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Loneliness, academic self-efficacy, and student engagement in the online learning environment: the role of humor in learning

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Abstract

This study investigated the impact of loneliness on academic self-efficacy (ASE) and student engagement in the context of remote teaching during the COVID-19 pandemic. Moreover, as a boundary condition, we examined the role of intermediate ASE in the relationship between loneliness, student engagement, and perceived humor in learning. A total of 367 undergraduate students from six universities in Indonesia completed an online questionnaire. Data were analyzed using Macro Process version 4 to test the moderating mediation model hypothesis. As expected, the study results show that loneliness is negatively related to ASE and student engagement. ASE is proven to affect student engagement positively; concurrently, it plays an intermediate role in the link between loneliness and student engagement. Finally, humor had a significant moderating effect on learning in the tested model. This study contributes to the existing literature on loneliness and student engagement by uncovering the intermediate role of ASE. Drawing on the social cognitive theory (SCT) and instructional humor processing theory (IHTP), we explored how perceived humor in learning moderates the relationships between loneliness, ASE, and student engagement.

Keywords: Loneliness, Academic self-efficacy, Humor in learning, Remote teaching, Student engagement

Introduction

Over the last two years, the COVID-19 pandemic has raised awareness that communication and information technology are critical factors in economic, business, and educational activities. We were introduced to “work from home” and “school from home” to minimize the potential for spreading the virus. This initially caused several problems, especially in education (Cahyadi et al., 2021), because of the rapid transition from conventional to online

modes. Schools, teachers, and students have begun to adapt and make various improvements to online learning activities (Cahyadi et al., 2021). However, despite the various advantages offered by online learning, it creates a sense of loneliness among students caused by a lack of social presence (Kaufmann & Vallade, 2020). This condition was exacerbated by isolation policies and restrictions on social activities, which simultaneously led to loneliness and mental health problems among students (Fu et al., 2021; Lasheras et al., 2020; Li et al., 2021; Wang et al., 2020; Werner et al., 2021). Thus, it is essential to study loneliness to mitigate its effect on student learning behavior, especially in online learning settings during the pandemic.

Loneliness has attracted the attention of researchers over the past few years for several reasons. First, researchers have noted that the lockdown and physical and social distancing policies created increased anxiety, stress, and a sense of loneliness among students during the pandemic compared to before (Fu et al., 2021; Lasheras et al., 2020; Li et al., 2021; Wang et al., 2020; Werner et al., 2021). Second, perceived loneliness is higher in online learning than in face-to-face (Kaufmann & Vallade, 2020). Similarly, maintaining student engagement in online learning has become a particular concern for researchers (Chiu, 2022; Gillett-Swan, 2017; Salas-Pilco et al., 2022). Furthermore, online learning is becoming increasingly popular and growing in the educational environment; therefore, it is essential to alleviate students' perceptions of loneliness and mitigate its possible impact on their learning behavior (Kaufmann & Vallade, 2020). As loneliness can threaten students' mental, emotional, and psychological health (Kaufmann & Vallade, 2020; Kim et al., 2019; Richardson et al., 2017), efforts to consider its impact on student learning behaviors need to be explored. Accordingly, this study focuses on how loneliness affects academic self-efficacy (ASE) and learning engagement. Moreover, we added the role of humor in learning as a boundary condition in these relationships.

This study contributes to the literature on loneliness and learning engagement in several ways. First, apart from the COVID-19 pandemic, both loneliness and student engagement have received considerable attention in the context of online learning. However, research specifically discussing the relationship between loneliness and student engagement is scarce (e.g., McHugh Power et al., 2019; Singh et al., 2021). For example, Singh et al. (2021) examined the relationship between loneliness and student engagement in India, while McHugh Power et al. (2019) used the concept of social engagement. Thus, we add new empirical evidence by taking a sample of Indonesian students.

Second, it fulfills the need to clarify the relationship between loneliness and ASE. Previous studies on the relationship between loneliness and ASE have yielded contradictory results. While recent studies have clarified that loneliness is not associated with ASE (e.g., Andretta & McKay, 2018), older studies have reported results that support the relationship between the two (Feldman et al., 2016). Additionally, the impact of ASE

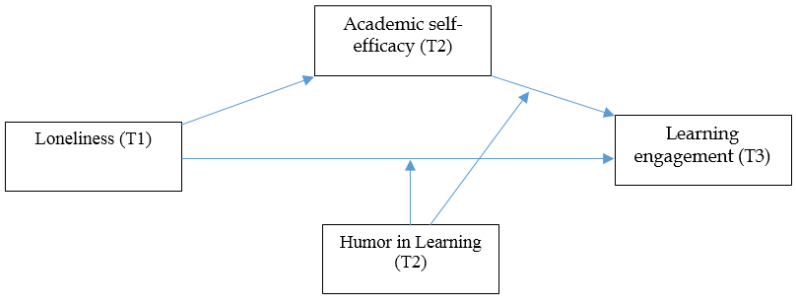

Fig. 1 Research model

on various related learning behaviors has many limitations, as it is often temporary and closely related to a point in time (Honicke & Broadbent, 2016). Furthermore, this study provides the latest empirical evidence on the relationship between loneliness and ASE during the pandemic. We used a short-term longitudinal design by separating the data collection times for the studied construct to ensure a causal relationship between the variables (see Figure 1). We also used a data collection design feasible for mediation testing (Law et al., 2016).

Third, in contrast to Singh et al. (2021), who examined the intermediate relationship between academic burnout and engagement, our study identified ASE as a mediator of the relationship between loneliness and student engagement. Drawing on the social cognitive theory (SCT) (Bandura, 1977), our study adds to the knowledge of the intermediate role of ASE and, simultaneously, as a determinant of student engagement. The relationship between self-efficacy and engagement has been explored previously; however, previous researchers have used a different concept: social self-efficacy (Bakioğlu, 2020; Jin et al., 2020; McHugh Power et al., 2019). Therefore, our study provides insights into ASE.

Finally, we integrated the instructional humor processing theory (IHPT) (Wanzer et al., 2010) as a boundary condition in the relationship between loneliness, ASE, and student engagement. Using humor in teaching is one of the instructors' pedagogical abilities (Garner, 2006) to engage students creatively and produce effective interactions (Lei et al., 2010). Thus, we advance our knowledge by adding new empirical evidence to cover the role of humor in learning to minimize the negative effect of loneliness on ASE and increase its effect on student engagement.

Theoretical framework and hypotheses

Academic self-efficacy (ASE)

ASE is another form of self-efficacy based on the social cognitive theory (SCT). Bandura first defined self-efficacy in 1960 as an individual's belief in their abilities, optimism, and

confidence in performing a task (Bandura, 1977, 1997). Because self-efficacy reflects people's beliefs about their abilities, this concept has been studied in various aspects of life, including health, education, and business. Bandura (1977) identified four main components of self-efficacy: mastery experiences; vicarious experiences; social persuasion/feedback; and a combination of emotional, physical, and psychological well-being. An additional factor of "imaginal experiences" was suggested by Maddux (2013), who stated that it contributed to shaping individual self-efficacy.

In a general context, self-efficacy is the basis of attitudes and behaviors, where individuals with high self-efficacy have a high tendency for motivation, well-being, and goal achievement (Akturk & Ozturk, 2019; Alhadabi & Karpinski, 2020; Marshall et al., 2020; Owens et al., 2015; Schöber et al., 2018; Yusuf, 2011). The concept of self-efficacy has evolved under various labels depending on the specific area used (i.e., general self-efficacy, social self-efficacy, ASE, and learning self-efficacy). However, this study used the concept of ASE (Schunk & Pajares, 2002), representing self-efficacy in an academic context. ASE is students' self-belief related to academic activities, including their belief in their ability to achieve academic or learning goals (Hussain et al., 2021). Because it concentrates on self-belief, ASE has attracted the interest of researchers in the education and teaching fields (Hayat et al., 2020; Li et al., 2020; Yokoyama, 2019).

Loneliness and its impact

Loneliness describes a discrepancy in the quality of a network of relationships that is expected and received (Peplau & Caldwell, 1978; Perlman, 2004). The keyword for loneliness is "deficits in social relations" (Dykstra & Fokkema, 2007), so it is closely related to an individual's personal and social resources and restrictions (Gierveld, 1998). In line with this definition, loneliness in the educational environment is also related to a lack of social presence and interaction (Kaufmann & Vallade, 2020; Kim et al., 2019) and is believed to harm students' learning experiences and mental health (Kaufmann & Vallade, 2020). Researchers also believe that students' feelings of loneliness affect their academic performance (Alhadabi & Karpinski, 2020; Benner, 2011; Fan et al., 2021; Yalçın et al., 2020) and dropout intentions (Alkan, 2014). It also affects well-being (Freire et al., 2019; Heiman & Olenik-Shemesh, 2020; Yu & Luo, 2018) and social self-efficacy (Bakioğlu, 2020; Jin et al., 2020).

Loneliness and self-efficacy are interchangeable. For example, some authors (e.g., Fry & Debats, 2002; Jin et al., 2020) have documented the effect of self-efficacy on loneliness, whereas others have indicated that loneliness is a predictor of self-efficacy (Bakioğlu, 2020; Hacihasanoglu Asilar et al., 2020; Tu & Zhang, 2015). Another model demonstrated a reciprocal relationship between loneliness and self-efficacy (Tsai et al., 2017). Therefore, previous researchers have reached different conclusions regarding the relationship between

loneliness and ASE. Andretta and McKay (2018) examined the relationship between loneliness and two types of self-efficacy (academic and social) among students in Northern Ireland and Scotland. Their findings clarified that loneliness is not a predictor of ASE but of social self-efficacy. Additionally, differences can be observed in the results of older studies that have identified a significant relationship between loneliness and ASE. For example, Feldman et al. (2016) found that loneliness significantly affected ASE when the two variables were measured simultaneously but not when they were measured at different times (e.g., loneliness time 1 to ASE time 2).

This study proposes that loneliness is a predictor of ASE for several reasons. First, according to Kaufmann and Vallade (2020), the COVID-19 pandemic, which has led to isolation and restrictions on social interaction, has been one of the reasons for loneliness in the last two years. Thus, loneliness was the starting point of this study. Second, although ASE, as students' belief in their academic success, is more likely to be caused by academic sources (e.g., technology support and instructor quality), non-academic sources may also cause it. Recently, Alemany-Arrebola et al. (2020) studied a sample of university students in Spain and found that anxiety arising from COVID-19 was negatively correlated with perceived ASE. In other words, students who reported higher anxiety levels had lower ASE. Similarly, a study conducted among students in Norway reported that mental health is a predictor of ASE (Grøtan et al., 2019). Third, a sense of loneliness can affect students' emotional and psychological well-being (Freire et al., 2019; Heiman & Olenik-Shemesh, 2020; Yu & Luo, 2018). Thus, self-efficacy can easily be created if students feel healthy and good (Bandura, 1997). Based on these arguments, we propose the following hypotheses:

H1: Loneliness is negatively associated with ASE.

In educational research, the concept of student engagement was introduced by Tyler (1969), who used the term "time on task" (cite in Salas-Pilco et al., 2022). Another definition was proposed by Fredricks et al. (2004), describing student engagement as the three interrelated dimensions of affective, cognitive, and behavioral. Fredericks et al.'s (2004) definition later became one of the most popular definitions of student engagement. Meanwhile, to mitigate the spread of COVID-19, the remote teaching policy that has been carried out for the last two years also has various challenges—especially in maintaining student engagement (Cahyadi et al., 2021; Chiu, 2022; Gillett-Swan, 2017; Salas-Pilco et al., 2022). Thus, both loneliness and learning engagement are relevant to the current situations experienced by students in online learning environments.

Although limited studies have been conducted on the relationship between loneliness and student engagement, they have successfully documented this relationship. Singh et al. (2021) found that loneliness was negatively correlated with student engagement and acted

as an intermediate relationship between academic burnout and engagement in a sample of Indian students. Using a longitudinal study, McHugh Power et al. (2019) found that the relationship between loneliness and social engagement is bidirectional such that the two alternately affect each other at different times. Student loneliness has also been shown to decrease the sense of achievement and learning emotions (Lin & Huang, 2012). Similarly, Andangsari et al. (2018) found that loneliness predicts academic procrastination among Indonesian students. As loneliness is closely related to emotions and avoidance behavior (e.g., procrastination), it can also affect learning engagement, which refers to students' energy, emotions, and dedication to the learning environment. Therefore, we propose the following hypotheses:

H2: Loneliness is negatively associated with learning engagement.

ASE as a mediator

According to SCT (Bandura, 1986), self-efficacy is an individual's belief in their ability to complete a task. Because they have high self-confidence, students with high self-efficacy are likely to have greater engagement in learning (Schunk & Mullen, 2012). Students with high self-efficacy believe they can achieve learning success; therefore, cognitively and behaviorally, they will be more involved in learning activities (Lam et al., 2012). More specifically, empirically personal factors (e.g., self-efficacy) influence student behavior (Bandura, 1986), including academic achievement and performance (Akturk & Ozturk, 2019; Alhadabi & Karpinski, 2020; Eakman et al., 2019; Nasir & Iqbal, 2019; Tomas et al., 2020), procrastination behaviors (Maricutoiu & Sulea, 2019; Wu & Fan, 2017), and student engagement (Halbesleben, 2010; Maricutoiu & Sulea, 2019; Wolverton et al., 2020). Regarding engagement in general, Halbesleben (2010) conducted a meta-analysis and found that self-efficacy and engagement are closely related. Furthermore, in the educational environment, self-efficacy has been shown to directly affect student engagement. It can also mediate between the moment of measurement and student engagement (Maricutoiu & Sulea, 2019). In addition, Wolverton et al. (2020) confirmed that computer self-efficacy among students in the southeastern United States influenced their engagement in online learning. Ouweneel et al. (2011) also confirmed that variations in student engagement could arise from personal resources (e.g., self-efficacy). Based on the above literature, for this topic, our proposed hypothesis is:

H3: ASE is positively associated with learning engagement.

In addition to being studied as an antecedent of learning engagement (Halbesleben, 2010; Wolverton et al., 2020), ASE has also been studied as a mediating variable (e.g., Li et al., 2020; Maricutoiu & Sulea, 2019; Wang et al., 2022). For example, Maricutoiu and Sulea (2019) examined the role of intermediate self-efficacy in measuring moments and student

engagement. Li et al. (2020) confirmed that the ASE acts as an intermediary between smartphone addiction and ASE. Zhen et al. (2017) reported that ASE mediates the relationship between basic psychological needs satisfaction and learning engagement. Recently, Wang et al. (2022) found an intermediate role for self-efficacy in interactions and learning engagement among students in China. Subsequently, we tested the following hypothesis:

H4: ASE mediates the association between loneliness and learning engagement.

Humor in learning as a moderator

Undeniably, the learning environment is closely related to students' learning success; this involves the instructor's ability to manage classes. Although researchers initially thought that humor in the learning process was unnecessary (Lei et al., 2010), the current development of humor is considered a way to reduce tension in the classroom and facilitate good social relations between instructors and students. (Lei et al., 2010). Humor in learning is one of the instructors' pedagogical abilities (Garner, 2006) to engage students creatively and interestingly (Lei et al., 2010) in a university environment. The IHPT (Wanzer et al., 2010) is a theoretical foundation that explains how humor in classroom learning affects student learning. Moreover, the IHPT relies on students' perceptions (appropriateness) of the instructor's humor, which can positively or negatively affect their learning effectiveness. In contrast, humor does not directly influence learning but can create conditions for learning activities (Bains et al., 2015; Garner, 2006; Lujan & DiCarlo, 2016). Drawing on the propositions of the IHPT (Wanzer et al., 2010), our study proposes instructors' use of related humor in class as a boundary condition of loneliness, ASE, and student engagement.

The role of humor in learning has not been previously studied as a moderator of the relationship between loneliness and student engagement or ASE and student engagement. In this study, we used several arguments, the first being that a sense of loneliness is strongly related to students' emotions and psychological well-being (Freire et al., 2019; Heiman & Olenik-Shemesh, 2020; Kaufmann & Vallade, 2020; Yu & Luo, 2018). Relevant literature suggests that students' perceptions of humor are significantly related to their emotions and the quality of the learning situation. Boyle and Bush (2018) found that appropriate humor can increase attention and create a more relaxed learning environment. Similarly, Savage et al. (2017) found that the results led to the development of more constructive relationships and increased students' positive feelings in learning. Hence, a pleasant learning atmosphere for teachers who use humor in their teaching buffers the adverse effects of loneliness on ASE.

Second, learning humor can reduce students' anxiety and stress (Jeder, 2015; Tagalidou et al., 2018). At the same time, it can be utilized as a stimulus to create a more pleasant

learning atmosphere and increase interaction and student engagement (Lujan & DiCarlo, 2016; Nienaber et al., 2019; Savage et al., 2017). Teachers who use humor are considered more effective than those who do not (Shahid & Ghazal, 2019). Teachers can use humor to create a pleasant climate, improve the atmosphere, and create more effective interactions so students become more involved in learning activities. This argument suggests that humor is essential to the relationship between ASE and students' learning engagement. The relationship between ASE and student engagement was stronger when humor in learning was high. Accordingly, we propose the following hypothesis:

H5: The association between loneliness and learning engagement is moderated by humor.

H6: The association between ASE and student engagement in academic efficacy is moderated by humor in learning.

Methods

Sample and procedure

A mixed purposive snowball sampling method was used to select the target sample. The primary researcher communicated with colleagues and lecturers from various universities as data collaborators. After the data collaborators agreed to participate voluntarily, an online questionnaire was distributed through online classes. Fourteen lecturers from six different universities were willing to collaborate and subsequently, they distributed the questionnaires through online classes.

Data were collected using a three-stage time-lag approach. In the first stage (August 2021), respondents were asked to provide biographical information on loneliness. In total, 524 responses were obtained during the first phase. In the second stage (mid-semester), participants who had completed the online questionnaire in the first phase were invited via email to fill in information about their attitudes towards humor in learning and ASE. In total, 448 participants (85 percent in the first phase) responded. The final stage was held at the end of the semester. Stage 2 participants were asked to answer questions related to their learning engagement. After eliminating unqualified data (duplicates and incomplete responses), 367 respondents were included in the final data. As shown in Table 1, 62.40% of the respondents were male and 61.31% were employed. Interestingly, in line with Indonesian culture, 49.86 percent of the respondents reported living with their families, and only 20.16% admitted to living separately.

Measurement

All the measurements were performed using scales adapted from previous studies. Loneliness was measured using a short version of a scale developed by the University of California, Los Angeles (UCLA) to measure loneliness. Eight items from the scale were

Table 1 Characteristics of respondents

	Frequency	Percent
Gender		
Male	229	62.40
Female	138	37.60
Age		
< 22 yrs	162	44.14
22 - 25 yrs	133	36.24
> 25 yrs	72	19.62
Residence		
Living in the family house	183	49.86
Living alone	74	20.16
Mix	98	26.70
Did not answer	12	3.27
Employment Status		
Employed	225	61.31
Unemployed	142	38.69

used in this study. This scale has been shown to have good validity and reliability in cross-cultural studies, including those conducted in Asia (Arimoto & Tadaka, 2019; Suri et al., 2019; Xu et al., 2018). Sample items included "I lack companionship" and "I feel left out." Each item had a 5-level frequency score ranging from 1 = never to 5 = always.

The short Utrecht Work Engagement Scale (UWES-9) developed by Schaufeli et al. (2006) was adapted to measure student learning engagement. Specifically, the word "workplace" was replaced with "online class." Previous studies also employed this method (Cahyadi et al., 2021b; Zhang et al., 2021; Zhao et al., 2021) and modified the items to describe engagement in classroom learning settings. Some sample items include "Time flies when taking online classes" and "I feel happy when I am learning intensely." Each item had a 5-level frequency score ranging from 1 = never to 5 = always.

The nine-item subscale of the Motivated Learning Strategies Questionnaire (MLSQ-SE) originally developed by Pintrich and De Groot (1990) was adapted to measure ASE. Following Alemany-Arrebola et al. (2020), a minor adjustment was made by adding the phrase "during online learning in the COVID-19 pandemic" at the beginning of each original item to describe self-efficacy in specific situations. Some sample items include "I think I will get a good grade in this course" and "I expect to do very well in this class." Respondents were asked to rate 5-type points, ranging from 1 (strongly disagree) to 5 (strongly agree).

Finally, Askildson's (2005) nine-item scale was adapted to measure humor in learning, and minor adjustments were made to the items. Sample items included "Your instructor uses humor to draw your attention in the classroom" and "How often does your instructor use humor during each class session?" Each item had a 5-level frequency score ranging from 1 = never to 5 = always.

Control variable. We used two general respondent characteristics (gender and age) as control variables because they are related to loneliness, efficacy, and learning engagement (Barreto et al., 2021; Korlat et al., 2021; Li et al., 2020; Maes et al., 2019; Oga-Baldwin & Nakata, 2017; Wang et al., 2008). Another control is residences related to Indonesian culture, in which children stay with their parents until they marry. According to Hofstede et al. (2005), this culture is a form of parental loyalty to children and vice versa. Furthermore, it is a special feature of the collectivist family culture in Indonesia (Hofstede et al., 2005).

Data analysis procedure

This study followed two procedures. First, we tested the common method bias using the Harman single-factor model (Podsakoff et al., 2003) and estimated the average variance extracted (AVE), as in Kock (2017). Furthermore, we performed a factor analysis to test construct validity and Cronbach's alpha to assess internal consistency. Second, we applied Macro Process version 4 (Hayes, 2017) to test the mediation moderation model. We chose Process Model 15 to examine the moderating role of humor in determining the relationship between loneliness and learning engagement and ASE in learning engagement. The overall scale score consists of the mean of all items per construct. All data analyses were performed using IBM SPSS version 23.

Results and discussion

Descriptive statistics

Table 2 presents descriptive statistics and bivariate correlation variables. Loneliness was negatively correlated with ASE ($r = -.28$; $p < .01$) and learning engagement ($r = -.24$; $p < .01$). Learning engagement was positively related to ASE ($r = .43$; $p < .01$) and humor in learning ($r = .17$; $p < .01$).

Table 2 Mean, SD, correlation, and discriminant validity

No.	Variable	Mean	SD	1	2	3	4	5	6	7
1	Gender	-	.49	**1**						
2	Age	-	.76	-.12*	**1**					
3	Family	1.83	.93	-.14**	.12*	**1**				
4	LON	3.21	.98	.04	-.06	-.09	***.80***			
5	ASE	3.29	.83	-.05	.11*	.13*	-.28**	***.88***		
6	ENG	3.21	.98	-.10*	.04	.05	-.24**	.43**	***.83***	
7	HUM	3.31	.90	-.04	.00	.07	-.19**	.17**	.21**	***.86***

Notes: n = 367; **Correlation significant at .01 level; discriminant validity is depicted diagonally and in italics; LON = loneliness; ENG = learning engagement; ASE = academic self-efficacy; HUM = humor in learning, root of AVEs = bold italics.

Common method bias, validity, and reliability

We evaluated data quality before conducting further analyses. First, because the data comes from one source, namely, students, there are concerns about common method bias (Podsakoff et al., 2012). Therefore, to address these concerns, we exercised two types of controls: procedural and statistical. We conducted our control procedure by designing a questionnaire with various response types (1 = never or strongly disagree to 5 = always or strongly agree). Furthermore, we measured the variables at three different times so that the respondents did not connect the answers between the constructs psychologically. Statistical controls were performed using the Harman single-factor model approach (Podsakoff et al., 2003). The evaluation of the single-factor model was based on the total variance explained (Podsakoff et al., 2003) and the average variance explained (AVE), according to Kock's (2017) recommendations. The results presented in Table 3 show that no construct has a dominant explained variance (> 0.50), and that the AVE value in the single-factor test is 0.29, which is below 0.50, indicating that standard method variance is not detected in the data (Kock, 2017; Podsakoff et al., 2003). However, in the separate factor analysis test, construct reliability and validity met the recommended conditions, and the results were satisfactory (Hair et al., 2019): Cronbach's alpha values > 0.70; construct reliability > 0.70, and AVE > 0.50. Furthermore, discriminant validity (see Table 2) was satisfactory, where all AVE score roots (bold italics) exceeded the correlation value between the variables studied (Fornell & Larcker, 1981).

Hypothesis testing

The results in Table 4 show all the results of the hypothesis testing. The first hypothesis proved a negative correlation between loneliness and ASE (b = -.24; p-value < .01), and loneliness and learning engagement (b = -.16; p-value < .01). Thus, H1 and H2 were confirmed. The results also showed that ASE was positively related to learning engagement (b = .30; p-value < .01), thereby supporting Hypothesis H3. In addition, the indirect effect of loneliness on academic efficacy was partially supported as loneliness remained significant when learning engagement was included in the model (Table 5). The indirect

Table 3 Common method bias, validity, and reliability

	N items	Factor loading	Variance explained*	CA	CR	AVE
Loneliness	8	0.61–0.83	31.11	0.93	0.93	0.63
Academic self-efficacy	9	0.74–0.85	8.89	0.86	0.94	0.77
Learning engagement	9	0.68–0.82	15.22	0.84	0.94	0.74
Humor in learning	5	0.76–0.83	7.39	0.90	0.95	0.68
Percent of variance*	62.62					
AVE*	0.29					

Note: n = 367; * = single factor estimation; CA = Cronbach's alpha; CR = construct reliability; AVE = average variance explained.

Table 4 Hypothesis testing (Macro Process Model 15)

Variables	Academic Self-Efficacy			Learning Engagement		
	b	SE	p-value	b	SE	p-value
Control Variable						
Gender	-.19	.11	.08	.03	.08	.68
Age	.02	.07	.75	.50	.05	.27
Family	.01	.06	.84	.09	.04	.04
Main Effect						
Loneliness	-.24	.04	.00	-.16	.04	.00
ASE				.30	.04	.00
Humor in Learning				.04	.04	.29
Moderating						
Interaction 1				.22	.04	.00
Interaction 2				.23	.04	.00
R Square	.07			.33		
F	6.56			21.92		

effect was -.16, with a confidence interval [CI] using a 5,000-bootstrap sample that did not include 0; the CI was -.23 (LL) and -.08 (UL). Learning engagement partially mediated the relationship between loneliness and academic efficacy; thus, H4 was supported.

The moderating effect of humor on learning was also confirmed by the two hypothesized relationships. As such, H5 stated that humor in learning moderated the relationship between loneliness and learning engagement and that this relationship was proven based on interaction 1 (humor in learning × loneliness), which was significant ($b = .22$, $p < .01$). The positive interaction results indicate that the moderator's role is positive, and the negative influence of loneliness on learning engagement weakens with an increase in humor in learning. Table 5 shows the conditional effect, which shows that the effect of loneliness on learning engagement was -.35 when the level of humor in learning was low. This effect then significantly decreased and became positive .04 at the position of humor in learning at a high level (see Figure 2). Hence, when learning humor was high, the effect of loneliness on learning engagement was positive and insignificant.

In line with H6, the moderating role of humor in learning in the relationship between ASE and learning engagement was established. The interaction value proved to be

Table 5 The indirect and moderating effect

Indirect Effect	*Effect*	*BootSE*	*BootLLCI*	*BootULCI*	
LON --> ASE --> ENG	-.16	.04	-.23	-.08	
Moderating Effect	***Effect***	***SE***	***p***	***LLCI***	***ULCI***
Conditional effects of LON on ENG at values of the HUM					
Low HUM (-1 SD)	-.35	.05	.00	-.45	-.24
High HUM (+1 SD)	.04	.05	.47	-.23	-.08
Conditional effects of ASE on ENG at values of the HUM					
Low HUM (-1 SD)	.10	.05	.06	-.01	.20
High HUM (+1 SD)	.50	.05	.00	.40	.60

Notes: n = 367; LON = loneliness; ENG = learning engagement; ASE = academic self-efficacy; HUM = humor in learning.

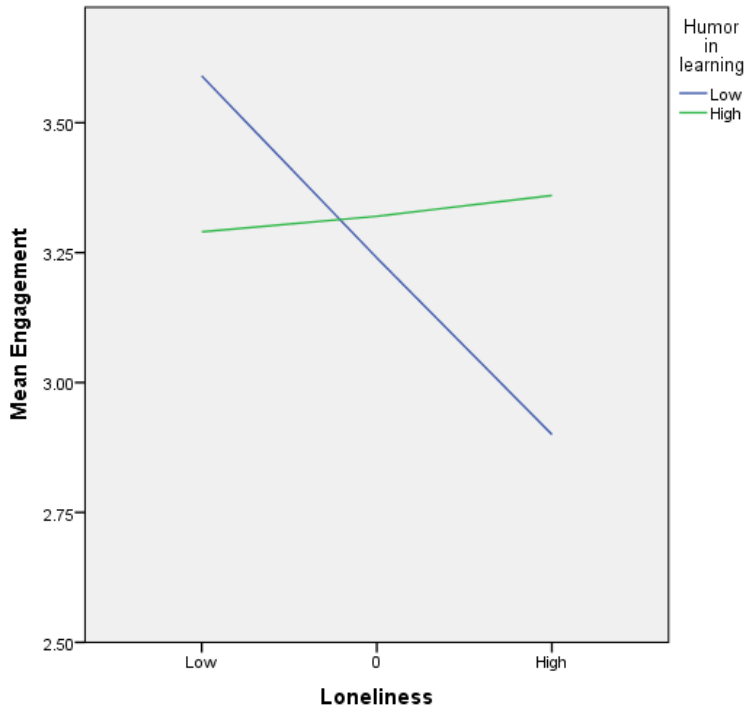

Fig. 2 Conditional effect of loneliness on student engagement based on humor in learning

significant (b = .23, p < .01) in the positive direction, indicating the positive role of humor in learning in the relationship. The conditional effect shown in Table 5 indicates that the effect of engagement on academic efficacy dramatically increases from .10 to .50 in the low-to high-humor learning position. Thus, it can be stated that perceived humor in learning moderates the relationship between ASE and learning engagement; moreover, the relationship becomes stronger as students experience an increase in humor in learning (see Figure 3).

Discussion

This study aimed to investigate the relationship between sense of loneliness, ASE, and learning engagement in a remote teaching setting among a sample of students in Indonesia. We also examined the role of ASE as an intermediator in the relationship between loneliness and learning engagement. Finally, we tested the moderation model of humor in learning on the relationship between loneliness and ASE and the link between ASE and learning engagement. Our study found a negative association between ASE and learning engagement. ASE is positively related to learning engagement and acts as an intermediate relationship between loneliness and learning engagement. Finally, humor played a vital role in determining the degree of loneliness, ASE, and learning engagement.

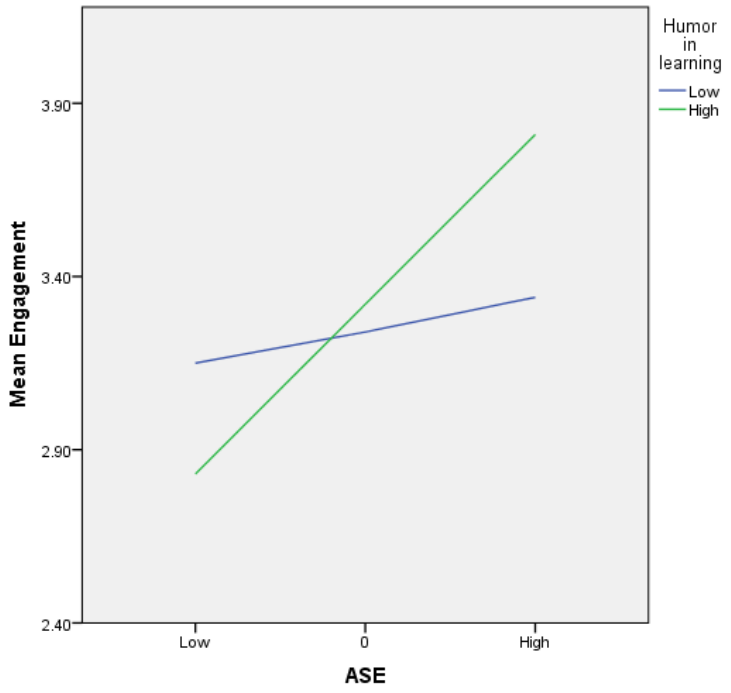

Fig. 3 Conditional effect of ASE on learning engagement based on humor in learning

First, the results show that loneliness negatively affected ASE, indicating that a high sense of loneliness could reduce ASE. Our findings add to the previous empirical findings (Feldman et al., 2016) in a different setting. Unlike previous studies, the present study was conducted during the pandemic. However, the relationship between loneliness and ASE still needs special attention because ASE is usually temporary and closely related to the point in time (Honicke & Broadbent, 2016). This is also why many differences have been observed in previous findings. For example, Feldman et al. (2016) found that loneliness significantly affects ASE when measured at the same time but not when measured at different times (e.g., loneliness time 1 to ASE time 2). Other studies (e.g., Andretta & McKay, 2018) have concluded that loneliness only affects social self-efficacy and not academic efficacy. This study examined students who experienced higher levels of loneliness at the beginning of the semester and reported lower ASE levels in the middle semester. Students' sense of loneliness is associated with poor social relations; therefore, loneliness seems to be related to social self-efficacy rather than to academic efficacy. However, loneliness also includes feelings of helplessness, which has exacerbated the pandemic situation. Due to the helplessness associated with loneliness, students give up more quickly when faced with the many challenges that arise from remote teaching-learning, thereby possibly affecting their perceived ASE. Hence, these findings suggest that ASE may be influenced by academic and non-academic factors in certain situations.

For example, anxiety during the pandemic and mental distress in non-pandemic situations among students affect negative emotions and reduce ASE (Alemany-Arrebola et al., 2020; Grøtan et al., 2019). Thus, the loneliness experienced by students during the pandemic had a spillover effect on various attitudes and behaviors related to learning, including ASE.

Second, we found that loneliness directly affected learning engagement. In other words, students who reported higher levels of loneliness at the beginning of the semester reported lower levels of learning engagement at the end of the semester. Our findings fulfill the dearth of empirical evidence that places loneliness as an antecedent of learning engagement (e.g., Singh et al., 2021) and a similar concept, namely social engagement (e.g., McHugh Power et al., 2019). This finding is not surprising because learning engagement represents high energy, joy, and dedication to learning. High learning engagement indicates students' physical, emotional, and cognitive involvement in the learning activities. In contrast, loneliness is a negative emotion that is closely related to burnout, emotional well-being, and mental health (Freire et al., 2019; Gradiski et al., 2022; Heiman & Olenik-Shemesh, 2020; Kaufmann & Vallade, 2020; Kim et al., 2019; Richardson et al., 2017; Yu & Luo, 2018). Furthermore, loneliness is closely related to various student learning behaviors such as academic performance (Alhadabi & Karpinski, 2020; Benner, 2011; Fan et al., 2021; Yalçın et al., 2020) and dropout intentions (Alkan, 2014). Hence, loneliness due to social isolation during the pandemic creates negative emotions and generates low levels of learning engagement.

Third, ASE positively affects learning engagement. Our findings are consistent with previous findings that students with high general self-efficacy believe they will be more involved in learning activities (Lam et al., 2012), such as engagement (Halbesleben, 2010; Maricutoiu & Sulea, 2019; Wolverton et al., 2020). Specifically, our findings support the relationship between ASE and learning engagement (Zhen et al., 2017). Similar to the relationship between loneliness and ASE, the relationship between ASE and learning engagement also requires special attention. A meta-analysis conducted by other researchers (e.g., Honicke & Broadbent, 2016) demonstrated that a high level of ASE at one point sometimes does not continue and may be limited. It may also affect other variables if measured at a distance too close or far apart. The present study used time-lag data, where ASE was measured at Time 2 (mid-semester) and learning engagement was measured at Time 3 (end of the semester), with a distance of three months between the two. Students who perceived a higher level of ASE in the middle semester reported higher levels of engagement by the end semester.

Fourth, as expected, loneliness indirectly affected student engagement, indicating that ASE mediates the relationship between loneliness and learning engagement. The lack of social interaction due to isolation, which causes an increase in the sense of loneliness, can have a spillover effect of decreasing ASE (Feldman et al., 2016; Quan et al., 2014), which,

in turn, leads to a decrease in student involvement and participation in learning activities (Zhen et al., 2017). The present study adds to the ASE literature on its mediating role in the relationship between smartphone addiction and academic procrastination in students in China and the relationship between basic psychological needs satisfaction and learning engagement (Li et al., 2020; Zhen et al., 2017). Moreover, the use of a cross-lag design by measuring loneliness, ASE, and learning engagement at three time points was sufficient for testing the mediation model (Law et al., 2016). In other words, ASE has an intermediate learning engagement function resulting from the students' sense of loneliness during the pandemic.

Finally, as expected, we observed that humor in learning moderated the relationship between loneliness, ASE, and learning engagement. This result adds to the empirical evidence from previous findings in the IHPT literature. According to the IHPT (Wanzer et al., 2010), humor in learning reduces the negative effects of loneliness and ASE on students' learning engagement. In other words, students with a high sense of loneliness tend to have low engagement. However, this negative effect can be minimized if teachers create a more intimate, comfortable, and open learning atmosphere through appropriate humor (Bains et al., 2015; Garner, 2006; Lujan & DiCarlo, 2016). In different situations, humor in learning strengthens the influence of ASEs on learning engagement. These results indicated that students with high ASE tended to be more involved in learning. This relationship can be further strengthened by creating a pleasant learning atmosphere through humor. Thus, our findings add new empirical evidence to compensate for the lack of evidence regarding increased learning effectiveness when teachers create a pleasant atmosphere in a classroom with humor.

Pedagogical implications

These results offer three managerial implications for increasing students' ASE and learning engagement. First, it helps educational institutions understand the mechanisms underlying student engagement in online learning settings. Although online learning provides various conveniences and advantages in terms of accessibility and time flexibility, students' low direct interactions can have implications for the sense of loneliness. Educational institutions need to consider that loneliness hurts ASE and student engagement. Schools can precisely and carefully investigate signs of loneliness in students by utilizing the broader role of academic supervisors. Specifically, the academic supervising lecturer is a particular assignment for certain lecturers to become student guardians in completing studies and is a common practice carried out by universities in Indonesia. Academic supervisors can make it easier for schools to mitigate students' problems and provide various solutions to personal problems that can interfere with learning activities.

Second, we suggest several ways to alleviate students' feelings of loneliness in online learning activities. For example, instructors must have adequate pedagogical skills to design and develop exciting learning. As a result of this study, instructors can apply humor in learning to maintain student engagement and reduce the adverse effects of loneliness caused by social restrictions. Especially in online learning, instructors must present fun learning in class by introducing humor and stories that arouse their students' attention and engagement. Taken together, we suggest that schools train instructors to manage classes effectively. Since humor in learning is an instructor's pedagogical ability (Garner, 2006), increasing this ability can affect learning effectiveness (Ellingson, 2018).

Finally, based on the results of this study, we invited stakeholders, including administrators, teachers, parents, and the general public, to be aware of students' loneliness syndrome to ensure that they have high academic self-confidence and engage in learning activities. As a sense of loneliness can harm students' mental and emotional health, educational institutions must design comfortable learning by introducing humor into the classroom. In addition, parents need to develop open communication with their children to ensure that various problems faced by students in their social environment can be handled immediately.

Limitations and future direction of research

First, it should be noted that this study was conducted via online learning because of the COVID-19 pandemic; in particular, this may not capture the phenomenon of the student experience in conventional learning settings. Furthermore, researchers must explore relationship models of loneliness, ASE, student engagement, and humor in conventional learning modes. Second, this study only considered the setting of students in Indonesia, so it has a weakness in its generalization to different cultures. Therefore, we invite future researchers to examine the relationships among loneliness, ASE, and student engagement through cross-cultural studies. Third, the data collection design used a time-lag approach to explore the intermediate role of ASE in the relationship between loneliness and student engagement (Law et al., 2016). However, we recommend that future studies use a longitudinal design to ascertain how these variables change over time to ensure the robustness of causality between variables.

Abbreviations

ASE: Academic self-efficacy; SCT: Social cognitive theory; AVE: Average variance explained; IHPT: Instructional humor processing theory; MLSQ-SE: Motivated Learning Strategies Questionnaire; UCLA: The University of California, Los Angeles; UWES-9: Utrecht Work Engagement Scale.

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Competing interests

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