Exploring the Differences in Taiwanese University Students' Online Learning Task Value, Goal Orientation, and Self-Efficacy Before and After the COVID-19 Outbreak

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Abstract To date, researchers have not yet incorporated some prominent motivation theories to scrutinize and dissect learners' motivations of online learning, especially in this period of time under the influence of COVID-19. This study aimed to explore 558 Taiwanese university students' various online learning motivations, and to compare the salient differences before and after the COVID-19 outbreak. A survey named "COVID-19 Online Learning Motivation (COLM)" questionnaire was developed to thoughtfully evaluate the students' online learning task value, goal orientation, and self-efficacy. The results indicate that, first, the COLM questionnaire was valid and reliable for adequately probing the students' various online learning motivations. In general, the students expressed substantial increase in agreement for *Attainment value*, *Utility value*, *Mastery-approach goal*, *Mastery-avoidance goal*, *Performance-avoidance goal*, and *Functional self-efficacy* after the COVID-19 outbreak. This study further compared the two groups of students' scores on the COLM scales based on whether they had actual online learning experiences during the pandemic. The findings suggest that the students who had experienced comprehensive online learning during the COVID-19 pandemic may have held lower expectations regarding the personal relevance and anticipated future practicality of adopting online learning

before the pandemic. Interestingly, these preexisting differences on the two scales seemed to diminish after the outbreak of COVID-19, implying that this distressing pandemic which occurred worldwide did indeed have some impacts on how the Taiwanese university students valued the personal relevance and the future expected returns of adopting online learning in higher education.

Keywords COVID-19 · Online learning · Motivation · Higher education

Introduction

Since December of 2019, the operations of the whole world have been severely affected by a notorious coronavirus (i.e., COVID-19) in various aspects such as economy, industry, politics, and, undoubtedly, education. Many countries have been forced to abruptly terminate physical school operations and move education and learning activities online. Although the notion and research concerning online learning has been promoted and conducted for decades (Adedoyin and Soykan in press; Bonk 2020), it was not until these days that relevant stakeholders in education such as policy makers, school administrators, teachers, parents, and students began to realize the usage of online learning as a rapid response and solution to this crisis. However, this sudden and hesitant transition to remote teaching and learning was unplanned and unexpected by both teachers and learners, which may have resulted in unsatisfactory consequences and outcomes. For example, Bao (2020) conducted a study during this COVID-19 outbreak period and found that learners had encountered various issues related to the sustainability and

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persistence of engaging in meaningful learning with teachers, peers, and materials from a remote location.

In this circumstance, the issues relevant to how to continuously motivate learners online to avoid stress and anxiety during this crisis are of significance and should be the priority to educators while implementing such an emergency remote teachings mode (Adedoyin and Soykan, *in press*; Bozkurt and Sharma 2020). Researchers (Vanslambrouck et al. 2018) have claimed that understanding learners' motivation and intention to learn online or remotely should be regarded as a prerequisite for designing appropriate teaching and learning activities that align with learners' needs and interests. Although many motivation theories have been proposed and documented in the education literature (see Wentzel and Wigfield 2009), the research of applying relevant theories to online learning contexts is still limited, especially in this pandemic period when we definitely need to take a closer look at learners' various forms of motivation. In addition, motivation theorists (Turner and Patrick 2008) have argued that motivation is not static but rather contextual, and that learners' motivated behaviors may develop and change over time, even within the same context, suggesting that motivation may be context-specific and may be able to reflect underlying socio-cultural and educational influences in such contexts. Previous studies have also made it evident that cultural factors may play a critical role in the adoption of online learning technology (Arenas-Gaitan et al. 2011; Arpacı 2015). In other words, it is reasonable to assume that Taiwanese learners' motivation and intention to adopt online learning may be dissimilar due to the outbreak of the COVID-19 pandemic and the potential socio-cultural and educational features of Taiwan.

Also, researchers have advocated that students' self-regulation skill is essential to be persistent and successful in online learning, especially during this COVID-19 outbreak period (Vilkova and Shcheglova 2021). As indicated by a seminal work of Zimmerman and Campillo (2003) concerning self-regulated learning, the motivational constructs adopted in this study (i.e., task value, goal orientation, and self-efficacy) are regarded as essential to and closely related to how learners value their capability, the process as well as the consequences of learning that precede and set the foundation for subsequent self-regulated learning phases. In addition, much literature (e.g. Wong et al. 2019; Zheng et al. 2018) has highlighted the importance of self-regulated learning and its underlying motivational factors to overcome learners' struggles and anxiety in online learning environments. The targeted motivational constructs are also crucial for online learners to engage in self-regulatory processes (Wandler and Imbriale 2017) since recent studies have suggested that learners oftentimes lacked motivation and encountered

troubles in regulating their learning in online environments during the pandemic period (e.g. Aguilera-Hermida *in press*; Bao 2020; Gonzalez et al. 2020).

Taken together, it is argued here that initially understanding the learners' self-motivational beliefs of online learning can be seen as the fundamental step to promote constructive self-regulated learning behaviors, processes, and outcomes during the COVID-19 pandemic period. Thus, this study aimed to encompass several motivational constructs related to self-regulated learning to initially understand the changes in university students' online learning motivations before and after the outbreak of the pandemic. Exploring the underlying differences between the two periods would allow researchers to understand such changes of perception and identify the gaps that account for modifications to specific learning environments in terms of pedagogy and practice. The theoretical framework including the motivational constructs adopted in this study is presented in the following sections.

Literature Review

Task Value

The expectancy-value theory, proposed by Eccles and colleagues more than four decades ago, has been one of the long-standing motivation theories in education (Wentzel and Wigfield 2009). Based on the intricate expectancy-value model, a large number of educational studies (e.g. Eccles and Wigfield 2020) have been conducted to understand how learners' academic choice, engagement, persistence, and performance are motivated based on the expectations and values of the chosen activities and tasks. Among the constructs depicted in this prominent theory, the construct of task value has been regarded as one of the most significant psychological determinants to explain learners' motivation and subsequent behaviors. It comprises four main components, namely attainment value, utility value, intrinsic value, and cost (Eccles and Wigfield 2020). Attainment value refers to the degree of task importance to oneself relative to personal identity and relevance, while utility value represents the usefulness of the task for achieving present and future goals. Intrinsic value typically links to intrinsic motivation, which encompasses the anticipated enjoyment and interest one expects to gain. Perceived cost refers to how individuals undertake the unappealing consequences of engaging in a certain task such as loss of other opportunities resulting from making a certain choice rather than others. Recently, researchers (Artino and McCoach 2008; Chiu et al. 2007) have advocated that the task value construct is essential, and is a critical antecedent for understanding online

learners' intention, motivational regulation, engagement satisfaction, and continuance of using online learning. High task value learners often set proper goals and constantly evaluate their learning process, as well as being more strategic and self-regulated to accomplish the goals. Due to the significance of task value in education, more research evidence should be gathered to provide relevant insights and contribute to the field theoretically and practically.

Goal Orientation

Achievement goal theory denotes how individuals approach, respond to, and engage in achievement-type activities and behaviors (Pintrich and Schunk 2002). It involves the inclusion of different objectives for achievement and internal standards by which learners judge their performance in reaching the preset goals. Individuals with different goal orientations reflect the nature of purposes and motivations of approaching and avoiding certain tasks, and the internal criteria of evaluating task performance and achievement (Elliot and Thrash 2001). Early documented literature with respect to the conceptualization of goal orientation proposed a dichotomous model with the two main types of goals being mastery and performance (e.g., Dweck 1986). Recently, educational researchers extended this model to a 2-by-2 framework to conceptualize achievement goals as having four orientations, namely mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance (Elliot and McGregor 2001). The mastery-approach goal aims at learning for personal development, while the performance-approach goal is concerned with the desire to outperform others to demonstrate superiority of capability. The mastery-avoidance goal focuses on not falling short of task mastery, whereas the performance-avoidance goal manages to avoid failure or the demonstration of incompetence. Kaplan and Maehr (2007) claimed that different goal orientations may be related to various patterns of cognition, affection, and behavior. Relevant online learning research (e.g., Ng 2015; Remedios and Richardson 2013) also suggested that, in general, learners with mastery goals tend to express adaptive learning patterns such as higher levels of self-efficacy, persistence, deeper engagement, as well as frequent usage of cognitive and regulatory strategies. However, relevant studies adopting achievement goal theory in the line of online learning research are still scarce, and this field of research is still in its nascent stage. This motivational perspective of taking achievement goal theory into account may be meaningful to provide significant insights to the field.

Self-efficacy

Bandura's well-known social cognitive theory emphasizes the interplay among personal, behavioral, and environmental influences, and centers on the notion of self-efficacy which can be defined as individuals' judgments of their own capabilities to organize and execute courses of action required to accomplish designated types of performances (Bandura 2001). A person's self-efficacy may determine the level of motivation to exert the amount of effort invested in an endeavor. That is, an individual with low levels of self-efficacy will tend to exert less effort and show short-term persistence; therefore, he/she will be less likely to perform well. Recently, in the field of educational technology, researchers (e.g., Cheng and Tsai 2011; Hodges 2008) have claimed that the construct of self-efficacy should be tailored and conform to the context of online learning environments from, for instance, functional and academic aspects. In other words, to successfully engage in online learning, students' online learning self-efficacy not only involves their ability to accomplish online learning tasks but also encompass relevant skills and knowledge of using technology for educational purposes (Bawa 2016).

Moreover, self-efficacy has been regarded as a decisive factor in influencing learners' self-regulatory behaviors, processes, as well as online educational experiences such as acceptance, continuance or satisfaction (Albelbisi and Yusop 2019; Shen et al. 2013; Sun and Rogers in press). It is also suggested that evaluating online learners' self-efficacy could be beneficial for educators to make appropriate decisions on how to better approach and address learners' needs and concerns concerning online learning processes during this COVID-19 crisis (Li 2020). A recent study has been evident that college students' online learning self-efficacy may decrease due to the sudden change of adopting emergency online learning without adequate preparation during the pandemic and resulted in a negative impact on their cognitive engagement (Aguilera-Hermida 2020). In turn, as suggested by previous literature, understanding online learners' self-efficacy may be significant to reflect present online learning practices during this pandemic period.

Research Purpose and Context

Based on the aforementioned discussion, this study aimed to explore Taiwanese university students' motivations of online learning and to compare the salient differences before and after the COVID-19 outbreak. To date, researchers have not yet thoughtfully incorporated some prominent motivation theories such as expectancy-value theory, achievement goal theory, and social cognitive theory to scrutinize and dissect learners' motivations for

online learning, especially in this period of time under the influence of COVID-19. It is assumed that the students' intention to adopt online learning would be considerably affected by the pandemic and, thus, more endeavors should be made in this regard to clarify how learners respond to the situation.

In addition, at the beginning of the year 2020, the Taiwan Ministry of Education (MOE) took proactive actions to postpone the opening of the spring semester in all universities for two weeks around late February to allow universities to make contingency teaching and learning alternative plans due to the pandemic (Cheng et al. 2020). The MOE also established a series of guidelines such as "Class Suspension Standards of Campus Response to COVID-19 Epidemic" and "Guidelines for University and College Preventative Measures against COVID-19" to prevent the spread of the pandemic (Ministry of Education 2020). In particular, MOE announced that a course over one hundred registered students must be accustomed to distance learning or other less risky alternatives such as separation of small-group.

These relevant guidelines and plans, in general, allowed university staff, faculty, and students to prepare for emergency remote teaching and learning. For example, many universities in Taiwan started to hold a series of training seminars to recommend possible online platforms (e.g. Google Meets, Microsoft Teams) to instructors and encourage them to teach online. Although these safety measures made by the universities were not obligatory, many instructors in Taiwan have attentively followed the recommendations to adopt remote teaching and learning. Some prestigious national universities even decided to implement comprehensive online and distance learning throughout the spring semester. In turn, in this circumstance, it is also meaningful to explore whether actual experiences of online learning during the COVID-19 outbreak period affected Taiwanese university students' online motivation.

Methods

Participants

A total of 558 Taiwanese university students (311 male and 247 female) were invited to participate in this study. Among these undergraduates, who had an average age of 20.33 and came from eight prestigious national universities in Taiwan, 140 were freshman, 117 were sophomores, 103 were juniors, and 198 were seniors or above. Since online learning in Taiwan is quite a commonly-used and popular approach, these students are believed to have sufficient

online learning experience to complete the survey questionnaire developed in this study.

It is worth mentioning that, since the COVID-19 pandemic outbreak in late 2019, the Taiwan government responded promptly and so was able to contain the pandemic and minimize its impact on people's daily lives, with fewer than 500 confirmed cases at the time of the survey, which was administered in the summer (July 2020). As aforementioned, several targeted universities of this study took precautionary actions in the spring semester of 2020 (from mid-March to early-June) by implementing comprehensive online and distance learning to prevent and control the spread of the COVID-19 disease. As a result, among the total 558 university participants, 110 students (19.7%) reported that they had actually experienced comprehensive online learning courses during this precautionary period in their respective universities. To highlight the differences on the participants' online learning experience during the spring semester of 2020, the students ($N = 110$) with actual online learning experience were then characterized as "the *Experienced* group," while the rest of students ($N = 448$) without actual online learning experience in the same period were named "the *Anticipated* group," indicating that they merely had own preferences or expectations regarding online learning based on past relevant educational experiences.

Evaluating the Participants' Motivation for Online Learning

In order to understand the participants' various motivational constructs concerning online learning, a survey named the "COVID-19 Online Learning Motivation (COLM)" questionnaire (see Appendix 1) was developed. The COLM questionnaire aimed to capture respondents' experiences and motivations in three main constructs, task value, goal orientation, and self-efficacy. First, the task value construct consists of the four scales of *Attainment value* (e.g., The amount of effort it took through online learning was worthwhile to me), *Utility value* (e.g., What I learned through online learning was helpful for me to get a job), *Intrinsic value* (e.g., I think online learning is enjoyable), and *Cost* (e.g., Online learning reduced opportunities of student–teacher dialogue) with 16 items. The four scales and items were mainly chosen from the study of Chiu et al (2007). In their study, these items and theorized scales were validated with a confirmatory factor analysis (CFA) based on 202 Taiwanese university students' responses. In terms of validity, all factor loadings were above 0.60 and average variance extracted values were above 0.5, suggesting the measures have demonstrated sufficient construct validity. The reliability was examined using the composite alpha values and the results

showed that all four scales were reliable to assess the participants' task value of online learning.

Furthermore, the goal orientation construct (12 items) includes the four scales of *Mastery-approach* (e.g., It is important for me to understand the content of the online courses as thoroughly as possible), *Mastery-avoidance* (e.g., I worry that I may not learn all that I possibly could in online classes), *Performance-approach* (e.g., It is important for me to do well compared to others in online classes), and *Performance-avoidance* (e.g., My goal in online classes is to avoid performing poorly). The four scales and items were selected from the "Achievement Goal Questionnaire" developed by Elliot and McGregor (2001), which was validated by means of both exploratory factor analysis (EFA) and CFA with 180 and 148 undergraduates' responses, respectively. For instance, the EFA results indicated that the four scales accounted for 81.5% of the total variance and factor loadings were above 0.7 (0.74 ~ 0.93), while the CFA results supported the hypothesized four scales with a sufficient fitting model and the Cronbach's alpha values ranged from 0.83 to 0.94.

In addition, the online learning self-efficacy construct with 10 items includes the two scales of *General online learning self-efficacy* (e.g., I believe that I can master the learning materials in online learning courses) and *Functional online learning self-efficacy* (e.g., I believe that I can navigate instructional materials in an online learning system at will). The two scales and items were sourced from the Web-based Learning Self-Efficacy questionnaire in the study of Cheng and Tsai (2011). In their study, the validity and reliability were established with an exploratory factor analysis based on 300 Taiwanese university students' responses. The validation results indicated that the total explained variance was 61.10% and the overall reliability alpha was 0.86 (for each scale: 0.84 and 0.81, respectively), suggesting this questionnaire was verified as valid and reliable.

All items were modified to encompass the research context of this study (i.e., online learning) in the item-development phase. After the initial establishment of the COLM questionnaire, the definition of each scale and designed items were reviewed by two experienced professors in the field of educational technology and e-learning. In turn, the COLM questionnaire consists of a total of 10 scales and 38 items. It should be noted that the participants had to rate their responses to two different time periods (i.e., Before version/After version) at once. All items of the COLM questionnaire were presented using a 5-point Likert scale. The students also needed to answer a series of background questions related to their affiliations, gender, age, grade, and online learning experiences after the COVID-19 pandemic in the COLM questionnaire.

Data Analysis

In order to ensure the construct validity and reliability of the COLM questionnaires, all responses to the COLM scales were analyzed by means of two confirmatory factor analyses (i.e., before/after COVID-19), respectively. To evaluate the convergent validity and latent structure of the outlined constructs in the COLM, the values of factor loading, t value, average variance extracted (AVE), and composite reliability (CR) were calculated and examined. For instance, each factor loading coefficient must be larger than 0.5, with a significant t value. The cutoff values of AVE and CR should exceed 0.5 and 0.7, respectively (Hair et al. 2010). Besides, several goodness-of-fit indices, such as the chi-square per degree of freedom (< 5), root mean square error of approximation ($RMSEA \leq 0.08$), goodness of fit index ($GFI \geq 0.9$), comparative fit index ($CFI \geq 0.9$), normed fit index ($NFI \geq 0.9$), and non-normed fit index ($NNFI \geq 0.9$) were computed to evaluate whether the two measurement models fit the collected data responded by the participants. Furthermore, in order to compare the salient differences between the Taiwanese university students' motivations of online learning in terms of task value, goal orientation, and self-efficacy before and after the outbreak of COVID-19, a series of t -test analyses were conducted.

Results

Verifying the Structure, Validity, and Reliability of the COLM Questionnaire

Confirmatory factor analysis (CFA) was conducted to verify the construct validity of the COLM questionnaire. As shown in Table 1, the CFA results indicate that all factor loading coefficients of the measured items ranging from 0.60 to 0.95 are significant and higher than 0.6. The average variance extracted (AVE) and composite reliability (CR) values all exceeded the cut-off value of 0.5 and 0.7, respectively. Besides, the goodness-of-fit indices for the Before-version of the COLM questionnaire ($\chi^2/df = 2.02$, $RMSEA = 0.04$, $GFI = 0.94$, $CFI = 0.95$, $NFI = 0.90$, $NNFI = 0.94$) as well as those of the After-version ($\chi^2/df = 2.04$, $RMSEA = 0.04$, $GFI = 0.95$, $CFI = 0.94$, $NFI = 0.90$, $NNFI = 0.93$) were obtained, indicating that the measurement models of both versions had satisfactory fit to the collected data. In sum, the CFA results suggest that the COLM questionnaire developed in this study is valid and reliable for assessing students' motivation of online learning from multiple theoretical perspectives.

Table 1 The CFA analysis of the “COVID-19 Online Learning Motivation (COLM)” questionnaire ($N = 558$)

Version	Scale	Number of item	Factor loading	t -value	AVE	CR
Before	Attainment value	4	0.65–0.75	17.34***–22.48***	0.51	0.81
	Utility value	4	0.67–0.72	16.97***–21.91***	0.50	0.80
	Intrinsic value	4	0.61–0.93	17.17***–28.74***	0.70	0.90
	Cost	4	0.62–0.78	16.44***–18.73***	0.54	0.82
	Mastery-approach	3	0.69–0.76	18.67***–23.18***	0.53	0.77
	Mastery-avoidance	3	0.74–0.82	20.71***–24.69***	0.61	0.83
	Performance-approach	3	0.82–0.95	21.79***–29.65***	0.80	0.92
	Performance-avoidance	3	0.61–0.86	14.59***–22.09***	0.61	0.82
	General OLSE	5	0.64–0.79	19.24***–24.08***	0.51	0.84
	Functional OLSE	5	0.69–0.75	14.90***–21.68***	0.52	0.84
After	Attainment value	4	0.60–0.77	15.27***–21.98***	0.52	0.81
	Utility value	4	0.69–0.75	17.83***–21.48***	0.51	0.80
	Intrinsic value	4	0.72–0.94	19.74***–28.37***	0.67	0.89
	Cost	4	0.73–0.84	13.98***–19.11***	0.60	0.86
	Mastery-approach	3	0.66–0.74	16.90***–21.88***	0.51	0.75
	Mastery-avoidance	3	0.82–0.88	20.69***–23.51***	0.72	0.88
	Performance-approach	3	0.84–0.93	21.23***–29.15***	0.79	0.92
	Performance-avoidance	3	0.61–0.90	13.27***–20.83***	0.61	0.82
	General OLSE	5	0.64–0.78	19.12***–22.52***	0.51	0.84
	Functional OLSE	5	0.67–0.76	14.50***–21.82***	0.53	0.85

*** $p < 0.001$

AVE Average Variance Extracted, CR Composite Reliability, OLSE Online Learning Self-Efficacy

Within-group Comparisons of Students' Scores on the COLM Scales

Table 2 indicates the students' average item scores and standard deviations on the 10 scales of the two versions of the COLM questionnaire. The paired t -test results

computed based on three different clusters, including the total sample of 558 students, the *Anticipated* group of 448 students who had no experience of online learning during the COVID-19 outbreak, and the *Experienced* group of 110 students who had actual experience in that period, are also shown in Table 2. First, for the four scales related to task

Table 2 Students' responses on both versions of the COLM and differences between the two versions for the different clusters

Scale	All sample ($N = 558$)			Anticipated group ($N = 448$)			Experienced group ($N = 110$)		
	Before		t	Before		t	Before		T
	Mean (SD)	After Mean (SD)		Mean (SD)	After Mean (SD)		Mean (SD)	After Mean (SD)	
Attainment value	3.48 (0.75)	3.61 (0.74)	5.57***	3.51 (0.74)	3.63 (0.75)	4.54***	3.33 (0.76)	3.52 (0.69)	3.34**
Utility value	3.48 (0.71)	3.53 (0.74)	2.54*	3.52 (0.70)	3.55 (0.74)	1.65	3.34 (0.72)	3.45 (0.70)	2.29*
Intrinsic value	3.48 (0.86)	3.54 (0.97)	1.85	3.52 (0.87)	3.56 (1.00)	1.36	3.34 (0.81)	3.44 (0.86)	1.51
Cost	3.89 (0.74)	3.94 (0.81)	1.79	3.88 (0.75)	3.94 (0.84)	1.91	3.95 (0.68)	3.95 (0.71)	0.04
Mastery-approach	3.90 (0.73)	4.04 (0.71)	6.06***	3.92 (0.72)	4.06 (0.72)	5.36***	3.83 (0.78)	3.96 (0.67)	2.89**
Mastery-avoidance	3.59 (0.84)	3.70 (0.82)	3.68***	3.60 (0.83)	3.69 (0.92)	2.80**	3.57 (0.90)	3.72 (0.95)	2.87**
Performance-approach	3.17 (0.96)	3.18 (1.00)	0.92	3.19 (0.98)	3.20 (1.03)	0.48	3.06 (0.88)	3.09 (0.88)	1.51
Performance-avoidance	2.93 (0.85)	2.98 (0.89)	4.27***	2.93 (0.85)	2.99 (0.89)	3.71***	2.92 (0.89)	2.97 (0.89)	2.30*
General OLSE	3.45 (0.72)	3.47 (0.74)	0.80	3.46 (0.73)	3.48 (0.76)	0.54	3.38 (0.71)	3.42 (0.68)	0.81
Functional OLSE	3.87 (0.68)	3.97 (0.69)	5.87***	3.89 (0.68)	4.00 (0.68)	5.14***	3.76 (0.68)	3.87 (0.70)	2.87**

*** $p < 0.001$ ** $p < 0.01$ * $p < 0.05$

value of online learning, the three clusters all showed significantly higher scores on the *Attainment value* scale of the After-version COLM questionnaire than on the Before-version. For the *Utility value* scale, all students and the students of the *Experienced* group scored significantly higher on the After-version. Yet, the *Anticipated* group students did not show a significant difference on the two versions. In addition, the three clusters of students scored similarly on the *Intrinsic value* and *Cost* scales of the two versions (non-significant). In sum, whether or not the students had actual online learning experience during the COVID-19 period, they all agreed more that online learning is worthwhile and relevant to their personal needs, while only those with actual online learning experience in this period of time appreciated the adoption of online learning as valuable and felt that it helped them to fulfill their future career goals. Nevertheless, all students, either with or without online learning experience during the COVID-19 pandemic, remained unaffected and relatively stable in terms of the fulfilment of intrinsic motivation and undesirable effects when adopting online learning.

Furthermore, in terms of the four goal orientations, the three clusters of students expressed significantly higher scores on the *Mastery-approach*, *Mastery-avoidance* and *Performance-avoidance* goals in the After-version of the COLM. Yet, none of the three clusters of students showed significant differences on the *Performance-approach* goal scale. It seems that all students, regardless of their online learning experience in this period, were prone to aim at online learning as mastering personal development, preventing failures in the accomplishment of learning tasks, and avoiding inferiority compared to others, while they did not demonstrate significant fluctuation in their learning goal of outperforming others in online learning courses

before and after the COVID-19 outbreak. Regarding the two scales with respect to online self-efficacy, the results displayed in Table 2 show that all students (the *Anticipated* and *Experienced* groups included) were inclined to possess significantly higher scores on the *Functional* scale, while the scores on the *General* scale did not show any significant differences. It seems that these students' perceived capabilities of having sufficient technical skills to manage online learning technologies did fluctuate much before and after the COVID-19 outbreak.

Between-group Comparisons of Students' Scores on the COLM Scales

This study further compared the two groups of students' scores on the two forms of COLM scales (i.e., the *Anticipated* and *Experienced* groups), with the results shown in Table 3. With respect to the responses on the Before-version of the COLM questionnaire, the students in the *Anticipated* group only showed stronger agreements for the *Attainment value* as well as the *Utility value* scales than the other group of students did. However, the scores on the remaining scales of this version did not show significant differences between the two groups. Similarly, the scores on all scales of the After-version of the COLM questionnaire also indicate that the two groups had no significant differences. In general, the results suggest that the students who had experienced comprehensive online learning during the COVID-19 pandemic may have held lower expectations regarding the personal relevance and anticipated future practicality of adopting online learning before the pandemic. Interestingly, these preexisting differences on the two scales seemed to diminish after the outbreak of COVID-19, implying that this distressing pandemic which

Table 3 Differences between the two different clusters of students' responses on the two versions of the COLM

Scale	Before			After		
	Anticipated group (<i>N</i> = 448)		<i>t</i>	Anticipated group (<i>N</i> = 448)		<i>t</i>
	Mean (SD)	Experienced group (<i>N</i> = 110) Mean (SD)		Mean (SD)	Experienced group (<i>N</i> = 110) Mean (SD)	
Attainment value	3.51 (0.74)	3.33 (0.76)	2.32*	3.63 (0.75)	3.52 (0.69)	1.47
Utility value	3.52 (0.70)	3.34 (0.72)	2.40*	3.55 (0.74)	3.45 (0.70)	1.31
Intrinsic value	3.52 (0.87)	3.34 (0.81)	1.91	3.56 (1.00)	3.44 (0.86)	1.22
Cost	3.88 (0.75)	3.95 (0.68)	-0.92	3.94 (0.84)	3.95 (0.71)	0.18
Mastery-approach	3.92 (0.72)	3.83 (0.78)	1.18	4.06 (0.72)	3.96 (0.67)	1.39
Mastery-avoidance	3.60 (0.83)	3.57 (0.90)	0.34	3.69 (0.92)	3.72 (0.95)	-0.34
Performance-approach	3.19 (0.98)	3.06 (0.88)	1.33	3.20 (1.03)	3.09 (0.88)	1.02
Performance-avoidance	2.93 (0.85)	2.92 (0.89)	0.08	2.99 (0.89)	2.97 (0.89)	0.15
General OLSE	3.46 (0.73)	3.48 (0.76)	1.04	3.42 (0.68)	3.38 (0.71)	0.74
Functional OLSE	3.89 (0.68)	4.00 (0.68)	1.87	3.87 (0.70)	3.76 (0.68)	1.77

**p* < 0.05

occurred worldwide did indeed have some impacts on how the students valued the personal relevance and the future expected returns of adopting online learning in higher education.

Discussion and Implications

In this study, the Taiwanese university students' various online learning motivations were investigated before and after the outbreak of COVID-19. With this aim in mind, two versions of the "COVID-19 Online Learning Motivation" questionnaire were developed to encompass these targeted online learning motivations, and were proved to be valid and reliable through a series of confirmatory factor analyses to evaluate the participants' online learning task value, achievement goal orientation, and self-efficacy.

Recognizing Relevance and Usefulness of Online Learning After the Pandemic

In general, this study found that the students expressed substantial increase in agreements on the *Attainment value* and *Utility value* scales after the COVID-19 outbreak. Expectancy-value theorists (e.g., Eccles and Wigfield 2020) have indicated that individuals' attainment value may be regulated by their internal inclination to avoid unavailing academic outcomes related to self-esteem of doing well. Thus, the Taiwanese university students may merely consider online learning as a necessary means of learning that they were supposed to adopt during this distressing period. Besides, some studies (López-Pérez et al. 2011; Vanslambrouck et al. 2018) have suggested that the utility value, such as the flexibility and convenience of online learning, are one of the most frequently-mentioned traits that the students valued. Yet, this study found that only those students with actual online learning experience during this pandemic increased their perceptions of utility value. In fact, how individuals perceive the utility value of online learning is externally motivated by the degree of fit for future goals (Chiu et al. 2007). It is possible that those students who adopted online learning during this pandemic considered this approach as an alternative and viable solution to fulfill their own needs for getting good jobs or careers in the foreseeable future. Since the positive relation between utility value and online learning continuance intention is evident (Chiu and Wang 2008), educators may need to explicate the utility value of online learning to those who have not had actual experience of it (i.e. *Anticipated* group) to appropriately enhance their motivations to engage in online learning.

Compared to the above-mentioned scales, the degree of intrinsic enjoyment of online learning reported by the

students seems not to have been affected by the pandemic. This finding is reasonable in that intrinsic motivation or value tends to derive from personal satisfaction with online learning rather than being constrained by various social and contextual factors. Nevertheless, it should be noted that all participants tended to have the highest concerns about the perceived costs of online learning such as isolation from peers or instructors or lack of social interaction. Contrary to the findings of this study, Chiu et al. (2007) found that continuing education online learners' perceived cost of online learning was relatively lower than the other three task values, and did not link to their continuance usage intention or satisfaction. It is possible that the Taiwanese university students worried about the negative aspects of online learning which have potential effects preventing them from continuing to use online learning since this pandemic may last for a long time. They are not quite sure, and hesitated whether they can exert ongoing efforts and make sacrifices in this circumstance. Thus, policy makers and higher education educators should take proper actions to alleviate this concern and highlight various positive values to stimulate students' intention to continually use online learning during this crisis.

Toward Mastery-Oriented and Performance-Avoidance Goals After the Pandemic

Regarding the students' goal orientations evaluated in this study, it seems that the adoption of online learning during this pandemic may direct their goal orientations to be more mastery-oriented as seeking to increase competence and understanding or as avoiding not completing the learning tasks. At the same time, they also expressed the distress of demonstrating poor performance relative to others in online learning activities. Yet, their goal orientation of outperforming others remained similar and was not influenced by the outbreak. These findings may reflect that, first, the students may generally consider online learning practices as being independent and self-regulated and then endorse mastery-related goals as the most crucial orientations (e.g. Ng, 2015; Vanslambrouck et al. 2018). Second, it is possible that the long-term usage of online learning in the current situation may not be familiar to the Taiwanese students, even though they had relevant online learning experience before. These students still managed to become accustomed to this fully virtual university life. Therefore, they had avoidance-oriented goals to at least not fail and merely pass the course requirements relative to others. Another stimulating finding is that, due to the unique educational environment in Taiwan that is highly academically competitive in order to enter prestigious universities (e.g. Lin et al. 2013), these university students were quite rooted in the impression of outperforming

others academically. In turn, the students' perceptions of their *Performance-approach* goal orientation remained stable and were not affected by the pandemic. Yet, these relevant explanations and interpretations presented here may warrant further research evidence to clearly understand how students set their goal orientations during this enduring pandemic period.

Increase of Functional Self-efficacy after the Pandemic

Students' self-efficacy has been critical for being successful in online learning environments (e.g., Artino and McCoach 2008). In this study, the students' two forms of self-efficacy related to online learning were evaluated. The results suggest that only the students' functional aspect of self-efficacy significantly increased after the outbreak of COVID-19, while their general self-efficacy was relatively stable. Noticeably, the Taiwanese university students had established a certain degree of confidence in completing online courses academically based on their pre-existing experiences, and were not affected by the pandemic. Yet, the pandemic seemed to have an effect on the students' self-efficacy to re-evaluate their technical skills in operating relevant functions smoothly in online learning environments. According to Bandura's social-cognitive theory (2001), individuals are more likely to practice a desired behavior if they perceive themselves as having sufficient skills to do so due to some environmental factors (e.g., implementing online learning during this pandemic). Thus, this finding indicates that the students' online technical skills could serve as a basis for successfully participating in online learning activities and tasks, as suggested in the literature (e.g., Cheng and Tsai 2011; Wu and Tsai 2006). Educators, when implementing online learning during this crisis, should equip students with relevant technical skills with respect to the online learning environments and systems in advance in order to be self-efficacious.

Calibrations of Task Value after the Outbreak

The results of the between-group comparisons show that, first, the students in the *Anticipated* group showed stronger agreements for the *Attainment value* and *Utility value* than the other group students did on the Before-version of the COLM questionnaire. It should be noted that the students were asked to answer the Before-version of COLM questionnaire in retrospect (i.e., after the outbreak). The students, without actual online learning experience during the outbreak, may be still reinforced on the image of adopting online learning as closely related to attainment value and utility value after the COVID-19 outbreak worldwide from external sources (e.g., MOE, teachers, peers, news, and social media). Also, Butler (2005) also claimed that

students oftentimes hold overly optimistic expectancies of their own competencies or motivations in learning. In turn, those without actual involvement seemed to overestimate their expectations of the value of personal relevance and anticipated career fulfillment by adopting online learning as a cure-all solution to deal with the pandemic before the outbreak, although the pandemic did have some impacts on how they valued the personal relevance and the future expected returns of adopting online learning in higher education after the outbreak. This finding also suggests that the two task value scales may be situational in nature and be easily influenced by learning situations (Dietrich et al. 2017). Yet, this interpretation should be consolidated in the future.

On the other hand, it seems that those students with actual involvement in comprehensive online learning during the COVID-19 pandemic lowered their expectations and perceptions of some motivational constructs, *Attainment value* and *Utility value*, in particular, captured in the Before-version of the COLM questionnaire more than their counterparts did. This interpretation seems to highlight the importance of calibration in online learners' motivation. Muenks et al. (2018) reviewed relevant research with respect to students' understanding of expectancy-related beliefs from a developmental perspective. They argued that various psychological, social and school environmental factors may have a substantial influence on how students perceive and develop their expectancy beliefs (e.g. task value). To be specific, students may need to calibrate between their expectations and actual performance on academic activities. In order to better align one's expectations with one's academic performance, more accurate or realistic calibrations are required to be adaptive, metacognitive, and self-regulated. Thus, although all students were aware of the severity of the COVID-19 pandemic and its impact on higher education, it is possible that the students with actual experience (i.e., the *Experienced* group) attempted to re-calibrate their expectations and perceptions on the Before-version of the COLM questionnaire. It should be noted that, the functional effect of learners' internal expectations as whether being optimistic or realistic on their learning performance is still equivocal (Muenks et al. 2018). Researchers are encouraged to investigate further to clarify this interpretation. To identify the calibration process between students' expectancies and performances in this or a similar drastic change may have theoretical as well as practical significance for improving online learning pedagogies and practices. It is also crucial that educators should be aware of students' unrealistic expectations before the implementation of online learning to proactively diminish the gaps between ideal and actual motivations.

Reconsidering the Design of “Post-Pandemic Pedagogy”

Nevertheless, the scores on all scales of the After-version of the COLM questionnaire showed a similar level of online learning motivation between the two groups, suggesting that whether the students had real experiences of online learning after the outbreak did not significantly affect their online learning motivation in terms of task value, goal orientation, and self-efficacy. A recent study (Aguilera-Hermida 2020) indicated that university students tended to still prefer face-to-face learning due to their unpleasant experiences of a sudden transition to online learning such as lack of supporting resources from institution, teacher, or peer. Such a similar situation also happened in Taiwan that students oftentimes encountered difficulty to manage online learning responsibility to be self-regulated during the transition to comprehensive online learning mode. In addition, this transition only lasted for nearly four months. Many students and teachers were still in the process of fine-tuning their learning and teaching practices. In turn, despite having actual online learning experiences during this crisis, the Taiwanese students in the *Experienced* group were not fully benefited from the advantages of online learning and demonstrated no differences in online learning motivation concerning the After-version of the COLM questionnaire comparing to their counterparts. Researchers and educators are advised to consider how to carefully plan appropriate “post-pandemic pedagogy” (Murphy 2020) to normalize online learning procedure during the COVID-19 pandemic outbreak globally.

Limitations and Future Directions

Some limitations of this study could be served as future research directions. For example, this study only adopted a quantitative survey to initially understand the Taiwanese university students’ various forms of online learning motivation according to their self-reported responses. Researchers who are interested in this issue can utilize qualitative methods such as interviews or online observations to gain more insights based on the findings of this study. Moreover, although this study aimed to collect the students’ self-responses concerning the two different periods, the data can only be collected after the COVID-19 outbreak to make possible cross-sectional comparisons in retrospect. Since the COVID-19 pandemic is still prevalent around the world, more endeavors and interventions should be put on the issues such as how to facilitate online learners’ motivation and self-regulation. In order to better capture the potential fluctuations of students’ motivation during the online learning process, future research is

advised to carefully scheme relevant data collection procedures.

Another limitation is that relevant research exploring online learners’ motivation during the COVID-19 pandemic is still scarce and thus limited the interpretations of derived findings of the current study. More similar studies should be conducted to understand how this pandemic impact online learners’ motivation in various aspects. This endeavor may provide more fruitful understandings of how to motivate learners to continuously engage and to be self-regulated in meaningful online learning. Besides, the relationships between university students’ various forms of online learning motivation and their actual learning performance could be investigated and established further by means of a variety of research methods in similar social, cultural and educational contexts. For example, Taiwan and other Asian regions such as China, Hong Kong or Singapore commonly share the value of Confucian-heritage culture (Biggs 1998). In addition, some researchers (Arenas-Gaitan et al. 2011; Arpaci 2015) have claimed that learners’ expectancy beliefs and values in online learning are culturally-induced and may engage them in various motivational processes. It would be beneficial to explore and compare the differences and similarities of students’ online learning motivations for attaining theoretical advancements in the field.

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Appendix

Appendix 1 The COVID-19 Online Learning Motivation (COLM) questionnaire (Finalized version)

Attainment value

1. The amount of effort it took through online learning was worthwhile to me.
2. Online learning made me a more knowledgeable person.
3. Online learning broadened my view.

4. Being successful at online learning confirmed my competence.

Utility value

1. What I learned through online learning was helpful for me to get a job.
2. What I learned through online learning was useful for resolving my problems at school.
3. What I learned through online learning was useful for my future goals.
4. The credits I got through online learning were useful for pursuing advanced studies.

Intrinsic Value

1. I think online learning is interesting.
2. I think online learning is enjoyable.
3. I think online learning is fun.
4. I can learn many stimulating things from online learning.

Cost

1. Online learning reduced opportunities for interaction among learners.
2. Online learning reduced opportunities of student–teacher dialogue.
3. Online learning reduced the sense of being part of the learning community.
4. Online learning reduced opportunities for discussing with and learning from other learners.

Mastery-approach

1. I want to learn as much as possible from online courses.
2. It is important for me to understand the content of online courses as thoroughly as possible.
3. I desire to completely master the material presented in online courses.

Mastery-avoidance

1. I worry that I may not learn all that I possibly could in online courses.
2. Sometimes I am afraid that I may not understand the content of this class as thoroughly as I'd like.
3. I am often concerned that I may not learn all that there is to learn in this class.

Performance-approach

1. It is important for me to do better than other students in online courses.
2. It is important for me to do well compared to others in online courses.
3. My goal in online courses is to get a better grade than most of the other students.

Performance-avoidance

I just want to avoid doing poorly in online courses.

My goal in online courses is to avoid performing poorly.

My fear of performing poorly in online courses is often what motivates me.

General OLSE

1. I believe that I can get excellent grades on online courses.
2. I believe that I can capture the basic concepts taught in online courses.
3. I believe that I can understand the most difficult part of online learning materials.
4. I believe that I can do a good job of learning tasks involved in online courses.
5. I believe that I can master the learning materials in online courses.

Functional OLSE

1. I believe that I can find the functions I need in an online learning system.
2. I believe that I can upload assignments to an online learning system before the deadline.
3. I believe that I can download instructional materials and resources from an online learning system.

4. I believe that I can navigate instructional materials in an online learning system at will.
5. I believe that I can send private messages to instructors to make queries from an online learning system.

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