




EVALUATING LEARNING EFFECTIVENESS TOWARDS ONLINE LEARNING: APPLICATION OF DESIGN THINKING AND READING COMPREHENSION FOR CASE READING ON ECONOMIC ISSUES DURING COVID-19

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ABSTRACT

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This study focuses on developing an effective online teaching strategy to improve students' cognition engagement and application ability by applying design thinking and case readings on current economic issues for private university students in Taiwan during the COVID-19 pandemic. The teaching method combines design thinking and the reading comprehension process by the two principles of divergence and convergence. The design thinking method provides stepwise guidance for building understanding and analyzing competence on current economic issues. The reading comprehension process strengthens students' reading skills and learning capability. This combination increases student engagement and concentration in economic case readings during online learning. The research participants comprised 189 first-year students studying economics courses. After implementing the innovative teaching strategies, the results show that the more students are involved in frequent readings, the better are their economics semester grade. The findings revealed that their post-quiz scores improved significantly, and the semester grade increased by 3.44 points. Increasing the reading engagement on current economic issues cases also affected the learning outcomes for absentees. Using design thinking to introduce case reading comprehension, empathy has been suggested as an essential factor affecting the effectiveness of reading learning. This theoretical model can offer directional insights and guidance on developing an effective strategy in online economics education.

Contribution/Originality: This study's primary contribution is developing an innovative online teaching strategy to improve students' cognition engagement and application ability by combining design thinking and reading comprehension for case readings on current economic issues. The result shows that the students who engaged in more case readings have better learning effectiveness.

1. INTRODUCTION

At the beginning of 2020, the COVID-19 pandemic changed all aspects of life. Teaching and learning at higher education institutions worldwide had to switch from face-to-face to online. Drane, Vernon, and O'Shea (2020) noted the problems of school shut-downs for students learning including digital exclusion, poor technology management, an increase in psychosocial change, and disengagement with education in the longer term. Flack, Walker, Bickerstaff, Earle, and Margetts (2020) undertook an online survey on the impact of the pandemic on their students'

learning. They reported that most teachers believed that students needed more instructional support when they returned to school. Aguilera (2020) proposed that college students' motivation, self-efficacy, and cognitive engagement decreased, and teaching styles and strategies changed for professors after moving to online learning. Compared to face-to-face learning, the dropout rates in e-learning were generally higher (Yukselturk, Ozekes, & Turel, 2014). Mseleku (2020) found that this shift to online learning came with numerous challenges for students and academics. However, this transition induced opportunities such as innovation and capacity development. Since online learning is inevitable for higher education, it is essential to develop effective online teaching strategies to deal with the challenges of online learning. Muljana and Luo (2019) found that one of the factors contributing to student retention in online learning and recommended strategies included course design. Martin, Wang, and Sadaf (2018) used twelve different strategies to facilitate learning and actively engage students in online courses. However, in the practice of teaching economics, there is a dearth of studies which have applied the design thinking method for case reading on current economic issues to evaluate the learning effectiveness. While many researches focus on online learning, the unique situation in Taiwan private universities calls for more focused investigations.

Tsai and Wu (2019) noted that private university students in Taiwan generally face the pressure of student loans and even have to bear the living expenses by themselves. Therefore, studying and working part-time jobs simultaneously has become a learning restriction, and students skipping classes for part-time jobs will inevitably lead to a reduction in study engagement, which will affect the effectiveness of school learning. Thus, private university students must concern the restrictions on less study engagement when pursuing learning effectiveness.

Economics has systematically established complete theories for the phenomena that occur in the surrounding economic environment. The definition of economics terminology explains the economic problems in society. Economics often assumes "other conditions are the same..." and then explains the economic phenomena. However, in the real world, "other conditions," whether technology, income, population, system, or customs, are not unchanged (Gao, 1986). In the economics-teaching scene, students often confuse the actual economic phenomena surrounding them are the same as defined in economics. In a dynamic economic environment, why do other conditions remain unchanged? These questions often cause students to misunderstand the definition of terms in economics (Pühringer & Bäuerle, 2019). According to the above motives, this study focuses on the academic practice of online teaching and learning in economics during the COVID-19 crisis. Online learning in higher education is more popular. Developing more effective online teaching strategies to overcome online learning problems with less motivation, self-efficacy, and cognitive engagement is essential. The strategies include developing students' competence in applying and interpreting theories through reading case studies on current economic issues, using the design thinking method step-by-step to maintain students' engagement and to guide them to build their understanding and analyzing competence on current economic affairs issues, and enhancing students' learning effectiveness by improving their reading ability.

2. LITERATURE REVIEW

2.1 Reading Comprehension

"Reading engagement" is a dynamic process in which reading motivation and strategy are simultaneously implemented in reading behavior, a joint operation of motivation, conceptual knowledge (Guthrie, Alao, & Rinehart, 1997). Almasi, McKeown, and Beck (1996) described engaged reading as a cognitive experience of developing conceptual understandings. Education researchers have emphasized on pedagogical practices that promote engaged reading (Wilkinson & Son, 2010). Tsai and Wu (2019) used Asia Universities as the research object and collected 4,495 students' absenteeism (student engagement), book borrowing (reading engagement), and academic performance (learning effectiveness) for empirical analysis. The research found that the odds ratio of those who have borrowed books (reading engagement) in the top 50% of the class is 2.3 times more than those who have never borrowed books. Especially for the high absenteeism group, the reading engagement is more effective than students

who often participate in class. Reading comprehension is a complex task that depends on multiple cognitive and linguistic processes (Alrezqi & Althaqafi, 2019; Ozernov-Palchik et al., 2021). Individual differences in reading proficiency determine how much the reader understands what they read. Evidence indicates that decoding plays a prominent constraining role and dominates students' reading comprehension skills (Adlof, Catts, & Little, 2006; Florit & Cain, 2011; Kim, 2020; Kim & Wagner, 2015). Students who acquire knowledge through reading must go through a series of translation processes. Gagné, Yekovich, and Yekovich (1993) identified four reading comprehension processes, namely decoding, literal comprehension, inferential comprehension, and comprehension monitoring. Therefore, to improve reading ability, we must master the reading process.

Ray (2018) suggested that learning through "cases" effectively improved students' academic achievement. He explored that the case method offers an essential intervention for increasing student learning in the class. The use of cases shifts the dynamics of the course from a passive learning environment to an active learning one where the students are at the forefront. Zhang and Ramse (2021) showed how economic instructors integrate COVID-19 related events into economics instruction to stimulate students' interests and inspire motivation and engagement. Li, Baker, and Warschauer (2020) and Queiroga et al. (2020) proposed that student success in distance courses directly correlated with their engagement under virtual learning.

2.2. Design Thinking

The term design thinking first appeared in the book "Design Thinking," published by Rowe (1987) which provided a set of systematic design methods applied in architecture and urban planning. In 1991, IDEO, a design company located in Silicon Valley, USA, was founded. It used the concept of design thinking to product development as a process method, emphasizing the concept of "human-centered design." Design thinking has been used for innovation and creativity in various fields of learning programs, including business, law, primary school education, science, and medicine (Pande & Bharathi, 2020). Using the human-centered approach of design thinking for rethinking, the awareness about project management can help produce better project managers and reduce project failures (Ewin, Luck, Chugh, & Jarvis, 2017). There is an increasing trend of teaching design thinking in higher education, particularly in economics, business, and management (Lee & Benza, 2015; Matthews & Wrigley, 2017). Engagement in design thinking projects helps in solving complex problems. It also provides tools to develop perspectives supporting the endeavors (Glen, Suci, Baughn, & Anson, 2015).

In 2008, Brown (2008) systematically proposed the design thinking process, and suggested five steps: empathy, define, ideate, prototype, and test. Brown (2008) believed that the process of design thinking includes two thinking dimensions: "convergent thinking" and "divergent thinking." The two dimensions must be intersected together to form the best plan. In 2005 the British Design Council had also proposed a similar concept, through divergent and convergent binary, to form the design process, known as the "double diamond diagram." The design process is divided into four stages: discover, define, develop and deliver. This provides designers the thinking mode in different design stages, which is shown in Figure 1.

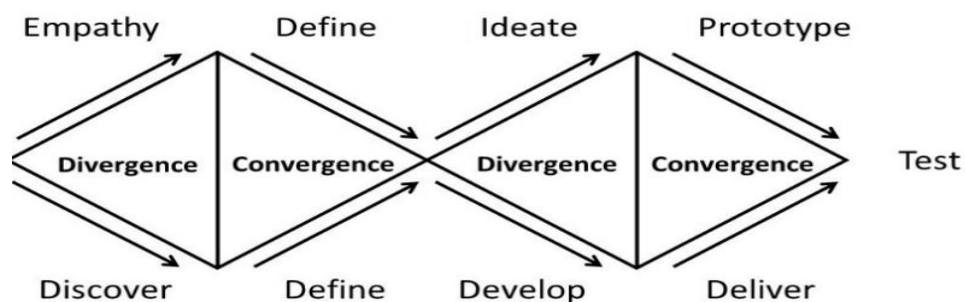


Figure 1. Double diamond model (British Design Council, 2019).

Design thinking solves problems by discovering in-depth demands and repeating tests, and it is widely used in product development and design instruction (Albay & Eisma, 2021; Koh, Chai, Wong, & Hong, 2015). To guide students to learn deeply by improving their reading engagement, reading comprehension is the key to the transition from the "reading" stage to the "understanding" stage. Therefore, this study will combine reading comprehension and the method of design thinking. The instructor guides students to read the assigned case reading on current economic issues in a step-by-step procedure applying the flow of "empathy → define → ideate → prototype → test." Through design thinking, students better understand case readings and then can interpret the meaning of terminology in economics. Furthermore, with two divergence and two convergence methods, students will be able to identify the problem of each of the cases. Lastly, by introducing economic theories, explanations, or possible solutions, it will help strengthen students' cognition and application of economics.

3. THEORETICAL FRAMEWORK AND RESEARCH DESIGN

3.1. Theoretical Model

The double diamond design provided by British Design Council was used in this study. This design enhances students' skills and abilities to read cases of current economic issues. It requires four essential steps of reading comprehension: decoding, literal comprehension, inferential comprehension, and comprehension monitoring, which were imported into the diverging and converging process to form the theoretical framework of this study (Figure 2).

3.1.1. Discover: The First Divergence

The first step of the design thinking method, "empathy," guides students to think from the perspective of the protagonists of current cases and discover possible problems. For example, "If it were you, what problems will happen?", "Will you encounter any problems like the case?" In other words, you need to "decode" the problems encountered by the protagonist in the case from empathy and record the reading experience or feelings to understand the issue of the case.

3.1.2. Define: The First Convergence

After the case problems are decoded empathically, the second step of the design thinking method, "define," is used to connect the terms or theoretical content of the teaching unit to echo to the reading process of "literal comprehension."

3.1.3. Develop: The Second Divergence

After the case problem is connected to economic principles, the third step of the design thinking method, the "ideate," assists in developing the "inferential comprehension" of the reading process: to propose possible solutions for the problem of the case and to express the reader's insights on the issue.

3.1.4. Deliver: The Second Convergence

At this stage, the "prototype" method was incorporated as the fourth step of design thinking to quickly deliver a 500-word reading reflection on the current issues. The content included keywords related to the teaching unit. Students showed the "comprehension monitoring" process by discovering problems from the reading practice and quickly solved the problem on current case readings.

Finally, through the "test" step of the design thinking method, students searched for another current issue case reading related to the teaching unit and completed a study sheet in a week. The "test" step checked whether the students could use the design thinking method's steps skillfully to improve the application ability of economic theory and achieve the teaching goal of mass reading.

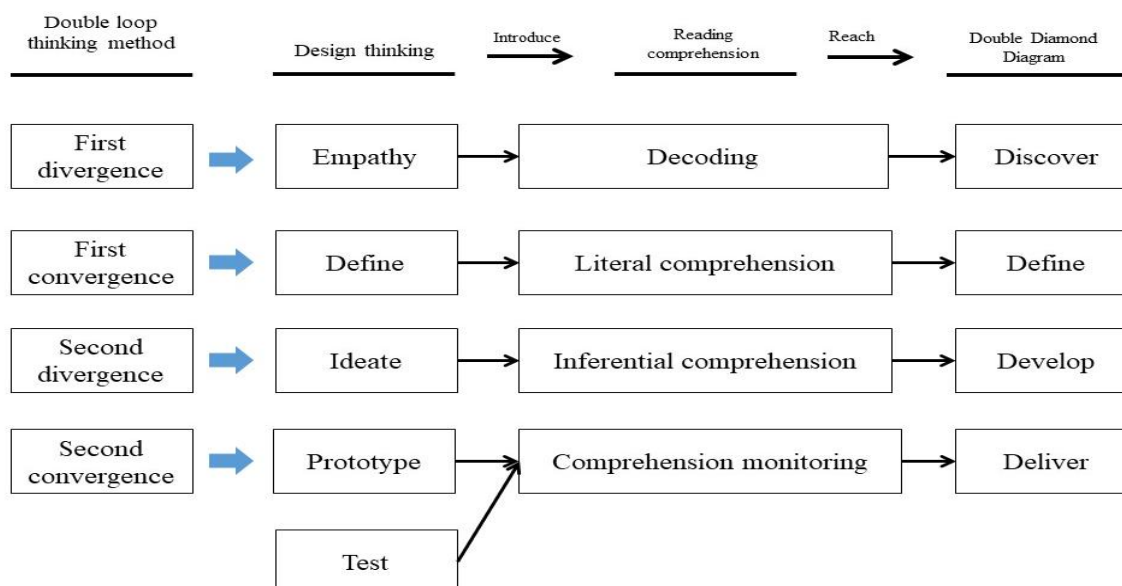


Figure 2. The theoretical framework of combining design thinking and reading comprehension.

Source: British Design Council, 2019.

3.2. Teaching Design

Asia University located in Taiwan, moved to online learning at the beginning of 2020 due to the COVID-19 pandemic. The university used Microsoft Teams as the online meeting tool and Moodle as a digital teaching platform. Instructors introduced case reading on current economic issues to overcome online learning challenges, including distraction and disengagement. While students read, the instructor guided them step-by-step with design thinking methods to build a deeper understanding of economic concepts. The online teaching implementation procedure of this study, shown in Figure 3, can be divided into six steps:

Step 1: Economics unit lecture.

Economics lecture contents of first-year student covered topics like market demand and supply, market mechanism and price control, externalities, demand elasticity, utility analysis, production, cost, market structure, game theory and information economic, etc. There were fifteen units with the definition and theory of economic terms as the lecture content.

Step 2: Pre-quiz

A pre-quiz was conducted immediately at the end of each unit. The quiz was designed in Google form, and students were asked to scan the QR code and answer the questions. The main purpose of the quiz was to test students' preliminary cognition of the definition and theory lectured in the unit.

Step 3: Case reading on current economic issues.

Based on the 15 lecture units, 23 current economic issues were selected. Among the 23 issues, 15 case-reading were selected for students to read. The case readings covered four steps of reading comprehension: "decoding," "literal comprehension," "inferential comprehension," and "comprehension monitoring."

Step 4: Reading study sheet

An instruction manual was established for the lecturer. Students followed the lecturer's guide on design thinking steps: empathy, define, ideate, prototype, and test, to complete the study sheet for the case readings.

Step 5: Post-quiz.

After completing the study sheet for the case reading, students took a post quiz. The quiz was still designed with Google form, and students were asked to scan the QR code to answer the questions.

Step 6: Assessment of learning effectiveness.

Based on the teaching implementation procedure, the learning effectiveness assessment in this study was semester grade, including summative assessment and formative assessment (Figure 3).

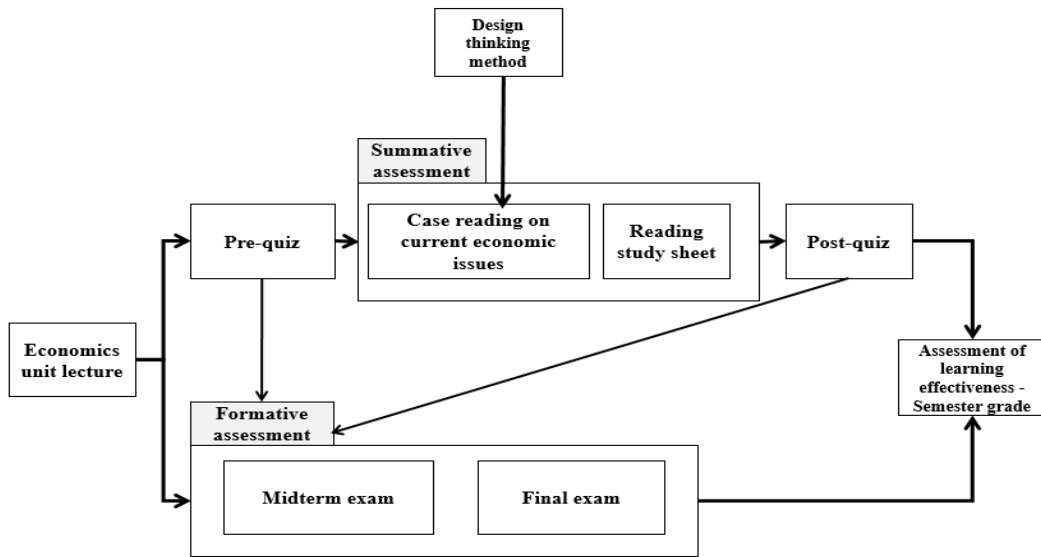


Figure 3. Teaching implementation procedures.

3.3. Research Design

The research design covers the framework, problems, hypotheses, empirical model, variables, and sample data.

3.3.1 Research Framework

This study established a framework for the impact of case study reading on economics college students' online learning effectiveness. The research explored the connections and relationships of student engagement (attendance), case reading engagement, and students' learning effectiveness (semester grade) as shown in Figure 4. The model shows a direct relationship between student engagement and learning effectiveness, and reading engagement has a moderating relationship between student engagement and learning effectiveness.

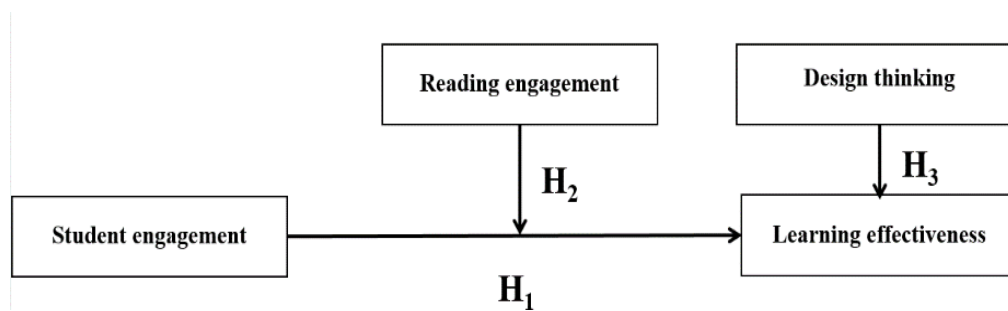


Figure 4. Research framework.

"Students' relatively low engagement as a constraint on private college students in Taiwan" is a situational problem in the economics education field. In order to further verify whether this issue will lead to ineffective learning outcomes in future should be further verified, this study proposed the first hypothesis:

Hypothesis 1: Student engagement positively influences the learning effectiveness of economics

"Economics terms are too stringent, and students have little understanding of the definition," is the learning challenge of economics teaching. According to Tsai and Wu (2019) strengthening college students' reading engagement can significantly improve their learning performance. Therefore, this study proposed the second hypothesis:

Hypothesis 2: The case reading engagement on current economic issues has a moderating effect on the relationship between student engagement and learning effectiveness

"Lacking the ability to apply economic theories" is another problem of student learning in the field of economics teaching. Whether this issue can be improved by introducing innovative teaching design should be further verified. This study formed the third hypothesis:

Hypothesis 3: Introducing design thinking steps will enhance students' ability to apply economic theory

3.3.2. Regression Model

Based on the variables related to the prediction of students' learning outcomes by Huang and Fang (2013) this study constructed an economic learning effectiveness model, as shown in Equation 1.

$$Y_1 = f(X_1, X_2, X_3, X_4, X_5, X_4 * X_5) \quad (1)$$

The dependent variable (Y_1) is learning performance evaluated by the student's economics semester grade. The independent variables of the model are regular scores (X_1) include quizzes and assignments scores, midterm exam scores (X_2), final exam scores (X_3), and student engagement (X_4). Student engagement is the total number of absences in the class. The number of case readings participation (X_5) is the moderating variable of the model.

A learning progress rate model of case reading evaluated how design thinking can increase the effectiveness of case reading, is being made, as shown in Equation 2:

$$Y_2 = f(X_6, X_7, X_8, X_9, X_{10}) \quad (2)$$

The dependent variable (Y_2) is the average improvement rate from pre-quiz to post-quiz. The independent variables are the average rubric score of the five dimensions of the design thinking model, which were empathy (X_6), define (X_7), ideate (X_8), prototype (X_9), and test (X_{10}).

3.3.3 Data

In this study, we collected the sample data from first-year students studying "Economics I" in the Department of Business Administration of Asia University in the academic years 2018-2019 and 2019-2020. The course was taught in the classroom without case reading for the 2018 class as the control group; however, due to the COVID-19, the course was conducted online with case readings on current economic issues applying the design thinking method for the 2019 class as the treatment group. The control group had 94 students studying Economics 1, and the treatment group had 95 students studying the same course.

4. RESULTS AND DISCUSSIONS

4.1. A Hierarchical Regression Analysis of Economics Learning Effectiveness

According to the regression analysis results in Table 1, the explanatory power of independent variables, moderating variable, and interaction for "economics semester grades" is 98%. The overall regression effect reaches a significant level ($F = 1432.16$, $p < 0.01$), indicating that the economics learning effectiveness model established in this study has high explanatory power. Also, according to the VIF test, the VIF of the models is not greater than 10, which indicates that the collinearity of the predicted variables is not significant.

The three independent variables, including the regular score, the midterm exam score, and the final exam score, have a significant positive effect on the economics semester grade. Besides, the primary effect analysis of independent versus dependent variables shows that the number of absences had a significant adverse impact on semester grades ($\beta = -0.85$, $p < 0.01$). The greater is the absenteeism, the worse are the semester grades. In other words, less student engagement leads to poor learning outcomes. Exploring the causes of students' absenteeism, private college students in Taiwan often face the pressure of higher tuition and student loans. Hence, a higher proportion of private college students work part-time and lead to low student engagement. Therefore, hypothesis one in this study is supported.

Table 1. Hierarchical regression analysis of economics learning effectiveness.

Variables		Semester grades of economics			
		Model 1	Model 2	Model 3	Model 3 VIF
Independent variables	Constant	3.14 **	3.04 **	3.02 **	
	Regular score (X ₁)	0.40 **	0.40 **	0.32 **	1.18
	Midterm exam score (X ₂)	0.19 **	0.19 **	0.21 **	3.39
	Final exam score (X ₃)	0.22 **	0.23 **	0.25 **	3.41
	Number of absences (X ₄)	-0.51 **	-0.51 **	-0.85 **	3.66
Moderating variable	Number of reading cases (X ₅)		0.81 **	1.08 **	1.88
Moderating effect	Number of absences * number of reading cases (X ₄ *X ₅)			0.32 **	2.47
R ²		0.98	0.98	0.98	
F value		2069.53 **	1647.24 **	1432.16 **	
ΔR ²		0.98	0.00	0.00	
ΔF		2069.53 **	0.07 **	8.73 **	

Note: ** p < 0.01.

4.2. The Moderating Effect Analysis of Economics Learning Effectiveness

By observing the interaction, "the number of absences and the number of reading cases" had a significant interaction effect on the "semester grade of economics" ($\beta = 0.32, p < 0.01$). To better express the moderating effect of the interaction, the number of absences and the number of case readings were further divided into high and low groups. The interaction results are shown in Figure 5. The results show that the regression slope of the low number of case readings is relatively higher than that of the high number of case readings. It is evident that the "number of case reading" will improve the relationship between the "number of absences" and "economics semester grade." For those with a higher absent rate, the economics learning performance will have more significant improvement (more significant gap) if supplemented with a more number of case readings. In other words, case reading engagement has a moderating effect on student engagement and learning effectiveness. Therefore, hypothesis two in this study is supported.

4.3. Analysis of Economics Learning Effect on the Scale of Engagement in Case Reading on Current Economic Issues

As mentioned above, in addition to the moderating effect of the number of case readings on the learning effectiveness of economics, the probability of success of the scale of case reading engagement on the learning effectiveness was further predicted by the Logistic regression. The predicted results are summarized in Table 2.

The odds ratios of reading engagement on current economic issues show that those with high case reading engagement on current economic issues can successfully pass the course; the odds ratio is 2.56 times that of those with low reading engagement. Improving the effectiveness of economics learning has a significant effect.

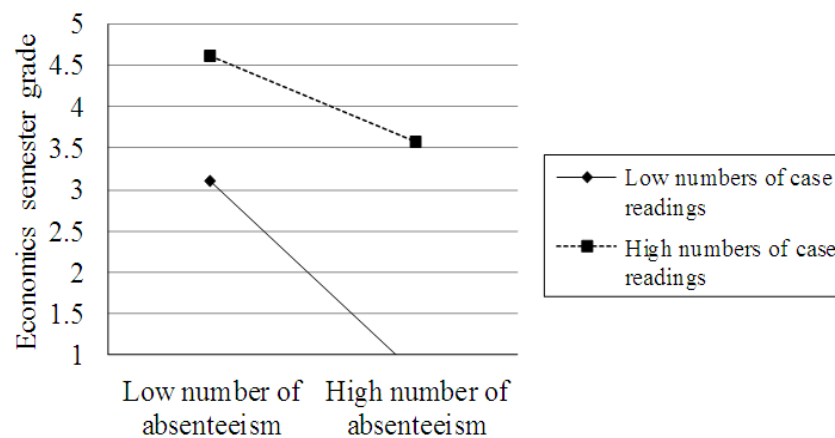


Figure 5. Moderating effect of introducing case reading on current economic issues.

Table 2. Parameter prediction of economics learning effectiveness on the engagement scale of case reading on current economic issues.

Variables	β	β standard error	Wald	Degrees of freedom	p-value	Odds ratio
Constant	-5.74	1.71	11.32	1	0.00	0.00
Number of case readings on current economic issues	0.94	0.24	15.25	1	0.00	2.56

The Logistic regression is changed into a probability model, as shown in Equation 3. Table 3 shows the probability of failing the course based on case reading participation. The results show that if fifteen case readings on current economic issues are introduced in the course, the lower the number of case readings on current issues, the higher probability of failing the course. If the number of case readings is less than six, the probability of failing the course will exceed 50%. In other words, strengthening students' participation in case reading on current economic issues has become an urgent problem to solve in economics teaching.

$$\ln\left(\frac{P_i}{1-P_i}\right) = \beta X'_i = -5.74 + 0.94X \quad (3)$$

P is the probability of passing the course, and X is the number of reading cases on current economic issues.

Table 3. Predicting the probability of failing grades based on the number of cases reading on current economic issues.

Number of case readings	Fail probability (%)	Number of case readings	Fail probability (%)
15	0.02	6	52.87
14	0.06	5	74.14
13	0.16	4	87.99
12	0.4	3	94.93
11	1.02	2	97.95
10	2.56	1	99.19
9	6.3		
8	14.66		
7	30.50		

4.4. Pre-Quiz and Post-Quiz Analysis of Cases in Economics Unit

A t-test was used to test whether there is significant progress in the pre-quiz and post-quiz for introducing case reading on current economic issues. The test results are summarized in Table 4. This results show that from fifteen scores of pre-quiz and post-quiz, only five scores were not significantly different ($p > 0.05$), and the other ten cases (66.67%) show significant progress in the post-quiz for introducing of cases on current economic issues.

Table 4. Pre-quiz and post-quiz analysis of cases in economics unit.

Unit case	Number of questions	Number of samples	The average number of correct answers in the pre-quiz	The average number of correct answers in the post-quiz	t-value
01-1	3	n=85	2.16	2.22	1.78
02-1	3	n=87	2.21	2.38	2.23 **
03-1	4	n=81	3.09	3.23	1.85
04-1	5	n=77	3.78	4.22	2.24 *
05-1	3	n=83	2.08	2.21	2.06 *
06-1	3	n=85	2.07	2.12	2.34 *
07-1	3	n=74	2.11	2.13	2.02 *
08-1	4	n=90	3.12	3.28	1.84
09-1	4	n=86	3.22	3.34	1.80
10-1	3	n=85	2.09	2.21	2.05 *
11-3	3	n=81	2.11	2.27	1.97 *
12-1	3	n=79	2.15	2.22	2.02 *
13-1	3	n=83	2.10	2.19	2.21 *
14-1	7	n=91	4.46	5.13	1.82
15-1	3	n=87	2.08	2.19	1.98

Note: * $p < 0.05$, ** $p < 0.01$.

4.5. Analysis of Semester Grades in Economics

This study compared the performance of the treatment group, who was taught Economics I course online with the case reading on current economic issues, with that of control group who was taught the course on-campus without the case reading on current economic issues. The treatment and control groups used the same midterm exam and final exam questions. Table 5 shows that semester grades between the two groups had a significant difference ($p < 0.001$). The average semester grade was 79.76 points for the treatment group, significantly better than the 76.32 points for the control group. In other words, due to introducing case reading on current economic issues applying the design thinking method for the treatment group, the semester grade increased by 3.44 points, indicating that reading cases on current economic issues significantly affected the learning effect of economics.

Table 5. Difference analysis of semester grade for the control group and treatment group.

Subject	Group	Number of students	Average semester grade	t-value	p-value
Economics I	Control Group	94	76.32	2.54	00 **
	Treatment Group	95	79.76		

Note: ** $p < 0.01$.

4.6. Progress Rate Analysis for Reading Cases on Current Economic Issues

In Table 2, there are ten case readings on current economic issues with significant differences in the pre-and post-quiz scores. Of these ten, regression analyses were run on the progress rate of the pre-and post-quiz scores and the rubric scores of the five "design thinking" evaluation dimensions (empathy → define → ideate → prototype → test) outline in the reading worksheet. The results are summarized in Table 6. This study found that the standardized regression coefficient of empathy was the highest, followed by the test phase. In other words, empathy is the primary factor affecting reading learning performance, and the higher the score "empathy" phase, the higher the degree of progress for pre-and post-quiz scores. In the "test" phase, students presented a similar case on current economic issues, which also showed that students' ability to apply economic theory improved after reading the cases. Therefore, hypothesis three in this study is supported.

Table 6. Regression analysis of learning progress rate for case reading on current economic issues.

Case	Standardized regression coefficient					R^2
	Empathy	Define	Ideate	Prototype	Test	
02-1	0.40 ** (1)	0.19 ** (3)	0.06 ** (4)	0.03 * (5)	0.35 ** (2)	0.91
04-1	0.21 ** (2)	0.19 ** (3)	0.05 (5)	0.16 ** (4)	0.41 ** (1)	0.89
05-1	0.44 ** (1)	0.19 ** (3)	0.11 ** (4)	0.05 * (5)	0.21 ** (2)	0.90
06-1	0.52 ** (1)	0.10 ** (4)	0.15 ** (3)	0.01 ** (5)	0.25 ** (2)	0.81
07-1	0.33 ** (1)	0.06 ** (4)	0.29 ** (3)	0.01 ** (5)	0.31 ** (2)	0.89
10-1	0.41 ** (1)	0.35 ** (2)	0.05 ** (4)	0.19 ** (3)	0.01 (5)	0.91
11-3	0.32 ** (1)	0.13 ** (5)	0.19 ** (3)	0.18 ** (4)	0.26 ** (2)	0.85
12-1	0.46 ** (1)	0.23 ** (3)	0.10 ** (4)	0.01 * (5)	0.25 ** (2)	0.88
13-1	0.37 ** (1)	0.29 ** (3)	0.02 ** (4)	0.01 (5)	0.33 ** (2)	0.89
15-1	0.45 ** (1)	0.08 ** (4)	0.21 ** (3)	0.01 (5)	0.30 ** (2)	0.89

Note: * $p < 0.05$, ** $p < 0.01$, (1) ~ (5) are the ranking of standardized regression coefficients.

5. CONCLUSION

Based on the problems faced by Taiwan's private college students in economics teaching, this study aimed to develop an effective online teaching strategy to improve students' cognition engagement and application ability by combining design thinking and case readings on current economic issues. This study showed that the students who were engaged in more case readings on current economic issues scored better semester grades. Besides, compared to the pre-and post-quizzes scores, the post-case reading quiz results had significantly improved. Online case reading helped students to enhance their cognition of economics content. These results are consistent with Almasi et al. (1996); Tsai and Wu (2019); Ray (2018) and Zhang and Ramse (2021) findings on reading engagement and case study, as well as consistent with the result of Tawafak, Romli, Malik, Shakir, and Farsi (2019) which also found interactive learning activities through online teaching increased students' learning achievement.

This study found that introducing case readings on current economic issues has a moderating effect, especially in improving the learning performance of students who have more absences. The odds rate of passing the class for students who have high reading engagement on current economic issues was found 2.56 times as high as low case reading engagement. Moreover, if the number of case readings is less than six, the probability of failure is more than 50%. This study also found that reading engagement positively affected the learning effect of economics for the high absence students. However, to check the issue of high absence, private college students need to consider part-time work and school studies. In other words, strengthening students' participation in case reading on current economic issues has become one of the solutions to problems in economic teaching. Therefore, if instructors can design supplementary measures for case reading, such as an online guiding system of case reading on current economic issues, this can improve student's academic performance in economics.

When we used the design thinking method to introduce the case reading comprehension, "empathy" was the most critical factor affecting reading learning performance, followed by the "test" phase. In other words, if students can put themselves in others' shoes, they can easily present a similar case after reading the case, showing that students improved their ability to apply economics theory. These findings are consistent with Glen et al. (2015) and Ewin et al. (2017) findings regarding design thinking providing teaching tools and helping students' learning performance. The continuous growth in online teaching and learning has productive dialogs among scholars. In sum, in terms of practical contribution to online undergraduate learning and open a way forward in strategic teaching for economics courses to achieve a more effective learning outcome. This theoretical model interacted with the design thinking, and reading engagement on current economic issues offers directional insights and guidance on online economics education. From this study's findings, if students get a better score on the empathy phase of design thinking during the reading process, the post-quiz score will be higher. Therefore, it is meaningful to study if strengthening empathy training can affect learning performance in economics in the future. The samples were collected from a single university in Taiwan; hence, future studies could be more widely in other universities or countries. This paper only focused on the economics course. It is valuable to invest gate learning effectiveness for different courses. This study evaluates design thinking's effectiveness during COVID-19. Thus future research could compare the results of post-COVID.

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