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

This study aims to investigate the impact of loneliness on academic self-efficacy (ASE) and student engagement in the context of remote teaching during the COVID-19 pandemic. Moreover, we examined the role of intermediate ASE on the relationship between loneliness and student engagement and perceived humor in learning as a boundary condition. A sample of 367 undergraduate students from six universities in Indonesia completed an online questionnaire. The data were analyzed by Macro PROCESS version 4 to answer 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 have a positive effect on student engagement; at the same time, it plays an intermediate role in the link between loneliness and student engagement. Finally, a significant effect was found on the role of humor in learning as a moderator in the tested model. This study adds to the existing research on loneliness and student engagement literature by uncovering the intermediate role of ASE. Drawing on social cognitive theory (SCT) and instructional humor processing theory, we explore how perceived humor in learning moderates the relationships between loneliness, ASE, and student engagement.

### **Introduction**

Over the last two years, the COVID-19 pandemic has provided an awareness that communication and information technology are critical factors in carrying out activities—whether economic, business, or educational. In the world of education, we were introduced to the concept of "work from home" along with "school from home" to minimize the potential for spreading the virus. Although it initially caused many problems, especially in education (Cahyadi et al., 2021), because of the rapid transition from conventional to online modes. Over time, schools, teachers, and students began to adapt and make various improvements to carry out their learning activities online (Cahyadi et al., 2021). In contrast, apart from the various advantages offered by online learning, it raises another problem, namely the sense of loneliness experienced by students caused by the lack of social presence (Kaufmann & Vallade, 2020). This condition was exacerbated by isolation policies and restrictions on social activities during the pandemic, which simultaneously led to a trend of loneliness and mental health 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 the phenomenon of

loneliness to mitigate its effect on student learning behavior, especially in online learning settings during the current pandemic.

There are several reasons why loneliness has attracted the attention of researchers in the last decade. First, the researchers noted that the lockdown, 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 mode than in face-to-face (Kaufmann & Vallade, 2020). Similarly, how to maintain student engagement in online learning has also become a particular concern for researchers (Chiu, 2022; Gillett-Swan, 2017; Salas-Pilco et al., 2022). Furthermore, online learning is increasingly popular and growing in the educational environment, so it is essential to alleviate students' perceptions of loneliness and mitigate its possible impact on their learning behavior (Kaufmann & Vallade, 2020). Since loneliness can threaten students' mental health, emotional well-being, and psychological health (Kaufmann & Vallade, 2020; Kim et al., 2019; Richardson et al., 2017), efforts to consider its impact on student learning behavior need to be explored. Accordingly, this study focuses on how loneliness can affect academic self-efficacy (ASE) and learning engagement. Moreover, we add the role of humor in learning as a boundary condition in these relationships.

This study contributes to the loneliness and learning engagement literature in several ways. First, apart from the COVID-19 pandemic, both loneliness and student engagement are phenomena that get much attention in the context of online learning. However, research that specifically discusses the relationship between loneliness and student engagement is still 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 among students 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 students in Indonesia.

Second, the present study fulfills the call to clarify the relationship between loneliness and ASE, which previously was contradictory. Recent studies have clarified that loneliness is not associated with ASE (e.g., Andretta & McKay, 2018), but older studies report results that support the relationship between the two (Feldman et al., 2016). In addition, the impact of ASE on various related learning behaviors also has many limitations, where ASE is often temporary and closely related to the point in time (Honicke & Broadbent, 2016). Furthermore, the present study provides the latest empirical evidence regarding the relationship between loneliness during a pandemic. In addition, our study uses a short-term longitudinal design by separating the time of data collection on the studied construct to ensure a causal relationship between the variables studied (see Figure 1), as well as responding to a data collection design that is feasible for mediation testing (Law et al., 2016).

Third, in contrast to Singh et al. (2021), who examined the role of the intermediate relationship between academic burnout and engagement, our study places ASE as a mediator of the relationship between loneliness and student engagement. Drawing on SCT (Bandura, 1977), our study adds to knowledge about the intermediate role of ASE and, at the same time, as a determinant of student engagement. The relationship between

self-efficacy and engagement has been explored, however, previous researchers used a different concept—in other words, social self-efficacy (Bakioğlu, 2020; Jin et al., 2020; McHugh Power et al., 2019). Therefore, our study may add insight into academic self-efficacy area.

Finally, we integrate instructional humor processing theory (IHPT) (Wanzer et al., 2010) as a boundary condition in the relationship between loneliness, ASE, and student engagement. The use of humor in their teaching is one of the instructors' pedagogical abilities (Garner, 2006) to creatively engage students and produce effective interactions (Lei et al., 2010). Thus, we advance knowledge by adding a piece of 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)

Academic self-efficacy (ASE) is another form of the self-efficacy concept from social cognitive theory (SCT). Albert Bandura first introduced self-efficacy in 1960 as individuals' belief in their abilities, optimism, and confidence in performing a task (Bandura, 1997; 1977). Since self-efficacy reflects people's belief in their abilities, it is no wonder this concept has been studied in various aspects of life, including health, education, and business. Bandura (1977) identified four main components forming self-efficacy: mastery experiences; vicarious experiences; social persuasion/feedback; and a combination of emotional, physical, and psychological well-being. One additional factor of "imaginal experiences" was suggested by Maddux (2013) which was stated to have contributed to shaping individual self-efficacy.

In a general context, self-efficacy is the basis of attitudes and behavior, where individuals with high self-efficacy have a high tendency of 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, learning self-efficacy). In this study, however, we use the concept of ASE (Schunk & Pajares, 2002), which represents self-efficacy in an academic context. Therefore, ASE is the self-belief of students related to academic activities, including their belief in their ability to achieve their academic or learning goals (Hussain et al., 2021). Because it concentrates on self-belief, ASE has become one of the issues that 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

In general, loneliness describes a discrepancy in the quality of the network of relationships that are expected and received (Peplau & Caldwell, 1978; Perlman, 2004). The keyword of 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, such as their mental health (Kaufmann & Vallade, 2020). Previous researchers also believed that

students' feelings of loneliness also affect their academic performance (Alhadabi & Karpinski, 2020; Benner, 2011; Fan et al., 2021; Yalçın et al., 2020) and dropout intentions (Alkan, 2014). Furthermore, 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).

The relationship between loneliness and self-efficacy has been confirmed to be interchangeable. For example, some authors (e.g., Fry & Debats, 2002; Jin et al., 2020) documented the effect of self-efficacy on loneliness, while other studies placed loneliness as a predictor of self-efficacy (Bakioğlu, 2020; Hacıhasanoglu Asilar et al., 2020; Tu & Zhang, 2015). Another model also shows that the relationship between loneliness and self-efficacy is reciprocal (Tsai et al., 2017). Specifically, previous researchers gave different conclusions on the relationship between loneliness and ASE. For example, Andretta and McKay (2018) examined the relationship between loneliness and two types of self-efficacy (academic and social) in Northern Ireland and Scotland students. Their findings only clarified that loneliness is not a predictor of ASE but social self-efficacy. However, older studies give different results where loneliness and ASE are significantly related. For example, Feldman et al. (2016) found a significant effect of loneliness on ASE when measured simultaneously but not at different times (e.g., loneliness time 1 to ASE time 2). The present study proposes loneliness as a predictor of ASE for several reasons. First, according to Kaufmann and Vallade (2020), the COVID-19 phenomenon that causes isolation and restrictions on social interaction has been one of the reasons for loneliness in the last two years. As such, loneliness is the starting point of our study. Second, although it seems that ASE as a student's belief in their success in the academic field is more likely to be caused by academic sources (e.g., technology support, instructor), non-academic sources may cause it. Recently, Alemany-Arrebola et al. (2020), taking a sample of university students in Spain, found that anxiety arising from COVID-19 negatively correlates with perceived academic self-efficacy. In other words, students who reported higher anxiety had less ASE. In the same vein, other researchers have also reported that mental health is a predictor of ASE (Grøtan et al., 2019) in students in Norway. Third, a sense of loneliness can affect students' emotional and psychological well-being (Freire et al., 2019; Heiman & Olenik-Shemesh, 2020; Yu & Luo, 2018). Comparably, self-efficacy can be easily created if the individual feels healthy and well (Bandura, 1997). Based on these arguments, the hypothesis we propose is as follows:

**H1:** Loneliness is negatively associated with academic self-efficacy (ASE).

In educational research, the concept of student engagement was first introduced by Tyler (1969) who used the term "time on task" (cite in Salas-Pilco et al., 2022). Another definition was put forward by Fredricks et al. (2004) which describes student engagement as the three interrelated dimensions of affective, cognitive, and behavioral. The concept of Fredricks et al. (2004) later became one of the most popular definitions used to define student engagement. On the other hand, to anticipate the spread of COVID-19, the remote teaching policy by adopting online learning that has been carried out for the last two years also has various challenges—especially how to maintain student engagement (Cahyadi, Hendryadi, & Mappadang, 2021; Chiu, 2022; Gillett-Swan, 2017; Salas-Pilco et al., 2022). Thus, both issues of loneliness and learning engagement have relevance to the latest situation experienced by students in online learning environments.

The relationship between loneliness and student engagement has been relatively limited, but several studies have succeeded in documenting this relationship. For example, Singh et al. (2021) found that loneliness is negatively correlated with student engagement and acts as an intermediate relationship between academic burnout and engagement in a sample of students in India. McHugh Power et al. (2019), using a longitudinal study, found that the relationship between loneliness and social engagement is bidirectional, so that the two alternately affect each other at different times. Student loneliness has also been shown to decrease the sense of achievement and learning emotion (Lin and Huang, 2012). In the same vein, Andangsari et al. (2018), from a sample of students in Indonesia, found that loneliness predicts academic procrastination. Since loneliness is closely related to emotions and avoidance behavior (e.g., procrastination), it can also affect learning engagement, which is students' energy, emotion, and dedication to the learning environment. So, regarding this matter, the hypothesis we propose is:

**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 who have high self-efficacy believe that they can achieve learning success so that 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; Maliha Nasir & Iqbal, 2019; Tomas et al., 2020), procrastination behaviors (Maricutoiu & Sulea, 2019; Wu & Fan, 2017), and student engagement (Halbesleben, 2010; Maricutoiu & Sulea, 2019; Wolverson et al., 2020). Regarding engagement in general, through a meta-analysis, Halbesleben (2010) found that these two concepts are closely related. Furthermore, specifically in the educational environment, it was reported that self-efficacy was shown to directly affect student engagement. It could also mediate the measurement moment and student engagement (Maricutoiu & Sulea, 2019). Also, Wolverson et al. (2020) confirmed that computer self-efficacy in students in the southeastern United States influences student engagement in online learning. Previously, Ouweneel et al. (2011) also confirmed that variations in student engagement could come from personal resources (e.g., self-efficacy). Based on the above literature, for this topic, our proposed hypothesis is:

**H3:** Academic self-efficacy (ASE) is positively associated with learning engagement.

Apart from being tested as an antecedent of learning engagement (Halbesleben, 2010; Wolverson et al., 2020), ASE has 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 on measurement moment and student engagement. Li et al. (2020) confirmed ASE as an intermediary between smartphone addiction and ASE procrastination. Zhen et al. (2017) also reported that ASE mediated the relationship between basic psychological needs satisfaction and learning engagement. Recently, Wang et al. (2022) found an intermediate role of self-

efficacy in interactions and learning engagement among students in China. Subsequently, the hypothesis we tested was:

**H4:** Academic self-efficacy (ASE) will mediate the association between loneliness and learning engagement.

### **Humor in learning as a moderator**

It is undeniable that the learning environment has a close relationship with student learning success; notably, this involves the instructor's ability to manage the class. Although initially researchers thought that humor in the learning process was unnecessary (Lei et al., 2010), the current development of humor is considered a way to make instructors reduce the 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. Instructional Humor Processing Theory (IHPT) (Wanzer et al., 2010) is a theoretical foundation that explains when humor in classroom learning will affect student learning. Moreover, IHPT relies on student perceptions (appropriateness) of instructor humor which can cause positive or negative effects on student learning effectiveness. In contrast, humor is considered not to directly influence learning; however, humor can create conditions in learning activities (Bains et al., 2015; Garner, 2006; Lujan & DiCarlo, 2016). Drawing on the propositions of IHPT (Wanzer et al., 2010), our study proposes instructors' use of related humor in the class to be the boundary conditions 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 as well as ASE and student engagement. In this study, we use several arguments, the first of which is 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). Besides, the relevant literature suggests that students' perceptions of humor are significantly related to their emotions and the quality of the learning situation. For instance, 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 results were found to develop more constructive relationships and increase students' positive feelings in learning. Hence, a pleasant learning atmosphere by teachers who used humor in their teaching buffered the adverse effect of loneliness on ASE.

Second, humor in learning can reduce student 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). Thus, teachers can use humor to create a pleasant climate, improve the atmosphere, and create more effective interactions so that students become more involved in learning activities. Based on this argument, humor in learning plays an essential role in the relationship between ASE and students' learning engagement. The relationship between ASE and student engagement will be stronger if humor in learning is high. Accordingly, we have the following hypotheses:



**H5:** The association between loneliness and learning engagement will be moderated by humor in learning.

**H6:** The association between academic self-efficacy (ASE) and student engagement to academic efficacy will be moderated by humor in learning.

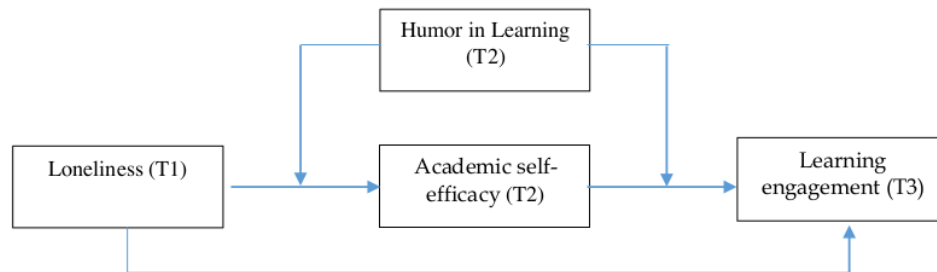


Figure 1. Research model

## Methods

### Sample and procedure

This study used a mixed purposive and snowball sampling method to determine the target sample. The primary researcher communicated with colleagues and lecturers at various universities as data collaborators. After the data collaborators agreed to be involved voluntarily in this research, an online questionnaire was distributed through online classes. A total of 14 lecturers from 6 different universities were willing to be collaborators; subsequently, they distributed the questionnaires through online classes.

Data were collected using a time-lag approach, consisting of three stages. In the first stage (August 2021), respondents were asked to fill in biographical information and loneliness. A total of 524 responses were obtained in the first phase. In the second stage (mid-semester), participants who filled out the online questionnaire in the first phase were invited back via email to fill in their attitudes towards humor in learning and ASE. As many as 448 participants (85 percent of the first phase) responded. The final stage was held at the end of the semester. The participants in Stage 2 were invited back to answer questions related to learning engagement. After eliminating unqualified data (duplication, not filled in completely), the final data used was from 367 respondents. As shown in Table 1, the respondents were 62.40 percent male and were employed at a rate of 61.31 percent. Interestingly, in line with Indonesian culture, 49.86 percent of the respondents reported living with their family and only 20.16 percent admitted to living separately from their family.

**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 family' house	183	49.86
Living alone	74	20.16
Mix	98	26.70
Not answer	12	3.27
Employment Status		
Employed	225	61.31
Unemployed	142	38.69

## Measurement

All measurements were achieved with a scale adapted from previous studies. Notably, a short version of the scale developed by the University of California, Los Angeles (UCLA) measures loneliness. A total of eight items were used. This scale has been shown to have good validity and reliability in cross-cultural studies, including in Asia (Arimoto & Tadaka, 2019; Suri et al., 2019; Xu et al., 2018). Sample items are "I lack companionship" and "I feel left out." Each item has a 5-level frequency score, 1 = never to 5 = always.

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

ASE was adapted via the nine-item subscale of the Motivated Learning Strategies Questionnaire (MLSQ-SE) originality developed by Pintrich and De Groot (1990). Following Alemany-Arrebola et al. (2020), we made a minor adjustment 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. Example items are "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 from 1 (strongly disagree) to 5 (strongly agree).

Finally, humor in learning was adapted from Askildson (2005) and consisted of nine items; additionally, minor adjustments were made for the items. For example, “Your instructor use humor to gain your attention in the classroom” and “How often does your instructor use humor during each class session?.” Each item has a 5-level frequency score, 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). One other control is residence related to Indonesian culture where children stay with their parents until they get married. This culture according to Hofstede et al. (2005) is a form of parental loyalty to children, and vice versa. Furthermore, it is also a special feature of the family collectivity culture in Indonesia (Hofstede et al., 2005).

### Data analysis procedure

The present study uses two procedures: first, we tested the common methods bias using the Harman single factor model (Podsakoff et al., 2003) and estimate the average variance extracted AVE as Kock (2017). Furthermore, factor analysis was used to test construct validity and Cronbach's alpha to assess internal consistency. In the second stage, we applied the 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 learning the relationship between loneliness and learning engagement and ASE to learning engagement. The overall scale score consists of the mean of all items per construct. All data analysis was applied with the IBM SPSS version 23.

## Results and discussion

### Descriptive statistics

Table 2 depicts the descriptive statistics and bivariate correlations variables. Loneliness was negatively related to ASE ( $r = -.28$ ;  $p$  value  $< .01$ ) and learning engagement ( $r = -.24$ ;  $p$  value  $< .01$ ). Learning engagement was proven to be positively related to ASE ( $r = .43$ ;  $p$  value  $< .01$ ) and humor in learning ( $r = .17$ ;  $p$  value  $< .01$ ).

**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	1.75	.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 *Italic*; LON = loneliness; ENG = learning engagement; ASE = academic self-efficacy; HUM = humor in learning, root of AVEs = bold italic

### Common Method Bias, Validity and Reliability

Before further analysis is carried out, the data quality is evaluated first. First, because the data comes from one source, namely students, there are concerns about the common method bias (Podsakoff et al., 2012). To reduce concerns regarding common method bias, we exercise two types of controls: procedural and statistical. Our control procedure was carried out by designing a questionnaire with various response types (1 = never/strongly disagree to 5 = always/strongly agree). Furthermore, we measured the variables at three different times so that psychologically the respondents did not connect the answers between constructs. Statistical control was carried out 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 shown in Table 3 show that no construct has a dominant explained variance (> 0.50), and the AVE value in the single factor test is .29 below 0.50, indicating standard methods variance is not detected in this data (Kock, 2017; Podsakoff et al., 2003) While in the separate factor analysis test, construct reliability and validity meet the recommended and satisfactory conditions (Hair et al., 2010): Cronbach alpha values > .70; construct reliability > .70, and average variance explained (AVE) > .50. Furthermore, discriminant validity (see Table 2) has been satisfactory were all root of AVEs scores (bold italic) have exceeded the correlation value between the variables in the study (Fornell & Larcker, 1981).

**Table 3.**  
Common method bias, validity and reliability

	N items	Factor loading	Variance explained*	CA	CR	AVE
Loneliness	8	.61 - .83	31.11	0.93	0.93	0.63
Academic self-efficacy	9	.74 - .85	8.89	0.86	0.94	0.77
Learning engagement	9	.68 - .82	15.22	0.84	0.94	0.74
Humor in learning	5	.76 - .83	7.39	0.90	0.95	0.68
Percent of variance*	62.62					
AVE*	0.29					

Notes: n = 367; \* = single factor estimation; CA = cronbach alpha; CR = construct reliability, AVE = average variance explained.

### Hypothesis testing

The results in Table 4 show all the results of hypothesis testing. The first hypothesis proves a negative correlation between loneliness and ASE ( $b = -.24$ ;  $p$ -value < .01) and loneliness to learning engagement ( $b = -.16$ ;  $p$ -value < .01). Thus, H1 and H2 have been confirmed. The results also show that ASE is positively related to learning engagement ( $b = .30$ ;  $p$ -value < .01), thereby providing support for H3. Also, the indirect effect of loneliness on academic efficacy is partially supported, since loneliness remains significant when learning engagement is included in the model (see Table 5). The

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

**Table 4.**

*Hypothesis testing (macro Process model 15)*

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

The moderating effect of humor in learning has also been confirmed in the hypothesized relationships. As such, H5 stated that humor in learning moderated the relationship between loneliness and learning engagement and that relationship was proven based on interaction 1 (humor in learning x loneliness) was significant (b = .22 p-value < .01). Positive results on interactions indicate that the moderator's role is positive, where the negative influence of loneliness on learning engagement will weaken along with the 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 to positive .04 at the position of humor in learning at a high level (see Figure 2). Hence, when humor in learning is at a high level, the effect of loneliness on learning engagement is positive and insignificant.

In line with H6, the moderating role of humor in learning on the relationship between ASE and learning engagement has also been established. The interaction value was proven to be significant (b = .23 p-value < .01) with a positive direction indicating the positive role of humor in learning in the relationship. The conditional effect shown in Table 5 shows that the effect of engagement on academic efficacy dramatically increases from .10 to .50 in the low to high humor in the 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).

**Table 5.***The indirect and moderating effect*

Indirect Effect	<i>Effect</i>	<i>BootSE</i>	<i>BootLLCI</i>	<i>BootULCI</i>	
LON --> ASE --> ENG	-.16	.04	-0.23	-0.08	
Moderating Effect	<i>Effect</i>	<i>SE</i>	<i>p</i>	<i>LLCI</i>	<i>ULCI</i>
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

**Discussion**

This study aimed to investigate the relationships between a sense of loneliness, ASE, and learning engagement in the remote teaching setting in a sample of students in Indonesia. Next, we examined the role of ASE intermediation 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 that it was negatively associated with ASE and learning engagement. ASE has been positively related to learning engagement and acts as an intermediate relationship between loneliness and learning engagement. Finally, humor in learning plays a vital role in the degree of loneliness, ASE, and learning engagement.

**Theoretical implications**

First, the results show that loneliness has a negative effect on ASE, indicating that a high sense of loneliness can reduce ASE. Our findings update previous empirical findings (Feldman et al., 2016) in a different setting, where the present study was conducted in a pandemic situation. 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), which causes many differences in the findings of previous studies. For example, Feldman et al. (2016) found a significant effect of loneliness on ASE when measured at the same time but not at different times (e.g., loneliness time 1 to ASE time 2). Meanwhile, other findings (e.g., Andretta & McKay, 2018) conclude that loneliness only impacts social self-efficacy, not academic efficacy. The present study examined students who experienced higher levels of loneliness at the beginning of the semester and reported lower levels of ASE in the middle semester. Students' sense of loneliness has poor social relations with other people, so it seems more related to social self-efficacy. However, loneliness also includes feeling helpless, and the pandemic exacerbates the situation. As a result, students give up more quickly when faced with the many challenges that arise from remote teaching-learning, thus possibly affecting their perceived academic self-efficacy. Hence, these findings suggest that in certain situations, ASE may be influenced by academic and non-academic factors. For example, anxiety during the

pandemic and mental distress in non-pandemic situation among students has consequences on negative emotions and less academic self-efficacy (Alemany-Arrebola et al., 2020; Grøtan et al., 2019). Thus, the loneliness experienced by students during the pandemic has a spillover effect on various attitudes and behaviors related to learning, including ASE.

Second, we found that loneliness directly affects 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 cover 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 activities. A high learning engagement indicates students' physical, emotional, and cognitive involvement in learning activities. Loneliness, on the other hand, is a negative emotion that is also 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). In the same vein, loneliness is confirmed to have a close relationship with 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, generating a low level of learning engagement.

Third, we find that ASE has a positive effect on learning engagement. Our findings are consistent with previous studies that reported 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; Wolverson et al., 2020). More specifically, our findings support the relationship between ASE and learning engagement (Zhen et al., 2017). Like the relationship between loneliness and ASE, the link between ASE and learning engagement also needs special attention. The meta-analysis conducted by (e.g., Honicke & Broadbent, 2016) concludes that a high level of ASE at one point sometimes does not continue and may be limited to affect other variables if measured at a distance that is too close or too far away. The present study uses time lag data, where ASE is measured at time 2 (mid-semester), and learning engagement is measured at time 3 (end of the semester), with a distance of 3 months between the two. At this point, students who perceived a higher level of ASE in the middle semester reported higher levels of engagement at the end semester.

Fourth, as expected, we observe an indirect effect of loneliness on 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 lonely can have a spillover impact on decreasing academic self-efficacy (Feldman et al., 2016; Quan et al., 2014), and this, in turn, leads to a decrease in student involvement in participating in learning activities (Zhen et al., 2017). The present study adds to the ASE literature related to its role as a mediator of the relationship between smartphone addiction on academic procrastination in students in China and the link between basic psychological needs satisfaction and learning engagement (L. Li et al., 2020; Zhen et al., 2017). Moreover, we use cross-lag design by measuring loneliness, ASE, and learning engagement at three-time points is sufficient for testing the mediation model (Law et al., 2016). In other words, ASE has an intermediate learning engagement function resulting from students' sense of loneliness during the pandemic.

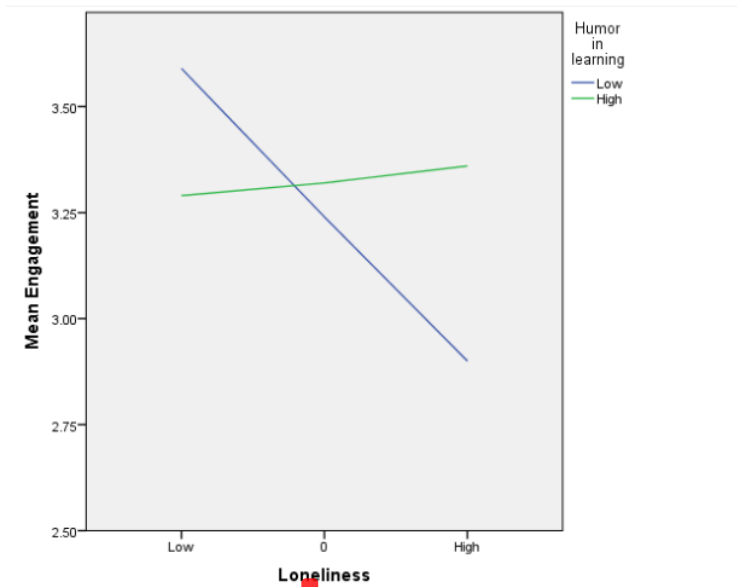


Figure 2. Conditional effect of loneliness on student engagement based on humor in learning

Finally, as expected, we observed the role of humor in learning as a moderator on the relationship between loneliness and ASE to learning engagement. This result adds to the empirical evidence of previous findings in the IHPT literature. As per IHPT (Wanzer et al., 2010), humor in learning reduces the negative effect of loneliness and ASE on student' learning engagement. In other words, students who have a high sense of loneliness experiences will tend to have low engagement. However, the negative effect can be minimized if the teacher can 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 will strengthen the influence of ASE on learning engagement. These results indicate that students with high ASE tend to be more involved in learning. Notably, the relationship is getting stronger, supported by a pleasant learning atmosphere through humor in learning. It can be argued that our findings add new empirical evidence to cover the dearth of learning effectiveness through the creation of a pleasant atmosphere with humor that teachers provide in the classroom.



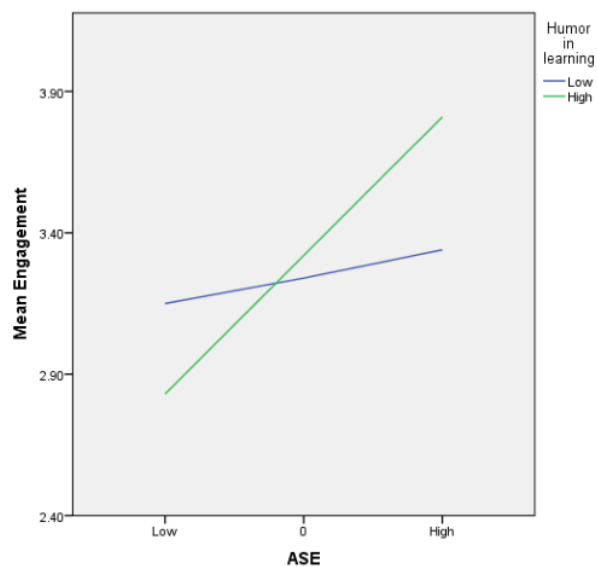


Figure 3. Conditional effect of ASE on learning engagement based on humor in learning

### Pedagogical implications

The study results offer three managerial implications for increasing ASE and students' learning engagement. First, this study is helpful for educational institutions to understand the mechanism of student engagement in online learning settings. Although online learning provides various conveniences and advantages in terms of accessibility and time flexibility, the low direct interaction of students can have implications for a sense of loneliness among them. The educational institutions need to consider that loneliness hurts ASE and student engagement, so it needs to be anticipated further. Precisely and carefully, the school can investigate the signs of loneliness in students by utilizing the broader role of academic supervisors. Specifically, the academic supervising lecturer is a particular assignment to 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 problems that occur to students and provide various solutions related to personal problems that can interfere with learning activities.

Second, we suggest several things that can be done to alleviate students' feelings of loneliness in online learning activities. For example, instructors need to be equipped with adequate pedagogic skills to design and develop more exciting learning. As the results of this study, humor in learning can be applied by instructors to maintain student engagement and reduce the adverse effects of a sense of loneliness caused by the social restrictions applied. Especially in online learning, online instructors must present fun learning in class by inserting humor and stories that can arouse their students' attention and engagement. Taken together, as a final implication, we suggest that schools provide training to instructors to effectively manage classes. Since humor in learning is an instructor's pedagogic ability (Garner, 2006), increasing this ability can impact learning effectiveness (Ellingson, 2018).

Finally, based on the results of this study, we invite stakeholders, including administrators, teachers, parents, and the general public, to be aware of students' loneliness syndrome to ensure students have high self-confidence in academics and engage in learning activities. Because a sense of loneliness can harm students' mental and emotional health, educational institutions need to design comfortable learning by inserting humor into the classroom. In addition, parents also 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 mode learning due to the COVID-19 pandemic; in particular, this may not capture the phenomenon of the student experience in conventional learning settings. Furthermore, researchers need to explore the relationship models of loneliness, ASE, student engagement, and humor in learning in conventional learning modes. Second, this study only takes the setting of students in Indonesia, so it has a weakness in generalization for different cultures. Given this, we invite future researchers to examine the relationship between loneliness, ASE, and student engagement through cross-cultural studies. Third, the data collection design in this study uses 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 generate the robustness of causality between variables.

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