self-efficacy. *Journal of Developmental Education*, 14-33.

Wright, V. H., Sunal, C. S., & Wilson, E. K. (2006). Research on enhancing the interactivity of online learning. Information Age Publishing Inc.

Yu, T. (2018). Examining construct validity of the student online learning readiness (SOLR) instrument using confirmatory factor analysis. *Online Learning*, *22*(4), 277-288. https://doi.org/10.24059/olj.v22i4.1297

Yu, Z. (2021). The effects of gender, educational level, and personality on online learning outcomes during the COVID-19 pandemic. *International Journal of Educational Technology in Higher Education*, *18*(1), 1-17. https://doi.org/10.1186/s41239-021-00252-3

Yukselturk, E., Ozekes, S., & Turel, Y. K. (2014). Predicting dropout student: An application of data mining methods in an online education program. *European Journal of Open, Distance and E-Learning*, *17*(1), 118-133.

Zembylas, M. (2021). The affective turn in educational theory. In *Oxford Research Encyclopedia of Education.* *https://oxfordre.com/education/view/10.1093/acrefore/9780190264093.001.0001/acrefore-9780190264093-e-1272*

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, *25*(1), 82-91. https://doi.org/10.1006/ceps.1999.1016

Zimmerman, W. A., & Kulikowich, J. M. (2016). Online learning self-efficacy in students with and without online learning experience. *American Journal of Distance Education*, *30*(3), 180-191. http://dx.doi.org/10.1080/08923647.2016.1193801