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# The Effect of the Hybrid Learning Environment on the Learning Experience and Engagement of Mature Students in Thailand

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**Abstract**

**Background and Aim:** Mature students have unique strengths and weaknesses compared to traditional students, including higher levels of self-directed learning and motivation, paired with more time and resource limitations, making online and hybrid learning very popular. However, the quality of the hybrid learning environment could impact learning outcomes. The research investigates the role of hybrid learning environments in the learning experience and cognitive engagement of Thai mature students using the Web-Based Learning Environment Instrument (WEBLEI) assessment framework for online environments.

**Materials and Methods:** An online survey was conducted among mature students at a Thai university (n = 290). Data was collected using a questionnaire based on the WEBLEI framework. The data analysis used descriptive statistics and Structural Equation Modelling for hypothesis testing.

**Results:** Hybrid learning environment characteristics of access, interaction, response, and results significantly influenced perceived learning. Perceived learning and academic self-efficacy influenced cognitive engagement. Academic self-efficacy fully mediated the relationship between perceived learning and cognitive engagement.

**Conclusion:** The hybrid learning environment and its characteristics have a direct influence on the learning experience of mature students, with interaction having a particularly strong effect. Students respond to interaction, feedback, and critical reflection about their contributions, with course design and structure, convenience, efficiency, and autonomy on participation also playing a role. To influence cognitive engagement, improving the online learning environment to support perceived learning and particularly academic self-efficacy is critical.

**Keywords:** Academic Self-Efficacy; Hybrid Learning; Mature Students; Perceived Learing; Cognitive Engageement; Weblei Framework

## Introduction

This research investigated the factors in cognitive engagement in hybrid learning courses among mature students in Thailand. Mature students (or adult learners) are students who return to education at least two years after secondary school (Fiorini et al., 2022). Mature students may be part-time or full-time, and may be enrolled in degree programs, certificate programs, or continuing education programs designed for career advancement or simply for personal interest (Fiorini et al., 2022). While mature students are a diverse group of students, they do have some shared characteristics, such as more developed self-directed learning skills and stronger learning motivation compared to traditional students (Hamlin, 2020). At the same time, mature students face challenges that traditional students do not, as they often must balance the demands of their educational program against work and family caring responsibilities and may have significant financial constraints (Gregersen & Nielsen, 2023; Osam et al., 2017; Venegas-Muggli, 2020). As a result, the learning experience may differ significantly from the experience of traditional students.

Hybrid learning is well-positioned to meet the needs of mature students. Hybrid learning is one of the most common ways in which classroom and online learning environments are combined (Saichaie, 2020). Specifically, hybrid learning is "the intentional use of technology as a replacement of seat time in class to foster an environment for student learning (Saichaie, 2020: 98)." The structure and design of hybrid learning courses are very flexible, with technologies and learning objectives influencing the design of courses (Linder, 2017). However, a typical hybrid course may be a structured replacement of some classroom contact hours with online lectures or other words, and use of the online learning environment to facilitate the distribution of learning materials and student collaboration and communication (Saichaie, 2020). Hybrid learning environments can be asynchronous, with students engaging in online activities on their schedule; synchronous, with some activities such as live chat taking place at specific times; and even 'hyper-hybrid', with online and classroom time-integrated (Nørgård & Hilli, 2022). Hybrid learning allows students some amount of flexibility and autonomy on



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how and when to engage in learning (Linder, 2017), which addresses the time limitations of mature students. The learning experience in online learning can also be highly satisfactory for students who are willing to engage with the material and who are self-motivated to learn (Xiao et al., 2020). Thus, there are some ways in which hybrid learning is uniquely suited to the needs of mature students.

While online and hybrid learning was introduced to Thailand in the early 2000s, it was initially adopted as a solution for remote students and students with exceptional learning needs (Bunyakiati & Voravittayathorn, 2013), and later in the form of massive open online courses (MOOCs) for rural secondary school students (Panyajamorn et al., 2016). The COVID-19 pandemic led to an explosion of online and hybrid learning at the university level in Thailand, with online learning programs adopted rapidly to address lockdown requirements (Kornpitack & Sawmong, 2022). There have been a few studies on undergraduate-level experiences in hybrid and online learning following rapid adoption. One of these studies, which investigated the experience of undergraduate English students, found that hybrid learning paired with peer coaching encouraged innovative language use and interaction between students (Plailek et al., 2022). Another study, examining undergraduate engineering students, found that students were highly satisfied with their learning outcomes (Purahong et al., 2021). Taken together, these studies supported the overall effectiveness of online learning, but have not, to a great extent, addressed the question of the role the learning environment plays in the learning experience of mature students.

In summary, online and hybrid learning is more important than ever in Thailand, particularly for mature students. However, there has been limited research into what role the learning environment, or the technological tools used for learning and how they are used, which influences the learning experience of mature students. This is a critical gap in the research. It requires from mature students the effective use of time, access to learning resources, flexibility, learning autonomy, and other aspects of the hybrid learning environment that enable them to engage with the learning process. However, the learning characteristics of mature students, particularly their academic self-efficacy, also play an important role in learning engagement. The reason for conducting this study was to evaluate the role of the online learning environment in the learning experience of mature students in Thailand, especially in their learning engagement.

## Objectives

The objectives of the research are stated as follows. 1) To determine the role that the hybrid learning environment plays in the mature student experience and cognitive engagement; 2) to identify the characteristics of the hybrid learning environment, including access, interaction, response, and results, which influence mature students' perceived learning; and 3) to examine the influence between perceived learning and cognitive engagement in hybrid learning environments among mature learners.

## Literature Review

The research is based on a theoretical framework that includes the WEBLEI assessment framework for online learning environments, perceived learning, cognitive engagement, and academic self-efficacy. The theoretical framework reviews the central theory of the WEBLEI framework. This is followed by a review of the core relationships of the study, including online learning environments and perceived learning, perceived learning and cognitive engagement, and academic self-efficacy as an intervening factor in the relationship between perceived learning and cognitive engagement.

### The WEBLEI framework of online learning environments

The Web-Based Learning Environment Instrument (WEBLEI) assessment framework for online learning was drawn from research on early online learning environments in a project called the Connecting Communities of Learners (CCL) experiment (Tobins, 1998; Tobins & Fraser, 1998). The CCL experiment, which was based on an online-only asynchronous learning environment, established three broad characteristics of online learning environments, which included:

- Emancipatory activities (related to convenience, efficiency, and autonomy).
- Co-participatory activities (related to interaction, collaboration, feedback, reflection, and flexibility).



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- Quality (student outcomes like feelings of accomplishment and enjoyment, confidence and learning success, and frustration and tedium) (Tobins, 1998; Tobins & Fraser, 1998).

These three characteristics were acknowledged as related to online learning environments and experience, but they were very broad and vague. The WEBLEI assessment framework was developed by Chang and Fisher (2003) to make these characteristics more specific and associate them with specific experiences in the online learning environment. Within the initial statement of the WEBLEI framework, the authors adopted emancipatory activities (renamed access), co-participatory activities (renamed interaction), and quality (renamed response) (Chang & Fisher, 2003). They also added a fourth dimension of results, which addressed the information structure and design of activities within the course (Chang & Fisher, 2003). Thus, the four dimensions of the WEBLEI assessment framework are now access, interaction, response, and results. The *access* dimension of the WEBLEI framework relates to aspects of the online learning environment such as convenience, efficiency, and autonomy (Chang & Fisher, 2003). The *interaction* dimension addresses the extent to which students can communicate and interact with each other, including synchronous and asynchronous interaction, collaboration, and availability and quality of feedback (Chang & Fisher, 2003). The *response* dimension relates to how students respond to the learning environment and their engagement with it (Chang & Fisher, 2003). Finally, the *results* dimension relates to the student's perception of the information structure and design of the course, such as its objectives, lesson structure, and so on (Chang & Fisher, 2003).

While the WEBLEI framework was originally designed for asynchronous online learning environments, later revisions of the scales have been updated for hybrid and synchronous online learning as technology has changed (Chandra & Fisher, 2009). The scale items use open-ended questions to evaluate the learning environment and may be adapted further to specific learning environments (Chandra & Fisher, 2009). The WEBLEI assessment framework scales have shown good reliability and validity characteristics (Gupta & Pathania, 2021). Thus, the WEBLEI framework is a useful theoretical and practical framework for assessing how students perceive an online or hybrid learning environment.

**Hybrid learning environments and perceived learning**

Perceived learning is what students view that they are learning or have learned within a particular learning environment (Donkin & Rasmussen, 2021). This can include aspects such as the perceived supportiveness of the learning environment, perceived motivation to learn, and perceived learning outcomes, independent of objective achievement indicators (grades) (Donkin & Rasmussen, 2021). There are some questions about whether hybrid learning enhances perceived learning; while some studies have suggested hybrid learning may lead to higher levels of perceived learning than traditional classrooms (Unal & Unal, 2017), others have found similar levels of perceived learning across different learning environments (Ramirez et al., 2022). At the same time, some studies have indicated that perceived learning within the hybrid learning environment can be associated with learning environment characteristics. Studies in hybrid learning environments have shown that factors like accessibility, convenience, and flexibility increase perceived learning (Chen & Chiou, 2014). However, they may also feel that the hybrid learning environment has inadequate interaction and is socially isolating (Berry, 2018). Technology access and structure have also been shown to be a factor in online learning, as well as opportunities for interaction between students and teachers (Johnson et al., 2018; Rodríguez et al., 2022). Furthermore, aspects like feedback and response times, as well as the structure and quality of materials and communication and interaction opportunities, influence student's perceived learning (Horvat et al., 2015). Thus, there is evidence that the online learning environment's characteristics do influence perceived learning among students in different ways. At the same time, these studies have not directly associated the WEBLEI framework dimensions with perceived learning, and only a few of the studies have investigated mature students. This research addresses this research gap by examining a relationship between the hybrid learning environment and perceived learning among mature students.

**Perceived learning and learning engagement**

Learning engagement is a cluster of student responses to the learning environment, including behavioral engagement (or participation in learning activities), affective engagement (emotional response and formation of emotional connections); and cognitive engagement, or learning absorption and "willingness to exert the effort necessary to comprehend complex ideas and master difficult skills



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(Fredricks et al., 2004: 60).” This research focused on cognitive engagement as the central response relating to the student’s ultimate outcomes. Perceived learning is known to be a factor in learning engagement and motivation, and ultimately can influence the student’s outcomes (Bayoumy & Alsayed, 2021). Therefore, perceived learning was investigated as the primary factor in students’ cognitive engagement in the hybrid course. Previous theoretical reviews have argued that perceptions of the online learning environment play a direct role in cognitive engagement, including perceived learning (Halverson & Graham, 2019). Empirical studies have confirmed a relationship between perceived learning in online and hybrid learning environments and cognitive engagement in learning activities. One of these studies, conducted in online and hybrid learning courses in computer science, found that positive perceptions of the online learning environment increased learning engagement among students (Eliveria et al., 2019). Another study found that students who felt that the learning environment and material influenced their understanding or enjoyment of a topic also had stronger cognitive engagement (Buelow et al., 2019). In short, studies have suggested that there is a connection between perceived learning in hybrid learning environments and cognitive engagement in the learning material. However, few of these studies have focused on mature students, and most have not directly considered the influence of the online learning environment. This research addresses this research gap by examining the role of perceived learning in cognitive engagement among mature students.

**Perceived learning, academic self-efficacy, and learning engagement**

The second factor considered in learning engagement is academic self-efficacy, which can be defined as the student’s “beliefs about one’s capabilities to learn or perform behaviors at designated levels (Schunk & Pajares, 2002: 15).” In other words, academic self-efficacy beliefs are a domain-specific expression of self-efficacy, or the individual’s belief in their capability to perform in a specific domain (Bandura, 1994). Academic self-efficacy is known to be a predictor of learning engagement, according to a meta-analysis of 26 different studies that have investigated the relationship (Chang & Chien, 2015). However, this relationship may be complex. A study that took place in a MOOC learning environment found that academic self-efficacy was one of the complex set of factors that influenced the learning environment. Studies have also shown that academic self-efficacy mediates the relationships of other factors in learning engagement, such as teacher support (Yang et al., 2021) and self-esteem and perceived social support (Zhao et al., 2021). In short, while academic self-efficacy is known to influence learning engagement, this relationship is complex and may not be direct, but it is also not well understood. This research addresses the research gap by examining academic self-efficacy as a mediating variable in the relationship between perceived learning and learning engagement.

## Conceptual Framework

The literature review has been used to formulate a conceptual framework, which predicts relationships between the online learning environment, perceived learning, academic self-efficacy, and cognitive engagement, which is the ultimate outcome variable. This conceptual framework is shown in Figure 1. As this shows, the online learning environment is proposed to directly influence perceived learning, which in turn is proposed to influence cognitive engagement. Academic self-efficacy is proposed to have a direct relationship to cognitive engagement and to mediate the relationship between perceived learning and cognitive engagement. The seven hypotheses of the conceptual framework are explained in the following section.



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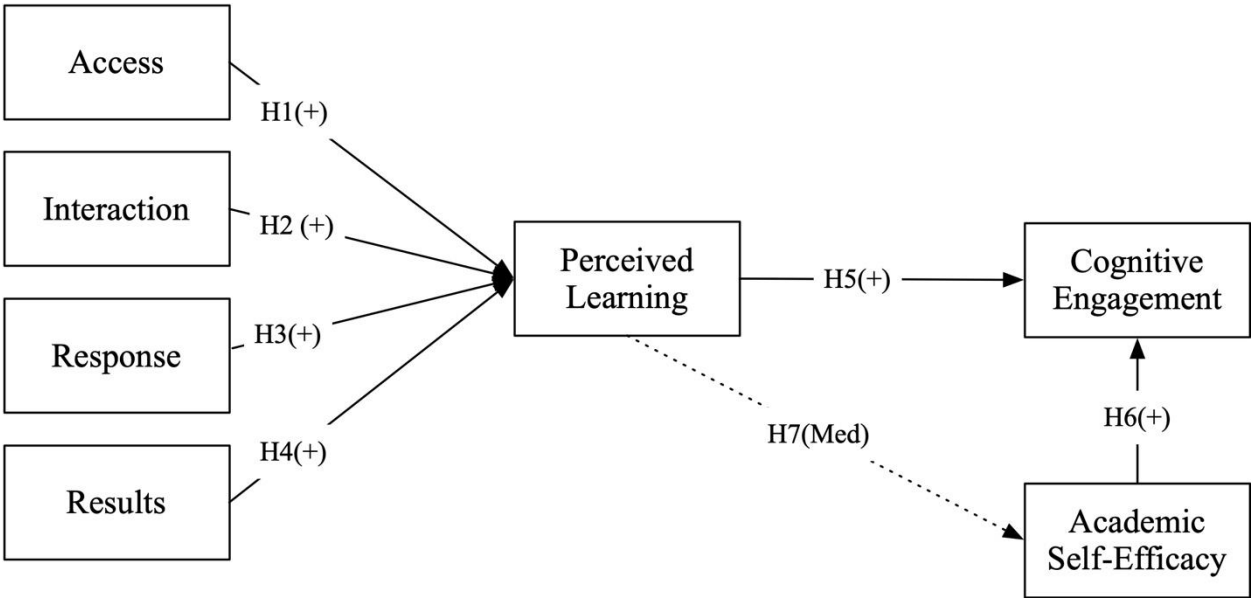


Figure 1 Conceptual framework of the study

**Hypotheses**

$H_a1$: Mature student's access to the hybrid learning environment influences perceived learning.

$H_a2$: Mature student interaction within the hybrid learning environment influences perceived learning.

$H_a3$: Mature students' responses within the hybrid learning space influence mature students' perceived learning.

$H_a4$: Mature student's results from the hybrid learning space influence mature students' perceived learning.

$H_a5$: Mature students' perceived learning in the hybrid learning environment influences learning engagement.

$H_a6$: Mature students' academic self-efficacy influences mature student's cognitive engagement in the hybrid learning environment.

$H_a7$: Mature student's academic self-efficacy mediates the relationship between perceived learning and cognitive engagement in the hybrid learning environment.

**Methodology**

The population of the study was mature students enrolled at the junior and senior undergraduate and postgraduate levels in a Thai university. The research was conducted as a survey of mature students (n = 290) enrolled in hybrid courses at a Thai public university. The sample was selected through the distribution of the questionnaire through university student administration departments to appropriate students.

Data was collected using an online survey. An online questionnaire was selected to ensure participant comfort while also maximizing the number of participants that could be included (Brace & Bolton, 2022). The questionnaire was adapted from the previous research. All survey scale items were collected using five-point Likert items, with 1 = strongly disagree and 5 = strongly agree. A summary of the questionnaire is provided in Table 1.

Demographic information and educational information were also collected using categorical items. The questionnaire items were assessed for content validity using an item-objective congruence (IOC) index approach, with a panel of three experts evaluating content validity (Sireci, 1998). Internal consistency reliability was assessed using Cronbach's alpha using the first wave of questionnaires (n =



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30) (Dunn et al., 2014). As shown in Table 1, all scales met the level of $\alpha \geq .700$ (Dunn et al., 2014), indicating initial reliability.

Table 1 Summary of the questionnaire

| Scale | Items | Sources |
|---|---|---|
| Access (AC) | 7 | (Chandra & Fisher, 2009) |
| Interaction (INT) | 8 | (Chandra & Fisher, 2009) |
| Response (RES) | 9 | (Chandra & Fisher, 2009) |
| Results (RESU) | 8 | (Chandra & Fisher, 2009) |
| Perceived Learning (PL) | 4 | (Unal & Unal, 2017) |
| Academic Self-Efficacy (ASE) | 5 | (Muris, 2001) |
| Cognitive Engagement (SE) | 4 | (Dixson, 2015) |

Data analysis was conducted in Jamovi, a free and open-source statistical analysis package that offers a range of flexible analysis tools (Şahin & Aybek, 2020).

The data analysis was conducted in two stages.

Descriptive statistics, including mean and standard deviation, were applied to measure samples' attitudes towards the variables. In addition, the frequency and percentage were reported for the samples' demographic information (Krieg, 2020).

Inferential statistics through Structural Equation Modelling (SEM) has been applied for the hypotheses testing. This process began with confirmatory factor analysis (CFA), which was used to refine the measurement model (Roos & Baudry, 2021). During this process, individual items that were poorly associated with the theoretical construct (factor loadings < .40) were removed to improve the fit of the measurement model. Next, the SEM process was used to investigate the internal relationships of latent variables (Byrne, 2016).

**Validity and reliability of the questionnaire**

Construct validity was investigated in a pre-test, using an item-objective congruence (IOC) approach. A panel of three experts was asked to review items and determine whether they were valid (-1), invalid (1), or the expert was not certain (0) about the validity of each item as reflecting the underlying construct. Items with a response rate of < 0.67 were revisited and either removed or revised.

Internal consistency reliability was based on Cronbach's alpha. The results of the Cronbach's alpha test completed in the pilot test (n = 30) are shown in Table 2. As this shows, there was adequate reliability ($\alpha \geq .70$) in all scales for a non-diagnostic measure (Hair et al., 2016). The complete process of data collection and analysis was then followed.

Table 2 Pilot test Cronbach's alpha

| Scale | Items | α |
|---|---|---|
| Access (AC) | 7 | 0.908 |
| Interaction (INT) | 8 | 0.821 |
| Response (RES) | 9 | 0.746 |
| Results (RESU) | 8 | 0.881 |
| Perceived Learning (PL) | 4 | 0.843 |
| Academic Self-Efficacy (ASE) | 5 | 0.819 |
| Cognitive Engagement (SE) | 4 | 0.880 |



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## Results

### Participant demographics and educational information

The demographic and educational information of participants is summarized in Table 3. As this table shows, a majority of respondents were female (54.1%), and most were aged 18 to 20 years (46.6%) or 21 to 25 years (37.9%). Junior undergraduates (53.1%) were the largest group, followed by seniors (25.9%), master students (12.8%), and Ph.D. students (5.9%). There were participants from a wide range of disciplines, with the largest groups from Languages (20.7%) and Economics and Finance (20%). Most students primarily used tablets or iPads (56.9%) in online learning, with other students primarily using mobile phones (23.8%) or PCs/laptops (17.9%).

Table 3 Demographic and educational information of participants

| Variable | Category | Frequency | Percentage |
|---|---|---|---|
| **Gender** | Male | 130 | 44.8 |
| | Female | 157 | 54.1 |
| | Prefer not to say | 3 | 1.0 |
| | **Total** | **290** | **100.0** |
| **Age** | 18-20 | 135 | 46.6 |
| | 21-25 | 110 | 37.9 |
| | 26-30 | 16 | 5.5 |
| | 31-35 | 18 | 6.2 |
| | 36-40 | 5 | 1.7 |
| | 41-45 | 1 | .3 |
| | 46-50 | 3 | 1.0 |
| | Older than 50 | 2 | .7 |
| | **Total** | **290** | **100.0** |
| **School year** | Junior | 154 | 53.1 |
| | Senior | 75 | 25.9 |
| | Master | 37 | 12.8 |
| | PhD | 17 | 5.9 |
| | Post-doctoral | 7 | 2.4 |
| | **Total** | **290** | **100.0** |
| **Discipline** | Languages | 60 | 20.7 |
| | Social sciences | 27 | 9.3 |
| | Economics and Finance | 58 | 20.0 |
| | Pure sciences | 21 | 7.2 |
| | Applied sciences | 42 | 14.5 |
| | Philosophy and Religion | 17 | 5.9 |
| | Others | 65 | 22.4 |
| | **Total** | **290** | **100.0** |
| **Learning equipment that you use most of the time** | Mobile phone | 69 | 23.8 |
| | Tablet or iPad | 165 | 56.9 |
| | PC (Personal Computer) | 52 | 17.9 |
| | Others | 4 | 1.4 |
| | **Total** | **290** | **100.0** |

### Descriptive statistics

The descriptive statistics are summarized in Table 5. These descriptive statistics were interpreted using the ranges set out for interpretation by Norman (2010), which are illustrated in Table 4.



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Table 4 Mean interpretations

| Mean | Interpretation |
|---|---|
| 1.00 to 1.50 | Strongly disagree |
| 1.51 to 2.50 | Disagree |
| 2.51 to 3.50 | Neutral |
| 3.51 to 4.50 | Agree |
| 4.51 to 5.00 | Strongly agree |

Source: Norman, G. (2010). Likert scales, levels of measurement, and the "laws" of statistics. *Advances in Health Sciences Education, 15*(5), 625–632

The perceptions of the respondents were calculated in the mean scores and standard deviations. The mean scores of each variable are shown in Table 5.

Table 5 Summary of descriptive statistics for scale variables

| Scale | No. of Items | Mean | Std. Deviation | Interpretation |
|---|---|---|---|---|
| Access (AC) | 7 | 3.72 | .987 | Agree |
| Interaction (INT) | 8 | 3.75 | .997 | Agree |
| Response (RES) | 8 | 3.68 | .978 | Agree |
| Results (RESU) | 7 | 3.68 | .973 | Agree |
| Perceived Learning (PL) | 4 | 3.69 | .991 | Agree |
| Academic Self-Efficacy (ASE) | 5 | 3.72 | 1.067 | Agree |
| Cognitive Engagement (CE) | 3 | 3.72 | .987 | Agree |

**Inferential Statistics**

Inferential statistics—CFA and SEM are used for hypothesis testing. The results are shown as follows.

**Confirmatory factor analysis (CFA)**

Before beginning the hypothesis testing, CFA was used to investigate the reliability and validity of the research model and to reduce the model if necessary. Convergent validity was evaluated based on factor loading > 0.50, average variance extracted (AVE) > .50, and composite reliability (CR) > .70 (Fornell & Larcker, 1981; Hair et al., 2016). Results are summarized in Table 6, showing that the scales were adequate to pass these criteria.

To investigate discriminant validity, correlation coefficients < square root of AVE were used (Fornell & Larcker, 1981; Hair et al., 2016). Results are summarized in Table 7, also illustrating that the instrument indicated discriminant validity. The model fit was assessed using root mean square error of approximation (RMSEA ≤ .08), comparative fit index (CFI ≥ .90), and Tucker-Lewis index (TLI ≥ .90) (Hair et al., 2016). As shown in Table 8, the measurement model met these criteria. Based on these outcomes, the measurement model was viewed as appropriately fitted and the analysis continued.

Table 6 Convergent validity of the research model

| Factor | Indicator | Estimate | SE | Z | p | Stand. Estimate | CR (> .7) | AVE (>.5) |
|---|---|---|---|---|---|---|---|---|
| ACCESS | AC1 | 0.976 | 0.047 | 20.600 | < .001 | 0.921 | 0.978 | 0.862 |
| | AC2 | 0.963 | 0.047 | 20.600 | < .001 | 0.921 | | |
| | AC3 | 0.998 | 0.047 | 21.100 | < .001 | 0.934 | | |
| | AC4 | 0.942 | 0.045 | 21.000 | < .001 | 0.931 | | |
| | AC5 | 0.989 | 0.047 | 21.000 | < .001 | 0.932 | | |



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| Factor | Indicator | Estimate | SE | Z | p | Stand. Estimate | CR (> .7) | AVE (>.5) |
|---|---|---|---|---|---|---|---|---|
| | AC6 | 0.977 | 0.046 | 21.000 | < .001 | 0.932 | | |
| | AC7 | 0.973 | 0.047 | 20.900 | < .001 | 0.929 | | |
| Interaction | INT1 | 1.028 | 0.050 | 20.500 | < .001 | 0.919 | 0.979 | 0.856 |
| | INT2 | 0.976 | 0.047 | 20.700 | < .001 | 0.922 | | |
| | INT3 | 0.971 | 0.047 | 20.800 | < .001 | 0.925 | | |
| | INT4 | 1.021 | 0.049 | 21.000 | < .001 | 0.932 | | |
| | INT5 | 0.972 | 0.047 | 20.600 | < .001 | 0.922 | | |
| | INT6 | 0.992 | 0.046 | 21.400 | < .001 | 0.940 | | |
| | INT7 | 0.945 | 0.045 | 21.000 | < .001 | 0.931 | | |
| | INT8 | 0.975 | 0.048 | 20.300 | < .001 | 0.912 | | |
| Response | RES1 | 0.981 | 0.046 | 21.200 | < .001 | 0.936 | 0.978 | 0.850 |
| | RES2 | 0.974 | 0.046 | 21.200 | < .001 | 0.935 | | |
| | RES3 | 0.987 | 0.047 | 20.900 | < .001 | 0.928 | | |
| | RES4 | 0.929 | 0.045 | 20.500 | < .001 | 0.918 | | |
| | RES5 | 0.972 | 0.047 | 20.500 | < .001 | 0.919 | | |
| | RES6 | 0.967 | 0.046 | 21.000 | < .001 | 0.931 | | |
| | RES7 | 0.969 | 0.047 | 20.800 | < .001 | 0.925 | | |
| | RES8R | 0.951 | 0.050 | 19.100 | < .001 | 0.881 | | |
| Results | RESU1 | 0.975 | 0.048 | 20.300 | < .001 | 0.912 | 0.979 | 0.828 |
| | RESU2 | 0.943 | 0.046 | 20.400 | < .001 | 0.916 | | |
| | RESU3 | 0.969 | 0.047 | 20.400 | < .001 | 0.917 | | |
| | RESU4 | 0.934 | 0.047 | 20.100 | < .001 | 0.908 | | |
| | RESU5 | 0.957 | 0.047 | 20.300 | < .001 | 0.914 | | |
| | RESU6 | 0.940 | 0.048 | 19.400 | < .001 | 0.890 | | |
| | RESU7 | 0.981 | 0.049 | 20.200 | < .001 | 0.912 | | |
| Perceived Learning | PL1 | 0.972 | 0.047 | 20.600 | < .001 | 0.923 | 0.956 | 0.846 |
| | PL2 | 1.006 | 0.048 | 20.800 | < .001 | 0.927 | | |
| | PL3 | 0.969 | 0.047 | 20.500 | < .001 | 0.919 | | |
| | PL4 | 0.922 | 0.046 | 20.100 | < .001 | 0.909 | | |
| Academic Self-Efficacy | ASE1 | 1.040 | 0.052 | 20.000 | < .001 | 0.907 | 0.959 | 0.823 |
| | ASE2 | 1.015 | 0.052 | 19.600 | < .001 | 0.896 | | |
| | ASE3 | 1.060 | 0.051 | 20.800 | < .001 | 0.927 | | |
| | ASE4 | 1.058 | 0.052 | 20.300 | < .001 | 0.916 | | |
| | ASE5 | 1.044 | 0.054 | 19.300 | < .001 | 0.889 | | |



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| Factor | Indicator | Estimate | SE | Z | p | Stand. Estimate | CR (> .7) | AVE (>.5) |
|---|---|---|---|---|---|---|---|---|
| Cognitive Engagement | CE1 | 0.912 | 0.047 | 19.600 | < .001 | 0.901 | | |
| | CE2 | 1.008 | 0.049 | 20.700 | < .001 | 0.929 | 0.938 | 0.834 |
| | CE3 | 0.954 | 0.048 | 20.000 | < .001 | 0.909 | | |

Note: CR = Composite Reliability, AVE = Average Variance Extracted

Table 7 Correlations of the Research Model

| | M_AC | M_INT | M_RES | M_RESU | M_PL | M_ASE | M_CE |
|---|---|---|---|---|---|---|---|
| M_AC | 0.929 | | | | | | |
| M_INT | 0.769 | 0.925 | | | | | |
| M_RES | 0.800 | 0.750 | 0.922 | | | | |
| M_RESU | 0.851 | 0.838 | 0.855 | 0.910 | | | |
| M_PL | 0.783 | 0.847 | 0.773 | 0.836 | 0.920 | | |
| M_ASE | 0.714 | 0.851 | 0.689 | 0.765 | 0.862 | 0.907 | |
| M_CE | 0.713 | 0.728 | 0.694 | 0.591 | 0.693 | 0.737 | 0.913 |

Table 8 Confirmatory factor analysis (CFA) model fit indices and criteria

| | | | RMSEA 90% CI | |
|---|---|---|---|---|
| CFI | TLI | RMSEA | Lower | Upper |
| 0.977 | 0.975 | 0.0434 | 0.0386 | 0.048 |

**Structural equation modeling (SEM)**

The final step of the analysis was SEM, which was used to investigate the relationships between latent variables and to test the hypotheses (Byrne, 2016). Model fit was investigated using several measures, including goodness of fit index (GFI ≥ .90), standardized root mean square residual (SRMR < .08), root mean square error of approximation (RMSEA ≤ .08), comparative fit index (CFI ≥ .90), and Tucker-Lewis Index (TLI ≥ .90) (Hair et al., 2016). The fit criteria for the model were as follows: GFI (0.899), SRMR (0.034), RMSEA (0.051), CFI (0.967), and TLI (0.965). While the GFI measure was slightly below the acceptance threshold, all other fit indices were adequate based on the established thresholds. Therefore, the model was suitably fitted to investigate the proposed relationships.



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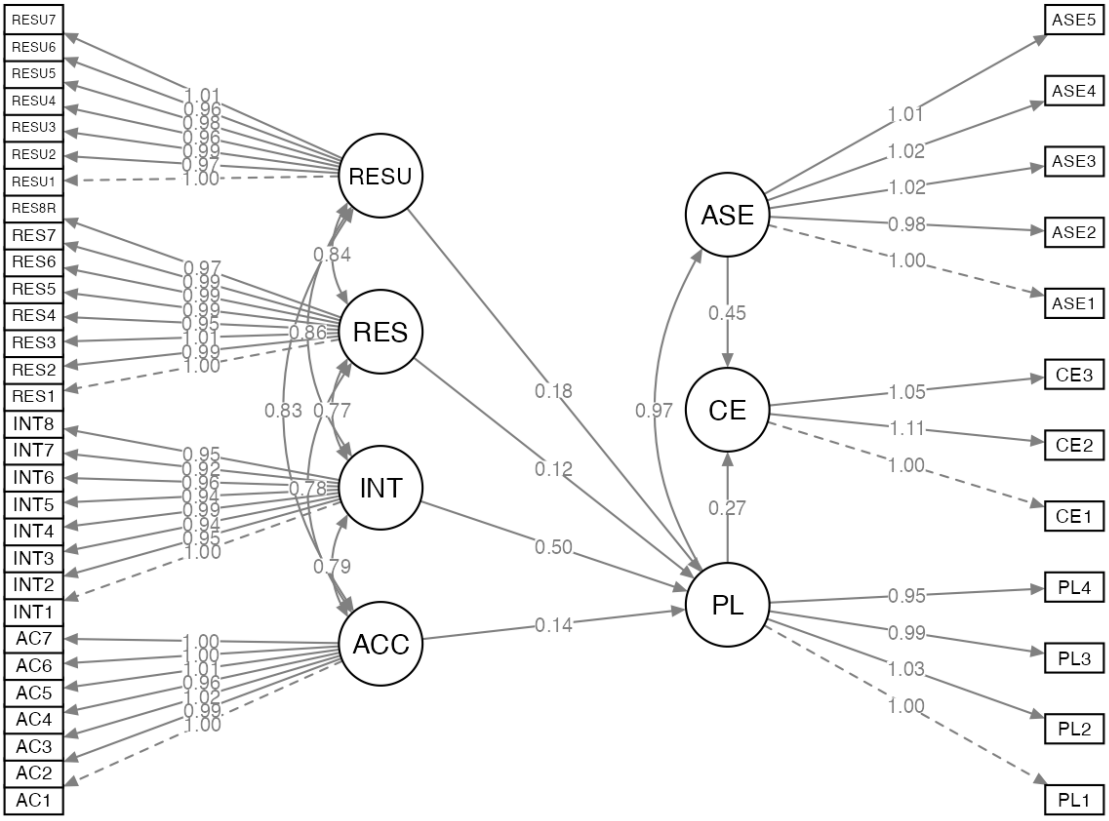


Figure 2 *Structural model*

Regression parameter estimates between the latent variables are summarized in Table 10. These parameter estimates are used to test the hypotheses (Table 11). Hypotheses 1 to 6 are based on the direct relationship, with hypothesis acceptance depending on a positive directionality of the relationship and the significance of the z-test ($p < .05$). Hypothesis 7 is based on the four-step mediation procedure (Baron & Kenny, 1986).

*Hypothesis 1.* $H_a1$ proposed an influence of Access (AC) on Perceived Learning (PL). The outcome of this test ($\beta = 0.138$, $p = 0.021$) confirms that Access has a significant and positive effect on Perceived Learning. Therefore, $H_a1$ is supported.

*Hypothesis 2.* $H_a2$ proposed an influence of Interaction (INT) on Perceived Learning (PL). The outcome of this test ($\beta = 0.534$, $p < .001$) confirms that this effect is positive and significant. Furthermore, this is the strongest effect of any of the WEBLEI assessment dimensions on Perceived Learning. Therefore, $H_a2$ is supported.

*Hypothesis 3.* $H_a3$ proposed that Response (RES) would influence Perceived Learning (PL). The outcome of this test ($\beta = 0.120$, $p = 0.047$) confirms that Response does have a positive and significant influence on Perceived Learning. Therefore, $H_a3$ is supported.

*Hypothesis 4.* $H_a4$ proposed that Results (RESU) would influence Perceived Learning (PL). The outcome of this test ($\beta = 0.185$, $p = 0.033$) confirms that Results do have a positive and significant influence on Perceived Learning. Therefore, $H_a4$ is supported.

*Hypothesis 5.* $H_a5$ proposed that Perceived learning (PL) would influence cognitive engagement (CE). The results of the regression test ($\beta = 0.283$, $p = 0.015$) confirm that Perceived Learning does positively influence Cognitive Engagement. Therefore, $H_a5$ is supported.

*Hypothesis 6.* $H_a6$ proposed that Academic Self-Efficacy (ASE) would influence Cognitive Engagement (CE). The results of the regression test ($\beta = 0.518$, $p \leq .001$) confirm that there is a positive



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and significant influence of Academic Self-Efficacy on Cognitive Engagement Furthermore, this effect is stronger than the effect of Perceived Learning. Therefore, $H_a6$ is also supported.

*Hypothesis 7.* $H_a7$ was a mediation hypothesis, proposing that Academic Self-Efficacy (ASE) would mediate the relationship between Perceived Learning (PL) and Cognitive Engagement (CE). This followed the four-step procedure, which requires that

(1) predictor has a significant influence on the outcome (X → Y);
(2) that the predictor has a significant effect on the mediator (X → M);
(3) that the mediator has a significant effect on the outcome (M → Y), and
(4) for full mediation, the effect of the predictor on the outcome variable is eliminated when controlling for the outcome (Baron & Kenny, 1986).

Following the first of Baron and Kenny's (1986) mediation steps, it can be shown that Perceived Learning did have a positive and significant effect on Cognitive Engagement ($\beta = 0.283$, $p = 0.015$). In the second step, Perceived Learning did have a significant and positive effect on Academic Self-Efficacy ($\beta = 0.911$, $p < .001$). In the third step, Academic Self-Efficacy did have a significant and positive effect on Cognitive Engagement ($\beta = 0.518$). Finally, in the fourth step, the effect of Perceived Learning on Cognitive Engagement when controlling for the effect of Academic Self-Efficacy was fully mediated. Therefore, it can be stated that $H_a7$ was supported, with Academic Self-Efficacy fully mediating the relationship of Perceived Learning and Cognitive Engagement.

Table 9 Regression parameter estimates

| | | | | 95% Confidence Intervals | | | | |
|---|---|---|---|---|---|---|---|---|
| **Dep** | **Pred** | **Estimate** | **SE** | **Lower** | **Upper** | **β** | **z** | **p** |
| PL | AC | 0.137 | 0.060 | 0.020 | 0.254 | 0.138 | 2.300 | 0.021 |
| PL | INT | 0.503 | 0.055 | 0.396 | 0.610 | 0.534 | 9.190 | < .001 |
| PL | RES | 0.119 | 0.060 | 0.001 | 0.236 | 0.120 | 1.980 | 0.047 |
| PL | RESU | 0.184 | 0.087 | 0.015 | 0.354 | 0.185 | 2.130 | 0.033 |
| CE | PL | 0.265 | 0.109 | 0.052 | 0.479 | 0.283 | 2.440 | 0.015 |
| CE | ASE | 0.454 | 0.103 | 0.252 | 0.655 | 0.518 | 4.410 | < .001 |
| ASE | PL | 0.975 | 0.046 | 0.885 | 1.065 | 0.911 | 21.180 | < .001 |

Table 10 Summary of the hypothesis testing results

| **Hypothesis** | **Standardized Coefficients (β)** | **z-value** | **Result** |
|---|---|---|---|
| $H_a1$: Mature students' access to the hybrid learning environment influences mature students' perceived learning. | 0.138 | 2.300* | Supported |
| $H_a2$: Mature student interaction within the hybrid learning environment influences mature student's perceived learning. | 0.534 | 9.190*** | Supported |
| $H_a3$: Mature students' response within the hybrid learning space influences mature student's perceived learning. | 0.120 | 1.980* | Supported |



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| Hypothesis | Standardized Coefficients (β) | z-value | Result |
|---|---|---|---|
| $H_a$4: Mature students' results from the hybrid learning space influence mature students' perceived learning. | 0.185 | 2.130* | Supported |
| $H_a$5: Mature students' perceived learning in the hybrid learning environment influences mature students' cognitive engagement. | 0.283 | 2.440* | Supported |
| $H_a$6: Mature students' academic self-efficacy influences mature students' cognitive engagement in the hybrid learning environment. | 0.518 | 4.410*** | Supported |
| $H_a$7: Mature students' academic self-efficacy mediates the relationship between mature student's perceived learning and cognitive engagement in the hybrid learning environment. | | | Supported |
| Step 1: Perceived Learning Effect on Cognitive Engagement | 0.283 | 2.440* | Supported |
| Step 2: Perceived Learning Effect on Academic Self-efficacy | 0.911 | 21.18*** | Supported |
| Step 3: Academic Self-efficacy Effect on Cognitive Engagement | 0.518 | 4.410*** | Supported |
| Step 4: Effect of Perceived Learning on Cognitive Engagement when controlling for Academic Self-efficacy | ≤0 | | Supported |

Note *** = p<.001, * = p <.05

## Conclusion

In conclusion, this research has shown that the hybrid learning environment has a direct influence on the learning experience of mature students in Thailand. The findings illustrated that the dimensions of the online learning environment as represented in the WEBLEI framework play a direct role in the perceived learning of students, with the strongest influence coming from interaction, followed by results, access, and response dimensions. This suggests that above all students respond to the opportunity to interact with and receive feedback from peers and teachers and engage in critical reflection about the contributions of themselves and their peers. However, aspects such as the course design and structure, the convenience, efficiency, and autonomy of the class, and the cognitive and emotional responses of the student will also influence perceived learning. Furthermore, the findings showed that perceived learning had a direct effect on students' cognitive engagement, which means that indirectly the hybrid learning environment influenced students' willingness to engage with the course material. Perceived learning also had a direct effect on academic self-efficacy, indicating that the hybrid learning environment supported feelings of self-efficacy by increasing perceived learning. Furthermore, academic self-efficacy fully mediated the relationship between perceived learning and cognitive engagement, indicating that the influence of academic self-efficacy on cognitive engagement. From these findings, it can be concluded that the hybrid learning environment does influence student experience and outcomes for mature students in hybrid courses. Furthermore, it can be concluded that to influence the cognitive engagement of mature students in online learning, not only improving the online learning environment but also supporting perceptions of academic self-efficacy is key. Figure 3 highlights a concept map of the relationships that were found in the study. In the following sections, the implications of these findings are discussed in more detail.



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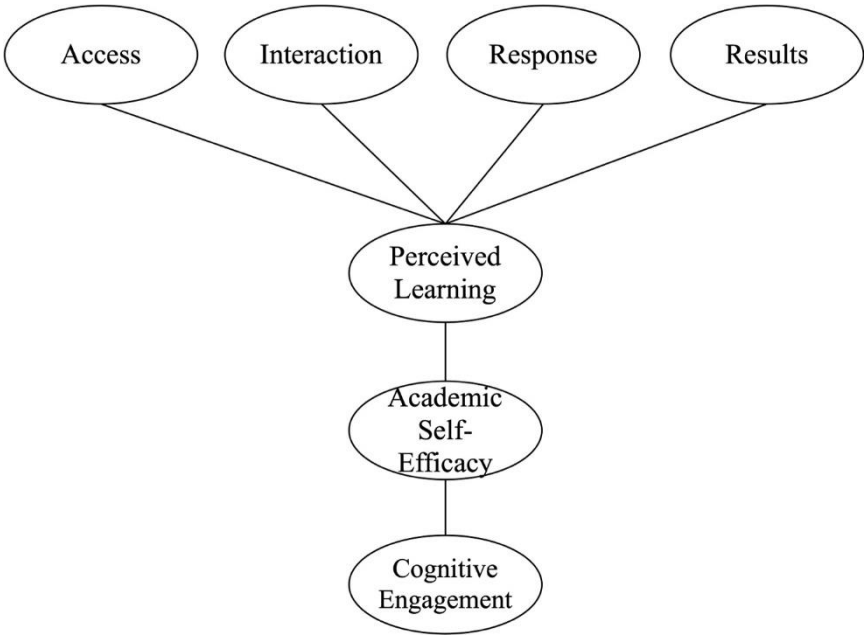


Figure 3 A concept map of the relationships between the online learning environment and student engagement

**Discussion**

This research has shown that the characteristics of the online learning environment influence student perceived learning and ultimately their cognitive engagement and academic self-efficacy. The WEBLEI model on which the study was founded was based on an early asynchronous online learning environment (Tobins, 1998; Tobins & Fraser, 1998), which has been formalized (Chang & Fisher, 2003) and updated (Chandra & Fisher, 2009) to deal with changes in online and remote learning, particularly the development of hybrid learning styles. This research has confirmed that when adapted appropriately, the WEBLEI assessment framework remains a reliable and valid model for assessing student experience in online learning, as has been suggested by recent authors (Gupta & Pathania, 2021). At the same time, the study has gone beyond earlier studies by directly testing the effect of the hybrid learning environment on the learning experience of mature students. This builds on earlier research, which has used the WEBLEI assessment framework as part of a holistic assessment of student learning in online and hybrid learning environments. It also illustrates the importance of academic self-efficacy in the student's cognitive engagement in hybrid learning.

Furthermore, the research has gone beyond earlier studies by focusing directly on the learning experience of mature students. Mature students have different characteristics from traditional students, which both support and inhibit their learning experience. Mature students may be more self-motivated and self-directed than traditional students (Hamlin, 2020), but at the same time have practical resource barriers that traditional students may not have (Gregersen & Nielsen, 2023; Osam et al., 2017; Venegas-Muggli, 2020). The findings of this study have shown that the structure and delivery of the online portion of hybrid learning is critical for mature learners, contributing to their perceived learning and cognitive engagement. Thus, the research illustrates how important the online learning environment is for mature students.

**Recommendations**

*Practice recommendations.* The study has provided some particularly important recommendations for practice. The first of these recommendations is that online and hybrid learning environments must be structured to enable interaction, between students and teachers, collaboration, feedback, and critical reflection on performance. This was the most important aspect of the online learning environment according to the WEBLEI assessment dimensions for perceived learning, and this should not be overlooked. The second recommendation for practice is that instruction and course design



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should be structured not just to transfer technical knowledge, but also to provide a supportive environment that encourages academic self-efficacy. Academic self-efficacy was the most important factor in cognitive engagement, and fully mediated the effect of perceived learning on cognitive engagement. Therefore, finding ways to build support for and development of academic self-efficacy could significantly improve the cognitive engagement of mature students, and therefore their academic performance. Therefore, this should be a priority for of course design and delivery in online and hybrid learning environments aimed at mature students.

*Recommendations for future research.* By highlighting how the WEBLEI dimensions of online learning environments can have a direct influence on student perceptions and outcomes, the research has contributed to understanding both online learning environments and student responses to them. However, there could be much more research done in this area to better understand how the characteristics of an online learning environment influence student experiences. There could be many other student perceptions – for example, technological self-efficacy – which also play a role in the relationship between the online or hybrid learning environment and the student's learning engagement. There are other dimensions of student engagement, such as behavioral and affective engagement, which could be investigated. Furthermore, the WEBLEI framework could be extended and tested for use in other kinds of online and hybrid learning environments, such as flipped and blended learning. Development of more comprehensive WEBLEI-based assessment tools to evaluate different kinds of integration and take more account of the classroom learning environment and how it integrates into the online learning environment could provide a much better understanding of how different online and hybrid learning environments.

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