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# An Investigation of the Effects of EFL Students' Self-efficacy in an Asynchronous Online Course with Interactive Contents

**Yu-Ching Tseng[1], Mei-Rong Alice Chen[2] and Yi-Hsuan Lin[3*]**

[1]Department of English, Tamkang University, Taiwan // [2]Department of English Language and Literature, Soochow University, Taiwan // [3]Department of English Language and Literature, Chinese Culture University, Taiwan // ychtseng@mail.tku.edu.tw // mralice@scu.edu.tw // lyx29@ulive.pccu.edu.tw

[*]Corresponding author

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**ABSTRACT:** This study investigates the role of self-efficacy in an asynchronous online English course enriched with interactive features. Self-efficacy is a strong predictor of academic achievement in conventional classrooms. However, when learning happens in an online environment, the students' learning achievement is also affected by their psychological perceptions of online learning. In this study, the relationship between self-efficacy and affective factors (i.e., learner autonomy, learner–content interaction, and perceptions toward transactional distance) was investigated. The aims of this study were to identify the influence of different levels of self-efficacy on these factors and to explore their relationships in an online EFL course. In total, 286 students were administered the questionnaires before and after the curriculum to probe their self-perception of these affective variables. When asynchronous interactive learning materials came into play, learners with different levels of self-efficacy make statistically different learning achievements. The statistically significant differences were also found between the student's self-efficacy level, their learner autonomy, and their perception toward the interactive contents. However, the difference was not significant between self-efficacy and transactional distance. The cost of asynchronous learning is an increasing transactional distance due to the lack of instructor-learner interaction. This study suggests that interactive content triggered an opposite effect by making the instructor's role invisible rather than absent. A good online course must balance the student's self-determined learning and flexibility with the course structure. Interactive learning content can keep the balance between developing learner autonomy and fostering engagement by dissolving the teacher's role into interactive course material.

**Keywords:** Self-efficacy, Asynchronous learning, Learner perceptions, Transactional distance, Interactive contents

## 1. Introduction

Taiwanese learners who take remedial English courses to graduate from university tend to have lower English proficiency and different levels of self-efficacy. However, the cause of their low English proficiency is not their failure to learn but rather the failure of their teachers and the traditional classroom to teach them. As online education is becoming a global phenomenon, the emergence of technology-mediated learning in the English as a Foreign Language (EFL) classroom provides learners with an asynchronous environment that allows them diverse opportunities to learn English. Today, asynchronous classrooms can replace or enhance language learning. Thanks to the support of the Internet and technology, asynchronous learning does not require the learner to interact directly with the instructor or other learners. It offers temporal and spatial flexibility, individualized learning pace, and repeatability of course material without supervision from the instructor. The typical design of an asynchronous curriculum includes online activities that learners can access anywhere and anytime (Lai & Morrison, 2013; Sulha et al., 2021). Interactive contents enhance interactivity through the use of technologies and network communication. The traditional learning materials are transformed into digitalized formats that give an impetus to reciprocal activities between the learner's input and the immediate feedback from the interactive materials (Domagk et al., 2010; Kaplar et al., 2022). Thus, this study focuses on asynchronous English courses that incorporate recorded interactive instructional videos, HTML 5 materials, interactive readings with vocabulary explanations, pop-up quizzes, and gamification into the content of the interactive learning materials.

Self-efficacy refers to a student's belief in their ability to achieve successful learning. When self-efficacy is combined with a more accessible, flexible, and resourceful environment, the affective factors from the learners' aspect might interact, which can impact their perceptions toward learning and change learning outcomes. Previous research has extensively studied self-efficacy and made important contributions by emphasizing its positive association with academic achievement (Caprara et al., 2011; Honicke & Broadbent, 2016; Talsma et

al., 2018; Wang & Bai, 2017). Although self-efficacy is a predictor of academic achievement in classrooms featuring face-to-face interactions, many important questions remain unresolved in the research to date.

First, previous studies have successfully established a positive association between self-efficacy and learning achievement. However, few empirical studies have addressed the relationships between self-efficacy, self-perceived affective factors, and the emotional and attitudinal influence, which may impact one's self-efficacy in a technology-enabled learning setting. The way that a learner perceives their learning process and learning environment influences their confidence in gaining a successful learning experience, and the interference of technology and interactive features embedded in the course materials add further complexity to the issue. Therefore, the present study investigated the relationship between self-efficacy and the affective factors that can influence a learner's decisions regarding the management of their learning process, including learner autonomy, which involves the judgments that the student makes about their ability to take responsibility for their own learning process; learner–content interaction, which involves the students' perception regarding whether their interaction with the course content has been a successful experience; and transactional distance, which involves the perceived distance between the students and the course.

Second, the impact of self-efficacy on online learning has not yet been fully understood. An investigation of whether a student's self-efficacy is related to their self-concept in learning gains particular significance for an EFL course that is completely online without mandatory class meetings. In an asynchronous online course, students perceive a psychological distance from the instructor because they are physically separated. The transactional distance triggers two-sided effects. In one aspect, instructors strive to minimize this distance by developing interactive materials that can successfully engage the students' attention and time in learning. An increase in the learner's interaction with the course content reduces the distance between the students and the instructor, which could enhance the students' academic performance (Ekwunife-Orakwue & Teng, 2014; Shea et al., 2016; Swart & Wuensch, 2016). In another aspect, a highly structured and predetermined classroom often allows or requires less interaction between the students and the instructor, and therefore the transactional distance may increase. An increase in the transactional distance enhances the student's autonomy because they need to take more responsibility for their own learning (Moore, 1997). This study explained the two-sided effects on transactional distance by suggesting that a highly-structured asynchronous classroom abundant in interactive contents can enforce and constrain autonomous learning.

This study investigated whether an asynchronous EFL course enriched with interactive features can affect a student's perception of their online learning experiences through the lens of transactional distance theory (Moore, 1997). In particular, this study emphasized how high- and low-efficacious students perceive their learning experiences when they are provided with abundant interactive learning materials in a highly-structured online learning environment. The research efforts were guided by the following questions:

RQ1: Does providing interactive learning content to learners with different levels of self-efficacy make a significant difference in their learning achievements?
RQ2: Does providing interactive learning content to learners with different levels of self-efficacy make a significant difference in their perceptions regarding learner autonomy?
RQ3: Does providing interactive learning content to learners with different levels of self-efficacy make a significant difference in their perceptions regarding learner–content interactions?
RQ4: Does providing interactive learning content to learners with different levels of self-efficacy make a significant difference in their perceptions regarding the transactional distance?
RQ5: What is the relationship between the student's learning achievements, learner autonomy, learner–content interactions, transactional distance, and their self-efficacy?

## 2. Literature review

Social and cognitive theories have postulated the importance of self-concepts in motivating students' learning to achieve academic success (Deci & Ryan, 1987). This study investigated the interaction of self-efficacy with other learning variables (i.e., autonomy, learner–content interactions, and transactional distance) to discuss the effect of interactive learning content in an asynchronous classroom.

### 2.1. Self-efficacy and learning achievement

Self-efficacy is defined as a person's belief in their capacity to successfully accomplish a particular task (Bandura, 1986; Schunk, 1991). It exercises an influence over many different aspects of human behavior and plays a determinant role in predicting the effort that one puts into a designated task. More specifically, self-efficacy refers to an individual's perception of their ability "to exercise control over their own level of functioning and over events that affect their lives" (Bandura, 1991, p. 257).

Self-efficacy, as one of the most important components of self-concepts, has been studied extensively. It has been positively associated with subsequent academic proficiency in cross-sectional and longitudinal studies (Caprara et al., 2011; Wang & Bai, 2017), as well as meta-analyses (Honicke & Broadbent, 2016; Richardson et al., 2012; Talsma et al., 2018). In the educational setting, self-efficacy is a prediction of an individual's learning achievement (Bandura, 1977) because a strong sense of self-efficacy is key for "successful adaptation and change" (Bandura, 1997, p. 32).

In online learning, it is skeptical to assume that a person's sense of self-efficacy directly points to a successful learning experience. Previous studies have shown contradictory results. Some studies suggested that self-efficacy is correlated with academic learning achievement (Kitsantas & Chow, 2007; Lim, 2001; Yukselturk & Bulut, 2007), whereas others found no significant correlation between the two (Cho & Shen, 2013; Crippen et al., 2009). The direct relationship between self-efficacy and learning outcomes can be mediated by other factors. For example, the learner's attitude toward online instruction and familiarity with online learning devices (Cussó-Calabuig et al., 2018) can affect their learning outcomes. Meanwhile, task-oriented students can be motivated by task-based instruction (Yukselturk & Bulut, 2007). Finally, the competitive nature of gamified online learning activities may negatively influence the performance of students who prefer traditional classroom instructions (Charles et al., 2011).

### 2.2. Transactional distance, learner–content interaction, and learner autonomy

This study investigated the relationship between self-efficacy and the key factors under the framework of Transaction Distance Theory (TDT). According to Moore (1997), transaction distance (TD) is the psychological and communicative distance between the students and the instructor in the context where they are physically separate. The perceived distance influences different aspects of teaching and learning, which has been widely studied in the TD literature. For example, Benson and Samarawickrema (2009) designed course activities in distance education and applied components of TD to understand the students' learning experiences. Chen (2001a) conducted a study in an online setting to figure out the extent to which the students perceived psychological or communicational distance. Similar to the work by Chen (2001a; 2001b), other studies on TDT were carried out to measure the students' subjective perception regarding their actual performances in online learning environments (Zhang, 2003).

Teachers tend to reduce TD to facilitate the effect of the student's learning (Benton et al., 2013; Moore, 1984). Moore (1997) identified three factors that influence the extent of distance as follows: structure, dialogue (interaction), and learner autonomy. Structure refers to the level of rigidity of the structure of an online course, including facets such as the course objectives, the pedagogical model, the design of assessment, and the flexibility or adjustability of the course to accommodate individual student needs (Zhang, 2003). Dialogue consists of three forms of interaction in online learning (Moore, 1997), i.e., learner–content interaction, learner–learner interaction, and learner–instructor interaction. Learner autonomy refers to a student's ability to take charge of their own learning (Holec, 1981). It has been argued that learner autonomy is affected by self-efficacy, which predicts the efforts that the students are willing to put into the process of learning (Deci & Ryan, 1987). Further, learner autonomy is also highly related to TD. An increase in distance between the student and the instructor enhances the student's autonomy because they need to take more responsibility for their own learning (Moore, 1997).

Moore (1991) has suggested that there is an inverse relationship between structure and dialogue. A highly-structured course leaves little room for instructor–learner interaction, and so TD increases. This inverse relation is based on the studies that focused on the dialogue between instructor-learner interaction (Huang et al., 2015; Moore, 1991) or learner–learner interaction (Benson & Samarawickrema, 2009). When interactive learning content brings an innovative method of interaction for learners with course content, it becomes important to re-examine the relationship between structure and dialogue, as an online course that is full of interactive features requires more interactions between the students and the content. A rigidly structured online course controls part of the student's learning progress, and therefore learner autonomy may decrease because the student does not

need to take full responsibility for the management of their learning. Structural inflexibility influences the different forms of interaction. From the learner's perspective, when the perceived distance changes, the requirement of self-responsibility reduces, which affects their learning achievement.

### 2.3. Transactional distance in distance education

Online distance education is defined by four characteristics: institutionalization, geographical separation, interaction, and formation of a learning community (Schlosser & Simonson, 2009). An online course is institution–based. Although the instructor and the students are inherently separate temporally and geographically, a learning community is formed, where interactions are established between the instructor and the students, the students and the contents, and among the students through the course design and the learning activities.

The technology used in an online classroom is another focus of studies using the framework of TDT. Park (2011) has proposed that mobile learning added a new dimension to the original TDT frameworks. Swart and Wuensch (2016) indicated that the adaptation of digital devices has helped in shortening TD. Along similar lines, some studies have found that decreased TD could increase the learner's academic performance (Ekwunife-Orakwue & Teng, 2014; Shea et al., 2016; Swart & Wuensch, 2016). Huang et al. (2016) found that a good online course facilitates the interaction between the participants and the instructor. However, according to Moore (1997), the way that TD is influenced depends on the type of media used in the classroom. Interactive media can over-structure course material and allow for fewer interactions for the students to communicate with the instructor and their classmates, resulting in an increase in TD. Interactive materials bring more learner–content interaction because the materials respond to the learners or give the learners feedback while they are learning. Interaction with the course content has been identified as a vital factor in the success of online learning (Pham, 2018). Ekwunife-Orakwue and Teng (2014) investigated 342 students who were taking either online or blended courses and found that among the three factors, learner–content interaction exercised a greater effect on the student's learning outcomes than other forms of interaction.

## 3. Method

This study puts forward an example of asynchronous learning for a college-level online EFL course with the purpose to investigate the influence of a student's self-efficacy on their perception regarding the interactive materials and the overall course. This study employed TDT as its theoretical framework. The study utilized a quantitative method and used questionnaires to collect the data. Because the students' perception is important for the planning and revision of our online curriculum, self-reported questionnaires were used along with their academic achievement scores to investigate the effects of self-efficacy on their performance and other affective factors.

### 3.1. Participants

This study recruited 286 participants (Female = 163, Male = 123) from two online courses at the undergraduate level in a northern private university in Taiwan during the spring semester of 2021. The participants were junior and senior students from non-English major departments of the university. These students had completed two years of English courses, mainly through physical, face-to-face teaching. In addition, the high-low difference in the level of self-efficacy related to English learning is obvious among non-English majors. These online courses delivered remedial English lessons to students who had not reached the required level of English proficiency before graduation. The university set the exit requirement that the students must graduate with B1 (intermediate level) in the Common European Framework of Reference (CEFR). All of the students consented to participate in the study by viewing an online explanatory video that was recorded by the instructor/researcher and clicking into the questionnaire links.

### 3.2. Interactive learning content

The 18-week online course contained one synchronous week and 17 asynchronous weeks. The first week was the course orientation, where the instructor and the students interacted in a virtual classroom simultaneously using Microsoft Teams as the live web-based video conferencing. The other 17 weeks were conducted asynchronously, where real-time interaction was almost unattested between the instructor and the students. The instructor used

Moodle as the learning management system (LMS) to provide the students with learning resources and academic support during the process while the students took responsibility for their own learning (Majeski et al., 2016).

The asynchronous classrooms in the present study incorporated the use of interactive multimedia materials that were designed and generated by the course instructor. The highly interactive materials were designed to make learning more engaging and effective for the students. The courses were highly structured, requiring the students to follow a certain order and complete all of the required tasks rendered in different kinds of interactive formats (e.g., videos, readings, HTML5 materials, exercises, quizzes, and gamification).

*Table 1.* Descriptions of interactive contents

| Interactive content format | Description |
|---|---|
| Video | The interactive videos used in the courses allowed the students to interact with the video content by clicking, dragging, hovering, and exercising in the middle of video playing. |
| Reading | The interactive reading used in the courses contained audio and clickable vocabulary explanations. |
| HTML5 materials | The HTML5 interactive materials used in the course focused on grammar and some common usages of phrasal verbs. For each section, the students had to correctly answer all the questions before they could proceed with the material. |
| Exercise | The interactive exercises used in the courses included different kinds of interactive activities for students to complete repetitively, including multiple choices, drag-and-drop, memory games, fill-in-the-blanks, flashcards, word puzzles, and so on. |
| Quiz | The interactive quizzes used in the courses automatically graded the student's scores, and some provided feedback after the student has answered the questions. |
| Gamification | The gamification material used in the courses included web-based escape rooms created by the instructor. Students needed to solve puzzles and riddles to complete the missions. The tasks that were designed to challenge students included interactive exercises, animations, videos, and games. |

### 3.3. Measurement tools

#### *3.3.1. Learning achievement test*

The 18-week class involved 30 quizzes. All of the quizzes were based on the textbooks and developed as well as revised by the instructor/researchers according to the content designed for each week. Each quiz consisted of 10–20 items. This study used the 10th week, which is arranged to be the midterm week at most universities in Taiwan, as the divide to split the quizzes into half. A total number of 14 quizzes were completed before the 10th week, and the average score of these 14 tests was adopted as the pre-test results for each student participating in the study. To demonstrate the construct validity of the pre-tests, three experts reviewed and revised the reading quizzes. Kuder–Richardson 20 was used to measure internal consistency. The researchers selected the article from Unit 2, Can Facebook Change Your Life, from the textbook, *Read to Succeed*, which was published by Live ABC, as it is the standard textbook for intermediate readers. This pre-test had an acceptable reliability of 0.69.

For the post-test results, the average score of the 16 quizzes completed after the 10th week was adopted. It was assumed that the students would be more familiar with learning with technology as the semester progressed. The more time that the students spent on online learning elevated their familiarity with technology and enhanced their ability to learn autonomously. To demonstrate the construct validity of the post-tests, three experts reviewed and revised the reading quizzes. Kuder-Richardson 20 was used to measure internal consistency and reliability. The researchers selected the article from Chapter 2, Travelers' Tales from *Essential Reading 4*, which was published by Macmillan as one of the post-tests because this is also the standard textbook for students of intermediate proficiency. This post-test had an acceptable reliability of 0.70.

#### *3.3.2. Learner autonomy, learner–content interaction, and transactional distance in distance learning*

A large part of the quantitative data was acquired by distributing and collecting the questionnaires to and from the participants. After reviewing the existing literature, we considered distance learning to be a multidimensional construct that requires the inspection of several aspects of the cognitive construct, in which self-perceived autonomy, self-perceived interaction with the learning content, and self-perceived transactional distance are

integral elements. To gauge these three elements, the researchers adopted the constructs developed and validated by Huang et al. (2015) to further investigate the interaction of these elements and their relationship with self-efficacy.

To measure learner autonomy, Moore's (1991; 1997) original definition was adopted. Learner autonomy is related to self-directedness and a student's ability to control their learning process to achieve their goals. Therefore, two factors—the items related to the independence of learning (e.g., "Working on my own, I feel happy"), and the items related to study habits (e.g., "I enjoy less-structured courses which require me to take more control of my own learning")—were incorporated into the questionnaire. Expert judgments were incorporated to demonstrate content validity, and a total of 10 items were adopted to measure learner autonomy. The reliability of these questions was acceptable, with Cronbach's Alpha value being 0.78 for the pre-questionnaire and 0.83 for the post-questionnaire.

As regards learner–content interaction, we adopted the idea of "psychological or communication space" (Healey et al., 2008), which suggests how we communicate with the world affects our internal thoughts and self-perception. Therefore, the items related to the course design—such as course variety and individualization (e.g., "I receive individualized feedback on my assignments"; "The course is structured in a way that enables me to work at my own pace to meet the course goals and objectives") and formality (e.g., "Clear guidelines/rubrics on assignments, projects or other course-related tasks are provided for this online course")—were included. Expert judgments were used for content validity to gather constructive feedback (i.e., revisions and suggestions), and a total of 15 questions were adopted. The Cronbach's Alpha value for the pre-questionnaire was 0.89, while that for the post-questionnaire was 0.93.

To measure the learners' perception of transactional distance, the original questionnaire consisted of a set of items that were generated under two factors: learner–instructor interaction and learner–learner interactions. Although the questionnaire that was adopted in this study kept all of the items of the original, three experts revised them by adding the effect of interactive course materials into the formation of questions (e.g., "Interactive contents make me feel a strong sense of belonging to this online course"; "Through interactive contents, I feel closely connected to my instructor in this online course"). As regards the transactional distance questionnaire, the Cronbach's Alpha value for the pre-questionnaire was 0.92, while that for the post-questionnaire was 0.94—both values were at a good level.

#### *3.3.3. Self-efficacy questions*

A student's self-regulated and self-confident attitude during their participation encompasses the concept of self-efficacy, which is particularly important in technology-integrated classrooms. A student's self-efficacy in online learning courses is related to whether the online course meets their basic cognitive needs, such as their achievement in the course, their autonomy, and their interaction with the course materials. This study employed the questionnaire that was developed by Ngo and Eichelberger (2021) to reveal the student's perceived individual beliefs regarding their learning. A median split was used to categorize the sample into high and low self-efficacy (Marashi & Dakhili, 2015). The Cronbach's Alpha value for the questionnaire was 0.93.

### 3.4. Data collection procedures

All the students who volunteered to participate in the study were asked to complete two questionnaires. The self-efficacy questionnaire was collected at the end of the first week. The questionnaires, which probed their perceptions of autonomy, course content, and transactional distance, were conducted at two separate points in the semester. The first point was the end of the first week before any formal class activities occurred, while the second point was the end of the 17th week after the participating students had finished all the materials and tasks distributed on the learning platform. The 286 participants were classified as having either high or low self-efficacy based on the median split of their self-efficacy scores (Marashi & Dakhili, 2015; Ngo & Eihelberger, 2021). A significant between-group difference ($F = 478.09$, $p < .001$) was found in the high self-efficacy group ($N = 141$, 49.3 %, Female = 82, Male = 59, Mean = 4.08 $SD = 0.38$) and the low self-efficacy group ($N = 145$, 50.7%, Female = 81, Male = 64, Mean = 2.91, $SD = 0.51$). As the semester progressed, the scores of their achievement tests were also collected.

## 4. Results

### 4.1. Learning achievement

The students taking this online course were required to complete one or two topics of learning materials per week. Each topic contained one or two graded quizzes that evaluated the learner's overall understanding of the online materials. A total of 30 scores were collected during the semester. The quizzes were split into pre-test and post-test to compare their learning outcome after the extensive implementation of asynchronous instructions.

A one-way ANCOVA was performed to analyze the participants' learning achievements by using their pre-test as a covariate, self-efficacy as an independent variable, and the post-test as a dependent variable. The homogeneity of regression was not violated ($F = 2.72$, $p = .10 > .05$), showing a common regression coefficient for one-way ANCOVA. The examination of the self-efficacy in terms of learning achievement through the ANCOVA method showed that there were significant differences between the high self-efficacy group (Adjusted mean = 70.69) and the low self-efficacy group (Adjusted mean = 67.88) with $F = 4.37$ ($p = .04 < .05$), as presented in Table 2. The results indicate that the learning achievement of high self-efficacy learners was significantly higher than that of low self-efficacy learners.

*Table 2.* ANCOVA of the post-test for achievement

| Group | *N* | Mean | *SD* | Adjusted mean | *SE* | *F* | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| High self-efficacy | 141 | 71.31 | 11.58 | 70.69 | 0.95 | 4.37* | 0.02 |
| Low self-efficacy | 145 | 67.28 | 13.73 | 67.88 | 0.94 | | |

*Note.* $^{*}p < .05$.

### 4.2. Learner autonomy

Being autonomous reflects the psychological characteristics of individuals. This specific personal trait indicated whether these learners were able to independently direct their learning in the asynchronous English learning environment. The psychometrical scale from Huang et al. (2015) was adopted to measure the participants' perceptions regarding learner autonomy. A one-way ANCOVA was performed to analyze the participants' perceptions regarding learner autonomy by using their pre-questionnaire scores as a covariate, self-efficacy as an independent variable, and the post-questionnaire score as a dependent variable. The homogeneity of regression was not violated ($F = 3.62$, $p = .06 > .05$), showing a common regression coefficient for one-way ANCOVA. The examination of the self-efficacy in terms of the learner autonomy through the ANCOVA method showed that there were significant differences between the high self-efficacy group (Adjusted mean = 4.46) and the low self-efficacy group (Adjusted mean = 3.77) with $F = 6.08$ ($p = .05$), as presented in Table 3. The results reveal that the learners with high self-efficacy had significantly higher autonomy than the learners with low self-efficacy.

*Table 3.* The ANCOVA results for the learner autonomy of the two groups

| Group | *N* | Mean | *SD* | Adjusted mean | *SE* | *F* | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| High self-efficacy | 141 | 4.13 | 0.51 | 4.05 | 0.05 | 4.23* | 0.01 |
| Low self-efficacy | 145 | 3.84 | 0.69 | 3.18 | 0.05 | | |

*Note.* $^{*}p < .05$.

### 4.3. Learner–content interaction

Because learner–content interaction can be an indicator of self-paced learning, its effect was statistically tested in this study design. In contrast to real-time, off-campus synchronous learning, asynchronous learning in higher education offers flexibility for students to manage their own learning. Although asynchronous learning does not require interactions that come with scheduled class meetings, successful asynchronous learners demonstrate the ability to interact with the contents at their own pace. This self-paced orientation is important for meaningful learning to take place. Therefore, a one-way ANCOVA was performed to measure the participants' perceptions regarding learner–content interaction by using their pre-questionnaire scores as a covariate, the two groups of high and low self-efficacy students as an independent variable, and the post-questionnaire score as a dependent variable. The homogeneity of regression was not violated ($F = 0.90$, $p = .34 > .05$), showing a common regression coefficient for one-way ANCOVA. The examination of the effectiveness of the self-efficacy in terms of the learner–content interaction through the ANCOVA method showed that there were significant differences

between the high self-efficacy group (Adjusted mean = 4.46) and the low self-efficacy group (Adjusted mean = 3.91) with $F = 3.92$ ($p = .04 < .05$), as presented in Table 4. The findings demonstrate that the learners with high self-efficacy interacted significantly more with the content than the learners with low self-efficacy.

*Table 4.* The ANCOVA result for the learner–content interaction of the two groups

| Group | *N* | Mean | *SD* | Adjusted mean | *SE* | *F* | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| High self-efficacy | 141 | 4.13 | 0.63 | 4.06 | 0.05 | 3.92* | 0.01 |
| Low self-efficacy | 145 | 3.85 | 0.70 | 3.91 | 0.05 | | |

*Note.* $^{*}p < .05$.

### 4.4. Transactional distance

Given that online asynchronous English learning relies on technologically mediated interactions, the perception of psychological distance has long been considered an important construct. This aspect of technological mediation was investigated through statistical measures to obtain the full picture of the student's online learning perception. A one-way ANCOVA was performed to examine the participants' transactional distance by using their pre-questionnaire scores as a covariate, the self-efficacy as an independent variable, and the post-questionnaire score as a dependent variable. The homogeneity of regression was not violated ($F = 2.28$, $p = .13 > .05$), showing a common regression coefficient for one-way ANCOVA. The examination of the effectiveness of the self-efficacy in terms of the transactional distance through the ANCOVA method showed that there were no significant differences between the high self-efficacy group (Adjusted mean = 3.90) and the low self-efficacy group (Adjusted mean = 3.78) with F = 2.28 ($p = .13 > .05$), as presented in Table 5. The results indicate no significant difference in the perception of transactional distance between the learners with high and the learners with low self-efficacy.

*Table 5.* ANCOVA Analysis of perception toward transactional distance

| Group | *N* | Mean | *SD* | Adjusted mean | *SE* | *F* | $\eta^2$ |
|---|---|---|---|---|---|---|---|
| High self-efficacy | 141 | 3.98 | 0.68 | 3.90 | .056 | 2.28 | .01 |
| Low self-efficacy | 145 | 3.71 | 0.75 | 3.78 | .055 | | |

### 4.5. The relationship between learner autonomy, learner–content interaction, transactional distance, self-efficacy, and learning achievement

With the collected quantitative data, the researchers examined the relationships among the variables in the context of technology-mediated asynchronous English learning. The relationships between the indicators of transactional distance and the students' learning achievements are important for future curriculum design. As Table 6 demonstrates, learner autonomy correlated with learner–content interaction, transactional distance, and self-efficacy; learner–content interaction correlated with transactional distance and self-efficacy; transactional distance correlated with self-efficacy; and self-efficacy correlated with learning achievement. Most importantly, there was a statistically significant correlation between self-efficacy and learning performance, learner autonomy, learner–content interaction, and transactional distance. Therefore, in this study, self-efficacy can be interpreted as an essential factor of asynchronous online courses.

*Table 6.* Correlations of the variables

| | Learning achievement | Learner autonomy | Learner–content interaction | Transactional distance |
|---|---|---|---|---|
| Learner autonomy | .055 | 1 | | |
| Learner–content interaction | .065 | .822** | 1 | |
| Transactional distance | .011 | .767** | .790** | 1 |
| Self-efficacy | .175** | .607** | .515** | .554** |

*Note*. $N = 286$; $^{**}p < .01$.

## 5. Discussion

The present study demonstrated that in an asynchronous online course that is highly structured and incorporates highly interactive learning contents, self-efficacy could be a predicator of a student's learning achievement. We

found significant differences between the students with high and low self-efficacy in their learning achievements, learner autonomy, and their perceptions of learner-content interaction. However, no statistically significant relationship was found between the learners with different levels of self-efficacy and their perceived transactional distance. The findings also indicate that all of the variables correlated with each other, whereas learning achievement only correlated with self-efficacy.

### 5.1. Self-efficacy predicts students' achievements, autonomy, and interactions with content

The findings indicate that when learners were provided with interactive learning content, there was a statistically significant relationship between these variables—learners with different levels of self-efficacy performed differently in terms of learning achievement, developed different perception regarding learner autonomy, and demonstrated different learner–content interactions. These findings echo those of the previous studies that associated self-efficacy with academic achievement (Caprara et al., 2011; Honicke & Broadbent, 2016; Talsma et al., 2018; Wang & Bai, 2017). Further, the present study revealed that self-efficacy also correlates with the affective factors that are important to students' self-perception when taking online courses, including their self-perception regarding whether they can take responsibility of their own learning or not and whether their interaction with the course content constitutes a successful experience. Asynchronous classes incorporate technologies in students' learning to promote their interaction with course materials so they can better comprehend the content. It is important for online learners to develop a positive self-perception regarding their online learning experiences. The findings of our study indicate that self-efficacy is an important factor that affects not only a student's learning achievement but also how they react to online activities, manage their time to organize learning procedure, and complete the learning process to fulfill the requirements set by the instructor. Given that high self-efficacious students are more autonomous and interact significantly more with the content than low self-efficacious students, all of these positive self-perceptions assist the students in achieving more successful learning outcomes.

### 5.2. A well-structured asynchronous course triggers the two-sided effects of transactional distance

The findings also indicate that in a highly-structured asynchronous course constructed primarily by interactive contents, the perceived distance to the online course does not show differences between the high- and low-efficacious students. This result explains the two-sided effects of transactional distance. In one respect, TD should increase if the teacher's role disappears in the classroom, whereas in another respect, the interactive content reduces TD because a course incorporating rich interactive learning content keeps the students engaged, dissolving the teacher's role in the curriculum.

When interactive elements are blended in an asynchronous online course, access to interactive content makes individualized learning possible. The interactive content provides instant feedback to the students during the process of learning and allow them to learn through playing. An asynchronous teacher is part of the course content. Through the materials, the teacher interacts with the students, supervises their progress, and invisibly evaluates their performance. Interactive learning content strikes a balance between developing learner autonomy and fostering course engagement by making the teacher's role invisible. Swan (2002) argued that three factors—a clear and consistent course structure, frequent instructor-learner interactions, and a valued and dynamic discussion—are key to the success of an online course. However, a well-structured online classroom requires the instructor to interfere with the student's learning less because highly interactive content encourages the students to personalize and control their own pace of learning in a restrictive way. Moreover, interactive content nullifies the need for students to interact with the instructor because the teacher's role dissolves into the material. In a highly organized online course, the teacher may seem to be invisible, but, in fact, the teacher is everywhere. The students do not need to be physically close to the teacher if the instructions are clearly conveyed through the interactive materials. This can be verified through the student posts in every week's Q&A section. The two classes collected a total number of 61 posts, and none of the feedback was about the content-related clarifications. The students mostly posted comments to inquire about course management or to report LMS problems.

### 5.3. Transaction distance, learner autonomy, and interactive content are interwoven

The findings of this study revealed that the three affective variables (i.e., TD, learner autonomy, and learner–content interaction) are correlated. Moreover, these variables also correlate with self-efficacy, which, in turn,

correlates with learning achievement. A major goal of education is to develop a student's autonomy in learning (Bembenutty, 2011), but self-autonomy is not necessarily connected to their increased or decreased TD when learning occurs in an online setting characteristic of interactive contents. Asynchronous courses force the rules and regularities of student learning, as a well-organized online course requires the instructor to set clear goals, plan the detailed learning procedures, prepare learning resources, and determine appropriate evaluative methods for the learners. The interactive features that are embedded in the learning content forces the students to obey the regulations and follow the same path to complete the tasks. However, autonomous learners are innovative and creative. When it comes to learning, innovation and creativity pull the students out of regularity, often leading to a weaker bond with the course. In another aspect, interactive course content requires the students to become more autonomous in terms of learning, as they have to spare some time every week to complete all of the designated material and exercises. As the semester progresses, the more time that they have spent on interactive materials familiarizes them with online learning and improves their overall ability of learning with technology. Bandura (1986; 1997) identified mastery experiences as one of the four key sources of self-efficacy. In the educational setting, mastery experiences refer to a student's successful experiences in performing tasks. In contrast to traditional classrooms, students in asynchronous classrooms cannot simply sit without receiving any information from the lecture. Asynchronous classrooms reduce the student's mental and psychological stress by allowing them to repeat the material as many times as they need until they feel confident in their learning. Besides, they can also access the material at any time to refresh their memory and comprehension of the material. Students also have to actively participate in the learning activities to complete their weekly assignments. When interactive materials lead to more successful experiences for the students, they increase their learning achievements through their increased self-efficacy with online learning.

## 6. Conclusion

As English teachers are increasingly moving toward online teaching, it has become imperative to understand how the different variables related to a learner's perception interact with digitalized interactive learning contents to produce better learning outcomes with online instructions. Our statistical findings confirmed that a student's learning achievement in an asynchronous classroom can be enhanced by higher self-efficacy. Therefore, online instructors need to stress the importance of improving self-efficacy among students. For this, the instructors are encouraged to use interactive content to help their students establish more successful learning experiences. The flexibility and repeatability of online resources allow students to establish their own learning routines and determine their own pace of learning. Further, the instant feedback and interactive features provided by online learning materials can keep students engaged. Successful learning experiences can enhance a student's autonomous learning, while a stronger learner autonomy facilitates improved self-efficacy, which predicts the opportunity for better academic success.

In this study, we sought to examine how TDT (Moore, 1997) works in the context of an asynchronous online English course. Our findings have successfully established a relationship among the three learning variables that are considered important elements of describing a student's learning perception. For a long time, TDT has been used to explain the mechanisms of online education. The present study found that the difference in the overall transactional distance between the two groups of students and the course itself was not statistically significant because the relationship between TD and other affective factors is complex. This suggests that each factor is closely interwoven with the other factors, and there is no straightforward way to discuss any of them individually.

By combing all these factors, the results of this study bring the importance of interactive learning contents to the forefront. In an asynchronous environment, interactive learning content supports self-determined learning for both high and low self-efficacious learners. These learners accumulated successful learning experiences through the repetitive use of interactive materials. Positive learning experiences trigger higher course engagement, while higher engagement, in turn, brings in more positive experiences, and the whole process leads to a successful learning. Moreover, interactive learning materials encourage autonomous learning. When students become independent learners, the asynchronous classroom turns student-centric, and online learning no longer remains teacher-centric. In this context, students receive education not only from the instructor but also through the use of interactive learning content to discover their ability as independent learners. When interactive content is underpinned by a well-organized structure, it constrains autonomous learning by forcing students to obey course regulations and complete all of the tasks on time. Pedagogically speaking, the opposing but not conflicting features of interactive materials have successfully pushed the teacher's role behind the scene. Today, students can benefit from autonomous learning, even if the teacher is absent. However, the preset interactive activities must guarantee that the flexibility and repeatability of learning come with limitations.

Finally, a student's attitude toward English learning might not be persistent when they are learning with different types of interactive contents. This could trigger a positive learning effect for students with lower levels of English proficiency. Interactive learning resources can facilitate students who fail in traditional ways of teaching by giving them control over their own learning. The learning process is multifaceted and complicated, as students with different learning styles prefer different kinds of material and do not respond to all kinds of materials similarly. Therefore, future research could go one step further by investigating how academic self-efficacy might fluctuate when different interactive learning materials are used in an asynchronous setting, along with how they affect a student's academic engagement. Additionally, future studies might also be able to explain the mechanism behind the relationship between interactive materials and learning achievement for EFL learners.

## Statements on open data, ethics, and conflict of interest

The participants were protected by hiding their personal information during the research process. They knew that the participation was voluntary and they could withdraw from the study at any time. There is no potential conflict of interest in this study. The data can be obtained by sending a request email to the corresponding author.

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