

The University of San Francisco

USF Scholarship: a digital repository @ Gleeson Library | Geschke Center

Doctor of Education (Ed.D.) Dissertations

School of Education

2021

Effects of the Concept-Mapping Method on International Students' Academic Performance and Perceptions

Yinghung Natalie Chiang

Follow this and additional works at: https://repository.usfca.edu/soe_stu



Part of the [Bilingual, Multilingual, and Multicultural Education Commons](#), [Economics Commons](#), and the [Higher Education Commons](#)

The University of San Francisco

EFFECTS OF THE CONCEPT-MAPPING METHOD ON INTERNATIONAL
STUDENTS' ACADEMIC PERFORMANCE AND PERCEPTIONS

A Dissertation Presented
to
The Faculty of the School of Education
Learning and Instruction Department

In Partial Fulfillment
of the Requirements for the Degree
Doctor of Education

by
Yinghung N. Chiang
San Francisco
December 2021

THE UNIVERSITY OF SAN FRANCISCO

Dissertation Abstract

Effects of the Concept-Mapping Method on International Students' Academic
Performance and Perceptions

There is concern over international students' low academic achievement at the college level. Due to language challenges and cultural differences, international students' academic achievement is not satisfactory that results in a decrease in the retention rate. Note-taking strategies such as the concept-mapping method may enhance international students' knowledge acquisition by providing students with learning tools that promote meaningful learning.

The purpose of this mixed-method approach with a comparative research design was to investigate the effects of the concept-mapping strategy on international college students' economic learning and perceptions. One intact class comprised of international students was designated as a concept-mapping strategy group. Another intact class contained English-speaking-students who were designated as a comparison group. The students who were in the intervention group applied concept-mapping strategy while learning about economics. The student who was in the comparison group did not receive any special instruction during the research period. Both groups were given quizzes and midterms on economic learning.

At the conclusion of the study, students' economics achievement was measured by performance on achievement tests, including quizzes and midterms, concept-mapping rubric scores, and classroom participation. The concept-mapping strategy was found to effectively increase international students' achievement in economics. The results

indicated a positive trend of quiz scores across time for four quizzes and two midterms for both groups. The results also suggested no statistically significant difference in classroom participation scores between the two groups, which indicates that international students with traditional education background that is passive were participating at the same level as students from the US. The correlation coefficient between the concept-mapping total score and final grade indicates a moderate positive correlation. Six themes emerged from the qualitative data: (a) prior knowledge and use of the concept-mapping strategy, (b) resources for concept maps development, (c) participant-identified advantages of using the concept-mapping strategy, (d) the reasons for ambivalence about using the concept-mapping strategy, (e) additional note-taking strategies used by participants, and (f) participants' willingness of using the concept-mapping strategy in the future.

Lastly, the study suggests that instructors and teaching assistants should teach students the concept-mapping strategy as a means to take notes effectively. Furthermore, practitioners should consider applying the concept-mapping strategy as an alternative assessment method. Finally, future international students should have a flexible mindset and learn a new approach such as the concept-mapping strategy to adapt to the new learning environment.

SIGNATURE PAGE

This dissertation written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

Yinghung N. Chiang
Candidate

Nov 16, 2021

Dissertation Committee

Dr. Patricia Busk
Chairperson

Nov 16, 2021

Dr. Xornam Apedoe

Nov 16, 2021

Dr. Christina Yeh

Nov 16, 2021

ACKNOWLEDGEMENTS

The teachers who work at USF recognized my potential and strengths and constantly supervised me during my research journey. Mainly, I would like to acknowledge my chairperson, Dr. Patricia Busk, for her continued guidance and encouragement throughout my doctoral journey, especially the dissertation process. Her knowledge of analyzing the results, research experience, and constructive feedback were highly beneficial. Working with her is not easy because she has high expectations, which pushed me to embrace the challenges and eventually achieve success. Moreover, I admire how she does her best to listen and acknowledge students' perspectives to recommend the best adjustments.

I would like to thank Dr. Xornam Apedoe, one of my dissertation committee members. I am appreciative of her dedication to my study and ensuring that I conduct my work accurately. I also want to thank her for being available to provide valuable suggestions and guidance. I would like to thank Dr. Christine Yeh, another one of my dissertation committee members. I am grateful for her generosity in sharing her expertise and knowledge, especially in qualitative research. I also want to thank her for being patient and her gentleness in responding to questions.

Next, I would like to acknowledge Dr. David Sul for participating in my dissertation and assisting with the process of analyzing the results. Dr. Sul's knowledge in this segment was crucial. He devoted his time to examining the data results gradually and closely. Furthermore, he demonstrated a high degree of patience to discuss the findings with me.

In addition, I would like to acknowledge Dr. Sedique Popal for demonstrating the qualities of a good teacher. You taught my very first class at USF. You saw my potential. You motivated me to embrace my mistakes and gave me a second chance to improve my assignment or project. Your teaching philosophy and a grow-up mindset have profoundly influenced my teaching. Because of your encouragement, I overcame many challenges when I was on my academic journey.

I would like to acknowledge Dr. Onllwyn Dixon and Dr. Ion Vlad for participating in my dissertation writing process. Dr. Dixon and Dr. Vlad gave me tremendous writing support and encouragement. Without you, I would not be capable of completing this long journey. Dr. Vlad, I will never forget your phone call on the day before my proposal defense when I had lost my faith. You were the one who told me: "You can make it, Natalie! Don't give up!" Sometimes we need a person who gives us a hand at the right moment!

I would like to thank Dr. Mathew Mitchell for implementing the concept-mapping strategy during his class, which inspired me to use this strategy for my dissertation. Also, I would like to thank Professor Timothy Tong, who allowed me to research his classes. Especially thanks to teaching assistants, Linlin Liu and Jeffery Wong, who assisted with the data collection for the study. Also, I would like to thank Professor William Ktsanes, who connected Professor Timothy Tong and me. Without your kindness, I might not have had the opportunity to accomplish my study.

Finally, I want to thank the EAP Director of Academic Art University (AAU) Mr. Bob McDonald and English instructor Mr. Glan Ryan Alejandro. They generously enabled me to conduct the pilot study at AAU.

DEDICATION

When I was young, I drowned in a flawed education system, specifically in a teacher-centered and score-oriented education system. I was seen as a student who had fallen behind in learning. As I recall, a teacher even told the class: "I believe that no university will admit Natalie because of her poor academic performance." Since then, I lost my self-belief and learning motivation, which caused me to doubt my learning ability for a long time. These unfortunate experiences are the start point for this dissertation and make me a better teacher and person. I started my academic journey at USF seven years ago, where I rebuilt my self-confidence and values. I have received support and assistance from countless people, whether in life or academic learning.

Thank Dr. Wei Yang, ISSS Associate Director Cynthia Lai, and CAPS therapist Ray Lin, who helped me solve the life crises and gave me the most mental support during this journey. I want to thank my dear friends, Mario Aguirre, Wendy Yeh, Jiafong Xie, and Ted Johnson, who has accompanied me to complete this stage of my journey.

I want to dedicate this dissertation to my mom, Huichu, and Mrs. Monica Snow. You motivated me to demonstrate women's strength and believe in me that I will eventually achieve the goal.

I dedicate this dissertation to my family. Yuki, you have always supported me financially, which eliminated a considerable portion of my worries; we made a good team. My mother-in-law and father-in-law, thank you for taking care of Ashwin while I was not in Japan. My older brother, Dr. Boneng Chiang, and my older sister-in-law, Dr. Shiru Yang, demonstrate the quality of the resilient people who motivate me to follow your academic path. My younger brother, Bowen, and my younger sister-in-law, Liqui, 2thank

you for always being with me when I feel sorrow and depression. My beautiful three kids, Jay, Sunny, and Ashwin, thank you for understanding and always being proud of me. I feel so fortunate to have such loving and mature kids.

Last, I would like to thank those who underestimated me in the past. You made me recognize my weakness and taught me to overcome negative judgments through a great deal of effort and behavioral change.

TABLE OF CONTENTS

	Page
ABSTRACT	ii
SIGNATURE PAGE	iv
ACKNOWLEDGEMENTS.....	v
DEDICATION.....	vii
TABLE OF CONTENTS	viii
LIST OF FIGURES	xi
LIST OF TABLES.....	xii
CHAPTER	
I. INTRODUCTION.....	1
Statement of the Problem	1
Purpose of the Study.....	7
Educational Significance of the Study.....	8
Theoretical Framework.....	8
Background and Need	18
Research Questions.....	27
Definition of Terms	28
Summary	31
II. REVIEW OF THE LITERATURE	32
Effectiveness of the Concept Map on Reading Comprehension	32
Effectiveness of the Concept Map on Critical Thinking	41
Concept-Mapping Strategy Application in the Economics Course.....	48
Concept Maps as An Evaluation Tool.....	56
Summary.....	73
III. THE METHODOLOGY	76
Research Design.....	76
Research Study Setting.....	77
Study Participants.....	82
Protection of Human Subjects	83
Instrumentation.....	88
Reliability and validity of the Chinese version	90
Interview questions.....	91
Demographic survey.....	92
Concept-map scoring rubric	93
Treatment Description	93
Procedures for Data Collection.....	95

TABLE OF CONTENTS CONTINUED

CHAPTER	Page
Research Questions	101
Data Analysis.....	102
Quantitative analysis	102
Qualitative analysis.....	103
Establishing trustworthiness of data.....	105
Qualifications of the Researcher.....	106
Summary.....	107
 IV. THE RESULTS	 109
Introduction	110
Research Question 1	110
Research Question 2	113
Research Question 3	115
Research Question 4	116
Research Question 5	118
Research Question 6	120
Research Question 7	121
Summary	136
 V. SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS.....	 139
Summary of Study	139
Summary of Findings	141
Limitations	144
Discussion of Results	145
Conclusions	161
Implications for Future Research	162
Implications for Educational Practice.....	164
Afterword.....	169

TABLE OF CONTENTS CONTINUED

REFERENCES 173

APPENDIXES 177

 Appendix A: A Modified MUSIC Inventory 178

 Appendix B: Online Interview Questions 181

 Appendix C: Students Informed Consent Form 184

 Appendix D: Department Chair Informed Consent Form 189

 Appendix E: Course Instructor Informed Consent Form 192

 Appendix F: Native Chinese Speaker Confirmation Letter..... 195

 Appendix G: Survey Script..... 197

 Appendix H: Concept-Map Scoring Rubric 119

 Appendix I: Instructor Training Material 201

 Appendix J: Reading Material 206

 Appendix K: Demographic Survey 212

 Appendix L: Concept Map Rater Training Handout 215

 Appendix M: Concept-Map Scoring Sheet 220

 Appendix N: An Example of Assignment..... 222

 Appendix O: An Example Study Guide 226

 Appendix P: Final Project Guide..... 231

 Appendix Q: Codebook 235

 Appendix R: Interview Transcripts 243

LIST OF FIGURES

FIGURE	Page
1. A concept map that describes Ausubel's assimilation theory	10
2. The concept of the supply curve presented by a conceptual chapter map.....	23
3. The concept of the supply curve presented by a traditional concept map.....	23
4. A concept map showing the key features of concept maps.....	25
5. A sequence of Intervention timeline for study	98
6. A concept map developed by a student illustrates the monopoly model.....	100
7. The line chart represents the mean of the quiz scores	113
8. The line chart represents the mean of the midterm scores	116
9. Six themes merged from the analysis of the qualitative data	123

LIST OF TABLES

TABLE	Page
1. Bartels’ Concept-Map Scoring Rubric	59
2. Cronin et al. Concept-Map Scoring Rubric	61
3. Novak & Gowins’ Concept-Map Scoring Rubric	63
4. McMurray’s Concept-Map Scoring Rubric.....	65
5. A Graphic Depicting the Research Methodological Design	77
6. Demographic Survey Results for Intervention and Comparison Group Participants.....	84
7. Demographic Survey Results Interview Participants	85
8. Summary of Demographic Information for Interview Participants.....	86
9. Example Items from the Modified MUSIC Instruments	90
10. Modified MUSIC Instrument Constructs and the Definitions.....	91
11. Concept-Map Scoring Rubric, Definitions, and Weighted Scores.....	94
12. Timeline of the Assignments, Quizzes, and Midterms for the Intervention Group	96
13. Descriptive Results of the Quiz Scores	111
14. Tests of Within-Subject Contrasts Results in Quiz Scores.....	112
15. Means and Standard Deviations of Two Midterms Scores	114
16. Tests of Within-Subject Contrasts Results for Midterm Scores by Intervention and Comparison Groups.....	115
17. Independent-Samples t-Test Result in Classroom Participation Scores for Intervention and Comparison Groups	116
18. Results of Independent-Samples t test of Usefulness, Success, and Interest Ratings for Intervention and Comparison Groups.....	118
19. Means and Standard Deviations for the Concept-Mapping Rubric Scores of Weeks 4, 8, and 12	119
20. Paired-Sample <i>t</i> -Test Result for the Concept-Mapping Scores of Weeks 4, 8, and 12...120	120
21. Descriptive Statistics and Correlations Coefficient for Concept-Mapping Total Score and the Final Grade.....	121
22. Themes, Responses Frequency, and Percentage of Frequency of Interview Results.....	124

CHAPTER I

STATEMENT OF THE PROBLEM

The world's economies, cultures, and educational systems are increasingly interdependent due to globalization. As a result, more and more people are embracing opportunities to adapt to international conventions. An online article from the National Communication Association (n.d.) entitled "Internationalization" suggested: "Internationalization is about taking the rest of the world seriously, not only one's home country, and can be thought of as the formal term for thinking globally before acting locally" (Internationalization section). This aspect is evident when considering the number of international students seeking to pursue an education in Western countries (Institute of International Education, 2016). Killorin (2019) reported that international students are attracted to study in the US for the following six reasons: (a) diversity of student population on campus, (b) flexibility in declaring a major, (c) specialized services and support for international students, (d) engaging in the whole campus experience, (e) emphasis on internships and career advancement, and (f) taking a range of general education classes.

Consequently, the number of international students studying in U.S. colleges and universities is growing. According to the Institution of International Education (2016) research, the total number of international students reached 1,078,822 between 2016 and 2017. During the following years, the percentage of total international students increased by 1.5 %. The newest report found that between 2018 and 2019, there were 1,095,299 international students in the US. Although the number is growing continually, many universities report retention of international students as a growing issue (Fischer, 2014;

Holmes, 2016). Wecker (2017) claimed that “Year after year, international student offices invest significant money and staff bandwidth recruiting international students. But too many of those students ultimately struggle, pack their bags, and return home degreeless and vocally dispirited about the university” (p. 36). Because the number of international students is increasing, more scholars seek to understand these individuals' learning difficulties in the United States.

There are many factors related to international students' retention and graduation rate: (a) transferred to other institutions, (b) financial reasons, (c) academic struggles, (d) lack of internship opportunity, and (e) lack of scholarship funding, (Fishcher, 2014; Holmes, 2016). Specific to students' academic struggles, research highlights three major learning issues and two main instruction issues connected to international students' success. The three main learning challenges that international students face are: (a) lack of English proficiency (Ching et al., 2017; Chung & Huang 2009; Huang, 2012; Kao, 2011; Valdez, 2015; Wong, 2017), (b) cultural differences effect on students' academic performance (Huang, 2012; Valdez, 2015), and (c) lack of effective learning strategies (Holmes, 2016; Korobora, 2012; Wang, 2017). The two teaching-related requirements to support students' academic performance are student-centered instruction (Mayer, 2002; Sawant & Rizvi, 2015; Serin, 2018; Yamagata, 2018) and increasing meaningful learning instruction.

Before international students receive admission to enroll in U.S. colleges or universities, they need to meet the English proficiency requirement, such as the Test of English as a Foreign Language (TOEFL). TOEFL is a standardized test to measure the English language ability of non-native speakers who want to study in English-speaking

universities, including in the US, the United Kingdom, Australia, and Canada. Kao (2011) claimed that the standardized test results, however, could not reflect accurately an international student's English proficiency, especially not an individual's academic English ability. In other words, standardized test scores are not a warrant to secure international students' academic success. When international students arrive on campus in the US, they are expected to understand the lecture, learning materials, classroom interactions and meet course requirements the same as their native English-speaking peers. Unfortunately, meeting teachers' expectations does not happen to international students in a natural manner. For example, an international student, Wang, shared: "I have confidence with my English before I came because I have been in English majors for several years. Yet once I arrived, I found out that I still cannot totally understand what other people are talking about (in the class)" (Cheng & Erben, 2012, p. 488). The student illustrated a large gap between English learning in one's native country and English practicing in the U.S. classroom. Kao (2011) further revealed that many English training courses and programs assist second-language learners in passing the standardized exam. Unfortunately, these programs do not aim to help students to develop their academic-English skills. Instead, they focus on improving students' test skills. Therefore, many international students received high English proficiency scores, but they still faced an extensive academic challenge in the U.S. institution.

There is another reason why international students may experience difficulty learning in the US. International students who move to the US to seek their academic goals face immediately a Western academic culture. International students are disconnected from Western academic cultures in many ways (Wong, 2017). For example,

many international students from Asian countries think asking questions or interacting with professors during lectures is considered impolite or disrespectful. This cultural difference results in Asian students being unlikely to participate in the class (Kao, 2011). Hence, the result might indirectly affect students' learning.

Contributing to the low academic achievement among international students is applying ineffective note-taking strategies. In a recent study, Morehead et al. (2019) surveyed 577 college students to investigate the note-taking practice and implications for students' learning and academic achievement. Ninety-nine % of participants responded that they were taking notes during classes. And 96 % of participants concluded that note-taking was an important learning strategy for success in college. Yet, nearly 60 % of participants reported wanting better note-taking skills, which implied a need for students to require a more effective learning strategy. An international student shared her note-taking experience, as she stated: "Because I cannot understand all the course materials, I have to take notes in class. But when taking notes, the professor has moved on, and I didn't jot down too much information yet. That is the dilemma I have every day. It makes me want to cry" (Liu, 2016, p. 8). The example described an insufficient learning strategy that would become a stumbling block to interrupt and negatively effect students' learning attitudes.

The purpose of note-taking is to help students encode the target learning materials and store the information and its eventual effect on test performance (Morehead et al., 2019). The encoding process, such as reorganizing and transforming notes, involves a higher cognitive procedure versus just copying lectures entirely or simply rereading them. Morehead et al. (2019) revealed that rereading and repetition are rote learning and are

less effective than self-testing. In the same study, 85 % of students reported using bulleted lists or outlines as strategies to organize their notes. Unfortunately, bulleted listing and outlining are not adequate note-taking strategies because they are not elaborating on the relationship between the main topic and different concepts. Furthermore, they would not integrate the prior knowledge with new concept meanings (Novak & Gowin, 1984). In short, bulleted listing and outlining do not promote meaningful learning. The extent to which international students subsequently are dismissed for low academic achievement effects their retention and graduation rates in the US. (Wong, 2017).

Researchers pointed to international students' primary academic struggles and have discovered possible solutions to improve international students' academic performance (Ching et al., 2017; Liu, 2015). In addition, several empirical studies have indicated that utilizing the concept-map strategy as an intervention may improve academic performance and classroom participation (Casteleyn et al., 2013; Evrekli et al., 2009; Fadillah et al., 2017; Wu & Chen, 2018). Concept mapping is a graphical tool for organizing and representing knowledge or information in a visual framework. A concept map displays relationships between facts, concepts, or information upon a visual map, chart, or diagram, instead of written sentences.

The concept-mapping learning strategy provides a conceptual framework to understand how students constructed knowledge, while meaning is ascribed through a metacognitive process. The empirical intervention studies specifically highlighted how concept mapping could be a sufficient learning strategy to improve second-language learners' reading comprehension, enhance the ability to synthesize information, and

strengthen problem-solving skills. Furthermore, the concept map can raise classroom engagement, increase collaborative learning, and improve the attitude for future learning (Akinoglu & Yasar, 2007; Beitz, 1998; Casteleyn et al., 2013; Mueller et al., 2002; Wu & Chen, 2018). Over time, international students' academic challenges will decrease, and their academic performance and class participation will increase. Subsequently, their ability to achieve their educational goals will improve (Holmes, 2016; Wecker, 2017).

Even though there are the benefits of the concept-mapping strategy mentioned above, there is still a need for further research. Most of the existing studies investigating concept mapping as a learning strategy involve nursing education, second-language acquisition, and the science field. Only a limited number of studies include undergraduate international students, especially in the Business and Management field (Burdina, 2015; Morangos, 2003; and Morangos & Alley, 2007). For 10 consecutive years, the Institute of International Education (IIE, 2020) listed the top two popular majors among international students: Engineering and Business and Management. The percentage of total international students in the two majors is almost identical. From 2016 to 2017, the total number of international students majoring in Business and Management reached 200,754, nearly 20 % of total international students, compared to the number of international students majoring in Engineering, which was 230,711 or 21 % of total international students. The tendency in the following year is similar to the last academic year: among these two majors, 21 % choose Engineering, closely followed by the 18 % who select to study Business and Management. The total number of students in these two fields represents over half of the entire international student population. In short, there is a high demand for future research, especially in these two fields.

Many international students received rote-learning instruction before they arrived in the United States, and students employed ineffective learning strategies, such as repetition and memorization, for their learning. A concept-mapping strategy is a visualization learning strategy that has been suggested to be beneficial in meaningful learning. Hence, international students should be taught how to apply the concept-mapping strategy to facilitate learning.

Empirical studies have pointed out that international students face various academic challenges, which result in poor grades and low-grade point average (GPA). Consequently, they are dismissed for poor academic performance, which leads to low retention and graduation rates. Therefore, it is important to discover a way to support international students' academic performance. There were missing pieces related to exploring the effect of the concept-mapping strategies on international students' learning and perceptions. Therefore, specific research should reveal if international students could benefit from using the concept-mapping strategy to raise their academic performance.

Purpose of the Study

The purpose of the study was to investigate the effects of implementing the concept-mapping strategy on international students' academic performance and perceptions of their experiences using the strategy. The study applied a mixed-method approach with a comparative research design, retrieving both quantitative and qualitative data. Both forms of data were collected to investigate the effectiveness of the concept-mapping-strategy intervention on international students' academic performance and perceptions of usefulness, interests, and effectiveness. The research was conducted in two phases. The first phase was collecting students' learning outcomes. The outcomes

consisted of the participants' quiz grades, midterm grades, final grades, concept-map assignments, and survey results. The second phase consisted of online interviews. The interview results served as qualitative data that enriched and corroborated the quantitative data.

Educational Significance of the Study

The study linked international students' academic performance and concept-mapping methods as effective learning strategies to promote meaningful learning and classroom participation by developing concept maps. There were three important points of the study. First, the current study contributed to limited literature on the relationship between international students' academic performance and implementing the concept-mapping strategy. Second, the study results may empower international student's academic performance. Specifically, the concept-mapping strategy could support their comprehension and critical-thinking skills, elevating their academic performance. Ultimately, they may have a higher chance to reach their educational goals in a U.S. college or university. And third, the current study extended the use of concept maps beyond the language teaching and nursing disciplines where this skill has been previously described. In this case, instructors from a variety of disciplines who employ concept maps in their curriculum to encourage students' classroom participation may also improve student learning. Moreover, these instructors who integrate the concept-mapping strategy may promote meaningful learning to support all students' success including international students in their courses.

Theoretical Framework

The study investigated international students' academic performance and the

concept-mapping methods as an effective learning strategy to promote meaningful learning and classroom participation by developing concept maps. This study was guided by two theories: David Ausubel's (1963) assimilation theory and Joseph D. Novak's (1972) concept-mapping theory. First, Ausubel's assimilation theory is introduced, especially the two characteristics of learning, which are meaningful learning and rote learning. Concerning assimilation theory, the four assimilation learning modes presented are subsumption, superordinate, progressive differentiation, and integrative reconciliation. Next, several aspects of Novak's concept map theory are addressed in the following section. This section concludes with a summary of the main points from the selected theories.

Assimilation theory

Assimilation theory, the so-called subsumption theory or advance organizer theory, is one of the cognitivist learning theories promoted by David Ausubel throughout the 1960s. The theory describes individuals learning best when they can connect or assimilate new knowledge with previous information. According to Ausubel (1962), learning occurs by developing new cognitive structures that accommodate newly acquired information with prior knowledge. The knowledge that already existed is stored as schemata in long-term memory. The schemata are referred to as prior knowledge. Like a child who plays with the Lego pieces: one block attached to another one. To prior knowledge, one can attach new information. Furthermore, knowledge is organized hierarchically and shaped like a pyramid. At the top of the pyramid are the most general ideas of a subject. These are then progressively followed by more detail and specificity. Assimilation theory applies to Ausubel's reception learning, also recognized as expository

learning. Reception learning is when a teacher introduces the concepts explicitly and then presents an overview of information. Students are then expected to process information and apply concepts. As learners build their understanding of new information and link that to prior knowledge, learning becomes meaningful. In that manner, the new information more likely will be retained (Ausubel, 1962). Meaningful learning is the opposite of rote learning, in which new information is not linked with prior knowledge but merely is memorized (Figure 1).

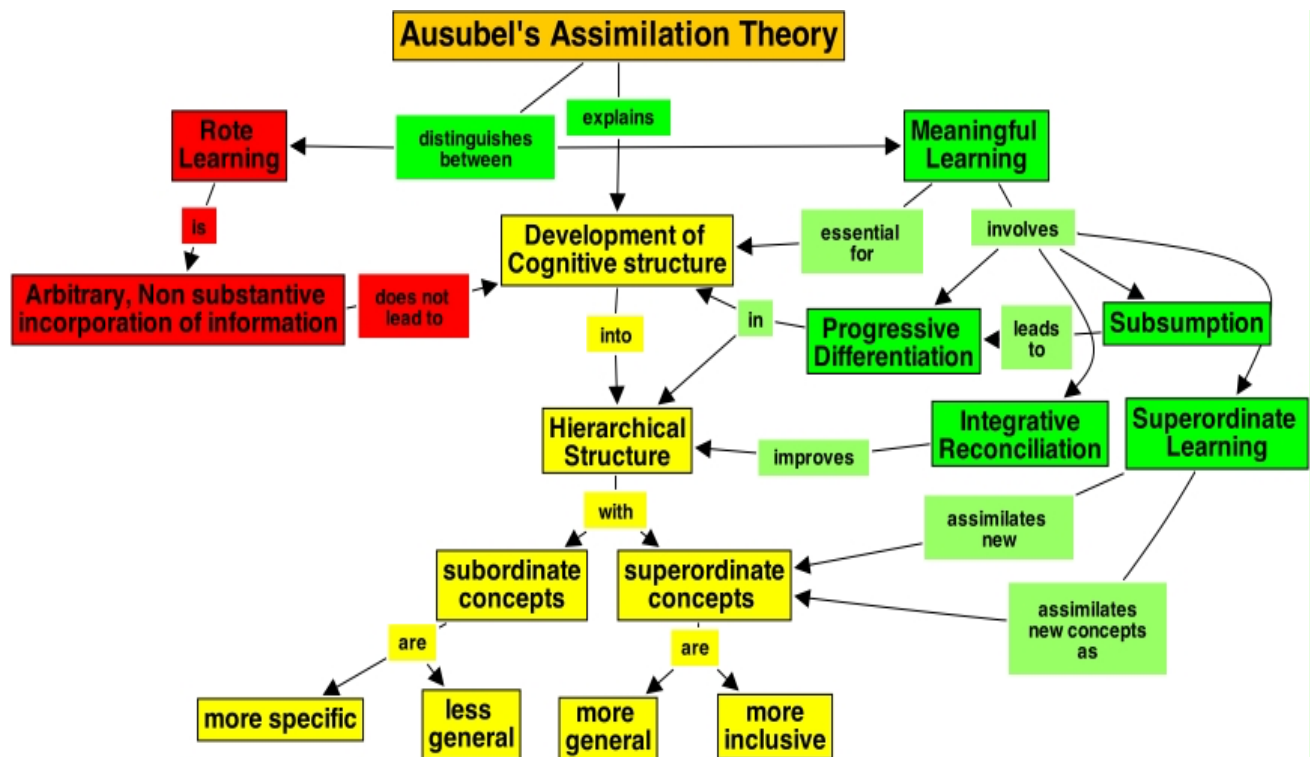


Figure 1. A Concept Map that describes Ausubel's assimilation theory.

Note. Adopted from *Assimilation theory*, by Learning Theories, n.d.

(https://www.learning-theories.org/doku.php?id=learning_theories:assimilation_theory).
CC-BY 4.0.

Meaningful learning will occur when three components exist (Ausubel, 1962).

First, the new knowledge that the learner acquires must be relevant to the individual's prior knowledge. Meaningful learning will not appear if the learner does not integrate the

new knowledge with pre-existing cognitive structure. Instead, the learning will become rote learning, which means the learner memorizes the information. Second, instructors should provide meaningful learning material to the learners. Ausubel (1962) emphasized that the learning material should be well organized, carefully explained, and adequately connected to the main subject. Finally, a learner consciously must decide to nonarbitrarily incorporate this meaningful material into his or her existing knowledge.

Ausubel proposed four fundamental assimilation modes based on the relationship between the students' prior knowledge and the new information that they will learn. The four assimilation modes are subsumption, superordinate learning, progressive differentiation, and integrative reconciliation. Ausubel suggested that assimilation is an interactive process between teachers and students. The process varies among the subsuming concepts and the new accumulation concepts for the learners. Subsumption includes derivative subsumption and correlative subsumption. Derivative subsumption refers to a learner adding new information to existing cognitive structures. For instance, if a learner already knows what a flower is and then learns about a specific type of flower, such as a rose, this new knowledge of the rose will be linked to the initial concept of the flower. Correlative subsumption refers to a learner adding further details to a higher-order concept. For example, suppose a learner is introduced to a new kind of flower that does not fit the accepted definition, like a Lobster Claw. For example, Lobster Claw's flowers develop from leaf clumps that look like bananas. And they do not have flower petals.

Superordinate subsumption means a new higher-level concept integrated with already existing categories. For example, a learner already knows about sunflowers and

daisies but later learns that they are all examples of flower types. Progressive differentiation is a process of developing and refining existing cognitive structures. To carry out the flower example, this general concept can be extended with concepts such as the structure of a flower or types of flowers. Finally, integrative reconciliation refers to reconciling differing statements and reconnecting them to new relationships.

Ausubel (1962) recognized that teachers could empower students' learning by providing better organizing information. Teachers should provide an existing idea to which the new information can be anchored. To assist with this aspect of instruction and learning, Ausubel suggested that advanced organizers would be an effective tool. The purpose of advance organizers is simply to indicate key ideas and represent the rest of the material briefly. The role of the advance organizers is to bridge new learning materials and prior knowledge. There are different types of advanced organizers, such as pictures, reviews of previously learned concepts, and graphic organizers. The concept-mapping strategy is one of the graphic organizers. Many studies suggested that to elevate international students' academic performance is to equip them with effective learning strategies, such as concept mapping, to promote meaningful learning. Some researchers (Bilik et al., 2020; Lee et al., 2013;) explored using concept mapping to promote meaningful learning at universities.

Acknowledging that the concept-mapping strategy could foster learners' meaningful learning, Bilik et al. (2020) aimed to examine the effects of web-based concept mapping education on college students' concept mapping and critical-thinking skills in Turkey. Additionally, the participants were asked to complete a questionnaire regarding students' perceptions of the concept-mapping strategy. As the course

progressed, the development of students' concept maps improved in quality and quantity. Participants reported that the concept maps assisted students in linking the new information with prior knowledge. Some of the participants illustrated that while they were creating a concept map, they could clarify misconceptions and develop a more sensible treatment plan for the clients. The students were experiencing meaningful learning because they not only consciously connected the concepts but also merged them to establish the newly attained knowledge.

Several studies pointed out the advantages of meaningful learning in respect to students' academic learning, including (a) promoting comprehension, not memorization, (b) supporting active-learning techniques such as classroom participation, (c) concentrating on the learning outcomes during the learning process, and (d) integrating new information to prior knowledge (Ameliana, 2017; Ausubel, 1963; Cardellini, 2004; Mayer, 2002; Novak, 2002; Novak & Cañas, 2006). Meaningful learning, however, is not without challenges. First, learners may take longer to master the knowledge fully. Second, meaningful learning requires building on prior knowledge. When learners lack substantial prior knowledge, they may take more time to integrate new knowledge with shallow previous knowledge. To elevate students' learning, Mayer (2002) suggests that instructors apply effective instruction for their teaching. Students have a lot to gain and improve their understanding of learning materials and concepts aligned with meaningful learning (Mayer, 2002). Fortunately, the concept-mapping strategy requires learners to integrate new information obtained by relating it to their previous knowledge, which leads to much more impressive academic results (Novak, 2002).

Concept-mapping theory

Novak and Gowins' (2008) early published book, *Learning about Learning*, shared that "Sometimes simple ideas are so obvious they are obscure. We desire in seeking simplicity to preserve complexity" (p. 1). Novak (1998) built on and refined Piaget's (1952) constructivist theory and Ausubel's (1963) assimilation theory, promoting his concept-mapping theory. Novak was aware of Ausubel's rote learning and meaningful learning. Therefore, one of the primary goals in applying the concept-mapping strategy is to advocate meaningful learning. Novak (2008) suggested that concept mapping is effective for facilitating meaningful learning because the function is to help systemize and construct knowledge.

Individuals learn best when they can merge new information with the prior cognitive structure (Ausubel, 1953). In the same vein, Novak suggested that "the construction of new knowledge begins with our observations of events or objects through the concepts we already possess" (Novak, 2009, p. 4). Novak defined an event as anything that happens or can be made to happen. For example, rain is a natural event; teaching is an event people make happen. An object is anything that exists and can be observed. For instance, a cat is an object; cars are objects that humans construct. To learn meaningfully, students must relate new knowledge to their previous events or objects (Novak, 2002).

When students struggle with complex concepts, a teacher should provide an efficient tool or learning strategy to clarify the relationship among different concepts. Novak (2002) argued that learning is more meaningful to learners when interacting with the problem or concept. A concept map is a visualization tool that specifically targets a

learner's cognitive construction and externalizes. Both the learner and the teacher are able to recognize the learner's learning. For example, concept mapping can be used for outlining or defining concepts to motivate the learner to take a reflective, systematic approach to capture the subject matter.

Mueller et al. (2002) applied the concept-mapping strategy to teach nursing students to use a comprehensive view of examining the relationship between the symptoms and how they affect the patient. As the course progressed, learners progressively applied concept-mapping strategies to develop sensible care plans for their clients. Their findings revealed that the concept-mapping strategy functions as an advance organizer to help students incorporate progressively differentiated details. In essence, the concept-mapping strategy increased students' meaningful learning and critical-thinking skills.

Novak and Gowin (2008) claimed that the "learning process involves a pushing and pulling of concepts, putting them together and separating them again" (p. 19). This perspective is an extension of assimilation theory. Ausubel believed that all acquired knowledge engages processing, storage, and retrieval procedures, which are universal for everyone. When an individual processes new concepts, they might have some misconceptions or unclear situations that can occur. Novak and Cañas (2006) argued that the concept-mapping strategy is designed to help people identify and clarify the relationships between misconceptions, themes, or topics. People enhance or modify the knowledge structure to solve vague or faulty ideas by developing concept maps. Consequently, the misconceptions will not persist, and the knowledge learned has the potential for further problem-solving.

For instructors, concept maps can be used to determine a roadmap for organizing new knowledge and pointing out learners' misconceptions. In other words, students' concept maps can be used as powerful evaluation tools.

Bloom (1956) established a framework for designating educational goals: Bloom's Taxonomy. The framework aims for six levels of education: remember, understand, apply, analyze, evaluate, and create. These goals help teachers (a) design and deliver appropriate instruction, (b) design valid assessment tasks and skills, and (c) ensure that instruction and assessment are aligned with the goals. Novak and Gowin (2008) stated it is not a challenge to develop objective questions for assessing students' memorization or rote recall, reflecting on Bloom's Taxonomy Level I goals. It is not easy, however, to evaluate whether new knowledge has been analyzed, synthesized, and evaluated by students. Novak and Grown (2008) indicated that students' concept map is a composite of six goals that drive the innovative measurement tools available. In one of Novak's (2002) earlier works, he claimed that the concept map is a way to represent the structure of knowledge that learners have learned, which empowers students' academic learning. Novak and Gowin (2008) observed:

Because concept maps are an explicit, overt representation of the concepts and propositions a person holds, they allow teachers and learners to exchange views on why a particular propositional linkage is good or valid, or to recognize missing linkages between concepts that suggest a need for new learning. Because they contain externalized expressions of propositions, we have frequently found that concept maps are remarkably effective tools for showing misconceptions (p. 20).

Recognizing that concept-mapping strategy is considered an efficacy learning tool, students will use concept-mapping strategies to organize knowledge and structure concept maps for students in economic courses (Marangos, 2003; Maragons & Alley,

2007). In the current study, the students learned about multiple economic systems in the Economics class and methods to align their learning materials. The concept-mapping strategy helps people identify and clarify the relationships between misconceptions, themes, or topics.

Furthermore, the students will link the information learned into their pre-existing cognitive structure to construct the new concepts. Novak and Gowin (2008) specifically pointed out that "We do not claim that a concept map is a complete representation of the relevant concepts and propositions..., but we do claim that it is a workable approximation. Both teacher and students can consciously and deliberately expand and move forward" (p. 40). Extensive studies have suggested that using the concept-mapping strategy can improve students' academic learning by increasing classroom participation, assisting learners to synthesize learning materials, improving reading-comprehension skills, and promoting higher academic achievement (Akinoglu & Yasar, 2007; Beitz, 1998; Butcher, 2006; Kern et al., 2006; Mueller et al., 2002).

In Kern et al.'s (2006) study, they explored how concept maps can be integrated as an innovative educational tool with traditional nursing-care plans. The researchers created a nursing-care plan in which they incorporated the concept-map learning strategy to teach college nursing students how nurses think. Participants were asked to develop concept maps with specific subjects. The data were collected from students' and faculties' survey responses and the results indicated that the concept-mapping strategy encourages students' comprehension and thinking skills and enhances their problem-solving ability.

Butcher (2006) conducted a study to investigate 74 college students' learning outcomes and comprehension processes. Students learned about the heart and circulatory

system using text only, text with diagrams, or text with detailed diagrams. The researchers discovered that learners who integrated simple diagrams had the best results in authentic learning and information integration. In essence, students displayed the relationships between facts, concepts, or notions of the reading material by using a concept-mapping strategy. In addition, the findings indicated that the diagrams improved inference generation and reading comprehension skills.

Summary

Ausubel's assimilation theory and Novak's concept map theory were selected as theoretical frameworks for the current study. The students utilized the concept-mapping strategy while learning about the economic concepts. Learning economics required a high level of critical thinking and comprehension skills. Meaningful learning could serve as a vehicle to increase critical thinking and comprehension skills. Based on Ausubel's assimilation theory, the following three components must exist when meaningful learning happens (a) the learner's prior knowledge, (b) meaningful material, and (c) the learner's choice to use meaningful learning strategies. Assimilation theory, however, fails to address the accuracy of the learner's prior knowledge, which is where the concept-mapping strategy remedies a defect. The concept-mapping strategy fosters meaningful learning because it visualizes a learner's assimilation thinking process from general concepts prior to more specific concepts and presents it in a hierarchical order (Cañas et al., 2003). In essence, the students assimilated new economics knowledge meaningfully.

Background and Need

The purpose of this section is to provide the background of the concept-mapping strategy, as well as a justification to explain why the current study is needed. The first

segment of this section is to address the learning challenges of international students in U.S. institutions of higher education. The second segment provides the definition and characteristics of a concept map. The third segment contains the benefits of the concept-mapping strategy and highlights how this strategy can improve reading-comprehension skills, critical-thinking skills, and classroom engagement to mitigate international undergraduates' learning challenges. The last section focus is on the concept-mapping application in the Economics course domain. This section concludes with a summary of the main points from the selected literature and with suggestions on how the concept-mapping strategy may empower students' academic performance and assist educators to reconsider their instruction design to support students' success.

The learning challenges of international students in the United States

Researchers pointed to international students' primary academic struggles and acknowledged that the learning challenges are related to students' academic performance. The main objective of Wolf and Phung's (2019) study is to explore the academic learning experiences of eight international students who were majoring in nursing in U.S. higher education. The study revealed how cultural differences and lack of English proficiency could effect students' academic performance. The participants reported that they faced unfamiliar academic writing formats, such as American Psychological Association (APA). APA is the format to document sources used for Social Sciences. It includes formatting rules such as citations, punctuation, grammar, and paper layout. Students struggled to adhere to this type of academic writing and formatting while also having difficulties with other learning challenges. Specifically, the participants attributed the difficulties to the following writing and formatting issues: grammar, organization,

accuracy, logic, and clarity.

Cennetkuşu (2017) examined the international students' academic writing challenges. In the study, professors reflected on the most problematic areas of international students' academic writing. He pointed out the international students were unable to use proper grammar, connections, and transition words and present their ideas clearly. U.S. institutions of higher education emphasize the importance of critical- and argumentative-thinking writing styles. Unfortunately, many international students lack critical-thinking skills (Wolf & Phung, 2019). Heng (2018) claimed that the reason for international students' insufficient critical-thinking skills and meaningful learning opportunities is because various instructors apply a teacher-centered pedagogy, especially in many Asian countries. The teacher-centered pedagogy requires students to prioritize memorization over connecting prior knowledge with new knowledge. Consequently, international students have limited critical-thinking skills and meaningful learning opportunities.

Another example illustrates how cultural differences and lack of supporting students' meaningful learning impacts international students' academic performance. Cheng and Erben (2012) identified the fact that international students who had received teacher-centered instruction have more difficulties with writing and speaking in the classroom because active production had been neglected in their learning. Cheng and Erben (2012) drew from research that evaluated the effect of length of stay in U.S. higher institutions, various programs, and the acculturation process on international students' learning anxiety with 156 Chinese international undergraduates participating in the study. As the two researchers underlined, class size in China is large, and the instructors

emphasized grammar and placed less emphasis on reading and oral skills. Thus, Chinese students had fewer meaningful opportunities to enhance their speaking skills. Wolf and Phung (2019) add another aspect to the speaking challenges of international students. Due to unfamiliarity with Western cultural norms, international students faced difficulties participating in classroom activities.

Empirical studies indicated that instructors or institutions should provide effective learning strategies to equip students with learning (Ching et al., 2017; Chung & Huang 2009; Huang, 2012; Kao, 2011; Valdez, 2015; Wong, 2017). Two analyses of particular relevance identified international students' reading challenges as the consequences of lacking effective learning strategies. Jiang et al. (2017) provide two case studies about Chinese international students' perceptions of their language challenges in U.S. universities. They highlighted that the international students had difficulty understanding the convoluted, extended, and complex structure of sentences. These results are similar to Hang's (2012) findings. Huang argued that synthesizing and comprehensive understanding of reading materials is another academic challenge in terms of reading. Additionally, the participants reflected that they were overwhelmed by the number of reading materials. Hang (2012) stated that compared with their native peers, international students needed more time to digest the content. According to Birch's (2002) interactive model of the reading process, international students have more limited language-processing strategies than their English-speaking peers, which may explain why they need to spend more time in preparation for their lessons. Therefore, instructors would have to provide effective learning strategies aligned with meaningful learning instruction for international students. The students will gain from that and generally improve their

understanding of learning materials and concepts.

Overall, international students' learning issues related to their retention and graduation rate. One of the factors affecting students' academic performance is missing effective learning strategies. Because many international students received rote-learning instruction in their native country, they did not experience meaningful learning environment. As a result, gradually, international students had limited critical thinking and comprehension skills. Empirical studies indicated that the concept-mapping method promotes meaningful learning and improves students' academic performance. Therefore, instructors should teach how to use concept maps as a practical learning tool to assist international students in becoming active learners capable of achieving and sustaining high-level academic performance. There were limited studies, however, related to the effectiveness of the concept-mapping strategy on international students' academic performance in U.S. higher education. Therefore, there was a need to investigate if the concept-mapping strategy would help improve international students' academic performance.

Definition and characteristics of a concept map

Since Novak et al. (1998) built on and refined Piaget's (1952) constructivist theory and Ausubel's (1963) assimilation theory promoting his concept-mapping theory, there are more and more studies to apply concept-mapping theory and redefine it to meet their needs. For example, Burdina (2015) provided a new-fashioned concept map called a Conceptual Chapter Map. A Conceptual Chapter Map is a transformed version of a traditional concept map. The Conceptual Chapter Map focuses on the links among concepts and missing contextual information to existing visual prompts. The following

maps represent the same relationship among concepts related to the supply curve. The map's main idea is to illustrate the difference between a shifting supply curve and a movement along the supply curve. The Conceptual Chapter Map (Figure 2) that displays the changes using figures whereas while the traditional concept map does not (Figure 3). Furthermore, both maps indicate what causes these changes.

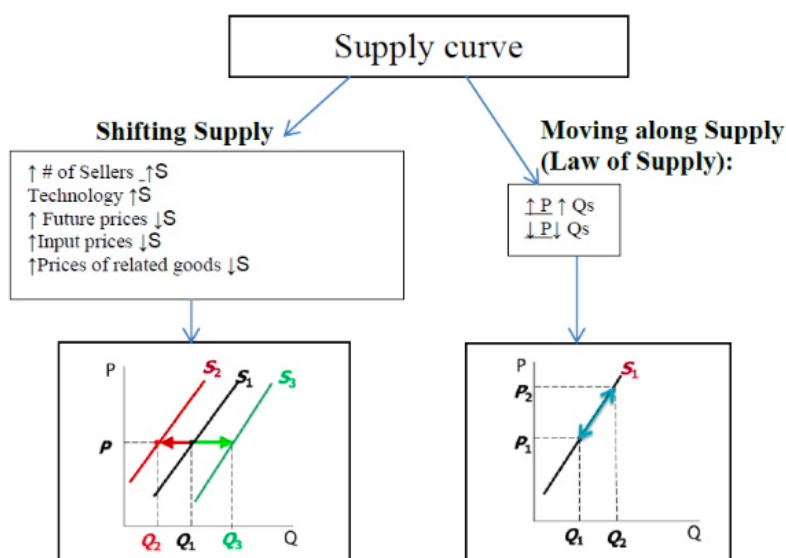


Figure 2. The concept of the supply curve presented by a conceptual chapter map
 Note. Adopted from “Rethinking the use of concept maps in interdisciplinary economics” by Burdina (2015).

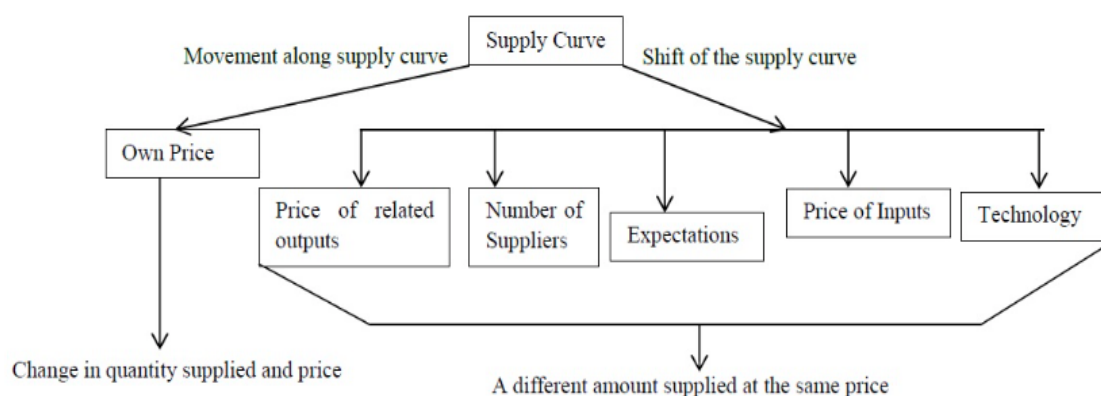


Figure 3. The concept of the supply curve presented by a traditional concept map
 Note. Adopted from “Rethinking the use of concept maps in interdisciplinary economics” by Burdina (2015).

For this study's purpose, the preceding definition of a concept map by Burdina will be used. Following are the reasons why Burdina's (2015) definition stands out from the rest. The current study extends Burdina's study because it was conducted in an introductory Economics course. Like Burdina, students read and reorganized the knowledge by constructing a concept map throughout the semester. Next, in Burdina's study, there was a large population of international students in the course. Third, as Burdina recommended, there is a need to investigate further the relationship between the concept maps' effectiveness and learning outcomes.

Novak and Gowin (2008) claimed that the purpose of the concept-mapping method is to illustrate meaningful relationships between concepts in the form of propositions. Novak (2002) described the four central elements of the concept map: concepts, propositions, cross-links, and hierarchy frameworks (Figure 4). He defined the concept as "a perceived regularity in events or objects, or records of events or objects, designated by a label. Most of the labels are words, but they could be symbols" (p. 1). The propositions are units of meaning. Two concepts connect to build a substatement of beliefs. For example, "earth" and "round" are two simple concepts (or labels) that could form a valid proposition: the earth is round. The concepts stored in one's head are not isolated. Instead, they are linked or hyperlinked to each other. Next, the cross-links represent the visual relationship between different ideas or knowledge that enhance audiences' understanding. The last element of a concept map is that concepts are expressed in a hierarchical order. The hierarchical order has two meanings: (a) the most general or prevailing concepts are revealed at the top of the map, and (b) more specific or few general ideas are located at the bottom of the map.

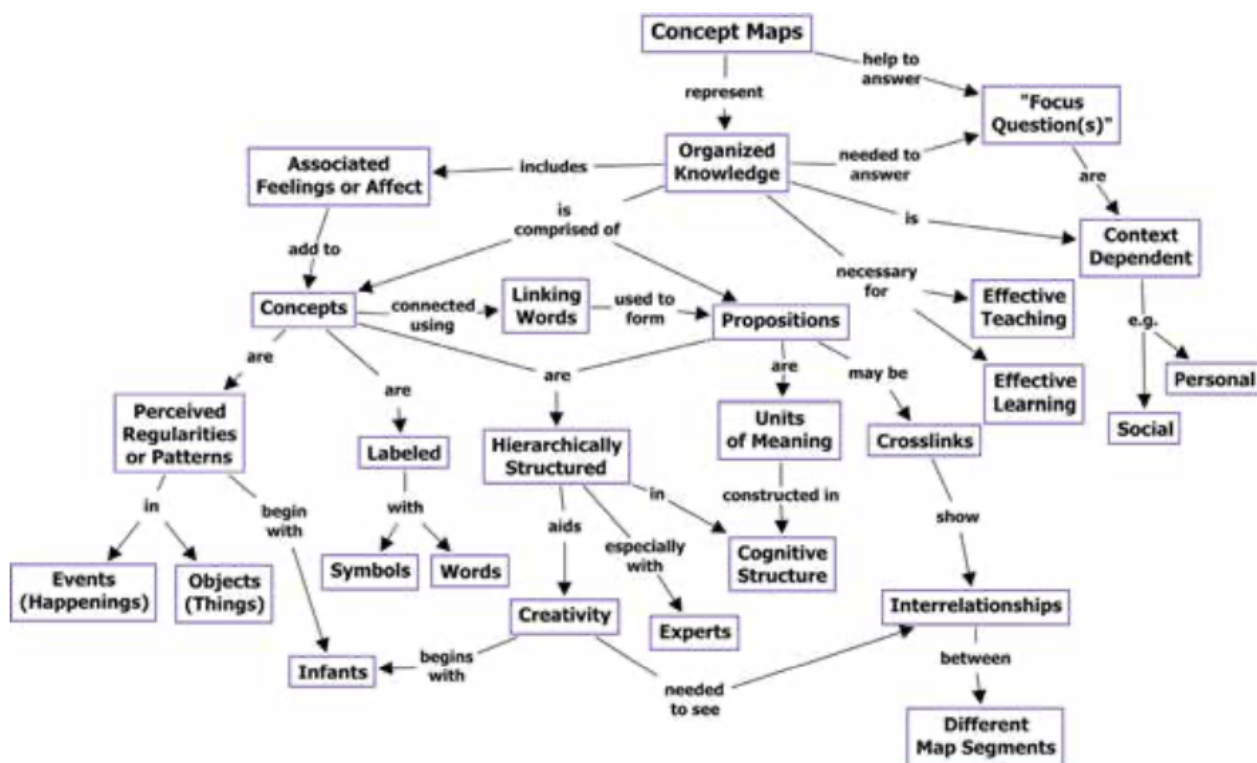


Figure 4. A concept map showing the key features of concept maps

Note. Adopted from “The Theory Underlying Concept Maps and How to Construct and Use Them,” by Novak & Cañas (2008).

Benefits of using the concept-mapping strategy

Researchers indicated the concept-mapping strategy is applied widely in different fields, such as U.S. government projects (Cardellini, 2004), nursing (Kern, 2006), or science instruction (Hanewald, 2012). In addition, these studies indicated that the concept-mapping strategy promotes meaningful learning, reading-comprehension skills, critical-thinking skills, and increased academic performance and classroom participation.

Cardellini (2004) reported that the concept-mapping strategy is used for general teaching and learning and to refine expert knowledge in the corporate and government fields. For example, the National Aeronautics and Space Administration (NASA) and the U.S. Navy incorporated the concept-mapping strategy into their Mars projects. The

concept map has also been utilized in the nursing curriculum. In Kern et al.'s (2006) study, they evaluated the effect of concept mapping on problem-solving skills, competence in clinical settings, and knowledge among undergraduate nursing students. Participants were asked to develop concept maps with specific subjects. The results indicate that the concept map encouraged students' comprehensive thinking and enhanced problem-solving ability.

Hanewald (2012) research used data from 93 undergraduate science communication students in an Australian university. The researcher tested his hypothesis by applying a digital concept-mapping strategy to help students develop life-long collaborative skills, communication skills, and comprehension skills. The results indicated that for the participants who required a concept-mapping strategy to align their learning, the life-long skills were improved. Schaal et al. (2010) drew from research in investigating the concept-mapping assessment of media-assisted learning in science education. One hundred and six high-school students participated in the research. The findings reveal that concept mapping is an adequate assessment method within classrooms. After students learned the units, learners' concept maps became more consistent with providing more detailed concepts. The accuracy of the interlinked with several other concepts is improved as well. These results are congruent with Beitz's (1998) study, suggesting that neophytes could become sophisticated learners in courses after practicing the concept-mapping strategy. Students lay out their understanding of the knowledge by constructing a concept map.

Summary

When the pedagogy lacks meaningful and immersive learning tasks, learners

develop poor English proficiency skills, and language fluency is subpar. Due to ineffective English language acquisition in their native countries, many international students lack sufficient skills to engage in U.S. classrooms. Perhaps insufficient English proficiency is a possible explanation why many international students are afraid to exchange ideas and concepts in English, rather than viewing these situations as obstacles to be overcome. Consequently, these academic challenges result in low academic achievement and lower retention and graduation rates (Wong, 2017). Empirical studies suggested that the concept-mapping strategy is a learning technique that could be used to improve learning and teaching practices to support undergraduates' academic performance and meaningful learning.

Research Questions

This study focused on six research questions. Questions one to six involve quantitative data. The final question involves qualitative data in order to retrieve insights into the students' perceptions of applying the concept-mapping strategy throughout the course.

1. To what extent is there a difference in the trend of quiz scores of weeks 1, 4, 8, and 12 between students who were in the intervention group and those who were in the comparison group?
2. To what extent is there a difference in the trend of two midterm grades between students who were in the intervention group and those who were in the comparison group?
3. To what extent is there a difference of classroom participation between students who were in the intervention group and those who were in the comparison group?

4. To what extent is there a difference between the comparison group and the intervention group in terms of the students' rating of their success, interest, and usefulness in learning?
5. To what extent is there a difference in the rubric scores for the concept-mapping assignments of weeks 4, 8, and 12 in the intervention group?
6. To what extent is there a relationship between the concept-mapping total scores with final grade?
7. What are the perceptions of international students regarding the use of concept mapping in their course?

Definition of Terms

The terms provided here may have other definitions than those given. The following definitions, however, are the ones used in this study.

Breadth is one of the parameters of McMurray's (2014) concept-map scoring rubric, and scores indicate that the concept map includes essential concepts and describes the domain on multiple levels. The performance ratings vary from 0 (*Unacceptable*) to 5 (*Excellent*).

Concept Map Scoring Rubric developed by McMurray (2014) was adapted for this study. The rubric has five parameters (a) breadth, (b) interconnectivity, (c) use of descriptive links, (d) efficiency of the link, and (e) layout. There are four levels of performance rating: *Excellent* (5 points), *Good* (4 points), *Acceptable* (3 points), and *Unacceptable* (0 to 2 points).

Cross-link is a link connecting different segments or domains to express the relationship on the concept map (Novak & Canas, 2008).

Descriptive Links is one of the parameters of McMurray's (2014) concept-map scoring rubric, and scores indicate that the links succinctly and accurately describe all relationships. The performance ratings vary from 0 (*Unacceptable*) to 5 (*Excellent*).

Efficient Link is one of the parameters of McMurray's (2014) concept-map scoring rubric, and scores indicate that each link type is distinct from all others, clearly describing the relationship. The performance ratings vary from 0 (*Unacceptable*) to 5 (*Excellent*).

Interconnectivity is one of the parameters of McMurray's (2014) concept-map scoring rubric and scores indicate that concepts are interlinked with several other concepts. The performance ratings vary from 0 (*Unacceptable*) to 5 (*Excellent*).

Interest is defined by Jones (2017) as when "the instructional methods and coursework are interesting" to the student (p. 31). Using the Modified MUSIC Inventory, there are six items that comprise this component. Responses are summed and divided by 6 so that the possible range of responses will be 1 (*strongly disagree*) to 6 (*strongly agree*).

International Students are individuals enrolled in institutions of higher education who are on temporary student visas and are non-native English speakers (Andrade, 2006).

Layout is one of the parameters of McMurray's (2014) Concept-map scoring rubric, and scores indicate that the map is contained on a single page, has multiple clear hierarchies, is well laid out, and provides a sufficient number of relevant examples with links. The performance ratings vary from 0 (*Unacceptable*) to 5 (*Excellent*).

Learning According to Celce-Murcia, Brinton, and Snow (2014), "learning was characterized by the accumulation of bits of knowledge organized according to an instructional sequence that moved, step by step, from simple to more complex skills" (p. 321).

Meaningful Learning happens when an individual acquires the knowledge in which he or she interacts with the problem or concept (Novak, 2002).

Modified MUSIC Inventory was administered to investigate students' perceptions of success, interest, and usefulness of the course instruction. The modified version of the MUSIC inventory is a self-report questionnaire containing 15 of the 24 original items and has three components, including (a) usefulness, (b) success, and (c) interest. Students rate themselves on a 6-point Likert scale, from 1 (*strongly disagree*), 2 (*disagree*), 3 (*somewhat disagree*), 4 (*somewhat agree*), 5 (*agree*), to 6 (*strongly agree*). The inventory has been translated into several languages, such as Mandarin, Spanish, Farsi, Turkish, and Icelandic. The English and Mandarin versions of the Modified MUSIC Inventory were used in this study.

Rote Learning Ausubel (1963) claimed that rote learning is a memorization technique based on repetition.

Student-generated Concept Map Students entirely developed their concept maps (Novak & Gowin, 1984).

Success For Jones (2017), success means that “he or she can succeed at the coursework” (p. 31). Four items constitute this component, and responses are summed and divided by four for the success component. The resulting values are interpreted in the same way as Interest.

Usefulness is defined as “the coursework is useful to his or her future and can succeed at the coursework” (Jones, 2017, p. 31). Using the Modified MUSIC Inventory with five items for this component, responses to the items are summed and divided by five. The resulting values are interpreted in the same way as Interest.

Summary

International students begin their undergraduate education in the US with many deficits. In particular, international students have performance issues in the following areas (a) lack of English proficiency, (b) cultural differences impact on students' academic performance, and (c) lack of effective learning strategy. One learning strategy that research has shown to improve academic performance and increase student engagement is concept maps. This chapter has provided the foundation for investigating the inclusion of concept maps in an Economics course. The main question for this research was, "Will international students improve their academic performance and classroom engagement by using the concept-map strategy?" The remaining chapters focus on the literature review regarding the use of concept maps in academic courses and on the methodology for the current research. The methodology chapter concludes with the limitations of this study.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this mixed-method study was to investigate the effects of implementing the concept-mapping strategy on international students' academic performance and perceptions of their experiences using the strategy. The research was carried out at a private university located on the West Coast. The first section of the literature provided the studies linked to concept mapping-strategy for reading comprehension, specifically in EFL (English as a Foreign Language) and ESL (English as a Second Language) settings. The second section examined a series of concept-mapping studies conducted in higher education. It includes a review of literature on the relationship between concept mapping and meaningful learning. This first section contains subsections on (a) using concept maps as a learning strategy to empower students' academic performance and (b) using concept maps as a facilitator to improve students' classroom participation. To conclude, the last section covers information regarding the use of concept maps as evaluation tools. This section addresses (a) four concept map rubrics, (b) concept-map scoring methods, and (c) the recent studies on concept-map scoring methods application.

Effectiveness of the Concept-Mapping Strategy on EFL and ESL Learners' Reading Comprehension

Frequently, students' success is examined based on their academic performance in most educational institutions. Francisco and Madrazo (2019) found a statistically significant correlation between learners' reading comprehension and academic performance. Reading is an active process where learners construct new ideas and attach

their past knowledge (Francisco & Madrazo, 2019). Similarly, Novak (1983) pointed out that meaningful learning exists when learners assimilate new ideas to their previous knowledge. For this study, the focus will be on research related to the effectiveness of concept mapping in reading comprehension on ESL or EFL learners. This section highlights three studies showing how the concept-mapping strategy offers meaningful learning for second language learners. Many studies found that the concept-mapping strategy has improved English as a foreign language or English as a second language students' reading comprehension. Three fundamental studies have analysis on the concept-mapping strategy concerning EFL and ESL college students' reading comprehension experience. Studies conducted by Liu et al. (2010) emphasized the effect of the computerized concept-mapping strategy on the reading skills of low and high achievers. In addition, Soleimani and Nabizadeh (2012) conducted a study on the effect of three different reading-comprehension skills on Iranian pre-university ESL learners. Finally, Rassaei (2009) explored the effects of two forms of concept-mapping strategies on EFL learners' reading comprehension and strategy awareness. What follows is an overview of each of these studies.

Liu et al. (2010) demonstrated that a computerized concept-mapping strategy promoted English reading comprehension for EFL college students. Specifically, the study investigated the concept-mapping strategy on the reading abilities of low-English-proficiency-achievers and high-English-proficiency-achievers. One-hundred-ninety-two first-year students were enrolled in the English course and were divided into a low-English-proficiency-achiever group and a high-English-proficiency-achiever group, according to their English proficiency test scores. The instructor introduced a computer-

assisted concept-mapping strategy to the participants in the 2nd and 3rd weeks for the experimental group. The participants developed concept maps every 2 weeks, with nine articles selected from an English magazine. For the comparison group, the instructor taught the same articles and applied traditional instruction, such as vocabulary and grammar teaching, in the class. As the course progressed, students had three reading tests on week 4, week 7, and week 10. There were 22 reading-comprehension questions on the test sheet. The purpose of the reading test was to assess students' knowledge after they read the articles. The reading-strategies application questionnaires were collected on week 4, week 7, and week 10. The purpose of the reading strategies application questionnaires was to explore whether the computer-assisted concept-mapping strategy empowers students to use other reading strategies while learning.

Analysis of the concept maps revealed that the concept-mapping strategy improves low achievers' reading-comprehension ability. Furthermore, the concept-mapping strategy reduces the difference between the reading ability of high achiever and low achiever. The concept-mapping strategy helps low achievers to transfer the segment sentences into images to have a holistic understanding of the learning materials. Novak and Gowin (2008) suggested that the cross-links connect different segments or domains to express the relationship on the concept map. The experimental group reported that they performed various reading strategies such as listening, enforcing, and reviewing while developing the concept maps through the post questionnaire. Also, the test outcomes indicated that until week 10, the experimental group outperformed the comparison group. In other words, before students' English comprehension scores improved, it took a while to practice the concept-mapping strategy for their English reading abilities. This study

shows that the concept-mapping strategy is more effective than the traditional reading strategy, especially for low achievers.

There are two limitations of the study conducted by Liu et al. (2010). The researcher adopted the scoring system from Novak and Gowin (1984) for assessing students' concept-map assignments. The researchers, however, did not provide any results related to the concept-map assignments in the study. The second limitation of the study was that the researchers did not evaluate the process of students' concept mapping.

The current study is connected to the study conducted by Liu et al. (2010) in a few ways. First, both studies engaged college students who are English as second-language learners. Second, similar to the study by Liu et al. (2010), the concept-maps strategy in the current study was used for empowering English learners' reading-comprehension skills. The present study extended Liu et al. (2010) because the learners' concept maps and students' perceptions of using the concept-mapping strategy were examined.

The study's finding is also in line with previous research on the effectiveness of the concept-mapping strategy on students' reading comprehension. In a study conducted by Soleimani and Nabizadeh (2012), researchers evaluated the effect of three different reading-comprehension skills on Iranian pre-university ESL learners. Soleimani and Nabizadeh (2012) conducted a quantitative pretest and posttest study to compare the use of a student-generated concept with three different reading strategies: learner-constructed concept-map group, fill-in-the-map concept-map group and summarizing strategy group. The participants of 90 intermediate EFL learners were selected for the study based on their placement test scores on the Oxford Solution Proficiency (Oxford University Press,

2007). Students had a pretest, which involved three reading passages. The test was administered to measure the comprehension ability of the participants before applying the treatment. The test included 30 multiple-choice questions that assessed the students' knowledge of the three reading passages.

Similar to the current study, this previous study was conducted within 3 months. Soleimani and Nabizadeh (2012) randomly assigned the participants into three groups: group one was learner-constructed concept mapping, group two was fill-in-the-map concept mapping, and group three was a traditional reading-comprehension-strategy group. The participants received a five-session treatment procedure instruction and practice of the specific strategy with a period of 20 minutes for each session. For experimental group 1, students were asked to create the concept maps for the five passages taught during the class. Students were asked to turn in the concept maps and received feedback from one of the researchers.

Like Liu et al.'s (2010) study, the researchers applied Novak and Gowin's (1984) scoring system to assess students' concept maps. For experimental group 2, the instructors provided a concept map that contained some blank spaces. Students were asked to fill in some concepts or link lines on the map based on the passages they were taught. Students were asked to turn in the concept maps and would receive feedback from one of the researchers. For experimental group 3, students were asked to summarize the passages that were taught. Students were asked to turn in the assignments, and they would receive feedback from one of the researchers as well. At the end of the treatment, the posttest was administered to all groups. The pretest and posttest results revealed that both concept-mapping strategy groups performed better than the traditional reading-

comprehension group. A difference in the posttest gain scores was discovered. Soleimani and Nabizadeh (2012) performed a post hoc with posttest scores and found that the fill-in-the-map strategy of the concept map was the most influencing strategy among all three groups.

One of the study's strengths by Soleimani and Nabizadeh (2012) was adopting a specific concept-mapping handout from Novak and Gowin (1984) for the intervention groups. The handout taught students explicitly how to develop a concept map step-by-step and a concept-map-scoring criteria. The participants who were in the concept-mapping groups received 5-week training sessions from practicing the concept-mapping strategy. The participants who were in the summarizing group received identical training sessions from practicing the summarizing strategy.

Another advantage of the study was that the instructors provided feedback on students' concept maps or passages summary. The study conducted by Soleimani and Nabizadeh (2012) had some limitations. First, the study only received a small number of concept-map assignments and did not report any results regarding concept-map assignments. Additionally, all concept-map assignments were only from female students, and each one majored in science. It would have been useful if the researchers could study both genders and different majors.

The researchers recommended that future research investigating the effectiveness of the concept-map strategy in the different fields should be conducted. The current study is an extension of the Soleimani and Nabizadeh (2012) study because the effectiveness of implementing a concept-mapping strategy on English learners' reading comprehension in the economics domain will be examined. Additionally, the participants in Soleimani and

Nabizadeh's (2012) study had 5 sessions to become familiar with the concept-mapping strategy before the actual treatment started. Each session was assigned to twenty minutes. The participants in the current study were experienced to the concept-mapping strategy over one-hundred minutes before the study began. Similar to the study conducted by Soleimani and Nabizadeh, the students in the current study also received feedback on constructing their concept maps from the course teaching assistant to improve their concept-mapping skills and understanding of economic-course materials during the study.

In another study, Rassaei (2019) demonstrated that concept-mapping strategy enhances reading comprehension and strategy awareness. Rassaei (2019) applied a quasi-experimental design, including a pretest and a posttest, with 56 English as foreign language (EFL) learners from three distinct classes. The three distinct classes were designated as two intervention groups and one comparison group. Eighteen students in the comparison group were asked to read a text in each session without doing any concept-mapping activity. Students were asked to answer 15 reading-comprehension questions and participated in the reading passage's discussion.

In contrast, 19 students in the first intervention group, the guided concept-mapping group, were trained to create concept maps by reading the same reading passage in each session and completing a partially filled concept map. Students were required to read the text and complete the concept map in 30 minutes. Nineteen students in the second intervention group were provided with a similar reading passage in each session along with its concept map in which some concepts were incorrect. Students were asked to read and revise the concept map in 30 minutes. One day before the study began, both intervention groups received a one-hour concept-mapping-strategy training by the

researcher. There were reading-comprehension tests, each containing two descriptive reading passages, arranged, and administered as a pretest and a posttest. The reading passages were selected carefully to match learners' English proficiency. Furthermore, the two reading passages were piloted on an unrelated group of 38 intermediate EFL students in two settings. A paired-sample *t* test revealed no statistically significant difference between the pilot group's scores in the two settings. In other words, the pretest and posttest reading passages had equal difficulty. At the beginning of the study, all students in control and experimental groups completed a reading pretest and posttest. The pretest and posttest both consisted of 10 multiple-choice items. The essence of the questions included the main idea of the passages, detailed information, compare and contrast, and so on. The perfect score for both pretest and posttest was 20. After students completed the pretest and posttest, they received a reading- strategies questionnaire immediately.

Rassaei (2019) adopted the survey that was developed by Sheorey and Mokhtari (2001). The questionnaire consists of a total of 28 items, with three subscales: cognitive strategies, metacognitive strategies, and support strategies. The items in the questionnaire represented a 5-point Likert scale. Sheorey and Mokhtari (2001) reported the reliability values of the overall scale was .93, which demonstrates good internal consistency. After the eight sessions, after the 4-week study, all of the students completed a posttest and the SORS questionnaire identical to the pretest. Mixed between-within group Analysis of Variance (ANOVA) was used to analyze learners' raw scores to perform the results. The mean of posttest scores indicated that the scores for both concept-mapping groups were statistically significantly higher than scores for the control group. In other words, the concept-mapping strategy was effective for improving reading comprehension. Rassaei

(2019) further applied Tukey post-hoc comparisons to determine that the correction-group exceeded the guide-concept-mapping-group. For the reading strategy awareness results, the means of three subscales scores indicated that the scores for both concept-mapping groups were statistically significantly higher than scores for the control group. Yet, the guided-concept-mapping-correction group outperformed the concept-mapping-correction group. Post-hoc comparisons indicated that learners were statistically significantly more aware of metacognitive strategies than cognitive and support strategies.

The study designed by Rassaei (2019) had a few features that distinguished it from the study conducted by Soleimani and Nabizadeh (2012). To begin, in Rassaei's study, the students experienced to the concept-mapping strategy only one day before the study. Students had minimal time to become used to the concept-mapping strategy before the study unfolded. Next, the sample size was small. Each group had less than 20 students engaging in the intervention group or control group.

Nevertheless, the study conducted by Rassaei (2019) had a few advantages. First, the study also employed a reliable reading-strategy awareness survey to discover learners' awareness while developing concept maps. Second, the research involved a pilot study to ensure that the reading-comprehension pretest and posttest were equivalent concerning the difficulty level.

The current study is an extension of the study by Soleimani and Nabizadeh (2012) in several ways. First, the participants in the present study received one-hour concept mapping training that comprised an introduction to concept mapping, the advantages of using the concept-mapping strategy, the types of concept maps, a guided practice, and an

individual exercise. Both studies adapted Novak and Gowins' (1984) study to teach the concept-mapping skill to the students step by step. Second, the current study provided 4 weeks for students to become familiar with the concept-mapping skill. The present study examined student-concept-maps' accuracy and further inspected the growth of the concept maps skill.

Effectiveness of the Concept-Mapping Strategy on Learners' Critical Thinking to Enhance Students' Meaningful Learning

Empirical studies indicated that meaningful learning emphasizes interconnecting with the subject matter, thinking critically, and linking all knowledge pieces together. Fundamentally, meaningful learning encourages understanding rather than simply memorization. Sadly, numerous international students are marginalized due to inadequate and not meaningful learning instruction and learning strategies (Wang, 2017). The main objective of this section is to further the understanding of the effectiveness of the concept-mapping strategy to promote meaningful learning in the nursing program. The selected literature is connected to the current study in a few ways. Although concept-mapping research suggests that it is an effective strategy to promote effective learning, up to the present time, there are limited studies that have investigated concept-mapping applied to economics courses. Learning in both nursing and economics is related to the real world, and specifically, both subjects link to the human condition. In addition to the reading-comprehension skills, the nursing programs require students to have extensive critical-thinking skills for patient-centered care plans. The current study was designed to promote international students' critical-thinking skills to improve their academic performance. Lee et al. (2013) suggested that critical thinking and inference were

associated positively with meaningful learning. Chen et al. (2010) claimed that critical thinking increased one's understanding, leading to a better learning outcome. Finally, the literature provides an appropriate methodology framework for the researcher to investigate students' perceptions of using the concept-mapping strategy. The research conducted by Lee et al. (2013), and Bilik et al. (2020) will be presented in detail.

Lee et al. (2013) designed a quasi-experimental with a longitudinal follow-up study to examine the effects of concept-mapping teaching on critical thinking in a 2-year nursing program in Taiwan. The intervention of concept-mapping teaching was conducted in the second semester, and the period was 15 weeks. There were 47 students in the experimental group and 48 students in the control group. Both groups received the same syllabus, course content, and course requirements. Similar to the current study, the students were requested to submit five analytical case-study papers and one final project. The five analytical case-study papers also were used for group discussion. Students were guided to practice critical-thinking skills through the case-study discussions. The final project required students to create a comprehensive patient care plan. The participants in the experimental group also were requested to produce a concept map for their final project. At the end of the semester, students were asked to present the final project in the class.

For the control group, the students received traditional lectures as a teaching strategy, and students were asked to complete their assignments using a traditional nursing process log. For the intervention group, the instructor applied the concept-mapping technique as a teaching and evaluation method. The students in the experimental group were asked to complete their coursework using the concept-mapping method.

Similar to the current study, the experimental groups received a concept-mapping strategy training in the first week of the semester, congruent with the steps outlined by Novak (1998). Data were collected at different time points at the beginning of each semester. Two instruments were utilized for the research: the Critical Thinking Scale (CTS) and the Approaches to Learning and Studying (ASI).

CTS was used to explore participants' critical thinking skills. It contains five subscales: inference, recognition of assumptions, deduction, interpretation, and argument evaluation. Students were asked to participate in the survey in the class. ASI was used to evaluate how a student studied within the course unit. ASI includes the in-depth approach (meaningful learning approach), surface approach (rote learning), organized studying, monitoring study, and effort management. The participants received the initial survey after the beginning of the first semester. The other three follow-up surveys were conducted before the intervention, after the intervention, and before graduation.

Independent-samples *t* tests were used to assess the baseline differences between the control group and the experimental group. The method to compare the experimental and control groups on outcome measures at each time point was the independent-sample *t* test. The results indicated that no statistically significant differences were found at time 1 (1st-semester beginning) and time 2 (before intervention) data between the two groups, but participants who were in the experimental group had statistically significantly higher scores of inferences and deduction than those who were in the control group at the time 3 (after intervention) measure. The results may imply that improving critical-thinking skills may take at least one semester or a more extended period to build the skills. There were several limitations to Lee et al. (2013) study. First, the two courses were taught by

different faculty. The researchers highlighted that faculty members regularly share course materials and evaluate the teaching strategy to maintain course teaching consistency. Yet, the teaching effectiveness might be different due to the instructor's pedagogy and interpersonal skills. Second, the critical-thinking scores are self-reported. It may not be adequate to present the critical-thinking ability for all students. Third, although students' self-reports indicated a statistically significant relationship between the concept-mapping strategy and growth in critical-thinking ability, there was not sufficient evidence, such as academic scores, to conclude that the concept-mapping skills foster students' academic performance. Fourth, even though the students were experienced to the concept-mapping strategy, there was no evidence to determine if the students were capable of creating accurate concept maps. Finally, there was inadequate evidence to conclude that the students created accurate concept maps that may have contributed to their critical-thinking ability.

The current study is an extension of Lee et al.'s (2013) work because the researcher further assessed students' learning outcomes such as concept maps and academic scores and perceptions of using the concept-mapping strategy. Additionally, the current study was conducted in two economics classrooms to contribute to the scarce literature on concept mapping in college economics courses.

Acknowledging that the concept-mapping strategy could foster learners' meaningful learning, Bilik et al. (2020) aimed to examine the effects of web-based concept-mapping education on college students' concept mapping and critical-thinking skills in Turkey. The participants were asked to complete a questionnaire regarding students' perceptions of the concept-mapping strategy. There were 410 students taking

the course entitled surgical nursing in the spring semester. There were 209 students who were grouped into the control group, and 201 students who were grouped into the intervention group. All participants received both theoretical knowledge and practicums during the semester. The control group had the 1st practicum early in the semester, and the intervention group had the 2nd practicum before the end of the semester. After they completed the practicums, they were asked to produce concepts. The intervention was started after the control group completed the concept-map development. Both groups received a web-based concept-mapping training one week before the second practicum in surgical clinics. Same as the control group, the students in the intervention group were asked to create the concept maps after the practicums. The participants were expected to develop correct and meaningful relationships between each concept based on their learning materials.

Similar to the current research, the concept-mapping training involved a PowerPoint presentation. The presentation contains the following topics: What is a concept map? Why is it important? How to construct a concept map? They exemplified concept maps for different cases and the types of concept maps that were most compatible. Bilik et al. (2020) sent the presentation material via email to all students. To confirm that students received the training material, the researchers asked students to construct a concept map about the case given in the presentation. Once students completed the concept map, the students sent it back to the researchers.

At the last practicum meeting, all students were asked to participate in a survey regarding their consent, demographic information, and a structured interview form. Additionally, the students who agreed to participate in the research would be asked to

answer a questionnaire called the Critical Thinking Motivational Scale (CTMS). CTMS is a 6-point Likert scale that attempts to collect information about learning motivation for a particular critical-thinking task. The scale has five subscales: expectancy, attainment, utility, value, and cost.

Compared with the current study, Bilik et al. (2020) provided a structured interview form to investigate participants' perceptions of the concept-mapping strategy. The structure consists of two open-ended questions: "What do you think of concept-mapping skill? (both positive and negative sides of concept-mapping skill)." And "What are the contributions of concept-mapping skills to your surgical nursing learning?" Two researchers analyzed the written responses.

After the study, all of the students completed a posttest that was identical to the pretest. Pearson's Chi-square test and independent-samples *t* test were used to analyze the quantitative results. Two researchers analyzed students' written data. The means of concept maps indicated that the values for the intervention group were significantly higher than those for the control group. Additionally, the scores for the CTMS were analyzed. The scores of the subscale's expectancy, attainment, and utility for the intervention group were statistically significantly higher than scores for the control group. The qualitative results revealed three main themes about participants' perceptions of the concept maps. First, the participants described that the concept-mapping strategy facilitated the practical nursing process. Second, the participants reported that the concept-mapping strategy assisted their learning. Third, some participants claimed that constructing concept maps is time-consuming and causes stress. The study designed by Bilik et al. (2020) had a few remarkable features that rendered it more substantial than the

study conducted by Lee et al. (2013). To begin, the sample size was large. Next, students' concept maps were evaluated as a part of quantitative results. Finally, Bilik et al. further explored students' insights of using the concept-mapping strategy.

The study conducted by Bilik et al. (2020) had some limitations. First, there is no information regarding concept-mapping training in the study. Furthermore, there is no evidence of the prior knowledge influences on concept-mapping creation. Second, the intervention group had more time to absorb the learning materials than the control group. The participants in the intervention group may have had more understanding of the content than the control group, which may have affected the accuracy of concept maps. Third, there is no evidence indicating how many concept maps that students created. Also, four teachers were involved in the study, and the researchers did not implement controls to determine if the learning materials were taught identically by four teachers.

There are many reasons for which the current study is an extension of the study conducted by Bilik et al. (2020). First, the present study was conducted in a university setting, and the students received a PowerPoint presentation of concept-mapping training. The students had 4 weeks to practice the concept-mapping skill. Next, the students received comments on the construction of their concept maps from a course teaching assistant. The feedback empowered students to enhance their concept-mapping skills and the accuracy of the concept maps. There were two raters to assess students' concept maps and to avoid bias. Finally, the current study investigated students' perceptions of using the concept-mapping strategy, focusing on interests, usefulness, and success. Three variables echoed Bilik et al.'s (2020) study: the effectiveness of the concept-mapping skill on students' expectancy, attainment, and utility. The study conducted by Lee et al.

(2013) resulted in a lack of concept-map evaluation and qualitative data. Although the study conducted by Bilik et al. (2020) provided the concept maps scores and qualitative data, there was one major research design flaw: the experiment group had to a more extended instructional time than the control group. From the results of the two studies described above, additional concept mapping research is vital.

The Concept-Mapping Strategy in the Economics Course Domain

Empirical research supports that concept mapping is an effective strategy to promote meaningful learning. Limited studies have investigated the meaningful learning of concept mapping in economics courses. The research setting of the current study is two online sections of economics classes. The focus will be on research related to the meaningful learning of concept mapping in the economics course domain. Specifically, research conducted by Morangos (2003), Morangos and Alley (2007), and Burdina (2015) will be presented in detail.

Marangos (2003) conducted a survey to investigate the effectiveness of concept maps as a teaching and learning tool to promote collaborative learning in a Microeconomics course. Similar to the current study, there were 120 participants recruited from the first-year Microeconomics class in Australia. There were 42 % of international students involved in the study. Students had two one-hour lectures and a one-hour tutorial session per week, and a course teaching assistant would conduct the tutorial sessions. In the first lecture, the concept-mapping strategy was introduced. Students received a hard copy of the concept-mapping instruction and had a one-hour concept-mapping training in the first tutorial session. At the end of the semester, students responded to a survey regarding concept map usefulness, effectiveness, and accessibility.

Students were divided into small groups, and they worked with their groups throughout the semester for the classroom activities. The instructor provided the students with knowledge of the price theory, stressing market structures, distribution, and the organization of economic systems during the semester. Sets of questions that align weekly topics were provided as assignments to the students by the instructor. Each predetermined student group presented their answers using the concept-mapping strategy. The fellow students would discuss and revise the concept map if needed. Throughout the process, students had the opportunity to engage in classroom discussions, construct a concept map, and collaborate to solve the problems (Marangos, 2003).

In the last week of lectures, the students were asked to complete a questionnaire associated with their perceptions of the course's usefulness, effectiveness, and accessibility. There are 17 questions in the survey. The first part of the survey, question 1 to 7, is a 5-point Likert scale. Students rated themselves from A (*always true*), B (*true*), C (*somewhat true*), D (*not true*), to E (*always not true*). In the second part of the survey, questions 8 to 17, students rated themselves as true, false, or not applicable. The survey results revealed that 96 % of students agreed that the concept map is an effective learning tool to facilitate their economics learning. Ninety-five percent of the students stated that the concept-mapping strategy conveys complicated ideas visually, which assists them in learning explicitly. Only 29 % of the students claimed that they would transfer the concept-mapping strategy to other subjects.

There were several limitations to this study. First, the student's collaborative concept map alone may not be adequate to present the problem-solving ability for individual students. Second, the study did not indicate how many assignments were given

to students. Furthermore, the researchers did not report the concept maps created by the students were evaluated for accuracy. Finally, although students' self-reports indicate that the concept-mapping strategy facilitates their learning, there was not enough evidence to conclude that concept-mapping skills foster students' academic performance. Also, there was one instructor and one teaching assistant involved in the study. The study, however, did not indicate if the teaching assistant had concept-mapping training before the study began.

In a follow-up study, Marangos and Alley (2007) performed a similar analysis to investigate the effects of concept-mapping strategies in an economics class in a U.S. university. One-hundred-one undergraduate students were recruited from a first-year Microeconomics class. Like the previous study, students had a hard copy of concept-mapping instruction with one-hour concept-mapping training given by the course teaching assistant. Contrary to Marangos' (2003) and Marango and Alleys' (2007) studies, the students were not assigned to a small group. Instead, the instructor asked students to construct the concept maps to align with the weekly subject before the class. Students presented their concept maps during the course. All students were expected to provide their feedback and discuss their thoughts on the concept maps. At the end of the class, students finalized the construction of the concept map. In the last week of lectures, the instructor asked the students to complete a questionnaire about the usefulness, effectiveness, and accessibility of the course instruction.

Some of the results echoed Marangos's (2003) study. Nearly half of the respondents found that they could express their thoughts through developing concept maps. Moreover, over half of the students agreed that the concept map empowers their

learning material comprehension. Students also highly agreed that concept maps facilitate group communication effectively. Controversially, in the study conducted by Marangos and Alley (2007), only 23 % of respondents agreed they would apply the concept-mapping strategy in other subjects. Compared with Marangos' (2003) study, 62 % of students were willing to use the concept-mapping strategy in future economics classes. Marangos and Alley provided one possible explanation for the results. The class size was large, which might create challenges for implementing the concept-mapping strategy into collaborative study groups. The concept-mapping strategy involves an in-depth learning process and active participation. During the study, a large number of students might not have been engaged to make extensive use of concept-mapping strategies (Marangos & Alley, 2007).

There is a contradictory finding in the previous research that needs more in-depth concept mapping research to investigate students' perceptions of concept-mapping strategies such as usefulness and effectiveness. Marangos (2003) indicated that the participants in an Australian university had a higher motivation to apply a concept-mapping strategy for other subjects than students in a U.S. university. As recommended by Marangos and Alley (2007), there is a need for more concept-mapping research investigating the effectiveness of the concept-mapping strategies in a small classroom setting in the US.

There were several limitations to this study. For example, there was a lack of evidence of the effectiveness of a concept-mapping strategy to improve students' academic performance. Although the students had the opportunity to develop and revise the concept map during the classroom discussion, the researchers did not know how

many of them engaged in the meaningful learning process and how concept-mapping strategies triggered their deep-learning process. Second, the study did not collect demographic data from participants. Marangos and Alley explained that due to privacy restrictions, they could not gather students' demographic information. Without such information, one cannot further analyze if there is a difference between students' gender, school years, or background.

The current study extended Marangos's (2003) and Marangos and Alleys' (2007) study because it was conducted in a first-year economics course. In Marango's (2003) study, a large population of international students in the course. Students' perceptions of concept-mapping strategies (usefulness and effectiveness) were analyzed for the current study. Additionally, the present study collected students' quizzes and midterms, and concept-map assignments for providing adequate evidence to support the concept map as an effective learning strategy. Furthermore, in the current study, students in the intervention group had six assignments aligned with the concept-map strategy. The researcher used a concept-map assessment rubric to evaluate students' concept-mapping assignments. Moreover, the current study interviewed participants to gain deep insights into the concept-mapping strategy application in economics classes in the US.

Recognizing that the concept-mapping strategy is considered a practical learning tool for students in economics courses (Marangos, 2003; Marangos & Alley, 2007), Burdina (2015) attempted to discuss the benefits of using conceptual-chapter-maps in economics courses. He utilized the conceptual-chapter-mapping strategy in his economics courses. He suggested that the conceptual-chapter-mapping strategy has more effect on students' meaningful learning than the traditional concept-mapping strategy and the

lecture-notes-learning strategy. Burdina (2015) further investigated students' attitudes toward the three concept-mapping strategies. Burdina claimed that the conventional concept-mapping strategy allows students to identify the different concepts, but it does not provide further explanation between other concepts. The conceptual-chapter-mapping strategy was developed based on the traditional concept maps with extra layers of description. The additional layers of contextual information are graphs, equations, or symbols. The conceptual chapter maps were created by the instructor, which provides high accuracy for the concept map.

There were 65 students involved in two economics sections. Nearly half of the students were freshmen, 40% were sophomores, and the remaining were juniors or seniors. There were seven different chapters taught during the semester. At the beginning of a new chapter, the instructor drew a conceptual chapter map on the board and encourage students to apply the map while doing class activities. Students were asked to find concept definitions, explanations, and illustrations based on the conceptual-chapter map given by the instructor. The teacher's role was to provide the essential concepts and correct links between different concepts from the chapter. The student's role was to expand the concept map by reorganizing the learning materials in a meaningful way. While students were working on their maps, the teacher examined the accuracy of the students' work and answered students' questions by referring directly to the conceptual chapter map. The seven classroom activities involved a concept-mapping strategy, developing throughout the semester. During the last class of the semester, 60 students were administered an anonymous survey, exploring their perceptions toward the conceptual chapter maps. Fifty-one students completed the survey. Burdina's (2015)

study is similar to the research designed by Marangos (2003) and Maragons and Alley (2007) because three studies were conducted in the college setting and examined students' perceptions of the concept-mapping strategy. Additionally, as an extension of the study conducted by Marangos (2003) and Maragons and Alley (2007), the students in Burdina's (2015) study received feedback on the development of their concept maps from the instructor. The feedback assisted students in identifying the incorrect links between different concepts and reducing comprehension errors. Burdina (2015) modified the survey that was designed by Marangos (2003). The author added three short answer questions to obtain students' insights into the usefulness of chapter maps in the course.

Similar to Marangos's (2003) and Maragons and Alleys' (2007) report, the result of this study indicated that 94% of respondents agreed that conceptual-chapter maps empower students' learning. The study conducted by Maragons (2003) resulted in only 38 % of the students using concept maps to assist their midterm preparation and 65 % of the students employing concept maps to assist their final exam preparation. The study conducted by Burdina (2015), however, found that 94 % of students used conceptual maps for their midterm preparation, and 92 % of students would use conceptual maps for their final exam preparation. The results from the students' survey stated that the benefits of using conceptual chapter maps were (a) visualizing the learning materials from text to maps, (b) providing a holistic view of the chapter, and (c) more usefulness than traditional lecture notes.

Furthermore, both studies did not examine the relationship between using concept mapping and academic performance. The study conducted by Burdina (2015) had some limitations. Even though the students were exposed to the concept-mapping strategy for a

semester, there was no solid evidence to indicate a relationship between the concept maps and learning outcomes. Also, there were two sections involved in the study, and there is no information to specify if the same teachers taught the two classes. Regarding the survey, researchers did not collect students' demographic information. The importance of collecting demographic data is that gender, year in college, and ethnicity might influence students' concept-mapping production.

The current study extended Burdina's (2015) study because it was conducted in an introductory economics course. Students read and reorganized the knowledge by constructing a concept map throughout the semester. In Burdina's study, there was a large population of international students in the course. As Burdina (2015) recommended, there is a need to further investigate the relationship between conceptual-chapter maps' effectiveness and learning outcomes. Students' perceptions of concept-mapping strategies (usefulness and effectiveness) were analyzed for the current study. Additionally, the present study collected students' quizzes and midterms grades, and concept-map assignments to provide adequate evidence to support concept mapping as an effective learning strategy. Furthermore, in the current study, students in the intervention group had six assignments aligned with the concept-map strategy.

The researcher used a concept-map assessment rubric to evaluate students' concept-mapping assignments. Moreover, the current study interviewed participants to gain deep insights into the concept-mapping-strategy application in this economics class in the United States. Novak and Gowin (2008) suggested that students' concept maps can be used as vigorous evaluation tools. The following section contains details on how concept maps can be used as powerful evaluation tools for education.

Concept Maps as An Evaluation Tool

The previous sections indicated that the concept-mapping strategy was effective in teaching and learning in different courses and at different education levels. Novak and Gowin (1984) suggested that the concept map represents the key concepts or propositions to be acquired. For the instructors, the concept-mapping strategy can be utilized as an alternative method to assess students' understanding. Novak and Gowin (1984) claimed that "achievement tests reveal very limited information about what is worth knowing and what we are to judge the worth of knowledge" (p. 110). In the same vein, Entwistle (2000) suggested that evaluating students' learning, such as multiple-choice questions and short-answer questions, demands that no more than accurate duplication of information leads students to depend on surface learning. Fundamentally, "students' learning can be described in terms of what students believe academic learning to require of them" (Entwistle, 2000, p. 10). The influence of the ways of evaluation is explicit. Entwistle pointed out that the use of assessment techniques could expose learners to meaningful learning. To promote meaningful learning (or deep learning), instructors should design appropriate assessment methods to emphasize students' understanding and cognitive structure, such as concept-maps assessment instead of traditional evaluation methods.

Novak (2008) proposed two distinguishing features of concept maps in promoting meaningful learning: the hierarchical structure and cross links. On a concept map, the concepts are represented as the most comprehensive concepts in a hierarchical order. The most general concepts at the top of the map and the more specific ones representing more details are listed hierarchically at the bottom. Novak (2006) described structural

knowledge of the universe by developing a concept map. The main concept was the universe, which is at the top of the map. It demonstrated an interrelation between two subconcepts. There were two subconcepts: “matter” and “energy” linked to the universe. Under “matter,” it extended to three subconcepts: particulate, mass, and organized. Under “energy,” three subconcepts were developed: different forms, stored, and organized. In essence, the understanding was that the universe contains matter and energy. The matter is particulate. And the matter has mass, and it may be organized. Energy comes in different forms, and it can be stored. The concept map explicitly represents students’ structural knowledge of content. Novak and Gowin (1984) suggested that structural knowledge is a crucial element of comprehension in a subject domain.

Another important characteristic of concept maps is the embodiment of cross-links. A cross link assists learners in visualizing how a concept in one domain of knowledge illustrated on the map is interrelated to a concept in another domain shown on the map. Examining cross links on concept maps could provide worthwhile information to investigate learners’ depth and breadth of understanding. Novak (2008) stated that “cross links often represent creative leaps on the part of the knowledge producer” (p. 2). In other words, students who develop concept maps with accurate cross-links might display an understanding of the embeddedness and interconnectedness between the subconcepts and main concepts.

Another concept-map example was created by a fourth-grade student following a class field trip to a paper mill (Novak, 2008). The student had difficulty adding linking words or connecting different concepts. The reason behind the challenges is that the student did not understand thoroughly understand the relationship between the concepts

or the meaning of the concepts. Students might face some frustration during this process. Learners, however, must choose and identify the most prominent and most useful cross links to overcome the challenges. Novak (2008) posited that the process of adding cross links involves a high degree of cognitive activity, which echoes Bloom's taxonomy (1956) evaluation and synthesis of knowledge. The concept-mapping strategy is a straightforward vehicle to perform high levels of cognitive activity which is why the concept-mapping strategy can be a potent evaluation tool (Novak & Gowin, 1984).

Concept map scoring methods

The previous section introduced the concept-mapping strategy that has the potential to replace the traditional assessment as an alternative evaluation tool and described how the concept-mapping strategy shifts students' learning from rote learning to meaningful learning. This section will explore types of concept-map assessment methods. This review does not intend to suggest which model is considered the most desirable for the assessment. These reviews, however, provided the related reference for instructors to select the most suitable model for fulfilling their needs. Four concept-map scoring models have served to consolidate the concept-mapping scoring system. The following four models are introduced: (a) Bartels Model (1995); (b) Cronin, Dekker, and Dunn Model (1982); (c) Novak and Gowin Model (1984); and (d) McMurray Mode (2014).

The purpose of Bartels's (1995) rubric was to assess a student's knowledge of mathematical concepts and the interlinks among concepts, the ability to develop a map, and the ability to interact through a concept map. The rubric contains three evaluation parameters and three levels of performance rating. The three criteria were (a) concept and

terminology, (b) knowledge of the relationship among concepts, and (c) ability to communicate through concept maps. The parameters were listed along one side, and the performance ratings with a description along the adjacent side (Table 1).

Table 1
Bartels' Concept-Map Scoring Rubric, Definitions, and Weighted Scores (1995)

<i>Concept map element</i>	<i>3 points</i>	<i>2 points</i>	<i>1 point</i>	<i>0 points</i>
Concept and Terminology	Shows an understanding of the topic's concepts and principles and uses appropriate terminology and notations.	Makes some mistakes in terminology or shows a few misunderstandings of concepts.	Makes many mistakes in terminology and shows a lack of understanding of many concepts.	Shows no understanding of the topic's concepts and principles.
Knowledge of the Relationship among Concepts	Identifies all the important concepts and shows an understanding of the relationships among them.	Identifies important concepts but makes some incorrect connections.	Makes many incorrect connections.	Fails to use any appropriate concepts or appropriate connections.
Ability to Communicate through Concept Maps	Constructs an appropriate and complete concept map that includes examples, places concepts in a proper hierarchy, and places linking words on all connections.	Places almost all concepts in an appropriate hierarchy and assigns linking words to most connections; produces a concept map that is easy to interpret.	Places only a few concepts in an appropriate hierarchy or uses a few linking words; produces a concept map that is difficult to interpret.	Produces a final product that is not a concept map.

Note. Adapted from "Promoting mathematics connections with concept mapping" by Bartels, B.H. (1995)

Three parameters have the three levels of performance rating: scoring three points, scoring two points, scoring one point, and scoring zero points. The rater is able to assign scores using the rubric that focus on the topic's concepts and principles and the

use of appropriate terminology. Next, the rubric assesses the accuracy of linking words. Finally, the topic interpretation and essential concepts placed within the hierarchy and relationships among concepts, subconcepts, and examples are evaluated. One of the limitations of the rubric developed by Bartels (1995) is that the criteria were ambiguous. For example, under the category of ability to communicate through concept mapping, one of the criteria is “place almost all concepts in an appropriate hierarchy and assign linking words to most connections” and “place only a few concepts in an appropriate hierarchy or use a few linking words.” Similarly, the category of concept and terminology showed that “making some mistakes in terminology earns two points.” The author should redefine the phrase “almost all concepts,” “places only a few concepts,” and “some mistakes” to provide adequate guidance for the rater.

An alternative scoring method by Cronin et al. (1982) focuses exclusively on groupings included in a concept map. There were five parameters: (a) concepts, (b) grouping, (c) hierarchy, (d) branching, and (e) proposition in the model (Table 2). Similar to Bartels’s model (1995), there was a description to oversee the definitions of each parameter and weighted score. Cronin et al. (1982) suggested that giving each concept one point that is connected to at least one other concept by a proposition. The factor of grouping has three performance ratings starting from score three points to score one point. For the category of grouping, there were three types of grouping: point grouping, open grouping, and closed grouping. Point grouping means several single concepts flow from one concept, which receives one point. The definition of open grouping is a single chain that interlinks three or more concepts that deserve two points. Finally, closed grouping refers to a concept map that forms a closed system or a loop that earns three

points. Under the hierarchy category, the performance ratings are four points, two points, and zero points. Four points signal that each concept is positioned correctly; two points refer to each concept on a level one far away from an assigned level; and zero points indicate that the concepts are two or more levels away from the given level. A score of one point is for each branching point that has at least two statement lines. Finally, the parameter of the proposition, the performance ratings, are from score two points to score one point.

Table 2
Cronin et al. Concept-Map Scoring Rubric, Definitions, and Weighted Scores

<i>Criteria</i>	<i>Description</i>
Concepts	Concepts are objects, events, situations, or properties of things designated by a label or symbol. Score 1 point for each concept that is connected to at least one other concept by a proposition
Grouping	Grouping is the way concepts can be linked or joined together. There are three types of grouping: (I) point grouping: several single concepts emanating from one concept. Score 1 point for each concept in the group; (II) open grouping: three or more concepts linked in a single chain. Score 2 points for each concept in the group; (III) closed grouping: concepts that form a closed system (a loop). Score 3 points for each concept in the group.
Hierarchy	Concepts on a map can be represented as a hierarchical structure in which the more general, more inclusive concepts are at the top of the map; the specific and exclusive concepts are at the lower end of the map. Concept hierarchy is based upon the extent that concepts are present in “assigned levels” (as designated by the instructor). Score 4 points are given to each concept correctly assigned to a level; Score 2 points for each concept on a level one-removed from an assigned level; and no score for concepts on a level two or more levels removed from the assigned level.
Branching	Branching of concepts refers to the level of differentiation among concepts: the extent to which the more specific concepts are connected to more general concepts—score 1 point for each branching point with at least two statement lines.
Proposition	Relationships between concepts are represented by connecting word(s) and phrases that join any two concepts. (I) a Simple Proposition is a simple English word or phrase. Score 1 point for each word or phrase; give half for repeated use of Simple Propositions; (II) a Scientific Proposition is a phrase or statement composed of a technical or scientific word(s). Score 2 points for each proposition; give 1 point for repeated use of Scientific Proposition.

Note. Adapted from “A procedure for using and evaluating concept maps. Research in Science Education” by Cronin, P., Dekker, J., & Dunn, J. (1982)

Similar to Bartels’s model, Cronin et al. (1982) focused on presenting the linking words. According to the authors, the scientific proposition is a phrase or statement composed of technical or scientific word(s). If a learner uses a simple English term or

phrase to connect two concepts, he or she earns one point in the proposition category. If a learner uses a scientific word or a scientific proposition, he or she receives two points of the proposition category. A strength of the rubric is that the authors developed this method for the science field. The rubric, however, is problematic because it was designed for the science field, and it may not fit with other fields. Cronin et al. added two measurable factors into the rubric, hierarchy and proposition, which provide an adequate narrative for the raters to examine students' maps.

The following rubric was proposed by Novak and Gowins (1984). The authors extracted the three main principles from Ausubel's cognitive learning theory as a fundamental theory for constructing the rubric. They acknowledged that the cognitive structure is a hierarchical system and the concepts in cognitive structure engage the progressive differentiation process. Novak (1984) stated that scoring a map should focus on the quality of the map rather than counting the numbers of concept units. Novak (1984) stated that when new propositional meanings interlink two or more concepts, an integrative syncretization process will exist.

The rubric has four parameters with different levels of performance rating (Table 3). The four parameters are (a) propositions, (b) hierarchy, (c) cross links, and (d) examples. The parameters are listed along one side, and the performance ratings are along the adjacent side (Table 3). Learners were expected to present a meaningful, valid relationship between two concepts symbolized by a linking word(s) that merit one point by evaluating the propositions. Students were expected to present valid levels of hierarchy that demonstrate subordinated concepts, from more general ideas to more specific ones. Five points were assigned for each level of the hierarchy if the student

fulfilled the criteria. Students awarded 10 points if they successfully illustrate meaningful and valid connections between one concept unit of the concept hierarchy and another concept unit.

Table 3
Novak and Gowins' (1984) Concept-Map Scoring Rubric, Definitions, and Weighted Scores

<i>Points</i>	<i>Description</i>
1 point	Propositions Is the relationship between two concepts indicated by a connecting line and linking word(s)? Is the relationship valid? Score 1 point for each meaningful, valid proposition.
5 points	Hierarchy Does the map show hierarchy? Is each subordinate concept more specific and less general than the concept above it (in the context of the material being mapped)? Score 5 points for each valid level of the hierarchy.
10 points	Cross Links Does the map show meaningful connections between one segment of the concept hierarchy and another segment? Is the relationship led significant and valid? Score 10 points for each cross-link that is both valid and significant.
2 points	Score 2 points for each cross-link is valid but does not illustrate a synthesis between sets of related concepts or propositions. Unique or creative cross-links might receive special recognition or extra points.
1 point	Examples Specific events or objects that are valid instances of those designated by the concept label can be scored 1 point each.

Note. Adapted from "Learning how to learn." by Novak & Gowin (1984).

In another scenario, students obtained two points if they successfully presented meaningful and valid connections between one concept unit and the other but failed to synthesize different sets of related concepts. Finally, students were assigned one point for providing a valid example to those designated by the concept unit. The sum of all components' scores was the final score. There are some limitations to the Novak and Gowins' (1984) scoring system. First, there will be an issue with the scoring levels of hierarchy when maps are not symmetrical. Second, it is possible to develop a link between any two concepts on a map (Novak, 1984), so the rater needs to decide if the link represents a valuable synthesis of two sets of concepts. One of the assets of the

rubric that is desirable is asking learners to accommodate a specific example in some cases to be sure that the students understand what kind of event or object is assigned by the concept unit. This process, however, may engage rote learning because students memorize a particular example linked to a specific concept unit.

McMurray (2014) introduced a more recent scoring system comprised of the traditional and holistic scoring approaches. According to Besterfield-Sacre et al. (2004), the traditional scoring approach evaluates a map based on counting the number of valid concepts, the highest hierarchy level achieved, and the number of hierarchies found in the map and the number of valid cross links. In contrast to the counting approach, the holistic scoring approach focuses on the map's comprehensiveness, organization, and correctness. Comprehensiveness is related to the map covering entirely or broadly the subject. For example, a map ultimately represents the subject area. The organization is defined as a map that has a well-organized systematic arrangement with concept integration. It also contains sophisticated branch structures and connections. Regarding correctness, a map successfully integrates the subject by conforming to or agreeing with fact, logic, or truth. For instance, a map integrates concepts properly and reflects an accurate understanding of the subject matter with few or no misunderstandings.

The rubric introduced by McMurray has six parameters and four levels of performance indicators. The six parameters are (a) breadth, (b) interconnectivity, (c) efficiency of the link, (d) layout, (e) use of descriptive links, and (f) development over time. In the rubric, the parameters are listed along one side and the performance indicators along the adjacent side (Table 4). The four levels of performance indicators are excellent, good, acceptable, and unacceptable.

Table 4
McMurray's Concept-Map Scoring Rubric, Definitions, and Weighted Scores (2014)

<i>Concept map element</i>	<i>Excellent (5points)</i>	<i>Good (4 points)</i>	<i>Acceptable (3 points)</i>	<i>Unacceptable (0-2 points)</i>
Breadth of net	The map includes important concepts and describes the domain on multiple levels.	The map includes the most important concepts; describes the domain on a limited number of levels.	Important concepts missing, describe domains on only one level, or both.	The map includes minimum concepts with many important concepts missing.
Inter-connectedness	All concepts are interlinked with several other concepts.	Most concepts are interlinked with other concepts.	Several concepts linked to other concepts	Few concepts related to other concepts
Efficient links	Each link type is distinct from all others, clearly describing the relationship; used consistently.	Most links are distinct from others, discriminate concepts, present a variety of relationships; used reasonably consistently.	Several links are synonymous, do not discriminate concepts well, do not show various relationships; used inconsistently.	Most links are synonymous or vaguely describe relationships and are not distinct from other associations.
Layout	The map is contained on a single page, has multiple clear hierarchies, is well laid out, and provides a sufficient number of relevant examples with links.	The map is contained on a single page, has several clear hierarchies, is reasonably well laid out, and provides a sufficient number of relevant examples with links.	The map is not contained on a single page, has unclear hierarchies, is poorly laid out, and provides some reasonably relevant links.	The map is not contained on a single page, is confusing to read with no hierarchical organization.
Use of Descriptive Links	Links briefly and accurately describe all relationships.	Links are descriptive and valid for most relationships.	Some links are unclear or vague; some invalid or ambiguous.	Links are vague; show inconsistent relationships.
Development Over Time	The final map shows a considerable cognitive progression from a base map and a significantly greater depth of understanding of the domain.	The final map shows some cognitive progression from a base map and a somewhat greater depth of understanding of the domain.	The final map shows a minimal cognitive progression from a base map and a slightly greater depth of understanding of the domain.	The final map shows no significant cognitive progression from a base map and no increase in the understanding of the domain.

Note. Adapted from "Rubric for assessing concept maps" by McMurray, J. (2014).

McMurray (2014) suggested that incorporating a traditional approach and a

holistic approach to assessing concept maps is adequate to measure students' structural knowledge of content. McMurray continued that a rater should examine the breadth and layout, which do not exist in the traditional approach by contrast. The criteria of an exemplary map should contain the major concepts and illustrate the domain on multiple levels. The multiple levels delineate clear hierarchies and reveal an ample number of related examples with links. Examining students' final map development indicates a substantial cognitive progression from an initial map and an extensive depth of comprehension of the main topic or a chapter. For example, the map size and the level of hierarchies give insight into the depth of a student's structural knowledge.

There were several limitations of this rubric. First, the rubric does not provide the scoring points for the raters, which generates difficulty in quantifying students' production. Second, one of the measuring factors termed "the development over time" examines students' concept-map development skills and knowledge structure ability over time. It may not be compatible with a research design that does not involve a long time to monitor students' cognitive progress. The rubric introduced by McMurray (2014) had a few notable aspects that placed it substantially above the rubric developed by Novak and Gowin (1984). McMurray's (2014) scoring rubric will allow the rater to combine an aerial view with a traditional approach to reflect on the quality of students' concept maps, rather than only focusing on counting valid concepts or cross links. Two noteworthy studies that have evaluated students' concept maps using McMurray's (2014) scoring rubric is introduced in the following section. It may not be compatible with a research design that does not involve a long time to monitor students' cognitive progress. The rubric introduced by McMurray (2014) had a few notable aspects that placed it

substantially above the rubric developed by Novak and Gowin (1984). McMurray's (2014) scoring rubric will allow the rater to combine an aerial view with a traditional approach to reflect on the quality of students' concept maps, rather than only focusing on counting valid concepts or cross inks. Two noteworthy studies that have evaluated students' concept maps using McMurray's (2014) scoring rubric will be introduced in the following section.

Previous studies on concept-map scoring methods and application

Many educators and practitioners utilized concept-mapping skills for teaching and learning since Novak advocated for the concept-mapping strategy in the 1970s. The concept map, however, can be similar to sketching; you either like one or you do not, Novak and Gowin (1984) claimed. Concept mapping has the potential to assess vital pieces of a student's developing knowledge structure (West et al., 2002). In essence, the rubric assists teachers in evaluating students' concept maps. The rubric also helps students understand their map quality in constructing concept maps.

Two notable studies have evaluated students' concept maps using the scoring rubric introduced by McMurray (2014). Farrag (2017) studied the effectiveness of concept-mapping skills of students' academic achievement and perceptions in nursing education. Abd El-Hay et al. (2018) conducted a study on the effectiveness of the concept-mapping strategy on problem-solving skills and competence in clinical settings and knowledge in nursing education. What follows is an overview of each of the two studies. Farrag (2017) aimed to explore applying the concept-mapping strategy as a study tool in achievement in a nursing program. The study consisted of 125 participants who were third-year nursing students and enrolled in 2014-2015 at a university in Egypt. At

the beginning of the study, 65 students were enrolled in the first-semester term as the comparison group and 60 students in the second-semester term as the intervention group. The comparison group received traditional-method instruction. The concept-mapping strategy was used as part of the instruction method for the intervention group.

There were four instruments used for the study (a) demographic survey, (b) pretest and posttest for evaluating students' concept-map knowledge, (c) midterms and final grade (d) a rubric for evaluating students' concept maps. Regarding their demographic characteristics, there were no statistically significant differences between the two groups. Students in the intervention group were given a pretest that measured students' prior knowledge of the concept-mapping strategy before the study began. After the pretest, the intervention group received three concept-mapping trainings. During the training, participants were given an illustrated educational booklet about constructing concept mapping. After the training, a posttest about the concept-mapping strategy was conducted with the intervention group to ensure the participants' mastery of the concept-mapping strategy.

During the study, the students in the intervention group were required to construct concept maps associated with the lecture before the class was dismissed. At the end of the study, students submitted eight concept-map assignments. Once a student submitted their concept-map assignment, the researcher and the instructor evaluated and gave feedback on the student-generated concept maps before starting the following lecture. The concept maps were scored by adopting McMurray's (2014) scoring rubric. Farrag (2017) incorporated qualitative and quantitative scoring methods in examining the concept maps. The qualitative part of the scoring process utilized the scoring rubric created by

McMurray (2014), which reviewed the concept map from a holistic view. In the quantitative part of the scoring process, the researcher assigned a value of zero to three based on each measure factor.

Farrag (2017) recognized that scoring the concept maps was to help the instructor monitor students' improvement of concept-mapping skills. The comparison group received the traditional instruction and completed the course. Both groups were given the same midterm exam and a final exam during the study. At the end of the 8-week study, participants in the comparison and intervention groups were given a survey. The Likert scale survey included 10 statements with three levels of responsibility toward the students' perceptions of the course design and instruction.

The study's outcomes showed a statistically significant difference in students' midterm and final scores between comparison and experimental groups. The researcher reported a statistically significant difference in students' knowledge of concept-mapping skills between pretraining and post training. In other words, the concept-mapping strategy facilitated students' academic learning. Regarding students' perceptions of course design, nearly 87 % of participants in the intervention group provided positive feedback. In comparison, 68 % of participants who were in the comprehension group gave positive feedback.

One of the limitations of Farrag's (2017) study is that it was conducted by a faculty researcher. According to Creswell and Creswell (2018), there is a potential ethical dilemma if a faculty researcher operates a study stemming from a lack of confidentiality and the absence of meaningful informed consent. Furthermore, the study conducted by a faculty researcher may not be objective enough, which may cause research bias. Another

limitation of the study is that the comparison and experimental groups operated in different semester terms, which implies the study might not have the same control variables.

One of the strengths of the study designed by Farrag (2017) was that the same instructor taught both the comparison and experimental groups to avoid the confounding effect. Another strength was that the study held three concept-mapping training sessions to ensure students understood concept-mapping development. Finally, the participants received feedback about their concept-map construction from the instructor, which allowed them to improve their concept-mapping skills and learning. Farrag (2017) recommended that future research should evaluate the effectiveness of concept-mapping skills in the nursing practice settings.

Abd El-Hay et al.'s (2018) study extended Farrag's (2017) study because the effectiveness of concept mapping on problem-solving skills, competence in a clinical setting, and knowledge with undergraduate nursing students were analyzed. The study aimed to demonstrate that concept mapping improves problem-solving skills and students' perceptions of the concept-mapping strategy.

Similar to Farrag's study (2017), Abd El-Hay et al. (2018) conducted a quasi-experimental method by recruiting 30 second-year and 30 fourth-year nursing students using concept-mapping strategy instruction for 3 months. There were four instruments utilized during the study (a) structure questionnaire to assess students' knowledge regarding concept-mapping skills, (b) a concept-map-scoring rubric for evaluating students' maps, (c) problem-solving skills-assessment sheet, and (d) a questionnaire to assess students' perception of the concept-mapping strategy. At the beginning of the

study, all students received four sessions of concept-mapping training: two sessions per week, one hour each. All participants completed a 23-item weather pretest consisting of concept map definition, the importance and the benefits of the concept map, the characteristics, and the construction steps of the concept map. Students were also given a demographic survey in the first session of training. Students had to complete clinical practice in three different areas during the semester. First, the second-year participants were assigned to the orthopedic department for clinical learning. After two weeks, they were assigned to the cardiology field. After one month, second-year participants moved to the medical area for their clinical training.

The fourth-year students were first assigned to the Tuberculosis (TB) clinic; then they moved to a mobile clinic after 2 weeks. Finally, they completed their clinical training at a maternal and child-health hospital. Students worked individually in the clinical setting. They were required to gather the client's medical diagnosis, chief complaint, medical history, treatment, and so on. After the students collected the client's information, they were asked to develop a concept map regarding the diagnosis and treatment plan. At the end of each clinic training, the researchers evaluated students' concept maps and gave feedback to the participants. The participants were asked to complete a problem-solving skill survey at the end of each clinic training. Before the end of the study, participants were required to complete a 4-point Likert scale survey regarding applying the concept-mapping strategy in clinical settings.

Abd El-Hay et al. (2018) indicated improvement among participants regarding the knowledge of concept mapping. This result was in line with Farrag (2017), who reported that there was a statistically significant difference between pretest and posttest in his

study. Another similarity to Farrag's (2017) study revealed a statistically significant improvement for the different periods in the scores of students who generated maps. Lastly, the results indicated that more than three-quarters of participants recommended applying the concept-mapping strategy in clinical settings.

One of the positive attributes of the study performed by Abd El-Hay et al. (2018) was that the researchers adapted McMurray's (2014) scoring system, which is holistic, to measure students' concept-map performance. Another plus of the study was that Abd El-Hay et al. (2018) provided adequate and comprehensive concept-mapping training for students to require the concept-mapping strategy. During the workshops, students had the opportunity to practice concept-mapping skills. The researchers were transparent about how many of the students obtained the training and the students' progress.

The study designed by Abd El-Hay et al. (2018) had many limitations. One of the weaknesses of the study was that it did not have a comparison group. Both groups utilized the concept-mapping strategy. It would have been useful if the researcher had a control group to compare outcomes. Another limitation of the study was that the two groups had different learning materials and settings. The second-year students conducted their concept maps based on their orthopedic, cardiology, and medical clinics training.

Whereas the fourth-year students developed their concept maps based on their training in a TB clinic, mobile clinic, and a child hospital. Both groups' learning content and settings were not the same. There have been inconsistencies with how the instruction was administered to the participants, resulting in differences in achievement. Another flaw of the study was that the participants' prior knowledge of nursing was on different levels. Fourth-year students had been engaged in the nursing field longer than second-

year students. They might have had a better understanding of the content and critical-thinking skills than second-year students. Furthermore, the researchers did not address how many concept maps were created by students they collected and analyzed.

The current study was similar to the study conducted by Farrag (2017) and Abd El-Hay et al. (2018) because both studies adapted the same scoring rubric system, which was introduced by MuMcrray (2014) into their research. The current study integrated a holistic view of the scoring system to evaluate students' concept maps instead of counting valid links or concept units.

Summary

In this literature review, the first section focused on the effectiveness of the concept-mapping strategy. Specifically, it highlights the effectiveness of the concept-mapping strategy in reading comprehension. Three studies explored how the concept-mapping strategy can be used to support ESL and EFL students' reading comprehension (Liu et al., 2010; Rassaei, 2019; Soleimani & Nabizadeh, 2012). Specifically, results indicate that the concept-mapping strategy is more effective than the traditional reading strategy, especially for low achievers (Liu et al., 2010). The pretest and posttest revealed that both concept-mapping strategy groups performed better than the traditional reading-comprehension group (Soleimani & Nabizadeh, 2012; Rassaei, 2019). The second section emphasized how the concept-mapping strategy can be implemented in teaching and learning practices (Burdina, 2015; Morangos, 2003; Morangos & Alley, 2007). This literature review revealed the major reasons for using the concept-mapping strategy in economics classes: classroom participation improvement and the promotion of meaningful learning.

The third section covered information regarding the use of concept maps as evaluation tools. This section addresses (a) four concept-map rubrics (Bartels, 1995; Cronin et al., 1982; McMurray, 2014; Novak & Gowin, 1984), (b) concept-map scoring-methods, and (c) the most recent studies on concept-map scoring-methods application (Abd El-Hay et al., 2018; Farrag, 2017). Scholars revealed two types of scoring systems: the traditional scoring system and the holistic scoring system. The holistic approach is designed to reflect on the quality of students' concept maps, rather than only counting valid concepts or cross links, which is the traditional approach. Moreover, scholars found a positive correlation between the concept-mapping strategy, students' collaborative learning (Morangos, 2003; Morangos & Alley, 2007) and increased meaningful learning (Burdina, 2015).

In conclusion, the findings of the previously mentioned studies support the effectiveness of using the concept-mapping strategy with international students and economics teaching. Moreover, implementing a concept-mapping strategy can improve students' reading-comprehension skills and academic performance. The concept-mapping strategy can provide an interactive learning environment, resulting in students who are more willing to be active learners in the meaningful learning process. Most of the concept-mapping studies have been conducted in ESL language or nursing classes. Consequently, more studies that investigate economics classes are necessary. Only a few studies have shown interviews to ascertain undergraduates' perception of the concept-mapping strategy. The current study contributed to the literature by researching the effect of the concept-mapping strategy on international students' academic performance and perceptions, especially in economics class settings. As a result, integrating the concept-

mapping strategy in teaching and learning can improve students' academic performance and classroom participation. The objective of the current study was to provide yet another exemplification of the effectiveness of concept mapping in a college setting.

CHAPTER III

METHODOLOGY

The purpose of this mixed-method approach with a comparative research design was to examine the effect of the concept-mapping method intervention on international students' learning outcomes and perceptions in two online Economics classes. This chapter described the proposed methodology, including research design, research study setting, study participants, protection of human subjects, instrumentation, intervention description, procedures for data collection, data analysis, research questions, and limitations of the study are provided in this chapter.

Research Design

The study used a mixed-method approach with a comparative research design, obtaining both quantitative and qualitative data. The data were collected to investigate the effectiveness of the concept-mapping strategy intervention on international students' academic performance and perceptions. The independent variable was the concept-mapping strategy intervention. The dependent variables were students' quiz grades, midterm, final grades, concept-map assignments, and survey results. The research methodology for this study is listed in Table 5. Students in the intervention group had six assignments using the concept-map strategy. The researcher used a concept-map assessment rubric to evaluate students' concept-mapping assignments. Students in the comparison group received regular instruction without concept-map instruction or assignments. Fifteen participants were selected randomly from those who volunteered from the intervention group to participate in a 20-minute online interview. The 20-minute

online interview was used to enrich and corroborate quantitative data.

Table 5
A Graphic Depicting the Research Methodological Design

Quantitative Data	Qualitative Data
Instrument	Interview
Academic performance	
Demographic survey	
MUSIC inventory	
Concept-map assessment rubric	
Variables	Variables
Academic performance: quiz grade, midterm grade, and final grade	Open-ended questions
Demographic survey	
MUSIC scales scores: usefulness, success, and interest	
Concept-map assignments	

Research Study Setting

The researcher used convenient samples from a private university located on the West Coast. This university offers 100 undergraduate and graduate degree programs. According to data compiled by the U.S. News & World Report (2019), this specific school's total student enrollment was 10,636 for the 2019 school year. Undergraduate enrollment represented 62.6%, and graduate enrollment represented 36.4% of the total. Approximately 14% of Fall 2020 enrolled students were international from 102 countries. The student body had more females (63%) than males (37%). The researcher used two Economics online course sections during the 2020 Fall semester at this particular university. Furthermore, the same instructor taught both course sections.

Course Description

Principles of Microeconomics was a four-unit course that introduced the subject of economics. Key topics of the course included the laws of demand and supply, elasticity, production possibilities frontier, different types of markets, and opportunity cost. These

topics correspond to the program goals and learning outcomes for the Economics department. These goals included developing a solid foundation in both the short-run and long-run, understanding how the competitive structure of a market affects outcomes and the role of government policies in decision making. There was a heavy focus on graphical, mathematical analysis, and critical thinking. In other words, this course aimed to explain essential topics in a way that was relevant to student life and real-world events. The course material was broad enough to prepare students for future courses in economics while also covering specific topics related to business, finance, and other key topics for different majors. Through the study of the subject, students learned how to approach problems in a highly analytical way. The class length was one hour and 15 minutes and met twice per week on the Zoom platform. The instructor was responsible for establishing a Zoom link for students to access the class. Worth to mention, due to the global pandemic, one course was internally designed for international student to accommodate different time zone for students' learning; one course was designed for domestic students who were live in the United States. In the end, 26 students from the intervention group and 25 students from the comparison group participated fully in the study.

Course Grading

The final grade breakdown was as follows: assignment (20%), participation and quizzes (15%), midterms (30%), final project (30%), attendance (5%). Worth mentioning, there was a final exam for both classes on the initial syllabus. Due to the coronavirus pandemic, the university suggested faculty cancel or postpone the final exams. Therefore, the course instructor offered an alternative assessment, a final project, to evaluate students' learning. There were two types of assignments: problem-solving questions and article

analysis, which were given throughout the semester (Appendix O). Problems on the homework followed the lecture material closely and some of the problems were taken directly out of the text. Worth mentioning, each problem-solving assignment contained two concept-map development tasks. Here is an example:

Produce a concept map for each of the following chapters from this course.:
chapter 4: The Market Forces of Supply & Demand, and chapter 5: Elasticity.
Work on producing a different style of concept map compared to homework #1.
For instance, the colors, shapes, and structures of your concept maps can be varied.
Your concept maps should ultimately be the best visualization of the concepts required to improve your learning in this course.

Three article analysis assignments were given throughout the semester. These articles needed to connect to a microeconomics topic, and the analysis would include a summary, key terms, and relevance to student life. Three students had the opportunity to present their analysis when they were due, which would count toward the participation portion of grades. Each article analysis was worth the same grade amount as an individual homework assignment. Due to the relatively short amount of time for synchronous sessions, the article analysis presentations occurred during the instructor's office hours. Students were encouraged to apply a concept-map strategy and work together on the homework. Every student, however, needed to turn in individual work in their own words. Students were required to submit their assignments through Canvas. Although there were no concept-map tasks for the article analysis assignments, the scores of the article analysis assignments were still evaluated because the purpose of these assignments was to present the applicability of the course topics and demonstrate student's critical thinking related to these topics.

Six attendance quizzes were given approximately every 2 weeks throughout the semester. Questions on quizzes were based on recent material. These quizzes were given at

the beginning, middle, or end of the lecture. The objective of the quizzes was to make sure students were keeping up with the course material. The quizzes included short answers, multiple-choice, and true or false statement questions. The quizzes were completed on Canvas. There were 6 questions, nineteen points for both quizzes 1 and 2. Quiz 3 contained 6 questions which were given nineteen points. For quiz 4 included 6 questions which were given twenty-one points. There were four questions that reflected twenty-six points for question 5. For the last quiz, 9 questions were designed for thirty-eight points.

Regarding participation grades, participation counted for 8% of the student's overall grades. Thus, a perfect score would be that full credit. The instructor included discussion questions (via Zoom chat or verbal prompt) during regular classes to encourage higher levels of active learning. Students had the opportunity to express their opinions and knowledge and actively participate in the course with these discussion questions. The opportunities were voluntary and counted toward participation credit in the class. Students earned one point per response for Zoom classes. Additionally, there were discussion opportunities, videos, and other supplementary material that were posted on the Canvas page. In Canvas discussion sections, students responded to other student's responses. When students interacted with their peers, they received participation score as well and actually the discussion netted them more credit.

Two midterms were given throughout the semester. The first midterm covered all course material up to that point and the second midterm would cover the material in between two midterms. Answers on tests were expected to be precise and accurate. Both midterms had 14 questions. The quizzes included fill-in-the-blank and true or false. Grading was stricter than homework or other assignments. Materials were not allowed

during the test except for writing implements, physical pocket dictionaries, and calculators. All required knowledge had to be in the minds of students. A week before the midterm, a study guide was given by the instructor (Appendix P). Students completed the midterms on Canvas. The structure of the midterm questions was as follows: true or false (15%), fill-in-the-blank (15%), short-answer (70%), and extra credit. Midterm two had the same structure as the first midterm. The procedure for midterms was as follows:

1. The midterm exam (PDF) was sent to all students at 5 PM on Thursday, September 24th, 2020.
2. The true or false and fill-in-the-blank questions were to be completed in the corresponding Canvas quiz (labeled midterm one quiz).
3. Students could answer the questions in any order that they chose. The exam closed at 6:15 PM.
4. Students were instructed to write down graphs on separate pieces of paper.
5. Pictures of short answer work were to be taken after completion of the exam. A 10- to -15-minute window occurred where students could take and send these pictures to the instructor's email, which was the only time that phones were allowed during this examination period.
6. Download a scanning app and send pictures of your work as PDFs.

The final project required students to create a comprehensive market analysis.

Students researched a key market, demonstrated the applications of key course content, and produced recommendations for producers and governments. For the intervention group, students were asked to produce a concept map for their final project. In addition, they had to include the appropriate concept map: competitive, monopoly, monopolistic competition, or

oligopoly for the specific market that their firm or company competes in the final project: a final project prompt distributed in class approximately halfway through the semester. Grading on the final project was dependent on their relative scores. Additional information on the final project guidelines can be found in Appendix Q.

Study Participants

There were two sections of the Economics course available for the term of 2020 Fall. Both groups of students enrolled in a private university located on the West Coast. Due to the global pandemic, one section was designed for international students who were still living in their home countries. The time for the course was scheduled to accommodate the different time zones for students. The second section was designed for domestic students living in the United States.

At the end of the semester, 24 students completed the course and survey and gave their consent from the comparison group. Student #17, from the comparison group, dropped from the course before the end of the semester and missing multiple academic performance records. The student's academic data was dropped from the research. Twenty-five students completed the course and survey and gave their consent from the intervention group. Student #6, from the intervention group, failed the course due to medical issues and his academic performance data were excluded from the research study. Two students attended the course over two-thirds of the semester, so the researcher included their MSIC survey results but not their academic scores. In the end, 26 students from the intervention group and 25 students from the comparison group participated fully in the study.

Demographic Survey Results of the Intervention and Comparison Group

Twenty-six valid recovery surveys were submitted from the intervention group.

Demographic information was collected regarding gender, sexual identity, age, ethnicity, family origin, native language, survey language using status, major, and enrollment status (Table 6). The 26 participants, ranging from 18 to 24 years of age, engaged in the concept-mapping strategy. The percentage of gender was nearly equal. The majority ethnic group represented within the sample was Asian.

Students were asked to report where their family originally came from regarding family origin. The results indicated that China was the most prominent family origin country. All students reported living in their native countries due to the coronavirus pandemic. In terms of students' native languages, the largest native language group represented within the sample was Mandarin. Additional information regarding students' major and enrollment status was collected. The majority enrollment status represented was freshmen with business-related majors. Twenty-five valid recovery surveys were submitted from the comparison group. Similar to the intervention group, the age range were from 18 to 24 years of age.

Female participants were more than male participants. The majority ethnic group represented within the sample was White. The United States was the most prominent family origin country regarding family origin. Most of the participants reported they currently lived in the US. In terms of students' native languages, the largest native language group represented within the sample was English. Additional information regarding students' major and enrollment status was collected. The majority enrollment status represented was freshmen with business-related majors. Demographic information regarding 15 participants who engaged in the interview are presented in Tables 7 and 8.

Protection of Human Subjects

The study ensured the protection of human subjects by following Standard 8: Ethical

Table 6
Demographic Survey Results for Intervention ($n=26$) and Comparison ($n=25$) Group Participants

Demographic Characteristics		Intervention		Comparison	
		<i>f</i>	%	<i>f</i>	%
Student Status	International	26	100	5	20
	Domestic	0	0	20	80
Gender	Male	12	46	8	35
	Female	14	54	14	61
Sexual Identity	Straight	21	81	18	78
	Bisexual	1	4	1	4
	Gay	1	4	1	4
	Lesbian	1	4	0	0
	Prefer not to disclose	2	8	3	13
Age	18 to 24	26	100	25	100
Ethnicity	Asian	24	92	2	9
	White	0	0	8	35
	Asian American	0	0	6	26
	Others	2	8	7	30
Family Origin	China	17	65	2	9
	United States	0	0	5	20
	Others (Asian Pacific, Latin American, Middle East, Europe)	9	35	18	71
Current Living Location	China	17	65	5	20
	United States	0	0	18	71
	Others (Asian Pacific, Latin American, Middle East)	9	36	7	30
Survey Language Preference	Chinese	17	65	0	0
	English	9	35	25	100
Native Language	Chinese	17	65	2	8
	English	2	8	13	52
	Others (Japanese, Indonesian, Filipino, Gujarati, Cantonese)	7	27	10	40
The Language Spoke Most Often	Chinese	17	65	0	0
	English	6	23	20	80
	Others (Arabic, Japanese, Cantonese)	3	12	5	20
Major	Business Majors (Business Management, International Business, Economic, Finance, Entrepreneurship, Marketing)	25	96	22	88
	Others (Design, Performing Arts)	1	4	3	12
	Enrollment Status (Semester)	One	20	77	14
	Two or above	6	35	11	36

Table 7
Demographic Information for Interview Participants ($n=15$)

Student ID	Gender	Sexual Identity	Ethnicity	Family Origin	Current Living Location	Interview Language Preference	Native Language	The language spoke most often	Major
2	F	Straight	Asian	China	China	Chinese	Chinese	Chinese	Economic
3	F	Bisexual	Asian	China	China	English	Chinese	Chinese	Business Management
4	M	Straight	Asian	China	China	Chinese	Chinese	Chinese	Economic
6	M	Straight	Asian	China	China	Chinese	Chinese	Chinese	Entrepreneurship & Innovation
7	M	Prefer not to disclose	White	Saudi Arabia	Saudi Arabia	English	Arabic	Arabic	Finance
8	F	Lesbian	Asian	China	China	Chinese	Chinese	Chinese	Business Management
10	F	Straight	Asian	Philippines	Philippines	English	Filipino	English	Design
11	F	Straight	Asian	China	China	Chinese	Chinese	Chinese	Finance
12	F	Straight	Asian	Philippines	Philippines	English	English	English	Business Management
13	M	Straight	Asian	Philippines	Philippines	English	English	English	Finance
18	F	Straight	Asian	Taiwan	Taiwan	Chinese	Chinese	Chinese	Marketing
20	F	Straight	Asian	China	China	Chinese	Chinese	Chinese	Business Management
21	F	Straight	Asian	China	Macau	English	Cantonese	Chinese	International Business
22	F	Straight	Asian	India	India	English	Guajarati	English	International Business
26	M	Straight	Asian	China	China	Chinese	Chinese	Chinese	Business Management

Note. Participants are international students. Pseudonyms will not be relatively indicated, as is the case of Caucasian students. Only student 7's enrollment status is three semesters; other students' enrollment status is one semester.

Table 8
Summary of Demographic Information for Interview Participants ($n=15$)

Demographic Characteristics		Frequencies (<i>f</i>)	Percentages (%)
Gender	Male	5	33
	Female	10	67
Sexual Identity	Straight	12	80
	Bisexual	1	7
	Gay	0	0
	Lesbian	1	7
	Prefer not to disclose	0	0
	Age	18 to 24	15
Ethnicity	Asian	14	93
	Others (Middle East)	1	7
Family origin	China	11	73
	Others (Middle East and Asian Pacific)	4	27
Current Living Location	China	9	60
	Philippine	3	20
	Taiwan	1	7
	India	1	7
	Saudi Arabia	1	7
Interview Language Preference	Chinese	8	53
	English	7	47
Native Language	Chinese	9	60
	English	2	13
	Arabic	1	7
	Others (Japanese, Indonesian, Filipino, Gujarati, Cantonese)	3	20
	The language spoke most often	Chinese	10
Major	English	4	27
	Others (Arabic, Japanese, Cantonese)	1	7
	Business Management	7	47
	International Business	5	33
	Economic	4	27
	Finance	4	27
	Entrepreneurship	3	20
	Design	1	7
	Marketing	1	7
Undeclared	1	7	
Enrollment Status (Semester)	One	14	93
	Two or above	1	7

Principles Concerning Research and Publication (American Psychological Association, 2012). Approval to conduct research was obtained from the research site and the Institutional Review Board for the Protection of Human Subjects at the University of San Francisco prior to contacting the research participants. All information obtained during this study was kept confidential, and participants for the study were recruited on a voluntary

basis. There were two parts of recruitment in this study (a) recruitment for instructor participation and (b) recruitment for subject participation. Recruitment procedures for two online class sessions consisted of outreach to the Department Chair of Economics to obtain general permission to research the online Economics courses. Additional information regarding the class sections, brief introduction of the research, research procedure, and potential outcomes of the research were provided to the Department Chair of Economics for review. After the Department Chair reviewed the materials, the study was approved by the Department Chair (Appendix D).

Once the Department Chair of Economics provided the consent, the researcher contacted the instructor to obtain his permission to research two Economics classes. The researcher provided the instructor with the same brief introduction to the research, the procedure, and the potential outcomes. After materials were reviewed, the instructor granted his permission to the researcher (Appendix E). The students who enrolled in the Economics classes were offered the opportunity to participate in the study.

At the end of the semester, the students who enrolled in two Economics classes were asked to give their consent to use their data submitted for course activities (Appendix C). All students enrolled in one of the two sections participated in research activities as part of their required coursework. The informed consent was obtained for all study participants' quiz grades, midterm grades, final grades, concept-map assignments, and survey results for those in the intervention section. For those in the comparison section, all study participants' quiz grades, midterm grades, final grades, and survey results were used for those students who gave their consent.

Participation in this study did not involve any physical or emotional risk beyond that

of everyday life. The only risk was confidentiality, which was protected. The research assistant collected all participants' quizzes, midterms, and final grades from the instructor. The researcher also collected the concept-mapping assignments from the students who were in the intervention section. After the end of the semester, two teaching assistants rated students' concept mapping assignments for the current research purpose. The research assistant designated an identification code for each student who gave his or her consent. All identification was removed from the data. An ID number was used assuring anonymous data. The data will be kept in an iCloud with a set of passwords for 10 years. After 10 years, the data will be destroyed. The researcher is the only person who can access the digital data.

Instrumentation

The study utilized four instruments to obtain the data. The instrumentation section includes the description of the MUSIC inventory (Appendix A), demographic survey (Appendix K), interview questions (Appendix B), and concept-map scoring rubric (Appendix H). The modified MUSIC inventory was used to investigate students' perceptions of success, interest, and usefulness of the course instruction. The demographic survey was used for obtaining participants' demographic data. The 20-minute online interview was used to enrich and corroborate quantitative data. The interview was conducted either in English or Chinese that depended on the participants' preference. Finally, the concept-map scoring rubric (McMurray, 2014) was adapted for grading students' concept-map assignments.

MUSIC Inventory

The MUSIC inventory was developed based on the MUSIC model of academic motivation (Jones, 2009). Jones (2009) developed the MUSIC inventory designed to diagnose the strengths and weaknesses of instruction. The original version of the MUSIC

inventory is a 24-item instrument based on a Social-Cognitive Theoretical framework and research with five components, including (a) eMpowerment, (b) usefulness, (c) success, (d) interest, and (e) caring. Students rate themselves on a 6-point Likert scale, from 1 (*strongly disagree*), 2 (*disagree*), 3 (*somewhat disagree*), 4 (*somewhat agree*), 5 (*agree*), to 6 (*strongly agree*). The inventory has been translated into several languages, such as Mandarin, Spanish, Farsi, Turkish, and Icelandic. For this research, students' perceptions of success, interest, and usefulness of the course instruction were measured using a modified MUSIC inventory. The modified version of the MUSIC inventory is a self-reported questionnaire containing 15 of the 24 original items and has three components, including (a) usefulness, (b) success, and (c) interest. According to Jones (2017), the definition of the three components is “Usefulness: the coursework is useful to his or her future he or she can succeed at the coursework,” “Success: he or she can succeed at the coursework,” and “Interest: the instructional methods and coursework are interesting” (p. 31). Given that most participants were Chinese international students, the Mandarin version was used for this study. The English version was also available for this study. Examples of the modified MUSIC inventory in English and Mandarin are provided in Table 9. A full-time Mandarin graduate student studying at the University of San Francisco reviewed the Mandarin translation of the consent form and the inventory and found them accurate (Appendix F). The online survey was constructed using Qualtrics. Qualtrics is an online survey platform. Using Qualtrics allowed the researcher to collect data confidentially and export data directly to other statistical software such as SPSS and Excel. There are four parts of the survey: a consent form, a modified MUSIC inventory, a demographic survey, and a reading of the concept-map introduction. The modified MUSIC instrument components and the definitions can be found in Table 10.

Table 9
Example Items from the Modified MUSIC Instruments

<i>Components</i>	<i>MUSIC Inventory Example Items</i>	<i>MUSIC Inventory Example Items</i>
Usefulness or Utility value	In general, the course was useful to me.	總體來說,這門課程對我是有用的。
Success or Expectancy for success	The knowledge I gained in this course is important for my future.	我在這門課程中獲得的知識對我的未來很重要。
Interest or Situational interest	The course was interesting to me.	這門課對我來說很有趣。

There are four parts of the survey: a consent form, a modified MUSIC inventory, a demographic survey, and a reading of the concept-map introduction. The modified MUSIC instrument components and the definitions can be found in Table 10. To obtain a score for each element, average the values for the items in the scales, as shown below:

$$\text{Usefulness score} = (\text{item 2} + \text{item 3} + \text{item 13} + \text{item 14} + \text{item 15}) / 5$$

$$\text{Success score} = (\text{item 5} + \text{item 7} + \text{item 10} + \text{item 12}) / 4$$

$$\text{Interest score} = (\text{item 1} + \text{item 4} + \text{item 6} + \text{item 8} + \text{item 9} + \text{item 11}) / 6$$

Table 10
The modified MUSIC Instrument Components and the Definitions

<i>MUSIC Model Components</i>	<i>Definitions The degree to which a student perceives that:</i>	<i>Items Number of Scale</i>
Usefulness/ Utility value	The coursework is useful to his or her future	2, 3, 13, 14, 15
Success/ Expectancy for success	He or she can succeed at the coursework	5, 7, 10, 12
Interest/ Situational interest	The instructional methods and course are interesting	1, 4, 6, 8, 9, 11

Note. Adapted from “User guide for assessing the components of the MUSIC® Model of Motivation,” by Jones, (2017). Retrieved from <http://www.theMUSICmodel.com>

Reliability and validity of the Chinese version

Jones, Ming, and Cruz (2017) conducted a cross-cultural validation study of the MUSIC inventory using 300 students from a Chinese university and 201 students from a Colombian university with the Mandarin and Spanish versions. The undergraduates from

the Chinese university were recruited from the School of Business. The results reported for Cronbach coefficient alpha were .82 for empowerment, .89 for usefulness, .87 for success, .88 for caring, which are good, and .93 for interest, which is excellent.

Confirmatory factor analysis for the five subscales produced fit indices within acceptable ranges. Jones et al. (2017) reported that “the CFI values indicate a good fit (Hu & Bentler, 1999), the SRMR values indicate a reasonable fit (Kline, 2005). The RMSEA values indicate a borderline reasonable fit (Browne & Cudeck, 1993; Byrne, 2001; Kline, 2005)” and that the factor loadings for the components all ranged between .72 and .86, which is an indication that the items loaded well on the respective components (p. 35). For the English version, Jones and Skaggs (2016) used the inventory with 338 college students from 221 different face-to-face, online, and hybrid (face-to-face and online) courses. The result reported excellent Cronbach’s alpha values of .91 for empowerment, .96 for usefulness, .93 for success, .95 for interest, and .93 for caring. Confirmatory factor analysis for the five subscales produced fit indices within acceptable ranges.

Interview questions

The instrument used for qualitative data collection was a set of interview questions. Three content questions were developed to investigate the students' perceptions of using the concept-mapping strategy, aligned with the learning materials covered during the 2020 Fall semester. Participants reflected on the concept-map strategy of classroom engagement and future use. The researcher developed and used an interview protocol for asking questions and recording answers during the interview (Appendix B). Previous studies on interview protocol development were used for constructing the interview protocol for this study (Creswell & Creswell, 2018). There are six steps included in the

protocol: (a) basic information about the interview, (b) an introduction, (c) opening questions, (d) content questions, (e) using probes, and (f) closing instructions. A thematic analysis served to investigate participants' responses (Creswell & Creswell, 2018). The interview was conducted in either Mandarin or English, depending on the participants' preferences. The content questions for the interview are as follows:

1. In general, do you think the Concept-Mapping method is useful to you?
2. How was it useful? Or why was it not useful? Do you think the Concept-Mapping method helps you to participate in the course activities? Why do you think the Concept-Mapping method helps you to participate in the course activities? Or why don't you think the Concept-Mapping method helps you to participate in the course activities?
3. Would you use this method in other courses in the future? If yes, how would you use this method in other courses in the future?

Demographic survey

The demographic survey is the second part of the online survey (Appendix K). The researcher obtained participants' demographic data specific to their gender, sexual identity, age, ethnicity, family origin, native language, language using status, major, and enrollment status. There were two types of questions developed for the demographic survey: short-answer questions and multiple-choice questions. The question of major was designed as short-answer questions. Gender and sexual identity, age, ethnicity, family origin, native language, the language is often spoken, major, and enrollment status was designed as multiple-choice questions, with predefined answer choices. If the categorical options did not

apply to the participants, there is an "Other" option for the individuals. The demographic information provided details regarding the research participants.

Concept-map scoring rubric

Concept mapping has the potential to assess vital pieces of a student's developing knowledge structure (West et al., 2002). Therefore, the intervention, concept-map method, included by the course instructor into the online course curriculum as a learning strategy for the intervention group. There was a total of six assignments allied with the concept-map strategy and one final project. The researcher adapted a concept-map scoring rubric, which was developed by McMurray (2014). (Table 11). The rubric had four parameters and four levels of performance rating. The five parameters were (a) breadth, (b) interconnectivity, (c) efficiency of the link, and (d) layout. The parameters were listed along one side and the performance ratings along the adjacent side.

Treatment Description

The study employed a mixed-method approach with a comparative research design to acquire both quantitative and qualitative data. Both data were collected to investigate the effectiveness of the concept-mapping strategy intervention on international students' academic performance and perceptions. One Economics class served as a comparison group, and the other one served as a concept-map intervention group. Students in both groups had to learn an introduction to price theory, stressing market structures, distribution, and the organization of economic systems. All students accessed Economics online classes through the Zoom platform. Zoom is a cloud-based video communication software platform. It is used for web conferencing and video conferencing, distance learning, and social communications. The instructor established the Zoom link for student access to the classes.

Table 11
Concept-Map Scoring Rubric, Definitions, and Weighted Scores

<i>Concept map element</i>	<i>Excellent (5points)</i>	<i>Good (4 points)</i>	<i>Acceptable (3 points)</i>	<i>Unacceptable (0-2 points)</i>
Breadth of net	The map includes important concepts and describes the domain on multiple levels.	The map includes the most important concepts; describes the domain on a limited number of levels.	Important concepts missing, describe domains on only one level, or both.	The map includes minimum concepts with many important concepts missing.
Inter-connectedness	All concepts are interlinked with several other concepts.	Most concepts are interlinked with other concepts.	Several concepts linked to other concepts	Few concepts related to other concepts
Efficient links	Each link type is distinct from all others, clearly describing the relationship; used consistently.	Most links are distinct from others, discriminate concepts, present a variety of relationships; used reasonably consistently.	Several links are synonymous, do not discriminate concepts well, do not show various relationships; used inconsistently.	Most links are synonymous or vaguely describe relationships and are not distinct from other associations.
Layout	The map is contained on a single page, has multiple clear hierarchies, is well laid out, and provides a sufficient number of relevant examples with links.	The map is contained on a single page, has several clear hierarchies, is reasonably well laid out, and provides a sufficient number of reasonably relevant examples with links.	The map is not contained on a single page, has unclear hierarchies, is poorly laid out, and provides some reasonably relevant links.	The map is not contained on a single page, is confusing to read with no hierarchical organization.

Note. Adapted from “Rubric for assessing concept maps” by McMurray, J. (2014).

When the course was available, students received the notification that the URL link from the instructor. The intervention, the concept-mapping method, was implemented into one of the course sections as a learning strategy. The experimental group participants had to develop concept maps to stress their thoughts that align with learning materials. The concept maps served to externalize students' concepts and improve their comprehension. Before the semester began, the researcher used PowerPoint to give one-hour concept-map training to the instructor via a Zoom meeting (Appendix I). The one-hour concept-map training included the

following: what is the concept-map method? What are the advantages of using concept maps for academic learning? What are the types of concept maps? How to construct a concept map? The training was recorded. The researcher established an URL linked to the online training video and shared the video link with the instructor.

Procedures

The study's procedures for the comparison group and experimental group are designated below (Table 12). Both comparison and experimental groups were taught by the same instructor and the course design and textbook were the same. The concept-mapping intervention was embedded into assignments for the experimental group. During Week 1, the instructor introduced the concept-mapping method to the experimental group and shared the online training video link with students during the class. The researcher conducted a concept-mapping training in the class and led a concept-mapping activity to make sure students understand the concept-mapping development.

After the class, students had to review the video at home. Students also were asked to practice the concept-map method and related activities during Week 2 to Week 4 of the online course. There were six problem-solving assignments and three article analysis assignments for both comparison and experimental groups throughout the semester. Every problem-solving assignment contained nine questions. Additionally, the instructor asked students who were in the experimental group to create the concept maps associated with their reading material as question 10. Students were expected to create a concept map that has multiple clear hierarchies. Students should develop well laid out maps with covered main concepts, subconcepts, and detailed information of the chapter. Students were expected to create a concept map that has multiple clear hierarchies, well laid out with covered main

concepts, subconcepts, and detailed information of the chapter.

Table 12
Timeline of the Assignments, Quizzes, and Midterms for the Intervention Group

Weeks	Assignments	Quizzes and Midterms
1	Review the concept mapping video	
2	Problem-Solving Question & Develop two concept maps based on Ch 2 and Ch 3	Quiz 1
3		Quiz 2
4	Problem-Solving Question & Develop two concept maps based on Ch 4 and Ch 5	Quiz 3
5		
6		Quiz 4
7		Midterm 1
8	Problem-Solving Question & Develop two concept maps based on Ch 7 and Ch 9	Quiz 5
9		
10	Problem-Solving Question & Develop two concept maps based on Ch 10 and Ch 11	
11		Midterm 2
12	Problem-Solving Question & Develop two concept maps based on Ch 15 and Ch 16-1	Quiz 6
13		
14		
15	Problem-Solving Question & Develop two concept maps based on Ch 16-2 and Ch 17	
16	Final Project	

The following passage is an example from the course material of a concept-mapping development assignment.

Produce a concept map for each of the following chapters from this course:

- (a) Chapter 2: Thinking Like an Economist
- (b) Chapter 3: Interdependence & The Gains from Trade

Week 16, the researcher joined both online classes for conducting the online survey. The researcher briefly introduced the research and the survey instruction to the students (see Appendix G for a script for the online survey). The researcher provided the survey link to the students for completing the online survey. Students had 20 minutes to complete the survey. Because the majority population was Chinese international students in the course, the researcher provided the consent form and the MUSIC inventory, which was presented in English and Mandarin to reduce students' language barrier. Students were asked to give their consent for quiz grades, midterm grades, final grades, concept-map assignments (only for international students), and survey results. Students in the intervention group also were asked if they would like to participate in the online interview. The demographic survey obtained information about their gender, sexual identity, age, ethnicity, family origin, native language, language using status, major, and enrollment status at the university.

Next, students' perceptions of success, interest, and usefulness of the course instruction were measured by a self-report questionnaire, a modified MUSIC inventory. The reading material was for those who do not wish to participate. They could read while others were responding to the instrument. Once students clicked the submit button at the end of the survey, the survey was terminated. During Week 16, a research assistant reviewed the survey results. There were 19 participants who gave consent for the intervention group's follow-up interview. The teaching assistant sent an email with a private Zoom link to each student. In the end, 15 students successfully completed the online interview.

Week 17, the researcher conducted an online interview through Zoom. Fifteen volunteer students had a 20-minute-long individual interview with the researcher. The researcher recorded the meeting and stored the video data in the iCloud using a set of

passwords. iCloud is a service for cloud storage and cloud computing that is provided by Apple Inc. It allowed the researcher to save the digital data with limited public access for protecting participants' confidential information.

The researcher emphasized that the survey and interview feedback would be kept confidential and would not be used as part of the final grade assessment for the online course. For the sequence of intervention timeline, see Figure 5. There were three stages of data collection. The first stage of data collecting was students' grades. After Week 16, the instructor provided the quiz grades, midterm grades, final grades, and concept-map assignments to the research assistant. Students' names were coded and given a unique identification number to maintain confidentiality by the research assistant. The second stage for data collection was the students' concept-mapping assignments. The researcher gave a one-hour online concept-map scoring training to the two raters (see Appendix L for rater training handout). During the training, the raters were expected to learn the definitions of the parameters and performance rating scales.

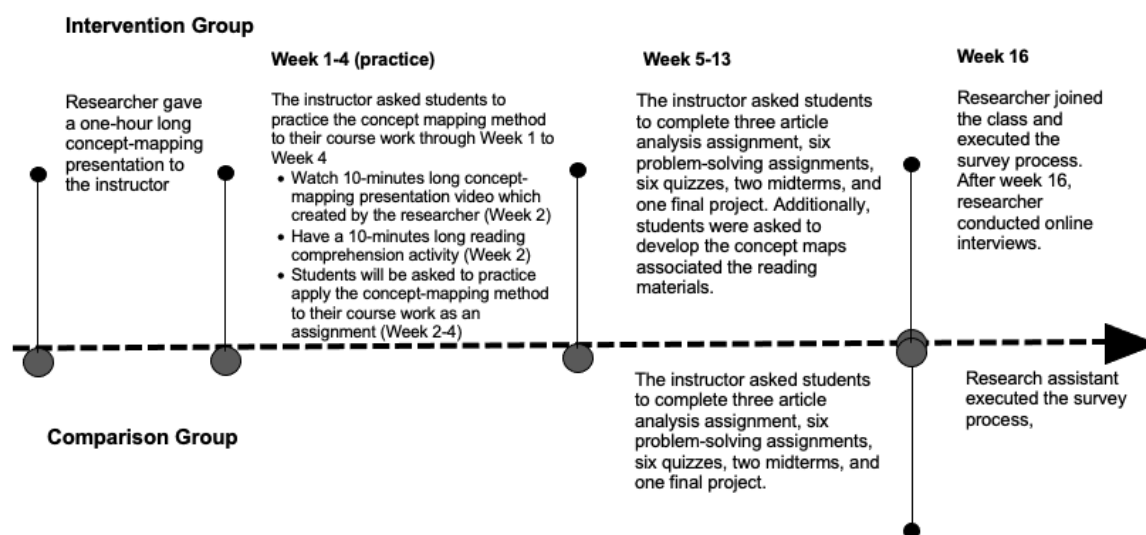


Figure 5. A sequence of Intervention Timeline for Study

An example of a concept map developed by a student, see Figure 6. Furthermore, two practice rating activities were part of the rater training. The purpose of the practice activity was to prevent and reduce rater errors. The teaching assistants shared students' concept-mapping assignments on Google Drive with two raters. Two raters were asked to give the grade according to the concept-mapping performance rating scales. Once two raters completed the grading, they shared the file with the researcher. The final stage of data collection was online interviews. The research assistant downloaded the survey data from Qualtrics.

The research assistant matched the ID on the MUSIC inventory results for those students who have given consent for their grades to use in the research. The research assistant scheduled the online interviews for the researcher. The researcher collected the qualitative data during this stage. Three questions were developed to investigate the students' perceptions of using the concept-mapping strategy, aligned with the learning materials covered during the 2020 Fall semester. Participants reflected on the concept-map strategy of classroom engagement and future use. The interview was conducted in either Mandarin or English, depending on the participants' preferences. The researcher recorded information from interviews by making handwritten notes and by Zoom recording. There were five steps involved in the online interview: (a) preparation, (b) introduction, (c) opening question, (d) content questions, and (e) closing. During the preparation, the researcher made sure the Internet signal was stable, the environment was quiet, and the microphone, audio, and Zoom recording were functioning before the interview began. Once the interview started, the researcher clicked the "Recording" button and recorded the interview to the Zoom Cloud. At the beginning of the interview, the researcher asked the participants which languages he or



Figure 6. An example of a concept map developed by a student

she preferred to use during the interview? Is it English or Chinese?

The next step was the introduction. The researcher reminded the participants about the online interview that would be recorded. The researcher introduced herself, presented the purpose of the study and discussed the general structure of the interview with the participant. Soon after, the researcher began with an ice-breaker type of opening question to the participant. The opening question was, how do you spend the day? Right after, the researcher began to ask the content questions by using probes to encourage participants to share more ideas. Here are some examples of using probes: tell me more, I need more details, and could you explain your response more? The researcher asked the participant if he or she has any questions before the next step. If the participant had no questions, the researcher started to ask the interview questions. In the end, the researcher asked the participants if the researcher could follow up with another interview to clarify certain points if needed. Once the interview was completed, the researcher clicked the "Stop recording" button. A cloud recording link was generated automatically by Zoom. The researcher stored all recording links in the Cloud. The research used the link to watch the recordings and transcript the interview results.

Research Questions

This study focused on seven research questions. Questions one to six involve quantitative data. The final question involves the qualitative data to retrieve insights into the students' perceptions of applying the concept-mapping strategy throughout the course.

1. To what extent is there a difference in the trend of quiz scores of weeks 1, 4, 8, and 12 between students who were in the intervention group and those who were in the comparison group?
2. To what extent is there a difference in the trend of two midterm grades between students

who were in the intervention group and those who were in the comparison group?

3. To what extent is there a difference in classroom participation between students who were in the intervention group and those who were in the comparison group?

4. To what extent is there a difference between the comparison group and the intervention group in terms of the international students' rating of their success, interest, and usefulness in learning?

5. To what extent is there a difference in the rubric scores for the concept-mapping assignments of weeks 4, 8, and 12 in the intervention group?

6. To what extent is there a relationship between the concept-mapping total scores with final grade?

7. What are the perceptions of international students regarding the use of concept mapping in their course?

Quantitative Data Analysis

To address question one, quantitative data analysis included both descriptive and inferential statistics. Descriptive statistics included means and standard deviations. Repeated measures analysis of variance was calculated for quiz scores of weeks 4, 8, and 12 to analyze the mean differences between the comparison and intervention groups.

To address question two, quantitative data analysis included both descriptive and inferential statistics. Descriptive statistics included means and standard deviations. Independent-samples *t* test was calculated separately for two midterm grades to analyze the mean differences between the comparison and intervention groups.

To address question three, quantitative data analysis included both descriptive and inferential statistics. Descriptive statistics included means and standard deviations.

Independent-samples *t* test was calculated separately for classroom participation to analyze the mean differences between the comparison and intervention groups.

To address question four, quantitative data analysis included both descriptive and inferential statistics. Descriptive statistics included mean and standard deviations. The independent-samples *t* test was calculated separately for each scale of participants' success, interest, and usefulness rating to analyze the mean differences between the two groups.

To address question five, quantitative data analysis included both descriptive and inferential statistics. A concept-map scoring rubric served to score participants' concept-mapping assignments (Appendix H for rubric details). Descriptive statistics included means and standard deviations. A paired-sample *t* test was conducted to investigate whether there is a difference in the rubric scores for the concept-mapping scores of weeks 4, 8, and 12.

To address question six, Pearson product-moment correlation coefficients were applied to investigate the relationship between the concept-mapping total scores with final grade. The correlation coefficient was tested for the difference between the two groups using a test for the difference between independent correlation coefficients (Glass & Hopkins, 2008).

Qualitative Data Analysis

To address question seven, a thematic analysis was used for obtaining insights of students' reflection on using the concept-mapping strategy. Creswell and Creswell (2018) suggested that there are five sequential steps to process the qualitative data. First, the researcher organized and prepared the interview recordings. The recordings were transcribed. Step two was to review the data holistically. Once the interviews transcribed, the researcher reviewed all interview data and highlighted relevant quotes or passages if it was worthy of

attention. Step three was to start coding all the data. The researcher organized the actual language of the participants by segmenting sentences. Finally, the researcher started coding all the data by bracketing chunks and providing a particular term representing a category. Before starting to code, the researcher created a working sheet with three columns. The first column presented an individual's transcript. The middle column provided a space where the researcher could take notes about the initial thoughts of the interview data. The left column presented a category and labeled the category with a specific term. Step four involved generating a description and themes.

Creswell and Creswell (2018) suggested generating a description of the setting or people as well as categories or themes for analysis. The researcher retrieved the data and tried a preliminary organizing scheme to check if new categories and codes emerge. Next, the researcher tried to reduce the total list of categories by grouping topics that relate to each other. After completing the coding process for all data, the researcher moved to step 5: representing the description and themes. The researcher used the narrative passage to convey the findings of the analysis and represent the interrelating themes and summarize the findings. After completing coding three interviews, the researcher saved the emergent codes as an individual file separate from other interview data.

The researcher developed a preliminary codebook based on the emergent codes (Appendix R). The codebook included a list of codes, a definition of each code, a code label of each code, and examples to present each code. Subsequently, the findings enriched and corroborated the perceptions of international students regarding the use of concept mapping in their course. The researcher applied NVivo 12, a software program, to organize and analyze the interview data. Specifically, NVivo12 is designed for qualitative and mix-method

research. It allows the researcher to import the qualitative data, analyze data with advanced management, query, and visualize the results. The researcher identified codes and emerged codes into themes and subthemes by reading interview transcripts. Then, the researcher stored and retrieved files from NVivo.

Establishing Trustworthiness of Data

According to Yeh and Inman (2007), there are three major factors that represent the trustworthiness data of researchers' interpretation: authenticity, quality, and consistency. Carspecken (1996, p.87-89) illustrated six techniques to support validity if researchers are to produce reports in which the findings can be considered sufficiently trustworthy. These techniques are (a) using multiple recordings devices and multiple observers, (b) using a flexible observations schedule, (c) practicing prolonged engagement, using a vocabulary in the field notes that is not overly colored by the writer's interpretations, (d) using peer-debriefing, and (e) using member checking.

The researcher applied triangulation, peer debriefing, and member checking to improve data reliability and validity. The researcher used Methods Triangulation to account for the accuracy of the data. The Methods Triangulation refers to combining quantitative data and qualitative data to enhance the validity and reliability of related findings. For example, qualitative findings may assist elaborate on the success of an intervention when the quantitative data do not provide any under-discovered information. Creswell (1998) suggested that peer debriefing enhances the trustworthiness and credibility of qualitative research. The teaching assistant was invited to engage in peer debriefing. The teaching assistant is a Chinese international student who reviewed the transcripts. The researcher had discussions with him through Zoom and emails.

For the member-checking, three participants from the study were invited to engage in the member-checking process. The participants reviewed the transcripts and merged themes. The researcher had discussions with the three students through emails. The researcher presented the interview transcripts and the study's findings for discussion and feedback that focuses on interrelationships across themes and subthemes. Three students agreed that the themes and subthemes reflected the transcripts and their concept-mapping using experience.

To establish interrater reliability for the coding system, a doctoral student coded three sets of interviews selected at random. The data was reanalyzed based on reviewers' feedback. The three sets of interview results were selected randomly. The creation of a codebook was an initial step toward establishing interrater reliability between the coder within a researcher. The initial codebook contained the definitions of each code that allows the coder to compare her work. The coding process and the development of the codebook can be found in the previous section. After the second coder completed the coding process, the researcher applied Miles and Hubermans' (1994) method to calculate the reliability, which they suggested 80% agreement between the coder on 95% of the codes is sufficient agreement among multiple coders. The following formula presented in Miles and Huberman:

$$Reliability = \frac{\textit{number of agreements}}{\textit{number of agreements + disagreements}}$$

The values were determined by the number of codes that all coders agreed on divided by the number of total coded sections. The consistency of the coding result was found 98%.

Qualifications of the Researcher

I have 2 years of professional teaching experience, 4 years of supervising language-tutor practice at the higher education level in the US, and 6 years of

postgraduate education in TESOL and Learning and Instruction. I am a native of Taiwan and bring different insights from my educational experiences to the host country. I understand the journey of studying in a foreign country as an international student, including the academic challenges and culture shock. I have overcome some learning challenges and reached my academic goals successfully. I believe that my academic journey makes me cognizant of and sensitive to the diversity of other people's backgrounds and needs. My work experience and educational background have helped to reshape my values, perspective, and understanding of students' challenges. I have worked with student populations such as domestic students, international students, and Chinese-American heritage students. Because I believe learning should be empowering and transformative, I have intentionally developed personal connections and relationships with my students to better facilitate their learning. Building relationships has also helped me to identify students' learning obstacles and life challenges, which helps me support them. After learning about and using the concept-mapping strategy in my studies, I became interested in determining the efficacy of the strategy for other international students. I have been applying the concept-mapping strategy in my teaching practice for three semesters to promote classroom engagement and meaningful learning. My primary goal is to help students become active learners who can achieve and sustain high-level academic performance.

Summary

The effects of the concept-mapping method on international students' learning and perceptions were investigated. The independent variable was the concept-mapping strategy intervention. The dependent variables were students' quiz grades, midterm, final

grades, concept-map assignments, and survey results. One of two economics classes at a private university located on the West coast were assigned to the concept-mapping intervention group. Before the study began, the participants in the experimental group received one hour of concept mapping training. And participants had two concept-mapping practicing assignments allied with course materials. The following 8 weeks, students in the intervention group had six assignments allied with using the concept-map strategy. Students in the comparison group had no intervention instruction. Finally, both classes had an online survey to evaluate their perception of course instruction. Additionally, 15 participants in the intervention group were selected randomly to engage in online interviews.

CHAPTER IV

RESULTS

The purpose of this mixed-method approach with a comparative research design was to examine the effect of the concept-mapping method intervention on international students' learning outcomes and perceptions in two online Economics classes. Both data were collected to investigate the effectiveness of the concept-mapping-strategy intervention on international students' academic performance and perceptions of usefulness, interests, and effectiveness. The research was conducted in two phases. The first phase was collecting students' learning outcomes. The outcomes focused on the participants' quiz grades, midterm grades, final grades, concept-map assignments, and survey results. Concept mapping has the potential to assess vital pieces of a student's developing knowledge structure (West et al., 2002). Therefore, the intervention, concept-map method, implemented by the course instructor into the online course curriculum as a learning strategy for the intervention group.

There was a total of six assignments allied with the concept-map strategy and one final project. The concept maps were scored and given back to the students with feedback by a course teaching assistant. The teaching assistant gave the feedback on students' map through Canvas, a learning management system. The concept-map scoring rubric was developed by McMurray (2014). The rubric had four criteria and four levels of performance rating. The four parameters were (a) breadth, (b) interconnectivity, (c) efficiency of the link, and (d) layout. The concept-map scoring rubric allowed the rater to assign scores that reflect on the quality of the students' concept-map assignments. In addition, students participated in a survey regarding their reflections on the course

instruction.

The second phase was online interviews. The interview results served as qualitative data as well as enriching and corroborating the quantitative data. This chapter contains the results of this study, including descriptive results, quantitative results, qualitative results, and a summary. Findings are presented in response to the research questions.

Research Question 1

To what extent is there a difference in the trend of quiz scores for weeks 1, 4, 8, and 12 between students who were in the intervention group and those who were in the comparison group?

The first research question was designed to investigate whether there was a difference in the trend of quiz scores for weeks 1, 4, 8, and 12 between students who were in the intervention group and those who were in the comparison group. Twenty-six students were in the intervention group, of which 16 completed all four quizzes. Twenty-five students did not participate in the concept-map intervention, of which 14 completed the four quizzes. There were six attendance quizzes given approximately every 2 weeks throughout the semester. Questions on quizzes were based on recent material. There were four to nine questions in each quiz. Because each quiz had different number of questions, the researcher used percentages to represent students' quiz performance. These quizzes were given at the beginning, middle, or end of the lecture. The quizzes included short answers, multiple-choice, and true-or-false items. Students completed the quizzes in the online management system, Canvas. The first quiz was designed to be a baseline for the current study.

The study researcher expected the concept-mapping intervention could assist English as a Second Language (ESL) learners in overcoming the language barrier to improve their quiz performance. Descriptive statistics included sample sizes, means, and standard deviations are provided in Table 13. There is a 34% difference between the comparison and intervention groups on the first measurement. At the second measurement, the score gap decreased to a 9% difference between the two groups. The gap of the quiz scores at the third measurement increased again, which is a 15% difference. At the last measure, the gap of the quiz scores is a 10% difference, favoring the intervention group. The intervention group had a better performance than the comparison group in the four quizzes. When comparing the two groups, the change from week to week was small for the intervention group, whereas the comparison group quiz scores fluctuated from week to week.

Table 13
Means and Standard Deviations of the 1st, 4th, 8th, and 12th Week Quiz Scores for Intervention and Comparison Groups

Measure	Comparison		Intervention		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Week 1	.51	.08	.85	.18	.69	.22
Week 4	.76	.31	.84	.17	.80	.24
Week 8	.64	.30	.79	.25	.72	.28
Week 12	.71	.26	.81	.23	.77	.24

Note: Comparison group $n = 14$, intervention group $n = 16$, total $n = 30$.

A repeated-measures analysis of variance (ANOVA), specifically, the tests of within-subject contrasts were conducted to investigate whether there is a linear, quadratic, or cubic trend of quiz scores for weeks 1, 4, 8, and 12 between students who were in the intervention group and those who were in the comparison group (Table 14). Box's M test is not statistically significant. Homogeneity of variances was not violated,

as assessed by Levene’s Test for Equality of Variances. There is a statistically significant linear interaction component for time by group with the partial η^2 value of .14.

Table 14
Tests of Within-Subject Contrasts Results in Quiz Scores for Intervention and Comparison Groups

Source	Time	SS	df	MS	F	η_p^2
Time	Linear	.05	1	.05	1.34	.05
	Quadratic	.04	1	.04	.81	.03
	Cubic	.16	1	.16	2.43	.08
Time*Group	Linear	.15	1	.15	4.56*	.14
	Quadratic	.08	1	.08	1.68	.06
	Cubic	.07	1	.07	1.07	.04
Error (Time)	Linear	.94	28	.03		
	Quadratic	1.35	28	.05		
	Cubic	1.89	28	.07		

* Statistically significant when the overall error rate is controlled at the .05 level.

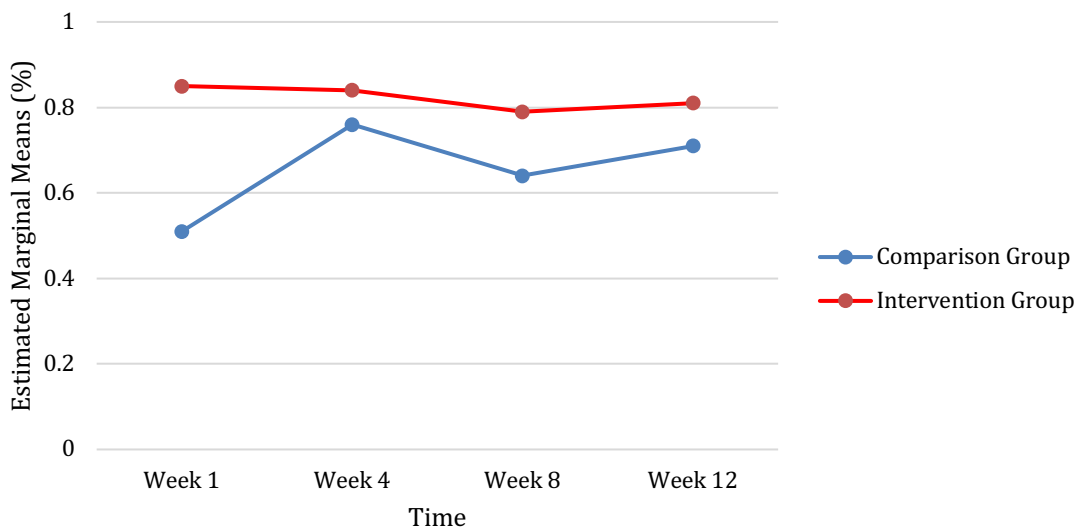


Figure 7. The line chart represents the mean of the quiz scores by percentage on the scale established by four-time points for the comparison and intervention.

A profile plot showed the estimated marginal mean of quiz scores by percentage on the y axis against the measurement time from 1 to 4 on the x-axis (Figure 7). Two lines were established, which represented the intervention group and the comparison group. The results indicated a positive trend of quiz scores across time for four quizzes

for both groups. The difference in quiz scores between the two groups occurred at the first measurement, a 34 % difference, and the last measure, a 10% difference, both favored the intervention group.

Research Question 2

To what extent is there a difference in the trend for two midterm grades between students in the intervention group and those in the comparison group?

The second research question was designed to investigate whether there was a difference in the trend of two midterm scores between students who were in the intervention group and those who were in the comparison group. Twenty-six students were in the intervention group, and all completed the two midterms. Twenty-five students did not participate in the concept-map intervention, of which all finished the two midterms. There were two midterms given throughout the semester. The first midterm covered all course material up to that point, and the second midterm covered the material in between. Answers on tests were expected to be precise and accurate. There were 14 questions for both midterms. Students completed the quizzes using the online management system, Canvas. The structure of the midterm was as follows: true-or-false questions (15%), fill-in-the-blank (15%), short answers (70%), and extra credit. The total score for both midterms was 100 points.

The majority of the comparison-group students were English speakers, when compared with the intervention group, all participants were ESL learners. The study researcher expected the concept-mapping intervention would assist ESL learners in overcoming the language barrier and enhancing learning material comprehension to improve their midterm performance. Descriptive statistics included sample sizes, means,

and standard deviations of midterm scores (Table 15). There is a 3-point difference between the comparison and intervention groups on the first midterm. At the second measurement, the score gap increased to 4 points. The comparison group presented higher scores than the intervention group for both midterms. Comprehensively, when comparing two groups, both group's midterm scores consistently increased across time.

Table 15
Means and Standard Deviations of Two Midterms Scores for Intervention and Comparison Groups

Measure	Comparison		Intervention		Total	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Midterm 1	77.80	17.08	74.96	13.38	76.35	15.22
Midterm 2	83.16	15.29	79.07	13.43	81.07	14.38

Note: Comparison group $n = 25$, intervention group $n = 26$, total $n = 51$.

Box's M test was not statistically significant. The result indicates that there is a statistically significant linear trend in time (Table 16). The partial η^2 value of .17 indicates a large effect, with 17% of the variance accounted for by time. The result also shows that there is no statistically significant of linear component on the effect of time by group interaction. A profile plot showed the estimated marginal mean of midterm scores on the y axis against the time of the two measurements on the x-axis (Figure 8). The two lines represent the intervention group and the comparison group. The intervention and comparison groups showed similar positive trends with marginal means tending to

Table 16
Tests of Within-Subject Contrasts Results for Midterm Scores by Intervention and Comparison Groups

Source	Time	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	η_p^2
Time	Linear	572.15	1	572.15	10.41*	.17
Time*Group	Linear	9.87	1	9.87	0.18	
Error (Time)	Linear	2694.21	49	54.98		

*Statistically significant at .05 level.

increase toward midterm two consistently. The difference of midterm scores between the two groups occurred at the first measurement, a 3-point difference, and the second measurement, a 4-point difference, both are favoring the comparison group.

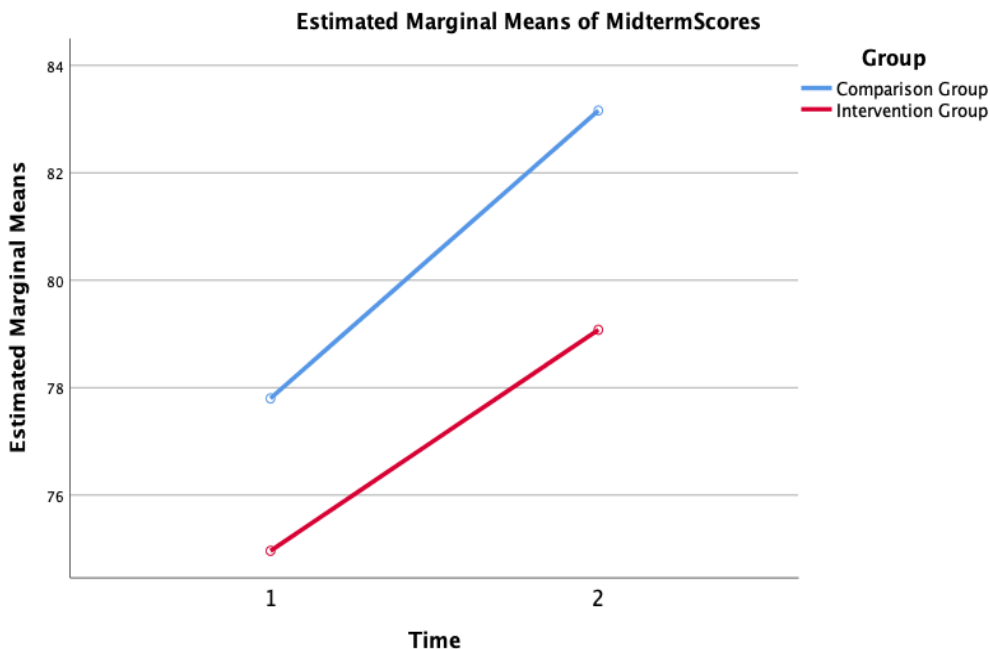


Figure 8. The line chart represents the mean of the midterm scores on the scale established by two-time points for intervention and comparison groups.

Research Question 3

To what extent is there a difference in classroom participation between students in the intervention and comparison groups?

The third research question was designed to investigate whether there was a difference in classroom participation between students in the intervention group and those in the comparison group. After removing two outliers, 24 students were in the intervention group. Twenty-five students were in the comparison group; after three outliers were removed, 22 participants remain in the comparison group. Regarding participation grades, the instructor included discussion questions (via Zoom chat or

verbal prompt) during regular classes to encourage higher levels of active learning. Students could express their opinions and knowledge and actively participate in the course with these discussion questions. These opportunities counted toward participation credit in the class.

An independent-samples t test was conducted to investigate whether there is a difference in classroom participation scores between students in the intervention group and those in the comparison group. The test is robust with respect to the equal population variances assumption because the sample sizes are nearly equal. Descriptive statistics included sample size, means, and standard deviations, are provided in Table 17. There is a 6-point difference between the comparison and intervention groups, which favors the comparison group. The result indicates that there is no statistically significant difference in classroom participation scores between the two groups. Cohen's d value suggests that a medium effect size of the variance is accounted for by group differences.

Table 17
Independent-Samples t -Test Result in Classroom Participation Scores for Intervention and Comparison Groups

Measure	Comparison		Intervention		$t(44)$	Cohen's d
	M	SD	M	SD		
Classroom Participation	42.09	7.15	35.88	15.80	-1.74	-.50

Note: Comparison group $n = 22$, intervention group $n = 24$, total $n = 46$.

Research Question 4

To what extent is there a difference between the comparison and intervention groups regarding the students' rating of their success, interest, and usefulness in learning?

The fourth research question was designed to investigate whether there was a difference in students' rating of their success, interest, and usefulness in learning between students in the intervention group and those in the comparison group. Specifically, the

modified MUSIC inventory (Jones, 2017) investigated students' perceptions of success, interest, and usefulness of their engagement in the course. The inventory is a self-report questionnaire containing 15 of the 24 original items and has three components, including (a) usefulness, (b) success, and (c) interest. The definition of three components is "Usefulness: the coursework is useful to his or her future," "Success: he or she can succeed at the coursework," and "Interest: the instructional methods and coursework are interesting" (Jones, 2017, p. 31). Students rated themselves on a 6-point Likert scale, from 1 (*strongly disagree*), 2 (*disagree*), 3 (*somewhat disagree*), 4 (*somewhat agree*), 5 (*agree*), to 6 (*strongly agree*). Twenty-six students were in the intervention group, of which all participants completed the survey. Twenty-five students were in the comparison group, of which all participants completed the usefulness and interest sections; one student did not complete the success section.

Three independent-samples *t* tests were conducted to investigate whether there is a difference between the comparison and intervention groups regarding the students' rating of their success, interest, and usefulness in learning. The tests are robust with respect to the equal population variance assumption because the sample sizes are nearly equal. Descriptive statistics included sample sizes, means, and standard deviations are provided in Table 19. For the rating of usefulness for both groups, there is little or no difference between the means; both groups agree that the instruction was useful in their future learning. Cohen's *d* value of .16 is a very small effect size. For the rating of success, there is little or no difference between the means of the two groups (Table 18). There is no statistically significant difference in the rating of success between the two groups. Cohen's *d* value is .12 for the success section.

For the interest, the mean for the comparison group is between ratings of 4 and 5, indicating that the students somewhat agree that the instructional methods and coursework are interesting. The mean for the intervention group, however, is above the rating of 5, which indicates that the students who were in the intervention group agree the instructional methods and coursework are interesting. There is a statistically significant difference in rating of interest between the two groups. Cohen's d value is .58 suggests that a medium effect size with 57.6% of the variance is accounted for by group differences in ratings.

Table 18
Results of Independent-Samples t test of Usefulness, Success, and Interest Ratings for Intervention and Comparison Groups

Measure	Comparison		Intervention		t	df	Cohen's d
	M	SD	M	SD			
Usefulness	5.11	0.92	5.25	0.71	0.58	49	0.16
Success	4.90	0.76	5.00	0.85	0.25	48	0.12
Interest	4.51	1.22	5.10	0.78	1.99*	49	0.58

Note: Usefulness and Interest: Comparison group $n = 25$, intervention group $n = 26$, total $n = 51$. Success: Comparison group $n = 24$, intervention group $n = 26$, total $n = 50$.

*Statistically significant at the .05 level.

Research Question 5

To what extent is there a difference in the rubric scores for the intervention group's concept-mapping assignments of Week 4, 8, and 12?

The fifth research question was designed to investigate whether there was a difference in rubric scores for the concept-mapping assignments of weeks 4, 8, and 12. There were six problem-solving assignments throughout the semester for both comparison and intervention groups. Every problem-solving task contained nine questions. Additionally, the instructor asked students in the intervention group to create the concept maps associated with their reading material, as in question 10. Students in the

intervention group could receive up to four percent of the final course grades for all concept-map activities completed. A teaching assistant graded students' concept map assignments by utilizing a concept-mapping rubric.

The rubric had four criteria and four levels of performance rating. The five criteria were (a) breadth, (b) interconnectivity, (c) efficiency of the link, and (d) layout. The four levels of performance rating were *Excellent* (5 points), *Good* (4 points), *Acceptable* (3 points), and *Unacceptable* (0 to 2 points). The concept-map scoring rubric allowed the rater to assign scores that reflect on the quality of the students' concept-map assignments. The maximum total score using this rubric was 20 points. The final scores reflect on students' concept-map construction that was divided into four levels: *Excellent* (16-20 points), *Good* (12-16 points), *Acceptable* (8-12 points), and *Unacceptable* (below 8 points). There was a 0.79-point difference between the first and second measurements on the concept-mapping assignment (Table 19). The gap decreased to 0.67 points when compared with the first and the third measurement. The gap of the concept-mapping scores between the second and the third measurement was only a 0.2-point difference. A paired-sample *t* test was conducted to investigate whether there is a difference in the rubric scores for the concept-mapping scores of weeks 4, 8, and 12. The result indicates that there is no statistical significance in the rubric scores for the concept-mapping scores

Table 19
Means and Standard Deviations for the Concept-Mapping Rubric Scores
of Weeks 4, 8, and 12

Pair	Week	<i>M</i>	<i>SD</i>	<i>n</i>
Pair 1	4	14.51	2.86	21
	8	13.71	3.66	21
Pair 2	4	14.46	2.80	22
	12	13.79	3.42	22
Pair 3	8	13.74	3.50	23
	12	13.51	3.50	23

of three pairs of times (Table 20). Cohen's d value suggests that a small effect size of the variance is accounted for by pair 1 and pair 2.

Table 20
Paired-Sample t -Test Result for the Concept-Mapping Scores of Weeks 4, 8, and 12

Pair	Week	M	SD	t	df	Cohen's d
Pair 1	4 & 8	.79	2.20	1.66	20	.28
Pair 2	4 & 12	.67	2.83	1.11	21	.23
Pair 3	8 & 12	.22	2.50	0.44	22	.07

Research Question 6

To what extent is there a relationship between the concept-mapping total scores with final grade?

The question was designed to investigate whether there was a relationship between the concept-mapping total scores and the final grade by applying the Pearson product-moment correlation coefficient. The teaching assistant graded and provided the concept-mapping assignment feedback to the students. Students in the experimental group could receive only up to four percent of the final course grades for all concept-map activities completed.

Table 21
Descriptive Statistics and Correlations Coefficient for Concept-Mapping Total Score and the Final Grade

Variable	n	M	SD	C.M. Total Score
C.M. Total Score	25	58.84	20.78	—
Final Grade	26	6.69	2.57	.65*

* Correlation coefficients is statistically significant at the .05 level (2-tailed).

In other words, the concept-mapping score contributed a low proportion toward to final grade. The correlation coefficient between the concept-mapping total score and final grade indicates a moderate positive correlation (Table 21), which indicates that the linear relationship between concept-mapping strategy and final grade contributes 42% of the variation.

Research Question 7

What are the perceptions of international students regarding the use of concept mapping in their course?

To address question seven, a thematic analysis was used to obtain students' insights on using the concept-mapping strategy. Fifteen participants were from the students who gave their consent for the interview. Three content questions were developed to investigate the students' perceptions of using the concept-mapping strategy aligned with the learning materials covered during the 2020 Fall semester. The content questions for the interview are as follows:

In general, do you think the Concept-Mapping method is useful to you? How was it useful? Or why was it not useful?

Do you think the Concept-Mapping method helps you to participate in the course activities? Why do you think the Concept-Mapping method helps you to participate in the course activities? Or why do you not think the Concept-Mapping method helps you to participate in the course activities?

Would you use this method in other courses in the future? If yes, how would you use this method in other classes in the future?

A thematic analysis (Creswell & Creswell, 2018) served to investigate participants' responses. The researcher applied NVivo 12, a software program, to organize and analyze the interview data. Specifically, NVivo12 is designed for qualitative and mix-method research. It allows the researcher to import the qualitative data, analyze data with advanced management, query, and visualize the results. The researcher identified codes and emerged codes into themes and subthemes by reading interview

transcripts. Then, the researcher stored and retrieved files from NVivo. The researcher used the narrative passage to convey the analysis findings, represent the interrelating themes, and summarize the results. Subsequently, the conclusions enriched and corroborated international students' perceptions regarding concept mapping in their course. The researcher developed a preliminary codebook based on the emergent codes. The codebook included a list of codes, a definition of each code, a code label, and examples to present each code (Appendix R).

The research questions were addressed with relevant quotes. The purpose of addressing participants' narrative is to support the statement that the themes were distinguished in the text and, by extension, the researcher's analysis. A concept map is used to summarize the participants' perspective of using the concept-mapping strategy (Figure 9). Six themes emerged from the interview analysis of the data. Each theme illustrated participants' perceptions of concept-mapping using experience, presented by a concept-map outlining.

The main theme was located on the left side and followed the subthemes that represented the relationships within the main theme. Themes, responses frequency, and percentage of frequency of interview results can be found in Table 22. The coded participants' responses were about the benefits of utilizing the concept-map intervention represented by 76% of responses. The following themes are the prior knowledge of the concept map (6%) and the reasons for ambivalence about using the concept-mapping method (6%). There is five percent of acknowledgment about the resources for concept-map construction. The least common themes were participants' additional note-taking strategies and participants' willingness to use the concept-mapping

technique in future learning. Ninety-three percent of participants reported that they had learned what concept-mapping strategy is and developed concept maps in junior-or senior-high school.

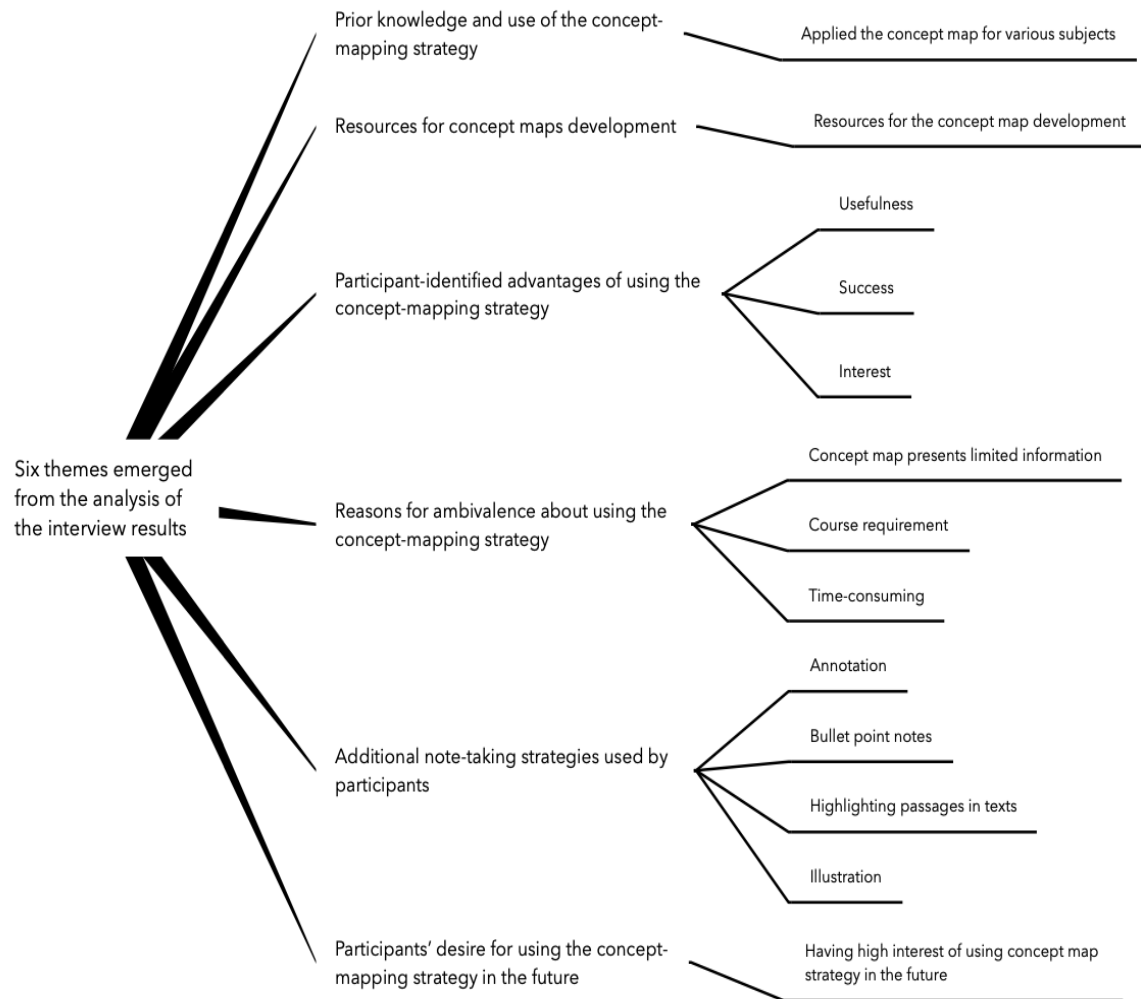


Figure 9. Six themes merged from the analysis of the qualitative data.

Theme 1: Prior knowledge and use of the concept-mapping strategy

Specifically, when asked to provide their prior knowledge of using the concept-mapping strategy, the most common theme derived from student responses was using the concept-mapping strategy in English writing class. In other reflections, using the concept-

mapping strategy in Biology, Mental Health, Chinese Writing, and Mathematics classes.

Table 22
Themes, Responses Frequency, and Percentage of Frequency of Interview Results

Main theme and Subthemes	Responses Frequency	Percentage of Frequency (%)
Prior knowledge and use of the concept-mapping strategies (6%)		
Students applied the concept-mapping before the current study	14	93
Resource for Concept-map developing (5%)		
Create the map based on personal notes	2	12
Create the map based on teacher notes	4	24
Create the map based on the textbook	9	53
Create the map during the lecture	1	6
Online material	1	6
Participant-identified advantages of applying the concept-mapping strategies (76%)		
Usefulness	185	67
Interest	39	14
Success	52	19
Reasons for ambivalence about using the concept-mapping strategies (6%)		
Concept map presents limited information	5	26
Course requirement	8	42
Time-consuming	6	32
Additional note-taking strategies used for economics learning (4%)		
Annotation	2	14
Bullet point note	10	71
Highlighting passages in texts	2	14
Illustration	1	7
Participant-identified willing to use the concept-mapping strategies in the future (4%)		
Willing to use the concept map strategy in the future	14	93

The following comment by student 21, a female student, family origin from China, interviewed: “I remember in my senior-high English reading class, the teacher asked students to analyze characters from a chapter and develop a concept map related to the

characters. When I analyze the characters or read texts, I use concept maps to sort out my thoughts.” Student 21 extended response:

I use concept maps for English writing essays because I have to organize my thoughts before writing. If I don't draw a concept map as my writing outline, I don't know how to start. I might know how to write at the beginning; then, I will be lost. Every time I have to create a concept map, I can stick to the topic.

Another example, a female participant, student 18 shared,

I used concept maps in English reading class when I was in senior high school. In the class, we need to analyze the articles. The teacher asked everyone to find the main points, then we examine the article and find the supporting ideas using the concept-mapping skill. In this way, when I write a summary paper, I can later use the map as writing material (outline).

Students 21 and 18 illustrated how they utilized the concept-mapping strategy for their reading and writing class. They discovered the main ideas and subideas by drawing a concept map. They further explained that the concept map became their outline for the summary writing assignment. Other participants, a male student 7 and a female student 11, applied the concept-mapping skill into mathematics learning. To illustrate, student 7, from a Middle East country, supported, “I use the concept map for math. I write down each formula in the middle of the paper that I know and link it to the units. It helps me to review.” Student 11, a female student from China, addressed, “My math teacher asked students to learn the unit by themselves before the class. So I start to read the table of contents and browse through it and then pay attention to its subunits. Then I begin to create a map of the chapter. It helps me have an overview of the chapter.”

Student 7 further organized the information from the course materials, constructed new ideas, and then attached them to past knowledge. Student 11 created a concept map as a chapter blueprint for previewing the learning material. Both students demonstrated how they generated concept maps to achieve meaningful learning.

Four students reported that they applied the concept-mapping strategy in the biology classes. One of the interviewees revealed that a biology teacher organized the learning materials by utilizing the concept-mapping method to provide a chapter outline.

Participant 26, a male Mandarin native speaker, recalled:

Well, I learned it (the concept-mapping strategy) in Biology class. The biology teacher created the concept maps to present the content from the textbook. Students know what teachers are going to teach immediately once they see the concept maps.

Student 26's reflection echoes Ausubel (1962) suggestion that teachers could empower students' learning by providing better organizing information.

Theme 2: Resources were used for development of concept maps

In the current study, the students applied the concept-mapping strategy to visualize their understanding of learning economics. The theme of resources assisting concept-map development has five subthemes. Five percent of the participants shared their resources for creating concept maps, including personal notes, teacher notes, textbooks, lectures, and online resources. The most common subtheme derived from student responses was the maps created based on the textbook from seven students' reflections. The students who used the textbook as resources to create maps identified English as the most language they spoke. It is considered that they might have less language barrier than those who reported themselves as ESL learners. Student 21 shared, "Every time I create a concept map, I read the whole chapter first; that is, then I write down the important points, which helps me to remember the key concepts of those lessons better."

Two participants reported using the teacher's notes to construct the concept maps. Students have a different perspective about using the teacher's notes as a resource for

constructing concept maps. Additional examples from the participants as follow:

For student 20, her non-English-speaker background came with a sense of challenge,

I usually use the teacher's notes to develop the concept map because if someone sorted the chapter information out, I feel less challenged to develop a concept map.....The teacher's notes present bullet points. Based on the topic, I draw a big circle first, add minor points under the big circle for summarizing, and then keep extending it. I use this way for probably every unit.

Conversely, student 21 has a different perspective about using the notes from the instructor for the concept-map construction. She suggested that,

He (the teacher) provides a complete summary for each chapter. If I used his notes for my concept-map assignment, I think it is not a good idea. Because it is better for me to read the whole chapter by myself, then develop the concept map.

Two participants reported that they preferred to use their notes to generate the map. For example, student 13, a male student who is from the Philippines, recalled that,

I take notes in my economics class, and I have my headings and my subheadings, and everything is written. After that, I start to develop my concept map based on my notes.

Students devoted their time to grasp the information and externalized their cognitive construction to a visual graphic no matter which resources students utilized. Through establishing concept maps, the learners retrieved and assimilated the knowledge.

Theme 3: Participant-identified advantages of using the concept-mapping strategy

During the interview, all participants mentioned that they benefited by using the concept-mapping strategy for their economics acquisition. Participant-identified advantages of using the concept-mapping strategy is the most common theme which presents 76 percent of the total responses. This theme builds on three subthemes: usefulness, interest, and success. Each subtheme contains several streams that reflect on its subtheme and the main theme. Usefulness was the most common subtheme derived

from student responses, represented by 67% of the total responses, 14% of the total responses for interest, and 19% of the total responses for success.

Usefulness

The usefulness ranges of applying the concept-mapping strategy are increasing classroom participation and elevating course-material comprehension. Therefore, the learners might be participating actively in the classroom activities. Nine of 15 participants shared that the concept-mapping strategy assists (a) answer the questions during the class, (b) identify vague concepts to ask the instructor, and (c) preview the class. Students addressed they were engaging actively in classroom activities. Student 7 remarked that,

Because it gives me an overall view, it helps me understand the lecture. After class, I create my concept map, and the next time I go back to the course, I can quickly answer the professor's question.

Student 12, she recalled how she responded to the professor's questions during the lecture, "Oh, I think it's (concept map) helping. Because whenever our professor asked some questions. I can find the answer when I draw on the concept maps." Student 2 recognized that she had more interaction with the professor, she said that,

I use this method to take notes every time I finish the class. Then you will be more aware of things that you did not understand in class or that you still need to ask the teacher. If there is something unclear, I will ask the teacher next time or ask my classmates to see anything I can add to their notes. I have more opportunities to talk to the teacher.

Comprehension level increased is another subtheme to support the concept-mapping strategy is useful for students' economics learning. Ninety-five percentage of responses in reflection of Usefulness commented that the understanding of the learning material was improved. The text evidence of obtaining clarity of thoughts include (a) overview of the lecture, (b) organization of the information, (c) create visual

representations of information, (d) identify key concepts, (e) identify knowledge gaps, and (f) clarify ambiguous thoughts.

Ten of 15 students pointed out the concept map as a roadmap to accommodate them to overview the lecture. Therefore, they have a better understanding of learning objectives. Student 2, a female Chinese international student, stated how she felt a sense of excitement about the concept map, “Look! My concept map presents the whole story on a piece of paper. I understand clearly what the story tells!” Likewise, student 7, he recalled, “a concept map would give you an overview of everything. Then your brain will be ready to intake more information.”

Student 3 mentioned the usefulness of concept map construction:

The Economics class is complicated. The map (concept map) helped me build a better and clearer structure and understand what the chapter is about. The concept map assignment allows me to see the overview of the chapter. It gives me a sense of the topic.

Explicitly, these experiences, according to student 20, represent the important characteristic of the concept map; she pointed that,

Because of the concept map, present information concisely. I think I can understand what is going on at a glance. If this is the case, even if it is difficult for me to remember it, I can remember it when I see it.

Student’s responses highlighted how the concept-mapping strategy supports them overview the course. The next subtheme is the concept map to help students organize the information. Half of the participants gave positive feedback about how they structure the course material and notes using the concept-mapping strategy. Student 6, a male Chinese international student, reviewing his experience about organized the learning material said that,

Because the concept map is more explicit and perceptive, the text’s presentation

in a concept map may not be so tight. Still, like traditional notes, it would be many pages if you want to review, and the text is densely packed.

Student 6 continued,

If you take notes, you just keep copying the teacher's words. But the concept map will extract the essence, comprehend, and then present it on paper. While you were drawing, you think.

Similarly, student 13, he expressed his high plausibility of concept-map strategy for systemizing the information:

It (concept map) helped my learning because it's organized and going back to it and reviewing my notes. I have fun because it's already there. It's all the organized details and topics. Overall, it helps organize my thoughts. So yes, and that's how concept maps help my learning.

Student 21, she shared valuable information about the merit of using a concept map:

If I have a notebook with all text on it, I don't want to read it. But if you have a concept map with different colors that distinguish concepts, and then you have images on it (concept map) to help your memory, there is a saying that a picture is worth a thousand words.

Student 21 laconically stated, "A picture is worth a thousand words." The purpose of the concept-mapping strategy is to help students to encode the target learning materials and store the information and its eventual impact on test performance (Morehead et al., 2019). The encoding process, such as reorganizing and transforming notes, involves a higher cognitive procedure, versus just copying lectures entirely or simply rereading them. Consequently, the concept-mapping strategy elevates learners' meaningful learning. Ten participants addressed how the concept-mapping strategy benefits them to identify key concepts, knowledge gaps and clarify ambiguous thoughts. Student 18 illustrated her experience of identifying key points by using a concept map:

First, to start with that unit topic. Then I will classify it into several major directions and then write down some key points for each direction. It is to simplify what the teacher teaches. So I understand fully at one glance.

Student 18 added,

The concept map is easy to understand at a glance. When looking for the key points, I can find the key points without going through many texts. Also, you can see the relationship between points and points.

All participants agreed that the concept-mapping strategy leads learners to evaluate the relationship between different concepts and discover the map flaws. During the process, students experience the moment of meaningful learning.

Students 21, 18, and 3 recalled that while they were creating a concept map, they were able to identify the knowledge gap and clarify misconceptions. Furthermore, student 2 noted, “I use this method (concept map) to take notes every time I finish the class. Then you will be more aware of things that you did not understand in class or that you still need to ask the teacher.” Likewise, participant 18 reflected, “While doing it, I can discover some important points that I may not have noticed in class, reinforcing my learning.” In another instance, student 3 recalled, “Concept map assignment helps me to see the overview of the chapter. It gives me a sense of the topic. When the class is going, although I can't understand all of it, I can come out with some meaningful questions to ask the professor.”

Interest

Forty percent of the participants indicated that their learning motivation increased. Findings show that students were gained not only knowledge, but also increased learning motivation. For example, student 11 does not consider that creating a concept map is just an assignment; instead, she considers its a creative project. Five participants shard that their learning motivation increased by used color-coding strategy for their concept maps. Specifically, student 11, described with a smile,

I do not see it (developing a concept map) as homework, but treating it better, I like to do it. There are many colors in my concept map. For example, using more colors will make me feel happier. There is nothing you can always enjoy unless you find ways to make yourself enjoyable.

When a learner has a positive learning attitude, their learning will be less stressful but more enjoyable. Another explanation for increased motivation is students obtaining a sense of accomplishment using the key element of the concept map. Student 6 identified that he was ecstatic after he completed a concept map. He said, “Developing a concept map is work for me. First, the concept map presents information concisely. The second is that I feel a sense of accomplishment after I finish constructing.” Some students face reading challenges, and they prefer learning by the concept map. For example, student 20 who is an ESL learner shared, “Sometimes, I feel bored when I read the teacher's notes. If I draw a map using the teacher's notes, I feel I can understand the learning materials.”

Success

The concept-mapping strategy occurs during learning and includes strategies such as reviewing and attention focusing, which magnified students' academic success.

Nineteen percent of the participants agreed that the concept-mapping strategy amplified the course materials' retention; seven participants shared the concept-mapping strategy help them to prepare for quizzes and midterms. Student 12 explained why the concept map improved her learning retention, “Because I'm a visual learner. For example, when I study for a test, the concept map helps me remember the chapter's section easily.”

Similarly, student 10 echoed student 12 with “The day before the exam, I would like to read the concept map that I submitted for my homework for preparing the test, just so that I really remember where everything is, connections between different ideas.”

Eight students stated the concept maps help them to review the lecture. Student 20

explained his experience about how the map accommodated his learning, he said, “When I need to review or write some arguments for this article, I read the concept map, and then I have a better understanding of each point and each content that needs to be written.”

Theme 4: The reasons for ambivalence about using the concept-mapping strategy

Although all participants expressed their positive perceptions of usefulness, and success, and interest in the concept-mapping strategy, some concerns were expressed: (a) concept map presents limited information, (b) course requirement, and (c) time-consuming. Student 18 explained her idea that the concept map presents limited information with “I feel that there is a part of economics content suitable for using concept maps, but some of the content is not suitable.

Student 8 shared his thoughts and said, “the image content such as tables or figures which may not be drawn in the concept map.... Because the concept map doesn’t present enough information, sometimes I can’t understand it.” Student 12 said, “It is quite time-consuming. I typically spend 30 to 45 minutes thinking about what I’m going to put on my paper. Once I have those ideas, I will transfer them to the paper. But it’s all good.” In another example, student 21 showed her colorful concept map to me and said,

It was good at first. In the beginning, I thought it’s good! Developing a concept map as an assignment, I like it! Later, I discovered that I have to develop two concept maps for every single assignment. You know I have to spend almost 2 hours developing a concept map.

Student 1 gave his opinion and complained, “It didn’t help me because I felt like I was forced to make a concept map since it was part of a requirement to get points. So it didn’t really help me as much as I’d want to because I felt like I was being forced to do it.

Theme 5: Additional note-taking strategies used by participants

The researcher further investigated the other alternative note-taking strategies used by participants during the interview. The results identified that bullet-point-note-taking-strategy is the major note-taking strategy for assisting students' learning. Seventy-one percent of responses in additional note-taking strategies used for economics learning that they preferred to use bullet-point-note-taking-strategy to accommodate their learning. Highlighting passages in the text is the second common strategy used for students' learning.

There were five participants who preferred to use bullet-point-note-taking-strategy to accommodate their acquisition. Student 12, a female Chinese international student, illustrated how she integrated the bullet-point-note-taking-strategy with the concept map. She said,

I typically use the bullet-point-note-taking-strategy; for example, I put the main topic first, and then subtopics will be the following line. My notes have many layers. I transfer my notes into a map. It's easier for me because I already know what the main idea and subtopics are.

There were three participants who reported they highlighted key points in the texts. Student 11, a female international student from Indonesia, showed her notes and explained the idea of using different colors for her highlight strategy for learning, "These are all the notes for chemistry class. First of all, I will mark each important point with color, and I will use another color to highlight the less important points. "Likewise, student 3, a female Chinese international student, reported that "I usually take notes. And I like to use different colors to highlight the important part. And it's really helpful."

Theme 6: Participant-identified future use of the concept-mapping strategy

To know about the participants' willingness to use the concept-mapping strategy in the future, the researcher asked, "Will you use the concept-mapping strategy for other subjects or courses in the future?" Ninety-three percent of the participants identified they would like to use the concept-mapping strategy for future learning such as Macroeconomic class, English writing, Biology class, and other business-related classes. Student 22, who enjoyed creating the concept map, shared, "I have Macroeconomics in my second semester and other subjects, so I will be using concept maps in the same way I used for this semester." Student 21, who used color coding in her concept maps, recalled, "I think the concept map is more commonly used in the Business field. My major is Business. I believe concept-mapping strategy is a good choice for my learning, especially when I represent market streams. There are many business models present in the form of concept maps. Then, I think I will use the concept-mapping method for English class."

Summary

The purpose of this mixed-method approach with a comparative research design was to examine the effect of the concept-mapping method intervention on international students' learning outcomes and perceptions in two online Economics classes. This chapter contained the results of the seven research questions that were the basis of the present study. The first research question aimed to explore whether there was a difference in the trend of quiz scores of weeks 1, 4, 8, and 12 between students who were in the intervention and comparison groups. To answer the first research question, a repeated-measured Analysis of Variance (ANOVA) was computed on students' quiz scores for the four different time points and between the comparison and intervention groups. There is a

statistically significant linear interaction component for time by group with the partial η^2 value of .14. Two groups show a positive trend in quiz performance and favoring the intervention group.

A repeated-measured ANOVA was conducted to investigate whether there was a difference in two midterms between the comparison and intervention groups for the second research question. The result indicates that there is a statistically significant linear trend in time. The partial η^2 value is 17% of the variance accounted for by time. The result also shows no statistically significant linear component on the effect of time by group interaction, indicating that the groups both changed over time, that is, the midterm scores were increasing for both groups from one midterm to the other. To investigate whether there was a difference in classroom participation between the intervention and comparison groups for the third research question. An independent-samples t test was computed on classroom participation scores between comparison and intervention groups. No statistically significant results were reported on this measure.

Three independent-samples t tests were conducted to investigate the fourth research question: whether there is a difference between the comparison and intervention groups regarding the students' rating of their success, interest, and usefulness in learning (Table 18). For the rating of usefulness for both groups, there is little or no difference between the means; both groups agree that the instruction was useful in their future learning. Cohen's d value of .16 is small effect size.

For the rating of success, there is little or no difference between the means of the two groups. There is no statistically significant difference in the rating of success between the two groups. Cohen's d value is .12 for the success section.

For the interest, the mean for the comparison group is between ratings of 4 and 5, indicating that the students somewhat agree that the instructional methods and coursework are interesting. The mean for the intervention group, however, is above the rating of 5, which indicates that the students who were in the intervention group agree the instructional methods and coursework are interesting. There is a statistically significant difference in rating of interest between the two groups. Cohen's d value is .58 suggests that a medium effect size with 57.6% of the variance is accounted for by group differences in ratings.

The fifth research question aimed to discover whether there was a difference in the rubric scores for the concept-mapping assignments of weeks 4, 8, and 12 in the intervention group. A paired-sample t test was conducted to investigate whether there is a difference in the rubric scores for the concept-mapping scores of weeks 4, 8, and 12. The result indicates no statistical significance in the rubric scores for the concept-mapping scores of three pairs of times (Table 20). Cohen's d value suggests that a small effect size is accounted for by pair 1: week 4 and 8 and pair 2: week 4 and 12.

The sixth question was designed to investigate whether there was a relationship between the concept-mapping total scores and the final grade by applying the Pearson product-moment correlation coefficient. The correlation coefficient between the concept-mapping total score and final grade indicates a moderate positive correlation.

The seventh research question aimed to discover international students' perceptions regarding concept mapping in the course. Qualitative data were gathered to answer the question. It introduced that six themes emerged from the transcripts: (a) prior knowledge and use of the concept-mapping strategy (6%), (b) resources for concept maps

development (5%), (c) participant-identified advantages of using the concept-mapping strategy (76%), (d) the reasons for ambivalence about using the concept-mapping strategy (6%), (e) additional note-taking strategies used by participants (4%), and (f) participants' willingness of using the concept-mapping strategy in the future (4%).

The data suggested that most students had prior knowledge of using the concept-mapping method before enrolling in the course. There was one-third of students indicated that they applied textbooks as a resource for concept-map development. The data revealed that as most students progressed in the concept-mapping strategies in the course, they identified that the concept-mapping strategy is useful for their learning. For example, they were increasing reading comprehension and retention, learning motivation, and classroom participation. Participants also perceived the concept-mapping strategy as interesting for them. They believed the concept-mapping strategy could be a practical tool for their academic success. Students also identified a few disadvantages of using the concept-mapping method: time-consuming, course requirements, and limited representation. Finally, 93% of the students shared that they were willing to utilize the concept-mapping strategy for future learning.

CHAPTER V

SUMMARY, LIMITATIONS, DISCUSSION, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The study aimed to investigate the effects of implementing the concept-mapping strategy on international students' academic performance and perceptions of using this method. This chapter comprises a summary of the findings, an analysis of the study's limitations, a discussion of the study's results, implications for future research and educational practice, and recommendations for future research on the subject of concept-mapping learning with college students, especially for the acquisition of economics course content.

Summary of the Study

The purpose of this mixed-method study with a comparative research design was to examine the effect of the concept-mapping method intervention on international students' learning outcomes and perceptions in two online economics classes. The independent variable was the concept-mapping strategy intervention. The dependent variables were students' quiz grades, midterm, final grades, concept-map assignments, and survey results. The survey contained two parts: a demographic survey and a modified MUSIC inventory. For this research, students' perceptions of success, interest, and usefulness of the course instruction were measured using a modified MUSIC inventory. The modified version of the MUSIC inventory is a self-reported questionnaire containing 15 of the 24 original items and has three components, including (a) usefulness, (b) success, and (c) interest.

The study began with a 30-minute concept-mapping training via Zoom. A total of 26 English as a second language (ESL) or English as a foreign language (EFL)

international students enrolled in one of the online sections. Another 25 native-speaker undergraduates enrolled in the other online section in a private university located on the West Coast. One section was administered the intervention, whereas the other was served as the comparison group.

Students who were in the intervention group had six assignments using the concept-map strategy. At the end of the semester, the researcher requested the teaching assistant use a concept-map assessment rubric to evaluate students' concept-mapping assignments. Students in the comparison group received regular instruction without concept-map instruction or assignments. Fifteen participants were selected randomly from those who volunteered from the intervention group to participate in a 20-minute online interview. The 20-minute online interview was used to obtain data to enrich and corroborate quantitative data. From the comparison group, 24 students completed the course and survey and gave their consent. At the end of the semester, 26 students from the intervention group completed the course and survey and gave their consent.

This study focused on seven research questions. Questions one to six involved quantitative data. The final question involved qualitative data in retrieving insights into the students' perceptions of applying the concept-mapping strategy throughout the course.

The following questions were examined:

1. To what extent is there a difference in the trend of quiz scores of weeks 1, 4, 8, and 12 between students in the intervention group and those in the comparison group?
2. To what extent is there a difference in the trend of two midterm grades between students in the intervention group and those in the comparison group?

3. To what extent is there a difference in classroom participation between students in the intervention group and those in the comparison group?
4. To what extent is there a difference between the comparison group and the intervention group regarding the students' rating of their success, interest, and usefulness in learning?
5. To what extent is there a difference in the rubric scores for the concept-mapping assignments of weeks 4, 8, and 12 in the intervention group?
6. To what extent is there a relationship between the concept-mapping total scores with final grade?
7. What are the perceptions of international students regarding the use of concept-mapping strategy in their course?

Summary of Findings

This section contains a summary of the findings of the study. The quantitative results are discussed first, followed by a presentation of the qualitative results. The seven research questions were the basis of the present study. The first research question aimed to explore whether there was a difference in the trend of quiz scores of weeks 1, 4, 8, and 12 between students who were in the intervention and comparison groups.

The result was a statistically significant difference as the quiz scores improved across time, favoring the intervention group. For the second research question, the result indicated that there was a statistically significant difference between performance on the two midterms with the comparison group having a better means. The midterm scores were increasing for both groups from one midterm to the other. To investigate whether there was a difference in classroom participation between the intervention and

comparison groups was the objective of the third research question. The result indicated no statistically significant difference in classroom participation scores between the two groups, with all international students in the intervention group.

For the rating of usefulness for both groups, there was little or no difference between the means; both groups agreed that the instruction was useful for their future learning. For the rating of success, there was little or no difference between the means of the two groups. There was no statistically significant difference in the rating of success between the two groups. For the interest, the mean for the comparison group was between ratings of 4 and 5, indicating that the students somewhat agreed that the instructional methods and coursework were interesting. The mean for the intervention group, however, is above the rating of 5, which indicated that the students who were in the intervention group agreed the instructional methods and coursework are engaging. There was a statistically significant difference in rating of interest between the two groups.

The fifth research question aimed to reveal whether there was a difference in the rubric scores for the intervention group's concept-mapping assignments of weeks 4, 8, and 12. The result indicates no statistical significance in the rubric scores for the concept-mapping scores of three pairs of times (Table 20). The average for the rubric scores was in the good range for these concept-mapping assignments.

The sixth question was designed to investigate whether there was a linear relationship between the concept-mapping total scores and the final grade by applying the Pearson product-moment correlation coefficient. Students in the intervention group could receive up to four percent of the final course grades for all concept-map activities completed. The correlation coefficient between the concept-mapping total score and final

grade indicated a moderate positive linear relationship.

The seventh research question aimed to discover international students' perceptions regarding the use of the concept-mapping strategy in the course. Qualitative data were gathered to answer the question. Six themes emerged from the transcripts: (a) prior knowledge and use of the concept-mapping strategy, (b) resources for concept maps development, (c) participant-identified advantages of using the concept-mapping strategy, (d) the reasons for ambivalence about using the concept-mapping strategy, (e) additional note-taking strategies used by participants, and (f) participants' willingness of using the concept-mapping strategy in the future. The data suggested that most students who were interviewed had prior knowledge of using the concept-mapping method before enrolling in the course. Regarding concept-map development, one-third of students had similar procedures for developing their map by using. The data revealed that as most students applied the concept-mapping strategies in the course, they identified that the concept-mapping strategy was useful for their learning. For example, they reported increasing in reading comprehension and retention, learning motivation, and classroom participation. Participants also perceived the concept-mapping strategy as interesting to them. They believed the concept-mapping strategy could be a practical tool for their academic success and motivate their learning.

Students also identified a few disadvantages of using the concept-mapping method: the time-consuming nature, the course requirements, and the limited representation. Finally, 14 of the 15 students shared that they were willing to utilize the concept-mapping strategy for future learning.

Limitations

Several limitations of the study are acknowledged. One of the limitations was that the study took place during the COVID-19 pandemic. Throughout the study, all of the students and the instructor were involved strictly in online education. The students were in their home country with a very different time zone. Due to this unique situation, the results of the study may not be generalizable to face-to-face instruction. The second limitation, having to do with learners' e-learning accessibility, was a concern in the present study. Learning and teaching inevitably were influenced by the pandemic (Pokhrel & Chhetri, 2021). Some students had unstable Internet accessibility during the semester, resulting in missed lectures or online quizzes. Although students could watch the lecture recording when they could access the Internet and make up the quizzes during the instructor's office hours, this situation might affect students' economics acquisition. Consequently, the results of students' learning might not reflect entirely on academic performance.

The third limitation, learner fatigue, was another concern in the present study. The COVID-19 pandemic had spread globally, affecting human life comprehensively, with particular psychological repercussions in students' lives. Students took all courses through Zoom; they forcibly were exposed to an online environment many hours per day. Students were away from the regular learning setting and needed to adopt new technology skills while facing challenges in the transition to college pedagogy while still in their home environment. These difficulties might have led to learning fatigue, which may have affected their academic performance. Unfortunately, the present study did not evaluate their exhaustion scale during learning.

A fourth limitation was the convenience sample used for the study. The participants were enrolled in two separate economics classes at a private university. The majority of participants in the intervention group were comprised of Chinese international students majoring in Business. The comparison group included 25 English-speaking students. Consequently, the findings may not be generalizable to a larger population.

A fifth limitation identified was related to the participants' English proficiency. Some students who were in the intervention group demonstrated better English ability than others. Those students were well-adjusted to meet the classroom norms and expectations. The participants informed the researcher during the interview that they completed their high-school education in the United States. To explain the results, one might hypothesize that their English proficiency affected their learning motivation and academic performance.

Another potential limitation of the present study was that the intervention group outperformed the comparison group on the first quiz. A few of the participants from the intervention group shared in the interview that they had learned introductory Economics beforehand in their native country. Therefore, the possibility that several learners had relevant prior knowledge cannot be excluded. As a possible explanation of the results, one might hypothesize that their prior knowledge influenced the results on the first quiz.

Discussion of Results

The first research question was designed to investigate whether there was a difference in the trend of quiz scores for weeks 1, 4, 8, and 12 between students who were in the intervention group and those who were in the comparison group. This

question addresses two gaps in the literature linked to the use of the concept-mapping strategy and international students' learning in economics. First, a limited number of studies investigated the effectiveness of the concept-mapping strategy. Studies were conducted with ESL or EFL college-level learners. Second, there is a lack of solid evidence to indicate the effectiveness of the concept-mapping strategy in international college students' economics learning. The majority of the concept-mapping studies have been conducted in nursing, English language learning, and science other than economics learning. It is essential to explore if the concept-mapping studies undertaken in different subject settings may be utilized and generalized to learners in economics course settings. Few studies have been conducted in college economics class settings. Furthermore, the studies did not investigate the effectiveness of the concept-mapping strategies in participants' academic performance.

Many studies found that the concept-mapping strategy has improved EFL or ESL students' academic performance. Two fundamental studies have provided analysis of the concept-mapping strategy in relation to EFL and ESL college students' reading comprehension experience (Liu et al., 2010; Rassaei, 2019). The study conducted by Liu et al. (2010) emphasized the effect of the computerized concept-mapping strategy on the reading skills of low-English-proficiency-achievers and high-English-proficiency-achievers. The results of Liu et al.'s (2010) study show that the concept-mapping strategy is more effective than the traditional reading strategy, especially for low-English-proficiency achievers.

Rassaei (2019) applied a quasi-experimental design, including a pretest and a posttest, with 56 EFL learners from the three distinct classes. The researcher placed the

participants into three learning groups: the traditional reading strategy group, the correction-concept-mapping-strategy group, and the guided-concept-mapping-strategy group. The mean of the posttest scores indicated that the scores for both concept-mapping groups were higher and statistically significantly higher than scores for the control group.

The current study's results support previous research and evidence that the intervention group, which was comprised of ESL and EFL students, experienced a positive trend in quiz scores across time, compared with the comparison group, which consisted of domestic students who are English speakers. Furthermore, the difference in quiz scores favored the intervention group.

There is a contradictory finding in the current study with previous research. The finding requires more in-depth concept-mapping research investigating the effectiveness of the concept-mapping strategies on reading comprehension. Liu et al. (2010) revealed that the experimental group's reading test outcomes were better than the comparison group until the concept-mapping strategy had been used for 10 weeks. The current study found that the intervention group presented higher averages than the comparison group in four quizzes conducted on weeks 1, 4, 8, and 12.

One possible explanation is that ESL learners in the current study performed better than domestic students in quizzes occurring since the first week. Of 15 participants, 14 in the concept-mapping group reported that they had learned the concept-mapping strategy in their native country. Compared with Liu et al.'s (2010) study, the participants in the current study had a more extended period of exposure to the concept-mapping strategy and the prior knowledge of economics, which might explain why the intervention group outperformed the other group from the very beginning.

The second research question aimed to investigate whether there was a difference in the trend of midterm scores between the comparison and intervention groups. This question was posed because only a limited number of concept-mapping studies explore the effectiveness of the concept-mapping strategy on academic achievement tests. Of the few studies that involve the concept-mapping strategy on academic achievement tests, Farrag (2017) explored the effect of applying the concept-mapping strategy as a study tool to facilitate academic success in a nursing program. A concept-mapping study conducted by Abd El-Hay, El Mezayen, and Ahmed (2018) involved the effectiveness of the concept-mapping strategy on problem-solving skills and competence in clinical settings and knowledge in nursing education.

Farrag (2017) demonstrated that students in the concept-mapping group outperformed the comparison groups on the midterm and final exams. Abd El-Hay et al. (2018) indicated statistically significant improvement among participants regarding knowledge of concept mapping. This result was in line with Farrag (2017), who reported a statistically significant difference between pretest and posttest in his study. Another similarity to Farrag's (2017) study revealed a statistically significant improvement of student-generated-map scores.

The results of the current study support previous research and suggest that the concept-mapping strategy can improve college students' midterm performances. The present study also revealed the intervention group had a statistically significant improvement on the second midterm. The current study found a statistically significant difference in quiz scores between the two groups; however, there was no statistically significant difference in midterm scores between the intervention and comparison groups.

There are two possible explanations. First, the processing of reading material was different between the quiz and midterm preparation. The quiz is chapter-based, which means a small amount of information needs to be digested, and it might be in an available state for a short period. The design of the quiz is multiple choice and tends to focus on low-level learning objectives. The preparation for processing of reading material might be less of a challenge for international students.

Second, the learning content was comprised of multiple chapters for a midterm. Two midterms were given throughout the semester. The first midterm covered all course material up to that point and the second midterm would cover the material in between the two midterms. Answers on tests were expected to be precise and accurate. Both midterms had 14 questions. The midterms questions included fill-in-the-blank and true or false. Grading was stricter than homework or other assignments. Materials were not allowed during the test except for writing implements, physical pocket dictionaries, and calculators. All required knowledge had to be in the minds of students. Students might have a limited capacity to hold a large amount of information for their midterm. Students' English proficiency was crucial in meeting the instructor's requirement and achieving high scores on the midterm exams. Unfortunately, this traditional assessment format and instructor's perspective increased the inequality assessment situation and affected ESL or EFL students' academic performance. Therefore, international students' midterm performance was not statistically significant, in contrast with the comparison group.

Although international students' midterm performance was not statistically different from the comparison group, in this case, international students performed similarly to the comparison group of domestic students. Seventeen percent of responses

on the usefulness of the concept-mapping strategy show that students used the concept maps for preparing quizzes and midterms. They demonstrated that they could present the same level of performance as domestic students through this intervention. Therefore, this finding is a meaningful and practical discovery with real-world implications.

The third research question was designed to investigate whether there was a difference in classroom participation between students in the intervention group and those in the comparison group. This question was structured around the notion that it would be helpful to investigate whether the concept-mapping strategy would be a handy resource in increasing classroom participation for international students.

Specifically, the research question was developed in response to previous concept-mapping studies investigating if the concept-mapping strategy would be a sufficient learning tool in supporting college ESL or EFL students' participation in classroom activities (Burdina, 2015; Marangos, 2003; Maragons & Alley, 2007). The previously mentioned studies, however, relied on students' self-report to suggest that the concept-mapping strategy could facilitate classroom discussions; in other words, the evidence was indirect. Therefore, the research question contributes to the literature by using the classroom participation scores to investigate directly whether the concept-mapping strategy might foster English learners' classroom participation. Marangos (2003) and Maragons and Alley (2007) analyzed the effectiveness of concept maps as a teaching and learning tool to promote collaborative learning in a Microeconomics course, followed by a survey regarding students' perceptions of concept map usefulness, effectiveness, and accessibility. Marangos's (2003) study revealed that students' classroom and group discussions were improved by accommodating the concept-mapping

strategy. Maragons and Alley (2007) recognized that the concept-mapping strategy is a practical learning tool to support collocative learning in economics courses. Burdina (2015) showed that 72 % of students reported using their concept maps while engaging in the classroom tasks. These studies suggest that the concept-mapping strategy could boost students' classroom participation.

The result for the research question indicates no statistically significant difference in classroom participation scores between the comparison and the intervention groups. The current study's findings support previous studies and suggest that concept maps may aid students' classroom participation. The intervention group of international students demonstrated that they overcame the language barrier and performed similar to the comparison group of domestic students by accommodating the concept-mapping strategy.

Novak (2002) stated that a concept-mapping strategy is a graphical tool for visually organizing and representing knowledge or information. A concept map displays relationships between facts, concepts, or information upon a visual map, chart, or diagram, instead of written sentences. Some learners from the current study reported they approached the instructor for illuminating vague concepts during the lecture, which improved classroom interactions. Furthermore, some participants who received the teacher-centered approach in their mother country shared that they actively participated in the classroom discussions because they could find possible answers in the concept maps. For student 20, her non-English-speaker and rote learning background came with a sense of challenge regarding classroom participation:

The education I received (before) is to memorize all the information. If I use the same strategy in the class in the United States, I think it will be more difficult because English is not my native language, and I have more challenges in memorizing it (the learning content). The concept map presents information

concisely...Sometimes, I don't quite understand it (the learning content) in class, and then when I glance at the concept map, I catch up on the lecture quickly.

The participants in the present study successfully dealt with the language barrier and cultural differences by utilizing the concept-mapping strategy to engage in classroom activities. International students proved to be able to adjust their previous learning behavior, namely passive learning, acquired in their native country. Gradually, they demonstrated being able to become active learners.

The fourth research question was designed to investigate if there was a difference in international students' rating of their success, interest, and usefulness in learning between the comparison and intervention groups. The current study measured students' perceptions of success, interest, and usefulness of the course instruction using a modified MUSIC inventory. The MUSIC inventory was developed based on the MUSIC model of academic motivation (Jones, 2009). Jones (2009) developed the MUSIC inventory designed to diagnose the strengths and weaknesses of instruction. The modified version of the MUSIC inventory is a self-reported questionnaire containing 15 of the 24 original items and has three components, including (a) usefulness, (b) success, and (c) interest.

According to Jones (2017), the definitions of the three components are “Usefulness: the coursework is useful to his or her future he or she can succeed at the coursework,” “Success: he or she can succeed at the coursework,” and “Interest: the instructional methods and coursework are interesting” (p. 31). Given that most participants were Chinese international students, the Mandarin version is used for this study. The English version also was available for this study. The research question was designed in response to previous studies regarding students' perception of applying the concept-mapping strategy in economics courses (Marangos, 2003; Maragons & Alley,

2007). Prior studies suggested that the concept-mapping strategy motivates students' learning.

Marangos (2003) surveyed to investigate the effectiveness of concept maps as a learning aid to support collaborative learning in a Microeconomics course. Similar to the current study, there were 120 participants recruited from the 1st-year Microeconomics class. There were 42 % of international students involved in the study. At the end of the semester, all participants responded to a survey regarding students' perceptions of concept map usefulness, effectiveness, and accessibility. The survey results revealed that 96 % of students agreed that the concept map is an effective learning tool to facilitate their economics learning. Ninety-five percent of the students stated that the concept-mapping strategy is a practical learning strategy to convey complicated ideas visually, which assists them in learning explicitly. Only 29 % of the students claimed that they would transfer the concept-mapping strategy to learning other subjects.

In a follow-up study, Marangos and Alley (2007) performed a similar analysis to investigate the effects of concept-mapping strategies in an economics class in a U.S. university. Some of the results echoed Marangos's (2003) study. Nearly half of the respondents found that they could express their thoughts through developing concept maps. Moreover, over half of the students agree that the concept map empowers their learning material comprehension. Students also agreed that concept maps facilitate group communication effectively.

The current study's findings revealed little or no difference between the means for the rating of usefulness for both groups; both groups agreed that the instruction was useful in their future learning. For the rating of success, there is no statistically significant

difference in the rating of success between the two groups. There is a statistically significant difference in the rating of interest between the two groups for the interest. The mean for the comparison group is between ratings of 4 and 5, indicating that the students somewhat agree that the instructional methods and coursework are interesting. The mean for the intervention group, however, is above the rating of 5, which indicates that the students who were in the intervention group agreed that the instructional methods and coursework are interesting.

The result from the current study mirrors the findings of previous studies (Marangos, 2003; Maragons & Alley, 2007) and suggests that the students in the intervention group agree that the course instruction is useful, and the concept-mapping strategy facilitates their academic proficiency. Notably, students in the intervention group expressed more vigorous learning enthusiasm than the comparison group as a result of applying the concept-mapping strategy to economics learning. For example, student 21 shared that “I feel a sense of accomplishment after finishing. I think the concept map helps my learning a lot. Now, when I look back, I don’t mind if it cost me much time to develop a concept map.”

The fifth question investigated the difference in rubric scores for the concept-mapping assignments of weeks 4, 8, and 12 in the intervention group. The purpose of the concept-mapping strategy is to help students to encode the target learning materials and store the information and its eventual effect on test performance (Morehead et al., 2019). The encoding process, such as reorganizing and transforming notes, involves a higher cognitive procedure versus just copying lectures entirely or simply rereading them. This question was designed because a limited number of concept-mapping studies evaluate

students' concept maps for accuracy in economics learning. Farrag (2017) further evaluated students' concept maps to explore applying the concept-mapping strategy as a study tool in achievement in a nursing program. Farrag (2017) discovered that students had better concept-map outcomes when their instructors progressively provided feedback on students' concept maps. Farrag (2017) drew this conclusion based on the essential concepts, accurate cross-links, color-coding, and the hierarchical nature of the students' concept maps. Similar to Farrag's study (2017), Abd El-Hay et al. (2018) applied McMurray's (2014) scoring rubric to evaluate the students' concept maps. The analysis revealed a statistically significant improvement among the different periods in the scores of students who generated maps.

Comparable to Farrag's (2017) and Abd El-Hay et al.'s (2018) studies, the present study adapted the concept-map scoring rubric introduced by McMurray (2014). The rubric had four parameters and four levels of performance rating. The four parameters were (a) breadth, (b) interconnectivity, (c) efficiency of the link, and (d) layout. The concept-map scores reflect on students' concept-map construction, which was divided into four levels: Excellent (16 to 20 points), Good (12 to 16 points), Acceptable (8 to 12 points), and Unacceptable (below 8 points). The teaching assistant reviewed students' concept maps and provided feedback.

Conversely, the result is inconsistent with Farrag's (2017) findings and Abd El-Hay et al. (2018), which suggested that the students' concept-mapping assignment scores would improve gradually. The current study demonstrated no statistical difference in the rubric scores for the intervention group's concept-mapping assignments of weeks 4, 8, and 12. The mean of the students' concept maps indicates that the quality of these

learning tools was located in the good tier for the three measurements. In other words, the intervention group has sophisticated concept-mapping developing skills. The current study's findings do not support previous studies' results. A possible explanation is that most participants recalled the prior experience using the concept-mapping strategy before college. Based on the interview results, 93% of participants in the current study reported that they had learned the concept-mapping strategy and developed concept maps in junior high school or senior high school. Therefore, they already might have mastered the concept-mapping skills, which could explain why there was no statistical difference in the rubric scores for the concept-mapping assignments of weeks 4, 8, and 12 in the intervention group.

Research question six aimed to investigate the relationship between the concept-mapping rubric scores and the final grades. The final grade breakdown was as follows: assignment (20 %), participation and quizzes (15 %), midterms (30 %), final project (30 %), and attendance (5 %). There was a final exam for both classes on the initial syllabus. Due to the coronavirus pandemic, the university suggested that faculty cancel or postpone the final exams. Therefore, the course instructor offered an alternative assessment, a final project, to evaluate students' learning. This question was framed because a limited number of concept-mapping studies analyzed the relationship between students' concept-mapping rubric scores and academic achievement.

Generally, the final grade is an essential indicator of students' learning achievement and educational success for most institutions. Francisco and Madrazo (2019) investigated the relationship between reading comprehension, academic achievement, and reading habits on primary-school students. Francisco and Madrazo (2019) concluded that,

overall, the students' reading routine positively correlated with their reading comprehension and academic performance. Furthermore, students' reading comprehension and academic performance were highly correlated. The studies mentioned above, however, were conducted on primary-school students.

In the current study, students in the intervention group were asked to apply the concept-mapping strategy to visualize their reading comprehension for their learning materials. A teaching assistant graded and provided the concept-mapping assignment feedback to the students. Students in the experimental group could receive only up to four percent of the final course grades for all concept-map activities completed. In other words, the concept-mapping score contributed a low proportion toward the final grade. The findings from the current study support previous studies and suggest that the correlation coefficient between the concept-mapping total score and final grade indicates a moderate positive correlation.

The statistically significant moderate positive correlation between the students' concept-mapping scores and their final grades revealed that both variables are viable and related methods of measuring students' learning outcomes in economics. Given the small sample size, further study is needed to explore if the concept-map scores could be a reliable factor in predicting students' academic achievement.

The seventh research question aimed to investigate the international students' perceptions of using the concept-mapping strategy in their course. This question was an extension of question four to obtain the insights and reflections of students on using the concept-mapping strategy and to enrich the quantitative findings. Regarding using the concept-mapping to improve economics learning, studies by Marangos (2003) and

Marangos and Alley (2007) suggest that the concept-mapping strategy is an effective learning strategy that supports students' academic achievement in economics learning. The studies were conducted, however, through a self-report survey. Although students' self-reports indicate that the concept-mapping strategy facilitates their learning, there was not sufficient evidence to conclude how the concept-mapping skills foster students' academic performance. In Marangos' (2003) study, 96 % of students agreed that the concept map is a useful learning tool to facilitate their learning in the economics course. Marangos and Alley (2007) found that over half of the students agreed that the concept map empowers their learning material comprehension.

Reflecting on the textual analysis in the current study, all participants mentioned that they benefited by using the concept map for their acquisition. Participant-identified advantages of using the concept-mapping strategy are the most common theme, reflected in 76 % of the transcripts. This theme builds on three subthemes: usefulness, interest, and success.

Usefulness was the most common subtheme derived from student responses, represented by 67 % of the answers. The participants believed the concept-mapping strategy is a useful technique to assist their economics learning, whether in class or after the lecture. Overwhelmingly, 95 % of responses in the reflection of usefulness commented that the level of comprehension was increased.

Interviewers agreed that the concept-mapping approach could help them succeed in the coursework, with the effectiveness varying from improving reading comprehension to increasing a feeling of accomplishment. They pointed out that their reading comprehension was enhanced because they achieved clearer thoughts through concept-

mapping construction. For example, student 4 indicated that “Developing the concept map is a creative process; through the steps, I have more straightforward ideas of the article. It is straightforward to make, and I can see the whole picture of the chapter.” Student 22 added: “There must be a sense of accomplishment after finishing.” “I think the concept map helps me quite a lot,” Student 21 shared.

According to the concept-map theory, a concept map leads learners to evaluate the relationship between different concepts and discover the map flaws. While developing the concept maps, they organize and visualize the learning material, identify the key concepts, and elucidate ambiguous ideas. During the creating process, students experience the moment of meaningful learning. Learning becomes meaningful as learners build their understanding of new information and link it to prior knowledge.

Novak (2003) suggested that the concept-mapping strategy occurs during learning and includes strategies such as reviewing and retention, which magnified students' academic success. Forty percent of responses in reflection of success commented that they believed the level of retention was increased. For example, participant 12 reflected and said that “Because I'm a visual learner, when I study for a test, the concept map helps me remember the chapter easily.”

The study conducted by Maragons (2003) resulted in 38 % of the students using concept maps to assist their midterm preparation and 65 % of the students employing concept maps to assist their final examination preparation. The study conducted by Burdina (2015), however, found that 94 % of students used conceptual maps for their midterm preparation, and 92 % of students would use conceptual maps for their final examination preparation. Although all participants recognized the advantages of using the

concept-mapping strategy to amplify their economics learning, only 19 % of students applied it to prepare for quizzes, midterms, and projects in the current study. The possible explanations can be linked to ambivalence about using the concept-mapping strategy: the concept map presents limited information, the course requirements are multiple, and the method can be time-consuming.

The studies conducted by Marangos (2003) and Maragons and Alley (2007) indicated that some participants claimed that constructing concept maps is time-consuming and causes stress, which might decrease learning motivation. In addition to being time-consuming, the current study found a concept map to present limited information, which was another concern regarding the viability and applicability of this method. Learning economics contains economics models and equations. Twenty-six percent of the participants who responded about the disadvantage of using the concept-mapping strategy pointed out that they had a difficult time to include figures or tables into the map. This finding might explain why several students still prefer to use traditional note-taking strategies, such as the bullet-points notetaking strategy and the copying notes over.

Regarding participants' willingness to use the concept-mapping strategy in the future, in the study conducted by Marangos and Alley (2007), only 23 % of respondents agreed they would apply the concept-mapping strategy in future economics classes. Compared with Marangos' (2003) study, 62 % of students were willing to use the concept-mapping strategy in future economics classes. As recommended by Marangos and Alley (2007), there is a need for more concept-mapping research investigating the willingness of using the concept-mapping skills in a small classroom setting in the US.

The results of the present study support Marangos' (2003) research and suggest that 93 % of participants would apply the concept-mapping strategy for other subjects or future economics classes. This result is contradicted with Marangos and Alleys' (2007) findings. One possible explanation is that the size of the intervention group was small for the current study, as compared with Maragos and Alleys' study, where each concept-map tutorial class had a capacity of 60 students. A classroom size that is large might create challenges for implementing the concept-mapping strategy through collaborative study groups. The concept-mapping strategy involves an in-depth learning process and active participation. During the study, a large number of students might not have been engaged enough to make extensive use of concept-mapping strategies (Marangos & Alley, 2007). For the current study, participants applied the concept maps individually. Perhaps through this individual and meaningful learning process, the participants obtained a better experience using the concept-mapping strategy.

Conclusions

This section focuses on the study's results about international students' learning obstacles and answers each research question. The results underline three themes regarding the effectiveness of the concept-mapping strategy: (a) concept maps as a vehicle to enhance students' reading comprehension and meaningful learning, (b) concept maps as a facilitator to improve students' classroom participation, and (c) the concept-mapping strategy as an aid to improve student's learning motivation. The themes covered in this section derive from both quantitative and qualitative results.

One of the study's important findings is that the concept-mapping strategy may empower international college students' economics learning performance. Specifically,

the concept-mapping approach promotes reading comprehension and enhances learners' meaningful learning.

Novak (2008) suggested that a concept-mapping strategy is a visualization tool specifically targeting learners' cognitive construction and externalizing. For example, when a learner applies the concept-mapping strategy for outlining or defining concepts, the developing process empowers the learner to reflect and synthesize the learning materials to capture the subject matter.

ESL students' quiz performance is better than the results of domestic students. Moreover, there is no statistical difference in midterm scores between the two groups. The overarching conclusion is that incorporating note-taking tools, such as concept-mapping strategies, in college economics classes may increase international students' classroom achievement.

Another important finding of the study is that the concept-mapping strategy improves students' engagement and classroom participation. The concept map can provide a holistic view of the critical concepts and subconcepts in the learning materials. In essence, students have a handy resource to respond to the questions during the lecture. Finally, another key conclusion of the study is that the concept-mapping strategy increases international students' learning motivation. Students identified the benefits of applying the concept-mapping method, such as assisting in the previewing and reviewing the lecture, improving the comprehension of the learning materials, and increasing the sense of self-fulfillment.

Implications for Future Research

As mentioned above, one of the limitations identified in the current study is the

participants' English proficiency. Although all the participants in the intervention group were 1st-year international students, their English proficiency was not even. First, because English proficiency affects students' ability to understand and communicate the course material, future studies should assess students' English proficiency before the research phase begins.

Second, future research should evaluate students' prior knowledge of economics. Although all participants in the intervention group were 1st-year students, some students reported that they had studied economics in China. Prior knowledge of economics could be used as an independent factor in the data analyses.

Third, the concept-mapping assignments were mandatory for the students who were in the intervention group. Future research should include students' willingness to use the concept-mapping strategy as a factor in the research design.

Fourth, future research should explore if students would apply the concept-mapping technique to learning in other subjects during the research phase. Due to the limitation about participants' learning fatigue, fifth, subsequent studies should require participants to complete a logbook recording their learning activities and degree of fatigue. This information would be used to investigate whether the degree of fatigue related to students' learning.

The current study expanded on the results of the Soleimani and Nabizadeh (2012) study. The results of the present study are not entirely in line with their research. One reason for the discrepancy can be that the current study was conducted in online classes. Sixth, because the current study was conducted in two online economics courses, there is a need to examine the effectiveness of the concept-mapping strategy in online classes to

reach more definitive conclusions for the future research. Seventh, the participants in the intervention group were all from China. Therefore, international students from other countries should be considered in future research. Eighth, the sample size was small for the current study; there were 26 participants in the intervention group and 25 participants in the comparison group. Future studies should employ larger sample size to gain more robust findings.

Ninth, future research could research instructors using their own concept maps with students to investigate whether using faculty-generated concept maps would facilitate students' learning.

Finally, future research should include courses beyond just economics.

Implications for Educational Practice

A Supreme Court case related to civil education rights, *Lau v. Nichols* (1974), assessed whether federally financed schools must provide complementary English language courses for ESL or EFL primary students. U.S. Supreme Court stated that when a child speaks only a foreign language, but not English, "sink or swim" instruction violates their civil educational rights. Sink or swim instruction is a metaphor to describe how ESL or EFL students thrown into a bottomless pool and are expected to learn to swim as quickly as possible. This description illustrates a dynamic in which international students either succeed through their efforts or fail without further support. The Court further pointed out that students who do not understand English are experiencing unmeaningful and incomprehensible learning processes in their classroom. The Court explicitly stated that educational institutions should provide support for ESL or EFL students' English deficiency.

Similarly, when international students leave their mother country and move to the US to pursue their academic goals with limited English proficiency, "sink or swim" instruction goes against their educational rights. The metaphor of "swim or sink" does not mean criticizing an educator as inattentive but rather reminding that non-English-speaking students should receive an equal education, especially in a classroom that comprises diverse populations.

The number of international students studying in U.S. colleges and universities is growing (Institution of International Education, 2016). Although the number continually increases, many universities report retention as a growing issue (Fischer, 2014; Holmes, 2016). To elaborate, the overall dropout rate for undergraduates is 40%. Ten percent of Asian students dropped out at 4-year institutions, and 35% of Asian students dropped out at 2-year colleges (Hanson, 2021). Hanson (2021) continued to report that 30% of the dropout rate comes from 1st-year college students dropping out before their sophomore year. Worth mentioning, most international students have met the English language proficiency requirement, such as a test of English as a foreign language (TOEFL) and the international English language testing system (IELTS) to the institutions. If these students' English proficiency is qualified to pursue their education in the US, what are the reasons contributing to the retention rate decrease? Perhaps the decreasing retention rate implies a dynamic in which international students either succeed through their efforts or fail without further support.

Novak (2008) underscored that education could be either liberating or oppressive. The concept-mapping method is committed to making education more liberating. Previous studies have indicated that utilizing the concept-map technique as an

intervention may improve meaningful learning, reading comprehension, academic performance, classroom participation, and learning motivation (Casteleyn et al., 2013; Evrekli et al., 2009; Fadillah et al., 2017; Wu & Chen, 2018). The results of this study apply to students, instructors, and organizations that consider utilizing the concept-mapping strategy as a central remedial tool. The concept-mapping strategy can be a possible solution to assist students' acquisition and support teachers in performing effectively.

The first measure in that direction is to provide effective note-taking methods and help students apply them to each course and specific self-learning processes. One reason contributing to the low academic performance among international students is using ineffective note-taking strategies (Morehead et al., 2019). The present study's findings revealed that although the participants in the intervention group were all 1st-year international students, their prior learning experience and English proficiency varied. International students, particularly those with low English proficiency, often feel overwhelmed in their 1st-month college course because they struggle with digesting and organizing the learning materials (Liu, 2016). Therefore, instructors and teaching assistants could find out who had prior knowledge of concept maps in the class and encourage them to use the concept-mapping strategy without providing the necessary learning or training. For those who do not have prior knowledge of the concept-mapping strategy, instructors and teaching assistants should teach students the concept-mapping strategy as a means to take notes effectively. The training guide can be found in Appendix I.

The second remedial measure is to have practitioners consider applying the

concept-mapping strategy as an alternative assessment method. International students are coming to study in English-dominant countries, even though they have a limited understanding of the U.S. classroom norms and expectations. Considerable differences in students' prior learning experience and language ability, obtained in a more traditional classroom environment, can generate assessment challenges for the instructor teaching domestic and international students in the same class. For example, Huang (2003) suggested that U.S. higher education institutions emphasize the importance of the critical and the argumentative-thinking writing style. Many Asian students, however, lack critical-thinking skills because they received rote teaching. Rote teaching and learning are based on memorization and repetition. The instructors could provide alternative assessment methods to evaluate students' academic performance to reduce educational inequality. For example, the teacher could include the concept map as an assignment. Compared with writing an essay, participants in the course can create a concept map to present their understanding of the conceptual framework, which reduces ESL or EFL students' language barrier. Novak (2003) stated that concept-map creation involves cognitive processes, and the map shows how students construct knowledge, while meaning is ascribed through a metacognitive process. Consequently, as students develop the concept maps, they learn meaningfully. The instructors evaluate learning outcomes by assessing the concept maps' effectiveness instead of concentrating on writing skills. Therefore, the instructors could incorporate the concept-mapping method as an assessment.

An implication of the present study for educational practice with 1st-year international students is the importance to persist in utilizing the concept-mapping

strategy to support acquisition processes across courses. Moreover, other students who do not apply the concept-mapping strategy for studying should reconsider using it as a learning strategy. Future international students should have a flexible mindset and learn a new approach to adapt to the new learning environment. In the present study, by applying the concept-mapping strategy in an online economics course, students improved their learning motivation, reading comprehension, and classroom participation, leading to overcoming many learning obstacles.

From an institutional standpoint, an implication for educational practice is to promote the concept-mapping strategy to faculty members to support international students' academic proficiency across courses. Although the number of international students studying in the US is growing continually, university instructors are not trained in ESL methodologies. They may lack the expertise to adjust their instruction to serve ESL learners (Baker, 2016). As international students reflected on their prior learning experiences in more traditional classrooms, they revealed common learning challenges.

Novak and Gowin (1984) claimed that the concept-mapping method is a simple but powerful strategy that assists instructors in organizing learning materials and students in processing information clearer. As a start, the organization should implement concept-mapping training sessions for the faculty. Teachers can learn how to integrate the concept-mapping strategy in their instruction. Using the concept-mapping strategy to assess students' learning produce an opportunity for meaningful learning. Instructors could use 5 to 10 minutes before the class is dismissed for asking students to generate a concept map regarding the lecture. The instructor gives a chance to help students to recall the points related to the learning materials, reflect on learning goals, and identify the

vague concepts via a concept-map creation. As several students in the current study reflected, “the concept maps explain why a picture is worth a thousand words. Concept maps convey meaning more effectively and straightforward than a verbal explanation.” Once students use the concept-mapping strategy as a blueprint for studying, they may improve their learning comprehension. More teacher training information can be found using the following link: <https://cmap.ihmc.us/docs/learn.php>.

Some participants claimed that a concept map presented limited information, which was another concern regarding the viability and applicability of this method. Novak (2006) suggested a concept-map software called the CampTools to empower concept-map development to solve the issues. The software allows the learners to combine images, graphs, tables, and clips in a concept map via a copy-and-paste procedure. For example, students could display the Supply and Demand Model as icons underneath the main concept. By using CampTools, students maximize the possibility to visualize their understanding of the learning material.

Afterword

When international students embark on their US educational quests, they leave behind everything: family, culture, and privilege. Their pursuit incorporates past, future, and expectations from the family and themselves. Nevertheless, these students embrace the host country and want to be high achievers. Whereas the adoptive country presents fresh possibilities, is the education system conducive to achieving these goals? Do the educational institutions provide sufficient supporting resources to allow international students to overcome these inherent challenges? Does the teacher create an equal opportunity for learning and evaluating educational outcomes? Colin (2016) defined

several essential, effective-teaching factors: maximizing equality of learning possibility, empowering students to interact meaningfully with other English speakers, and eradicating social and racial barriers. Most importantly, the teacher should be sensitive to students who have learning challenges. The researcher does not advocate that the concept-mapping strategy is a magic remedy to eliminate international students' learning problems and flaws in teaching practices. Rather, the researcher suggests an opportunity to encourage educational organizations to consider supplying equitable educational resources for international students. Schools should give adequate educational resources to international students and focus on remedial justice to ensure that international students can succeed in their programs. Furthermore, the study provides an opportunity for practitioners to reflect on their syllabus and curriculum. Due to cultural differences effecting students' academic performance, applying the academic criteria of mainstream students to international students may limit international students' academic performance. Teachers should reflect on their syllabus and curriculum design to provide international students equitable and unbiased learning opportunities and assessments.

The most substantial predictor of success in completing the program, unsurprisingly, is academic performance. Consequently, this study supplies a possible solution for international students to overcome their learning barriers. To be successful is an individual's obligation, and the instructor and the organization should share the responsibility. Educational justice involves striving to nurture international students' dreams by providing equal opportunities for all students. A glance at the international students' retention rate reveals that there is still room for improving education justice at the college level in the US.

References

- Akinoglu, O., & Yasar, Z. (2007). The effects of note taking in science education through the mind mapping technique on students' attitudes, academic achievement, and concept Learning. *Journal of Baltic Science Education*, 6(3), 34–43.
- Ameliana, I. (2017). Teacher-centered or student-centered learning approach to promote learning? *Jurnal Sosial Humaniora*, 10(2), 59–70. <https://doi.org/10.12962/j24433527.v10i2.2161>
- Andoko, B. S., Hayashi, Y., Hirashima, T., & Asri, A. N. (2020). Improving English reading for EFL readers with reviewing kit-build concept map. *Research & Practice in Technology Enhanced Learning*, 15(1), 1–19. <https://doi.org/10.1186/s41039-020-00126-8>
- Andrade, M. S. (2006). International students in English-speaking universities: Adjustment factors. *Journal of Research in International Education*, 5(2), 131–154. <https://doi.org/10.1177/1475240906065589>
- Ausubel, D. P. (1963). *The psychology of meaningful verbal learning*. Oxford, England: Oxford.
- Beitz, J. M. (1998). Concept mapping: Navigating the learning process. *Nurse Educator*, 23(5), 35–41. <https://doi.org/10.1097/00006223-199809000-00015>
- Birch, B. M. (2002). *English L2 reading: Getting to the bottom* (2nd ed.). Lawrence Erlbaum Associates Publishers.
- Browne MW, Cudeck R. (1993). Alternative Ways of Assessing Model Fit. *Sociological Methods & Research*, 21(2):230-258. <https://doi.org/10.1177/0049124192021002005>
- Byrne, B. M. (2001). *Multivariate applications book series. Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Lawrence Erlbaum Associates Publishers.
- Burdina, M. (2015). Rethinking the use of concept maps in introductory economics courses. *Journal of Economics and Economic Education Research*, 16(1), 31.
- Butcher, K. R. (2006). Learning from text with diagrams: Promoting mental model development and inference generation. *Journal of Educational Psychology*, 98(1), 182–197.
- Cardellini, L. (2004). Conceiving of concept maps to foster meaningful learning: An interview with Joseph D. Novak. *Journal of Chemical Education*, 81, 1303-

1308. <https://doi.org/10.1021/ed081p1303>

- Carspecken, P. F. (1996). *Critical ethnography in educational research: A theoretical and practical guide*. New York: Routledge.
- Casteleyn, J., Mottart, A., & Valcke, M. (2013). The impact of graphic organizers on learning from presentations. *Technology, Pedagogy and Education, 22*, 283–301. <https://doi.org/10.1080/1475939X.2013.784621>
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles: Sage.
- Celce-Murcia, M., In Brinton, D., & In Snow, M. A. (2014). *Teaching English as a second or foreign language*. Boston: National Geographic Learning.
- Cheng, R., & Erben, A. (2012). Language anxiety: Experiences of Chinese graduate students at U.S. higher institutions. *Journal of Studies in International Education, 16*, 477–497. <https://doi.org/10.1177/1028315311421841>
- Ching, Y., Renes, S. L., McMurrow, S., Simpson, J., & Strange, A. T. (2017). Challenges facing Chinese international students studying in the United States. *Educational Research and Reviews, 12*, 473–482.
- Chung, I. F., & Huang, Y. C. (2009). The implementation of communicative language teaching: An investigation of students' viewpoints. *Asia-Pacific Education Researcher, 18*(1), 67–78.
- Entwistle, N. (2000) Promoting deep learning through teaching and assessment: Conceptual frameworks and educational contexts. 1st Annual Conference ESRC Teaching and Learning Research Programme (TLRP), University of Leicester, November 2000.
- Evrekli, E., Balim, A. G., & İnel, D. (2009). *Mind mapping applications in special teaching methods courses for science teacher candidates and teacher candidates' opinions concerning the applications*. <https://doi.org/10.1016/j.sbspro.2009.01.400>
- Fadillah, A., Dewi, N. P. L. C., Ridho, D., Majid, A. N., & Prastiwi, M. N. B. (2017). *The effect of application of contextual teaching and learning (CTL) model-based on lesson study with mind mapping media to assess student learning outcomes on chemistry on colloid systems*. <https://doi.org/10.20961/ijsascs.v1i2.5128>
- Fischer, K. (2014, June 6). Retention Is a Growing Issue as More International Students Come to U.S. *The Chronicle of Higher Education, 60*(38).

- Hanewald, R. (2012). Cultivating life-long learning skills in undergraduate students through the collaborative creation of digital knowledge maps. *Procedia - Social and Behavioral Sciences*, 69, 847–853. <https://doi.org/10.1016/j.sbspro.2012.12.007>
- Hanson, M. (2021, September 14). College Dropout Rates. Retrieved November 01, 2021, from <https://educationdata.org/college-dropout-rates>
- Heng, T. T. (2016). Different is not deficient: Contradicting stereotypes of Chinese international students in US higher education. *Studies in Higher Education*, 43(1), 1-15. <https://doi.org/10.1080/03075079.2016.1152466>
- Hu, L.T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Huang, Y. (2012). Transitioning challenges faced by Chinese graduate students. *Adult Learning*, 23(3), 138–147. <https://doi.org/10.1177/1045159512452861>
- International student's enrollment trends. (2016). Retrieved November 07, 2020, from <https://opendoorsdata.org/data/international-students/enrollment-trends/>
- Internationalization. (2020). Retrieved November 07, 2020, from <https://www.natcom.org/academic-professional-resources/internationalization>
- Jiang, X., Yang, X., & Zhou, Y. (2017). Chinese international students' perceptions of their language issues in U.S. universities: A comparative study. *Journal of Interdisciplinary Studies in Education*, 6(1), 63–80.
- Jones, B. D. (2009). Motivating students to engage in learning: The MUSIC Model of Academic Motivation. *International Journal of Teaching and Learning in Higher Education*, 21(2), 272-285.
- Jones, B. D., & Skaggs, G. (2016). Measuring Students' Motivation: Validity Evidence for the MUSIC Model of Academic Motivation Inventory. *International Journal for the Scholarship of Teaching & Learning*, 10(1), 1–9. <https://doi.org/10.20429/ijstl.2016.100107>
- Jones, B. D., Li, M., & Cruz, J. M. (2017). A cross-cultural validation of the MUSIC® Model of Academic Motivation Inventory: Evidence from Chinese- and Spanish- speaking university students. *International Journal of Educational Psychology*, 6(1), 366-385. <https://doi.org/10.17583/ijep.2017.2357>
- Kern, C. S., Bush, K. L., & McCleish, J. M. (2006). Mind-mapped care plans: Integrating an innovative educational tool as an alternative to traditional care

plans. *Journal of Nursing Education*, 45(4), 112–119.

Killorin, M. (2019). 6 Best Reasons to Study in the U.S. Retrieved November 07, 2020, from <https://www.usnewsglobaleducation.com/all-advice/6-best-reasons-to-study-in-the-u-s/>

Kline, R. B. (2005). *Methodology in the social sciences. Principles and practice of structural equation modeling (2nd ed.)*. Guilford Press.

Lau v. Nichols. (1974). *Oyez*. Retrieved November 1, 2021, from <https://www.oyez.org/cases/1973/72-6520>

Liu, P. L., Chen, C. J., & Chang, Y. J. (2010). Effects of a computer-assisted concept mapping learning strategy on EFL college students' English reading comprehension. *Computers & Education*, 54(2), 436–445. <https://doi.org/10.1016/j.compedu.2009.08.027>

Marangos, J. (2003). The Effectiveness of Concept Maps in Introductory Microeconomics. *Economic Papers*, 22(4), 74–82. <https://doi.org/10.1111/j.1759-3441.2003.tb01135.x>

Marangos, J., & Alley, S. (2007). Effectiveness of concept maps in economics: Evidence from Australia and USA. *Learning and Individual Differences*, 17(2), 193–199. <https://doi.org/10.1016/j.lindif.2007.03.003>

Mayer, R. E. (2002). Rote versus meaningful learning. *Theory Into Practice*, 41, 226–232. https://doi.org/10.1207/s15430421tip4104_4

Marzetta, K., Mason, H., & Wee, B. (2018). “Sometimes they are fun and sometimes they are not”: Concept mapping with English Language Acquisition (ELA) and gifted/talented (GT) elementary students learning science and sustainability. *Education Sciences*, 8(1), 1-12.

McMurray, J. (2014). Rubric for assessing concept maps. University of Waterloo, California, available in <https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/assessing-student-work/grading-and-feedback/rubric-assessing-concept-maps>.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook (2nd ed.)*. Sage Publications, Inc.

Mueller, A., Johnston, M., Bligh, D., & Wilkinson, J. (2002). Joining mind mapping and care planning to enhance student critical thinking and achieve holistic nursing Care. *Nursing Diagnosis*, 13(1), 24–27.

Novak, J. D. (2002). Meaningful learning: The essential factor for conceptual change in limited or inappropriate propositional hierarchies leading to empowerment

of learners. *Science Education*, 86, 548–571. <https://doi.org/10.1002/sce.10032>

Novak, J. D., & Cañas, A. J. (2006). *The Theory Underlying Concept Maps and How to Construct and Use Them*. Institute for Human and Machine Cognition. <https://cmap.ihmc.us/docs/theory-of-concept-maps>

Piaget, J., & Cook, M. (1952). *The Origins of Intelligence in children*. W.W. Norton & Co.

Rassaei, E. (2019). Effects of two forms of concept mapping on L2 reading comprehension and strategy awareness, *Applied Linguistics Review*, 10(2), 93–116. <https://doi.org/10.1515/applirev-2017-0006>

Sawant, S., & Rizvi, S. (2015). International Journal of Anatomy and Research. Retrieved November, 2020, from <http://www.ijmhr.org/ijar.3.3/IJAR.2015.147.html>

Schaal, S., Bogner, F., & Girwidz, R. (2010). Concept mapping assessment of media assisted learning in interdisciplinary science education. *Research in Science Education*, 40, 339–352. <https://doi.org/10.1007/s11165-009-9123-3>

Serin, H. (2018). *A Comparison of Teacher-Centered and Student-Centered Approaches in Educational Settings*. <https://doi.org/10.23918/ijsses.v5i1p164>

Soleimani, H., & Nabizadeh, F. (2012). The Effect of Learner Constructed, Fill in the Map Concept Map Technique, and Summarizing Strategy on Iranian Pre-University Students' Reading Comprehension. *English Language Teaching*, 5(9), 78–87.

Valdez, G. (2015). U.S. Higher Education Classroom Experiences of Undergraduate Chinese International Students. *Journal of International Students*, 5(2), 188–200.

Wolf, D. M., & Linh Phung. (2019). Studying in the United States: Language Learning Challenges, Strategies, and Support Services. *Journal of International Students*, 9(1), 211–224. <https://doi.org/10.32674/jis.v9i1.273>

Wecher, M. (2017) How to Retain International Students. Retrieved December, 2020, from https://www.nafsa.org/sites/default/files/ektron/files/underscore/ie_julaug17_affairs.pdf

West, D. C., Park, J. K., Pomeroy, J. R., & Sandoval J., (2002). Concept mapping assessment in medical education: a comparison of two scoring systems. *Medical Education*, 36(9), 820–826. <https://doi.org/10.1046/j.1365-2923.2002.01292.x>

- Wong S. W. (2018). *The effects of concept mapping in student nurses' learning of medical-surgical nursing*. <https://doi.org/10.17638/03027950>
- Wu, T. T., & Chen, A. C. (2018). Combining e-books with mind mapping in a reciprocal teaching strategy for a classical Chinese course. *Computers & Education, 116*, 64–80. <https://doi.org/10.1016/j.compedu.2017.08.012>
- Yamagata, S. (2018). Comparing core-image-based basic verb learning in an EFL junior high school: Learner-centered and teacher-centered approaches. *Language Teaching Research, 22*(1), 65–93. <https://doi.org/10.1177/1362168816659784>
- Yeh, C. J., & Inman, A. G. (2007). Qualitative Data Analysis and Interpretation in Counseling Psychology: Strategies for Best Practices. *Counseling Psychologist, 35*(3), 369–403.

APPENDIXES

Appendix A

A Modified MUSIC Inventory

A modified MUSIC Inventory

Instructions

There is no right or wrong answer that our answer to the question in this questionnaire. We are interested in your opinion. Please answer the questions in this questionnaire honestly. Your answers will be kept confidential, and they will not be used as part of the final grade assessment for this course. All questions are referred to your 2020Fall Economic course.

Please rate the items in this section using the following scale:

1	2	3	4	5	6
Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree

Note that the word “coursework” refers to anything that you did in the course, including assignments, activities, readings, etc.

- _____ 1. The coursework held my attention.
- _____ 2. In general, the coursework was useful to me.
- _____ 3. The coursework was beneficial to me.
- _____ 4. The instructional methods used in this course held my attention.
- _____ 5. I was confident that I could succeed in the coursework.
- _____ 6. I enjoyed the instructional methods used in this course.
- _____ 7. I felt that I could be successful in meeting the academic challenges in this course.
- _____ 8. The instructional methods engaged me in the course.
- _____ 9. I enjoyed completing the coursework.
- _____ 10. I was capable of getting a high grade in this course.
- _____ 11. The coursework was interesting to me.
- _____ 12. Throughout the course, I felt that I could be successful on the coursework.
- _____ 13. I found the coursework to be relevant to my future.
- _____ 14. I will be able to use the knowledge I gained in this course.
- _____ 15. The knowledge I gained in this course is important for my future.

Copyright © 2017 Brett D. Jones. All rights reserved. MUSIC is a registered trademark of Brett D. Jones.

Jones, B. D. (2017, December). User guide for assessing the components of the MUSIC® Model of Motivation.

Retrieved from <http://www.theMUSICmodel.com>

MUSIC 學業動機問卷大學學生繁體中文修訂版

你對本調查卷中問題的回答，答案沒有對錯之分。我們感興趣的是你的觀點。請誠實回答本問卷的問題。你的答案將會保密，它們不會被用來作為本課程期末成績評判的一部分。所有問題中所提到的“課程”是指你的 2020 秋季經濟學這門課。

請用以下量表來回答問卷問題。

1 非常不同意	2 不同意	3 稍微不同意	4 稍微同意	5 同意	6 非常同意
------------	----------	------------	-----------	---------	-----------

請注意：這裡“這門課”一詞，指該門課程中所做的任何事情，包括作業、活動、閱讀資料等等。

- _____ 1. 這門課抓住我的注意力。
- _____ 2. 總體來說，這門課對我是有用的。
- _____ 3. 我從這門課中受益。
- _____ 4. 這門課的教學方法能吸引我的注意力。
- _____ 5. 我有信心在這門課中取得成功。
- _____ 6. 我很喜愛這門課程中的教學方法。
- _____ 7. 我感覺我能夠成功地達到這門課的學業目標。
- _____ 8. 這門課的教學方法讓我積極參與其中。
- _____ 9. 我很開心去完成該課程各項作業。
- _____ 10. 我有能力在這門課程中獲得高分。
- _____ 11. 這門課對我來講很有趣。
- _____ 12. 總觀整個課程，我已經覺得我能在這門課中取得成功。
- _____ 13. 我發現這門課和我的未來密切相關。
- _____ 14. 我將來能夠運用我在這門課中所學到的知識。
- _____ 15. 這門課學到的知識對我的未來很重要。

Copyright © 2017 Brett D. Jones. All rights reserved. MUSIC is a registered trademark of Brett D. Jones.

Jones, B. D. (2017, December). User guide for assessing the components of the MUSIC® Model of Motivation. Retrieved from <http://www.theMUSICmodel.com>.

Appendix B

Online Interview Questions

Online Interview: Participants' Perceptions of Using Concept-Mapping Strategy

Instructions

There is no right or wrong answer that our answer to the question in this interview. We are interested in your opinion. Please answer the questions honestly. Your answers will be kept confidential, and they will not be used as part of the final grade assessment for this course.

Opening questions

How's your day?

Content questions

1. In general, do you think the Concept-Mapping method is useful to you?

Why was it useful? Or why was it not useful?

2. Do you think the Concept-Mapping method helps you to participate in the course activities? Why do you think the Concept-Mapping method helps you to participate in the course activities?? Or why don't you think the Concept-Mapping method helps you to participate in the course activities?

3. Would you use this method in other courses in the future? If yes, how would you use this method in other courses in the future?

Closing instruction

Thanks for meeting with me. Our conversation is confidential. If you have further questions or concerns, please feel free to contact me. Here is my email address: ychiang13@usfca.edu

線上訪問: 受試者對於心智圖的使用經驗 (繁體中文版)

開場

你對本調查問卷中問題的回答，答案沒有對錯之分。我們感興趣的是你的觀點。請誠實回答本問卷的問題。你的答案將會保密，它們不會被用來作為本課程期末成績評判的一部分。

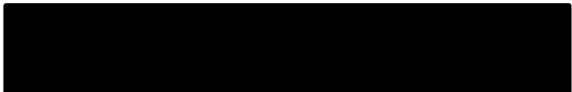
開場問題

你今天過的怎麼樣呢？

主要問題

1. 總體來說,心智圖方法對你是有用的嗎？為什麼？或為什麼不呢？
2. 你覺得心智圖這個方法讓你協助你參與課程活動嗎？為什麼？或為什麼不呢？
3. 你將來會在別的課程中使用心智圖方法嗎？為什麼呢？或為什麼不呢？

結尾

謝謝你今天和我見面。我們的談話是保密的。如果你之後有任何問題或疑慮的話，請不用客氣和我聯繫。這是我的郵箱地址 

Appendix C

Student's Letter of Consent

CONSENT FORM FOR RESEARCH PARTICIPATION (English Version)

Study Title:

The Effects of the Concept-Mapping Method on International Students' Learning and Perceptions

Student Researcher: Yinghung Natalie Chiang

I am a doctoral student at the [REDACTED]. I am planning to conduct a research project and I would like to invite you to take part in my study. This form has important information about the rationale for doing this study, what I will ask you to do if you decide to be in this study, and the way I would like to use information about you if you choose to be in the study. The information that you provide will be anonymous.

Why are you invited to this study?

The purpose of this research is to examine the effects of the Concept-Mapping method on the learning and the perceptions of international students who are studying at US universities.

What will I do if I choose to be in this study?

You will be asked to fill in an online questionnaire including feedback on the implications of the course instruction.

The participants will authorize the Economics Department of USF to release the following records with the Researcher:

- Quiz grades
- Midterm grades
- Final exam grades
- Concept map assignments

If you are in Econ 111-09, you will have a twenty-minute online interview regarding concept-mapping method using experience.

Study time: The ten minutes online survey will be conducted before the end of the semester. At the end of the semester, the Researcher will collect the students' quiz grades, midterm grades, final exam grades, online survey results and concept map assignments from the instructor.

Study location: All study procedures will take place at Economics 111-09 and 111-04 online class.

What are the possible risks or discomforts?

Your participation in this study does not involve any physical or emotional risk to you, beyond that of everyday life.

What are the possible benefits for me or others?

By the end of the semester, students should benefit from improved learning using Concept-Mapping method.

How will the Researcher protect the information collected from you, and how will that information be shared?

Results of this study may be used in publications and presentations. Your data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally-identifiable information will not be used. To minimize the risks to confidentiality, I will be coding your name and limiting access to study records. I may share the data I collect from you for use in future research studies. - if I share the data that I collect about you, I will remove any information that could identify you before I share it.

Financial Information

Participation in this study will involve no cost to you. You will not be paid for participating in this study.

What are my rights as a research participant?

Participation in this study is voluntary. You do not have to answer any question you do not want to answer. If you decide to participate in this study, the participation will not affect your grade in the course. Who can I contact if I have questions or concerns about this research study?

If you have questions, you are free to ask me now. If you have questions later, you may contact the Researcher, Yinghung Chiang, at [REDACTED]

If you have any questions about your rights as a participant in this research study, you can contact the following office at the [REDACTED]

Institutional Review Board for the Protection of Human Subjects (IRBPHS)

Email: [REDACTED]

Consent

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told who to contact. I agree to participate in the research study described above.

_____ I agree to participate in this study.

_____ I do not agree to participate in this study.

_____ Participant's Chinese Name (printed)

_____ Participant's English Name (printed)

_____ Participant's Signature

_____ Date

研究參與者同意書 (中文版)

研究計畫題目:
心智圖對國際學生學習及認知的影響

計畫主持人: 江映紅

您好。我是江映紅，我現在是 ██████████ 教育學院博士生。我在此邀請您參加本研究。這份研究參與者同意書 (以下簡稱本同意書)主要是要向您充分的說明有關本研究的相關資訊，以便於您決定是否要參加本研究。若您決定參加本研究，我將會收集及分析您所提供的資料。您所提供的資料將會是匿名的。

為什麼你會被邀請您參加本研究？

本研究目的在探討心智圖對國際學生學習及認知的影響

如果我選擇參加本研究，我要做些什麼？

- 你將被要求回答一份網路問卷，這份問卷是關於課程的反饋。
- 你將被要求授權 ██████████ 經濟學系分享你以下成績給研究人員：
 - 小考成績
 - 期中成績
 - 期末成績
 - 心智圖作業

如果你是 Econ-09 的學生，你將會有一個長達二十分鐘關於心智圖使用經驗的線上訪問。

研究時程：

在學期末前有一個十分鐘的網路問卷調查。研究人員會在學期末收集小考，期中考，期末考考試成績，網路問卷結果和心智圖作業。

研究地點：本研究將會在 經濟學 111-09 和的 11-04 網路課程進行。

參與本研究可能對您帶來可能的風險？

參與本研究不會對您的生活或未來帶來任何生理或心理的風險。

參與本研究對您或其他人之可能利益？

在學期結束時，你應該會因為學習心智圖方法，而克服了學習挑戰。

研究人員如何保護及分享您的資料？

研究結果也許會被發表於學術期刊或學術研討會。本研究將依法把任何可辨識您身分之紀錄與您的個人隱私資料視為機密來處理，不會公開，也不會向與本研究無關的人員透露。此外，為了確保機密性，我將把您的姓名編碼 並設定察看研究資料的限權。我可能會分享從您那裡收集的數據，以用於將來的研究。如果我分享從你那裡收集到的有關您的數據，我會在分享之前，刪除所有可以識別您身份的信息。

費用及津貼資訊

您不需要支付任何費用參加本研究，同時，您也不會得到任何形式的補貼。

研究參與者應有的權利

參與本研究是自願行為。如果您有任何不想回答的問題，您可以選擇不回答。如果您決定參與本研究，您的參與將不會影響到您本課程的成績。

如果我對本研究及研究參與者的權益有任何疑慮和申訴時，我該聯繫誰？

若您在閱讀本同意書或參與本研究的過程中，對於本研究仍有任何的疑問，歡迎您立即向計畫主持人或相關研究人員提出來，我們將為您做詳細的說明和回答。之後，如果您有任何疑問，歡迎您聯繫學生計畫主持人：江映紅。聯絡電話：[REDACTED] 電郵：

[REDACTED]。

如果你對於參與本研究有任何權益上的疑問，請聯繫以下辦公室：

[REDACTED]

同意簽章

研究參與者已詳細瞭解上述研究方法及其所可能產生的危險與利益，有關本研究計畫的疑問，業經計畫主持人或指定研究說明者詳細予以解釋。如果我有進一步的問題，我也被告知我該聯繫何單位。本人同意。接受為此研究計畫的自願研究參與者

_____ 我願意參與此研究。

_____ 我不願意參與此研究。

研究參與者正楷姓名（中文）： _____ 研究參與者正楷姓名（英文）： _____

簽名： _____

簽署日期：西元 _____ 年 _____ 月 _____ 日

Appendix D

Letter to Department Chair

Aug 24, 2020

Dear Chair [REDACTED]

How are you?

As a doctoral candidate at the [REDACTED] requesting the consent to research an ECON 111-09 and 111-04 class during the Fall semester of 2020. Econ 111-09 student will apply a note-taking strategy called concept map to align the course work. Econ 111-04 students will not have any changes to the course instruction.

I will receive students' quiz grades, midterm grades, final grades, and concept map assignments from the instructor. Students will be asked to participate in an online survey (both classes) and an online interview (only 111-09) before the end of the semester. The survey is about students' perceptions of using concept map strategy. These instructions and concept maps are part of the regular coursework, but students may opt-out via a consent letter should they not want their data included in the study.

Their participation will be voluntary. Their information will be anonymous. All information will be kept in the iCloud with a set of passwords. I will obtain Institutional Research Board Consent from [REDACTED] for this project. I hope you will give your consent to conduct this research project.

Thank you for your time and consideration.

Sincerely,

Yinghung Chiang

[REDACTED]

Department Chair's Consent for Research

My signature below indicates that I acknowledge and authorize Yinghung Chiang to conduct a research project in the Economic 111-09 and 111-04 classes during the Fall Semester of 2020. I am aware that the researcher will collect students' quiz grades, midterm grades, final exam grades, and concept map assignments at the end of the semester who consent to participate in the study. At the end of the semester, the researcher will ask both classes of students to participate in a ten-minute online survey. The researcher will ask 111-09 students to volunteer for a twenty minutes interview regarding students' perceptions of using concept-mapping. All of these instructions and concept maps are part of the regular coursework, but students may opt-out via a consent letter if they do not want their data included in the study.



Name

Title



Signature

Date

Appendix E

Instructor's Letter of Consent

Aug 24, 2020

Dear Prof. [REDACTED]

How are you?

As a doctoral candidate at the [REDACTED] I am formally requesting the consent to research an ECON 111-09 and 111-04 class during the Fall semester of 2020. Econ 111-09 student will apply a note-taking strategy called concept map to align the course work. Econ 111-04 students will not have any changes to the course instruction.

I will receive students' quiz grades, midterm grades, final grades, and concept map assignments from the instructor. Students will be asked to participate in an online survey (both classes) and an online interview (only 111-09) before the end of the semester. The survey is about students' perceptions of using concept map strategy. These instructions and concept maps are part of the regular coursework, but students may opt-out via a consent letter should they not want their data included in the study.

Their participation will be voluntary. Their information will be anonymous. All information will be kept in the iCloud with a set of passwords. I will obtain Institutional Research Board Consent from the [REDACTED] for this project. I hope you will give your consent to conduct this research project.

Thank you for your time and consideration.

Sincerely,

Yinghung Chiang

[REDACTED]


Instructor's Consent for Research

My signature below indicates that I acknowledge and authorize Yinghung Chiang to conduct a research project in the Economic 111-09 and 111-04 classes during the Fall Semester of 2020. I am aware that the researcher will collect students' quiz grades, midterm grades, final exam grades, and concept map assignments at the end of the semester who consent to participant in the study. At the end of the semester, the researcher will ask both classes of students to participate in a ten-minute online survey. The researcher will ask 111-09 students to volunteer for a twenty minutes interview regarding students' perceptions of using concept-mapping. All of these instructions and concept maps are part of the regular coursework, but students may opt-out via a consent letter if they do not want their data included in the study.



Name

Title



Signature

Date

Appendix F

A Native Chinese Speaker Confirmation Letter

Confirmation Letter

I am a native Chinese speaker and a Chinese conversation tutor at the [REDACTED]
[REDACTED]. I have reviewed the Mandarin translation of the consent form and found it to
be accurate.

Signature [REDACTED]

Appendix G

A Script for the Survey

A script for the survey

Hello Class, I am Yinghung Chiang is a doctoral student at [REDACTED] [REDACTED] I am planning to conduct a research project, and I would like to invite you to take part in her study. You will receive an online survey link that contains the two consent forms (one is the English version, and one is Chinese version), the questionnaire, and a reading. The consent form has essential information about the rationale for doing this study, what I will ask you to do if you decide to be in this study, and the way the Researcher would like to use information about you if you choose to be in the study. The information that you provide will be anonymous. (Next part, I will read aloud the student consent form (English version/Appendix B) for the whole class.) If you would like to participate in this research, you need to type your name on the end of consent form. Then you can begin filling out the questionnaire. You will take approximately 10 minutes to complete the survey. If you do not want to participate, you will be directed to read the reading while everyone else is filling out the questionnaire. When you complete the questionnaire, press submit button, you may close the survey window. If there are any questions, please let me know. (After 10 minutes, I will check if anyone needs more time.) When everyone is finished, please close the survey window. Thank you for your time and participation.

Appendix H

A Concept Map Scoring Rubric

Concept-Map Scoring Rubric, Definitions, and Weighted Scores

<i>Concept map element</i>	<i>Excellent (5 points)</i>	<i>Good (4 points)</i>	<i>Acceptable (3 points)</i>	<i>Unacceptable (0-2 points)</i>
Breadth of net	Map includes the important concepts and describes domain on multiple levels	Map includes most important concepts; describes domain on limited number of levels	Important concepts missing and/or describes domain on only one level	Map includes minimum concepts with many important concepts missing
Embeddedness and inter-connectedness	All concepts interlinked with several other concepts	Most concepts interlinked with other concepts	Several concepts linked to other concepts	Few concepts linked to other concepts
Use of descriptive links	Links succinctly and accurately describe all relationships	Links are descriptive and valid for most relationships	Some links unclear or vague; some invalid or unclear	Links are vague; show inconsistent relationships
Efficient links	Each link type is distinct from all others, clearly describes relationship; used consistently	Most links are distinct from others; discriminate concepts; present variety of relationships; used fairly consistently	Several links are synonymous; don't discriminate concepts well; don't show a variety of relationships; used inconsistently	Most links synonymous or vaguely describe relationships and aren't distinct from other links
Layout	Map is contained in a single page, has multiple clear hierarchies, is well laid out and provides a sufficient number of relevant examples with links	Map is contained in a single page, has several clear hierarchies, is fairly well laid out and provides a sufficient number of fairly relevant examples with links	Map is not contained in a single page, has unclear hierarchies, is poorly laid out and provides some fairly relevant examples with links	Map is not contained in a single page, is confusing to read with no hierarchical organization

Appendix I

Instructor training material

Introduce Concept Mapping Method

Natalie Chiang
Doctoral Candidate of Education
University of San Francisco


1

What is Concept-Mapping method/Mind-Mapping method (心智圖) ?

2

What is Mind mapping/Concept mapping?

It is a simple technique for drawing information in diagrams, instead of writing it in sentences.



3

Why use Mind mapping/Concept mapping?



Source: <http://www.mindomo.com/dashboard>

4

Research evidences

1. Mind mapping supported inference generation and decreased comprehension errors . Butcher, K. R. (2006).
2. The learners who use mind mapping have higher attitude toward the behavior, perceived usefulness and intrinsic motivation. Casaleyn, J., Motiart, A., & Valcke, M. (2013).
3. The results indicated that mind mapping helped participants increase their life-long learning skills such as problem-solving, negotiation, communication and team working skills. Hanewald, R. (2012).

5

Why use Mind Mapping?

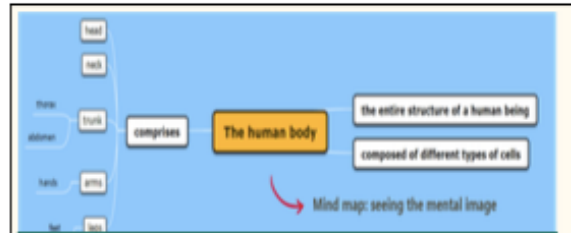
- A concept map has a clear and simple structure.
- All the information in a branch is related to each other.
- A concept map outlines the ideas and information.

6

The human body is the entire structure of a human being. It is composed of many different types of cells that together create tissues. It comprises a head, neck, trunk (which includes the thorax and abdomen), arms and hands, legs and feet.

Now close your eyes please.
Try to reflect how many information you remember from the passage.

7



Now close your eyes please.
Try to reflect how many information you remember from the diagram.

8



9



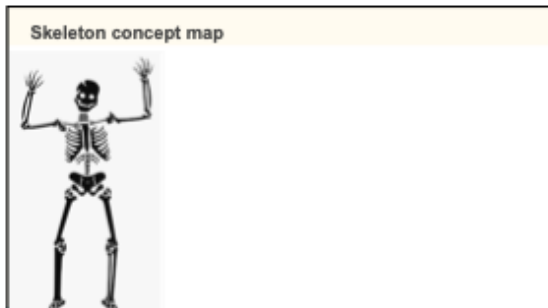
10



11



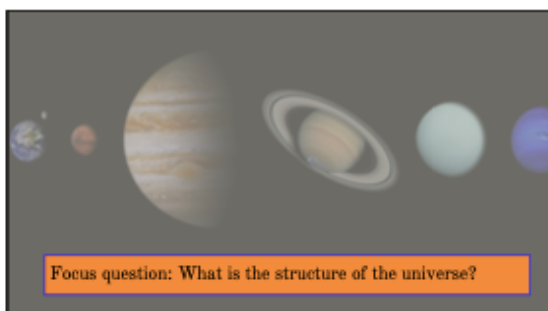
12



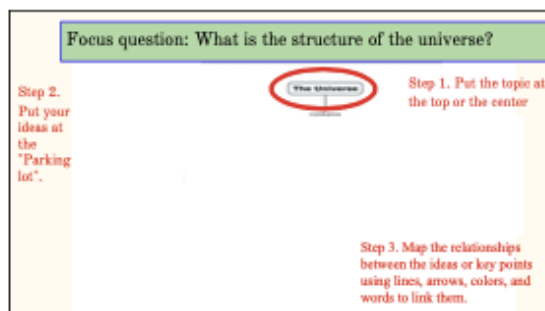
13



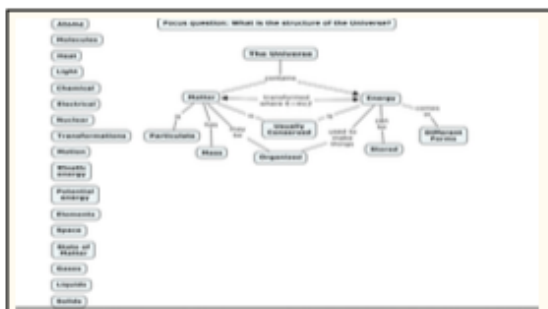
14



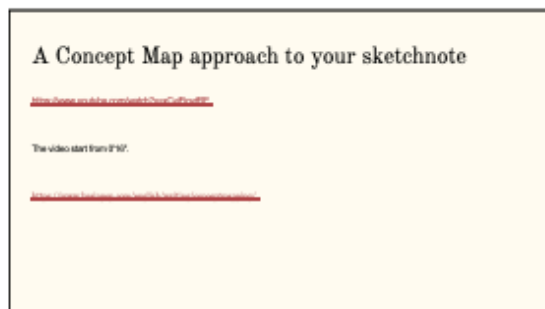
15



16



17



18

American Diners

A diner is a special kind of American restaurant. Diners are casual restaurants that serve American food. They are popular, and are often open very late. Diners are usually visited by travelers, truck drivers, employees and people who enjoy typical American food. Most diners have a stainless-steel exterior. The insides have booths and stools with counters. When diners were first started in 1872, they were small. They would first be made and then shipped to the owners. Today, there are many kinds of diners. Some are small; others are very large. A few are quite famous. Some diners do not even look like diners anymore! However, you can still tell a diner by its menu.

19

Create a concept map organizing your understanding of the reading

Step 1: Brainstorm

Step 2: Organization

Step 3: Final map

1. Write the topic in the center of a blank page.

1. Concept Parking Lot

Use colors, pictures, words, and symbols to record any ideas, topics, researchers, or theories that are associated with the topic. You can place these anywhere on the page. Associate freely and do not filter out ideas at this point; anything and everything is okay.

3. Map the relationships between the ideas or key points using lines, arrows, colors, and words to link them.

3. Identify the type of relationship between ideas or points, such as: contrasts, similarities, cause and effect. Write these relationships along the linking lines.

5. Once you are comfortable with the associations and organization in your brainstorm, then use the ideas that you have developed to draw out your final concept map.

20



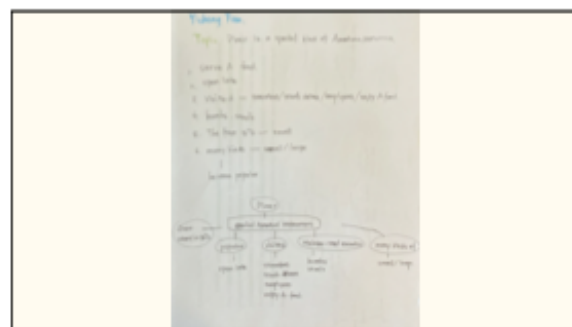
21



22



23



24

Appendix J

A reading material of concept mapping

Constructing Good Concept Maps

In learning to construct a concept map, it is important to begin with a domain of knowledge that is very familiar to the person constructing the map. Since concept map structures are dependent on the context in which they will be used, it is best to identify a segment of a text, a laboratory or field activity, or a particular problem or question that one is trying to understand. This creates a *context* that will help to determine the hierarchical structure of the concept map. It is also helpful to select a limited domain of knowledge for the first concept maps.

A good way to define the context for a concept map is to construct a *Focus Question*, that is, a question that clearly specifies the problem or issue the concept map should help to resolve. Every concept map responds to a focus question, and a good focus question can lead to a much richer concept map. When learning to construct concept maps, learners tend to deviate from the focus question and build a concept map that may be related to the domain, but which does not answer the question. It is often stated that the first step to learning about something is to ask the right questions.

Given a selected domain and a defined question or problem in this domain, the next step is to identify the key concepts that apply to this domain. Usually 15 to 25 concepts will suffice. These concepts could be listed, and then from this list a rank ordered list should be established from the most general, most inclusive concept, for this particular problem or situation at the top of the list, to the most specific, least general concept at the bottom of the list. Although this rank order may be only approximate, it helps to begin the process of map construction. We refer to the list of concepts as a *parking lot*, since we will move these concepts into the concept map as we determine where they fit in. Some concepts may remain in the parking lot as the map is completed if the mapmaker sees no good connection for these with other concepts in the map.

The next step is to construct a preliminary concept map. This can be done by writing all of the concepts on Post-its(TM), or preferably by using the IHMC CmapTools (Cañas *et al.*, 2004b, <http://cmap.ihmc.us>) computer software program described below. Post-its allow a group to work on a whiteboard or butcher paper and to move concepts around easily. This is necessary as one begins to struggle with the process of building a good hierarchical organization. Computer software programs are even better in that they allow moving of concepts together with linking statements and the moving of groups of concepts and links to restructure the map. When CmapTools is used in conjunction with a computer projector, two or more individuals can easily collaborate in building a concept map and see changes as they progress in their work. CmapTools also allows for collaboration between individuals in the same room or anywhere in the world, and the maps can be built synchronously or asynchronously, depending on the mapmakers' schedules.

It is important to recognize that a concept map is never finished. After a preliminary map is constructed, it is always necessary to revise this map. Other concepts can be added. Good maps usually result from three to many revisions. This is one reason why using computer software is helpful.

Once the preliminary map is built, *cross-links* should be sought. These are links between concepts in different segments or domains of knowledge on the map that help to illustrate how these domains are related to one another. Cross-links are important in order to show that the learner understands the relationships between the sub-domains in the map.

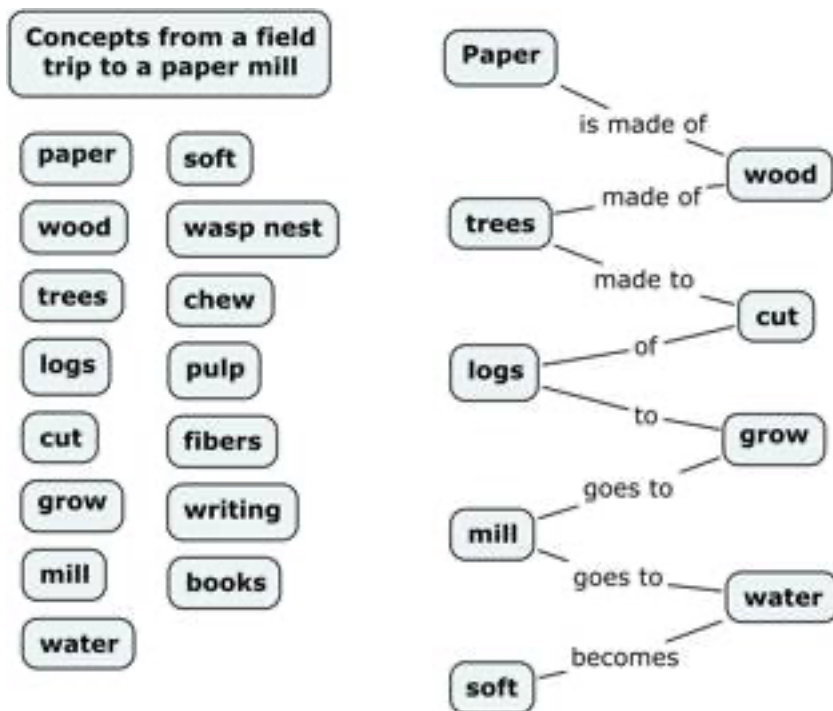


Figure 6. A “string” map created by a fourth grade student following a class field trip to a paper mill. The class identified concepts in the parking lot on the left, but this student was not successful in using many of these and her map makes little sense. This student was a good oral reader, but she had very poor reading comprehension and was a committed rote learner (see Novak & Gowin, 1984, page 108).

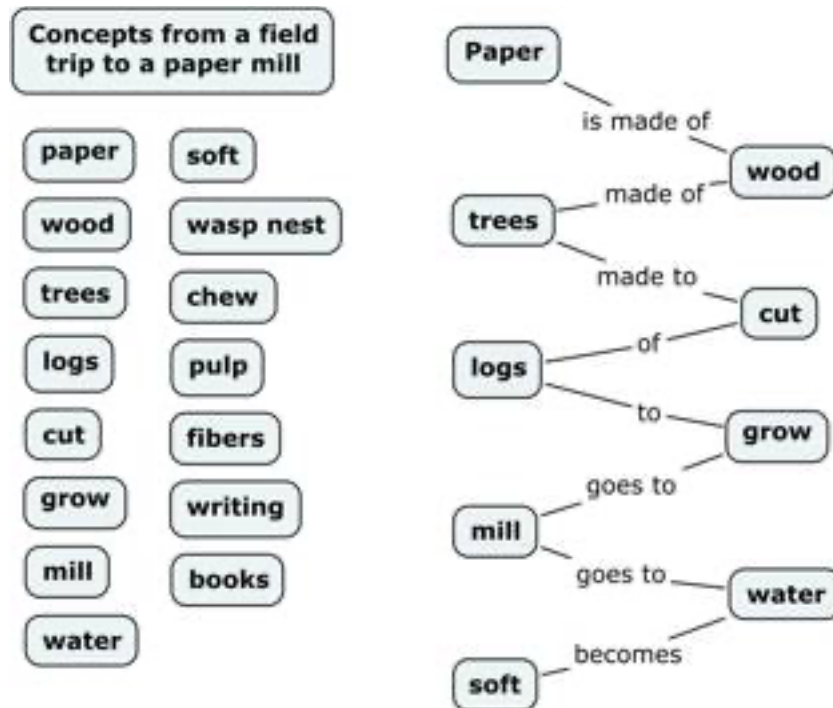
After a preliminary map is constructed, *cross-links* should be sought. These are links between concepts in different segments or domains of knowledge on the map that help to illustrate how these domains are related to one another. Cross-links are key to show that the learner understands the relationships between the sub-domains in the map.

It is important to help students recognize that all concepts are in some way related to one another. Therefore, it is necessary to be selective in identifying cross-links, and to be as precise as possible in identifying linking words that connect concepts. In addition, one should avoid “sentences in the boxes”, that is, full sentences used as concepts, since this usually indicates that a whole subsection of the map could be constructed from the statement in the box. “String maps” illustrate either poor understanding of the material or an inadequate restructuring of the map. Figure 6 shows an example of a string map.

Students often comment that it is hard to add linking words onto the “lines” of their concept map. This is because they poorly understand the relationship between the concepts, or the meanings of the concepts, and it is the linking words that specify this relationship. Once students begin to focus-in on good linking words, and on the identification of good cross-links, they can see that every concept could be related to every other concept. This also produces some frustration, and they must choose to identify the most prominent and most useful cross-links. This process involves what Bloom (1956) identified as high levels of cognitive performance, namely evaluation and synthesis of knowledge. Concept mapping is an easy way to encourage very high levels of cognitive performance, when the process is done well. This is one reason concept mapping can also be a very powerful evaluation tool (Edmondson, 2000).

Finally, the map should be revised, concepts re-positioned in ways that lend to clarity and better over-all structure, and a “final” map prepared. When computer software is used, one can go back, change the size and font style, and add colors to “dress up” the concept map.

Thus, we see that concept maps are not only a powerful tool for capturing, representing, and archiving knowledge of individuals, but also a powerful tool to create new knowledge.



Parking Lot

We refer to a list of concepts waiting to be added to a concept map as the *parking lot* of concepts. The starting point for the construction of the concept map can be a list of concepts that the teacher wants to make sure all students include in their map. An example of this was given in Figure 6 above. Figure 10 presents the focus question and parking lot for the focus question “What is the structure of the Universe?” The student, group of students, or class is expected to build a concept map that answers the question and includes at least the concepts in the list. Experienced concept mappers agree with Researchers that the most challenging and difficult aspect of constructing a concept map is constructing the propositions; that is, determining what linking phrases will clearly depict the relationship between concepts. So giving the student some of the concepts does not take away from the difficulty in the map construction, although it may somewhat limit the creativity of the student in selecting the concepts to include. It does provide the teacher with insight into which concepts the student(s) had trouble integrating into the concept map, indicating little or no understanding of these concepts.

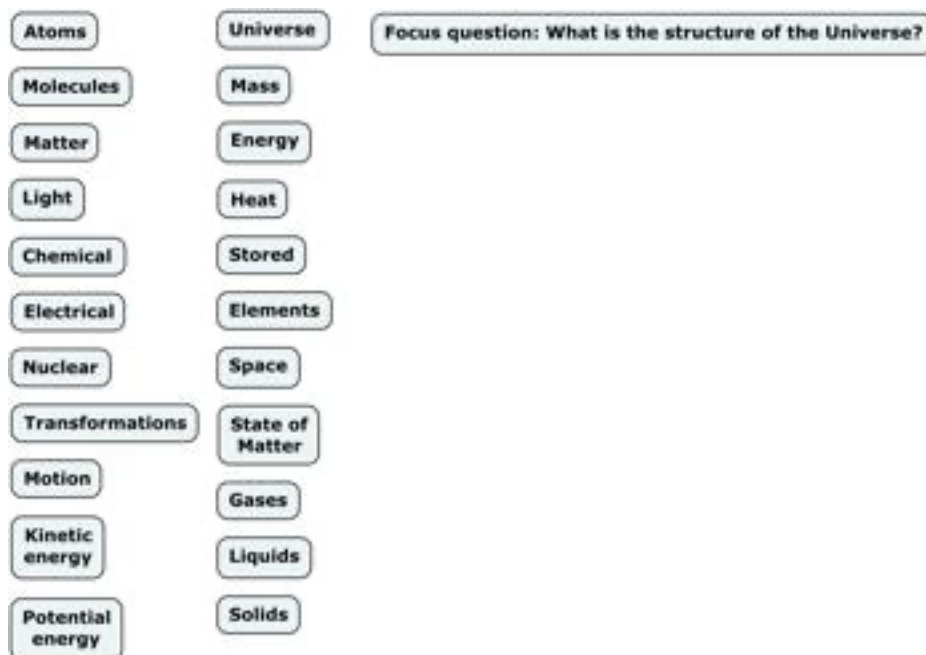


Figure 10. The beginning of a concept map with a focus question and a parking lot with concepts to be included in the map.

Expert Skeleton Maps

For difficult topics – whether difficult for the students as determined by the teacher’s previous experience, or difficult for the teacher because of his/her background – using an “expert skeleton” concept map is an alternative. An “expert skeleton” concept map has been previously prepared by an expert on the topic, and permits both students and teachers to build their knowledge on a solid foundation. “Expert skeleton” concept maps serve as a guide or scaffold or aid to learning in a way analogous to the use of scaffolding in constructing or refurbishing a building.

Figure 11 is an “expert skeleton” concept map that corresponds to the same topic as the “parking lot” in Figure 10. Observe that in this example, some of the concepts were left in the “parking lot” for the student to add to the concept map.

The use of “expert skeleton” concept maps is a research topic we are pursuing, and for which we don’t have as much experience as with the focus question and parking lot starting points. O’Donnell, Dansereau, & Hall (2002) have shown that “knowledge maps” can act as scaffolds to facilitate learning.

It is important to note that the “expert skeleton” concept maps should be built by an expert on the topic. The intention is that the expert will be better at selecting the small number of concepts that are key to understanding the topic, and express accurately the relationships between these concepts. In general, it is much more difficult to build a good, accurate concept map about a topic with a small number of concepts (e.g., four or five) than with fifteen to twenty concepts.

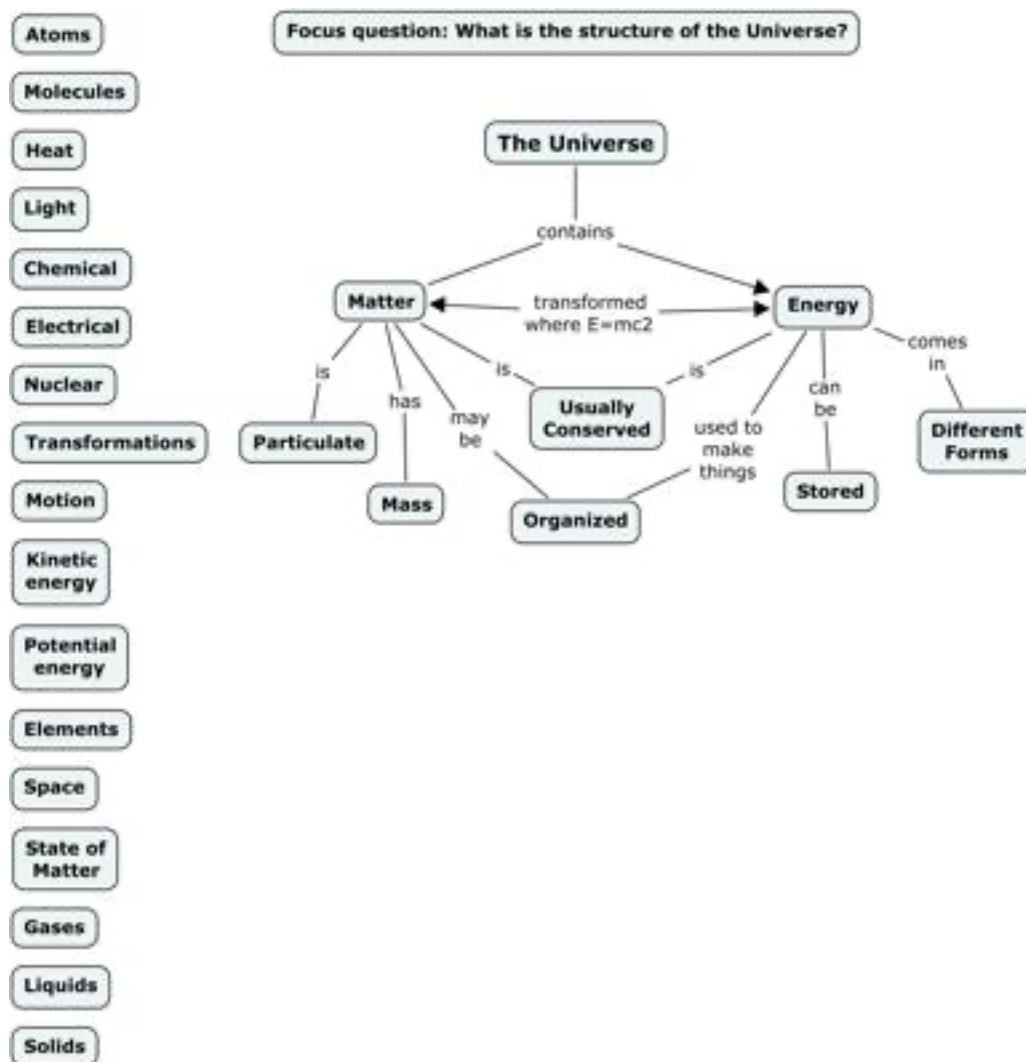


Figure 11. An expert skeleton concept map dealing with a key concept that needs to be understood as a foundation for learning science, based on the parking lot from Figure 10. Some concepts were left in the parking lot for the student to add to the Cmap.

There is no predetermined size that an "expert skeleton" concept map should have. But the expected final number of concepts in the map is a function of the number of concepts in the "skeleton". For example, a "skeleton map" that consists of five concepts should be expanded by the student to a map with 15 to 20 concepts. If the "skeleton" map contains 20 concepts, which makes it more of a complete map, the final map could be expected to contain about 50 to 60 concepts. In this case, we are probably referring to using a relatively complete (not skeleton) map as a scaffold, expecting students to go deeper into the topic by creating several submaps that are linked to the starting point map.

Resource from: <https://cmap.ihmc.us/docs/theory-of-concept-maps>

Appendix K

Demographic Survey

Demographic Survey

Instructions

There is no right or wrong answer that our answer to the question in this questionnaire. We are interested in your background information. Please answer the questions in this questionnaire honestly. Your answers will be kept confidential, and they will not be used as part of the final grade assessment for this course.

Are you an international student?

- Yes
- No

What is your age group?

- Under 18 years
- 18-24 years
- 25-34 years
- 35 and above

What is your major?

- (SPECIFY _____)

How many semesters do you enroll in this program?

- 1
- 2
- 3
- 4 or above

Which of the following describes your race? You can select as many as apply.

- White (e.g., Caucasian, European, Irish, Italian, Arab, Middle Eastern)
- Black or African-American (e.g., Negro, Kenyan, Nigerian, Haitian)
- Asian-American
- Asian (e.g., Chinese, Filipino, Vietnamese, Japanese or other Asian origin groups)
- Native American/American Indian/Alaska Native
- Hispanic/Latino (e.g., Mexican, Puerto Rican, Cuban)
- Some other race (SPECIFY _____)

What is the first language you learned to speak? (your native language)

- English
- Chinese
- Spanish
- Japanese
- Others (Please specify)

What language do you speak most often?

- English
- Chinese
- Spanish
- Japanese
- Others (Please specify)

To which gender identity do you most identify?

- Man
- Woman
- Non-binary
- Genderqueer
- Transgender
- Prefer not to disclose
- Additional gender identity category not listed, please specify

To which sexual identity do you most identify?

- Straight (Heterosexual)
- Bisexual
- Queer
- Gay
- Lesbian
- Prefer not to disclose
- Additional sexual identity category not listed, please specify

What country is your family originally from? (Example: Japan)

- (SPECIFY_____)

What is your current location? (Example: China)

- (SPECIFY_____)

Would it be okay for us to follow up with you about your responses?

- Yes
- No

If yes, please leave your email address.

Email address:_____

Appendix L

A Rater Training Handout

Purpose of the training: during the training, you will learn the definitions, and weighted scores of the parameter. You will have two practice rating activities will be part of the rater training. The purpose of the practice activity is to prevent and to reduce rater errors.

Here are the definitions, and weighted scores of the parameter:

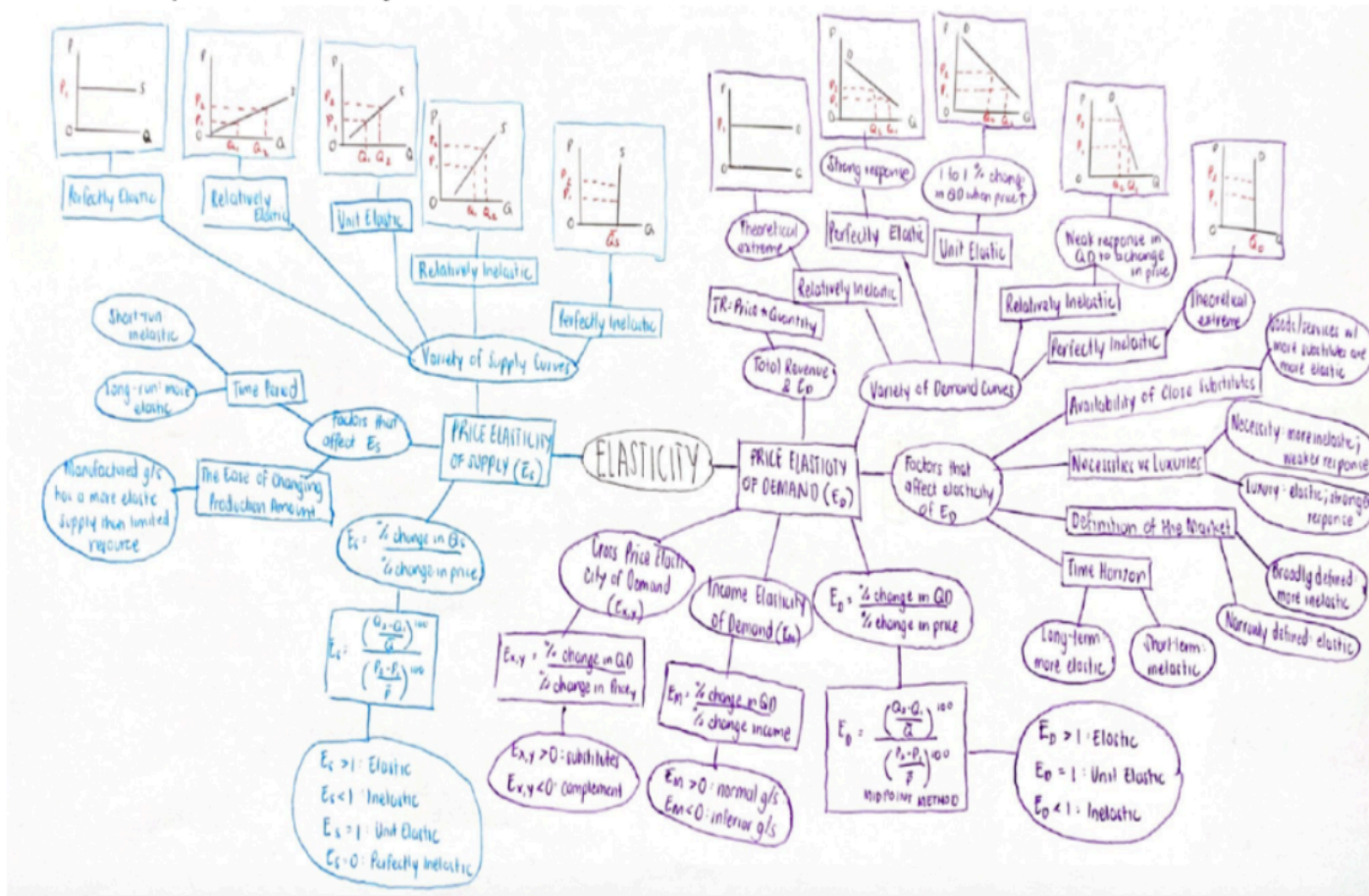
Concept-Map Scoring Rubric, Definitions, and Weighted Scores

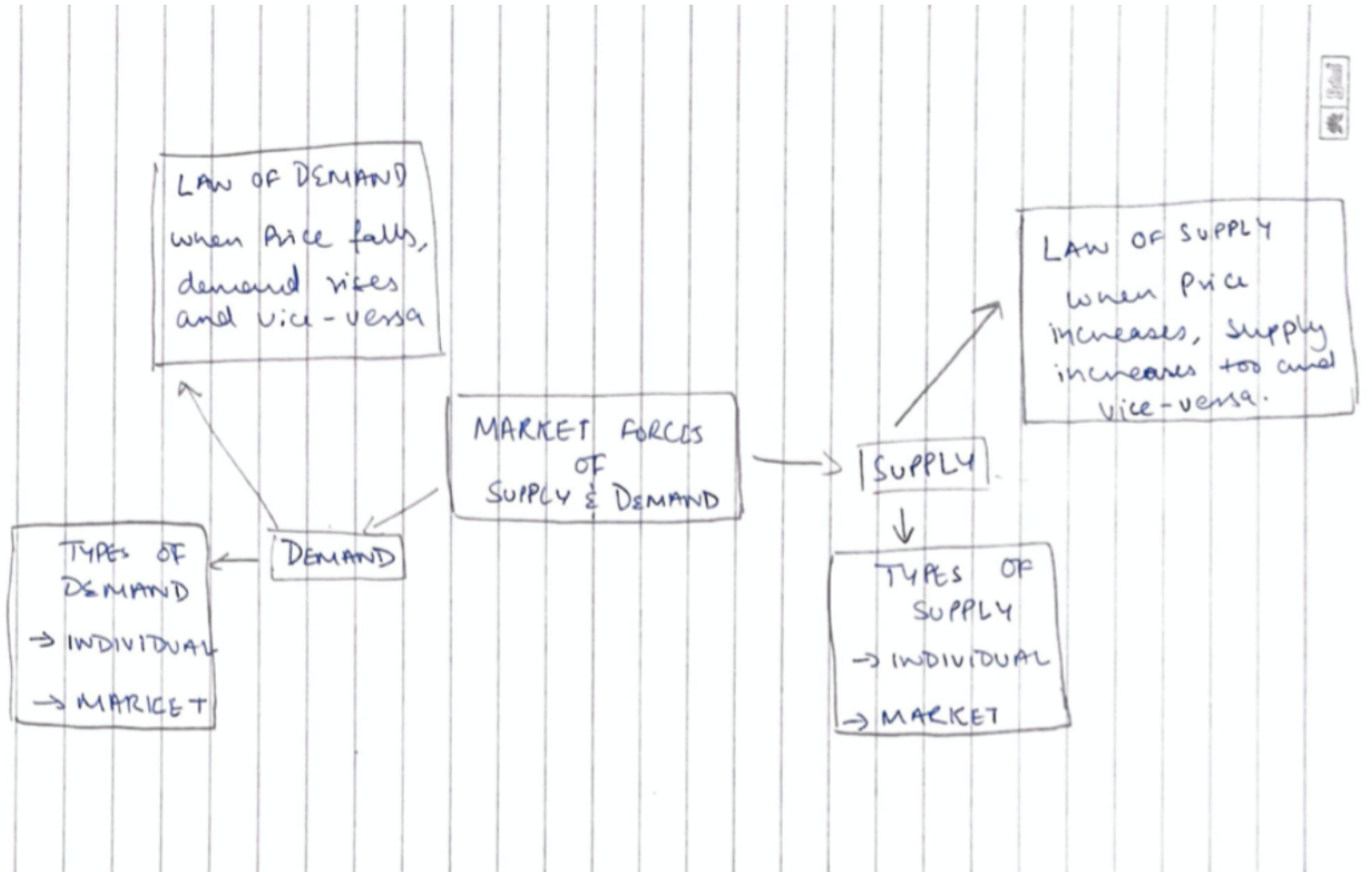
<i>Concept map element</i>	<i>Excellent (5 points)</i>	<i>Good (4 points)</i>	<i>Acceptable (3 points)</i>	<i>Unacceptable (0-2 points)</i>
Breadth of net	The map includes important concepts and describes the domain on multiple levels	The map includes the most important concepts; describes the domain on a limited number of levels	Important concepts missing, describe domains on only one level, or both.	The map includes minimum concepts with many important concepts missing
Inter-connectedness	All concepts interlinked with several other concepts	Most concepts interlinked with other concepts	Several concepts linked to other concepts	Few concepts linked to other concepts
Use of descriptive links	Links succinctly and accurately describe all relationships	Links are descriptive and valid for most relationships	Some links unclear or vague; some invalid or unclear	Links are vague; show inconsistent relationships
Layout	The map is contained on a single page, has multiple clear hierarchies, is well laid out and provides a sufficient number of relevant examples with links	The map is contained on a single page, has several clear hierarchies, is fairly well laid out and provides a sufficient number of fairly relevant examples with links	The map is not contained in a single page, has unclear hierarchies, is poorly laid out and provides some fairly relevant examples with links	The map is not contained on a single page, is confusing to read with no hierarchical organization

Note. Adapted from “Rubric for assessing concept maps” by McMurray, J. (2014).

Here are two concept maps created by students:

b. Chapter 5: Elasticity





Concept-Map Scoring Sheet

Date: _____

Total Score: _____

ID No.				
<i>Concept map element</i>	<i>Excellent (5points)</i>	<i>Good (4 points)</i>	<i>Acceptable (3 points)</i>	<i>Unacceptable (0-2 points)</i>
Breadth of net	5	4	3	0 1 2
Interconnectedness	5	4	3	0 1 2
Use of descriptive links	5	4	3	0 1 2
Layout	5	4	3	0 1 2
			Final Score	

Appendix M

A Concept-Map Scoring Sheet

Concept-Map Scoring Sheet

Date: _____

Total Score: _____

ID No.				
<i>Concept map element</i>	<i>Excellent (5points)</i>	<i>Good (4 points)</i>	<i>Acceptable (3 points)</i>	<i>Unacceptable (0-2 points)</i>
Breadth of net	5	4	3	0 1 2
Interconnectedness	5	4	3	0 1 2
Use of descriptive links	5	4	3	0 1 2
Layout	5	4	3	0 1 2
			Final Score	

Appendix N

An Example of Assignment

Econ 111 Homework 2

Due Date: September 21st, 2020

1. Explain each of the following statements using supply-and-demand diagrams.
 1. (a) When a cold snap hits Florida, the price of orange juice rises in supermarkets throughout the country.
 2. (b) When the weather turns warm in New England every summer, the price of hotel rooms in Caribbean resorts plummets.
 3. (c) When a war breaks out in the Middle East, the price of gasoline rises, and the price of a used Cadillac falls
2. Using supply-and-demand diagrams, show the effect of the following events on the market for sweatshirts.
 1. (a) A hurricane in South Carolina damages the cotton crop.
 2. (b) The price of leather jackets falls.
 3. (c) Simultaneously, all colleges require morning exercise in appropriate attire and new (more efficient) knitting machines are invented.
3. What is the definition of quantity demanded?
 1. (a) What is the definition of quantity supplied?
 2. (b) List the 5 factors that cause the demand curve to shift to the left or the right.
 3. (c) Choose one of the factors from part (b) and consider the market for bananas. On a well-labeled diagram, demonstrate what will occur in this market if there is a change in this factor.
 4. (d) List the 4 factors that cause the supply curve to shift to the left or the right.
 5. (e) Choose one of the factors from part (d) and consider the market for scooters. On a well-labeled diagram, demonstrate what will occur in this market if there is a change in this factor.
 6. (f) Choose one factor from part (b) and another from part (d) and consider the market for minivans. On a well-labeled diagram, demonstrate what will occur in this market given the change in both factors. (Hint: Draw separate diagrams for parts (c), (e), & (f))
4. Suppose that the price of basketball tickets at your college is determined by market forces. Currently, the demand and supply schedules are as follows:
 1. (a) Draw the demand and the supply curves. What is unusual about this supply curve? Why might this be true?
 2. (b) What are the equilibrium price and quantity of tickets?
 3. (c) Your college plans to increase total enrollment next year by 5,000 students. The additional students will have the following demand schedule:

Price	Quantity Demanded	Quantity Supplied
\$ 4	10,000 tickets	8,000 tickets
8	8,000	8,000
12	6,000	8,000
16	4,000	8,000
20	2,000	8,000

Price	Quantity Demanded
\$ 4	4,000 tickets
8	3,000
12	2,000
16	1,000
20	0

Now add the old demand schedule and the demand schedule for the new students to calculate the new demand schedule for the entire college. What will be the new equilibrium price and quantity?

- Market research has revealed the following information about the market for chocolate bars: The demand schedule can be represented by the equation $Q^D = 1600 - 300P$, where Q^D is the quantity demanded and P is the price. The supply schedule can be represented by the equation $Q^S = 1400 + 700P$, where Q^S is the quantity supplied.
 - Sketch a graph representing the market for chocolate bars. Identify the equilibrium point on your graph.
 - Calculate the equilibrium price and quantity in the market for chocolate bars.
- For each of the following pairs of goods, which good would you expect to have more elastic demand and why?
 - Required textbooks or mystery novels
 - Beethoven recordings or classical music recordings in general
 - Subway rides during the next six months or subway rides during the next 10 years
 - Root beer or water
 - Insulin or Tylenol
 - Food or bananas
- Consider the following information from the market for lemonade:

Price	Quantity Demanded	Quantity Supplied
\$1	500 cups	150 cups
\$2	200 cups	310 cups

- (a) As the price changes from \$1 to \$2, what is the value of price elasticity of demand?
- (b) As the price changes from \$1 to \$2, what is the value of price elasticity of supply?
- (c) Sketch a diagram demonstrating the market for lemonade. Are the supply and demand curves relatively inelastic or elastic? Explain.
- (d) Suppose that when the price of lemonade increases from \$1 to \$2, quantity demanded for orange juice increases from 150 cups to 190 cups. Calculate cross-price elasticity of demand for orange juice.

5. (e) Are orange juice and lemonade substitute or complementary goods? Explain.

8. Suppose that business travelers and vacationers have the following demand for airline tickets from New York to Boston:

Price	Quantity Demanded (business travelers)	Quantity Demanded (vacationers)
\$150	2,100 tickets	1,000 tickets
200	2,000	800
250	1,900	600
300	1,800	400

(a) As the price of tickets rises from \$200 to \$250, what is the price elasticity of demand for (i) business travelers and (ii) vacationers? (Use the midpoint method in your calculations)

(b) Why might vacationers have a different elasticity from business travelers?

9. Suppose the price elasticity of demand for heating oil is 0.2 in the short run and 0.7 in the long run.

1. (a) If the price of heating oil rises from \$1.80 to \$2.20 per gallon, what happens to the quantity of heating oil demanded in the short run? In the long run? (Use the midpoint method in your calculations)
2. (b) Why might this elasticity depend on the time horizon?

10. Produce a concept map for each of the following chapters from this course. Work on producing a different style of concept map compared to homework #1. For instance, the colors, shape, and structures of your concepts maps can be varied. Your concept maps should ultimately be the best visualization of our concepts required to improve your learning in this course.

- (a) Chapter 4: The Market Forces of Supply & Demand (b) Chapter 5: Elasticity

Appendix O

An Example of Study Guide

Econ 111 Midterm #1 Study Guide

Bold Sections of Material are Most Important

You will only be responsible for material covered in class through Tuesday, September 22nd's lecture.

I have extrapolated for the material we will finish through September 22nd's lecture. If we do not finish all of the material from **this** study guide on this date, it will not be on the midterm.

Anything covered **during** lectures is fair game for the midterm. This includes videos, PowerPoint slides, discussion sections, etc. (including from the asynchronous sections!)

Midterm #1 review will be available in an asynchronous video posted to Canvas

Homework questions are a great indicator of what to expect on the short answer on the midterm!

Structure of the test: 15% True/False; 15% Fill in the Blank; 70% Short Answer

- **Part I: The 10 Principles of Economic**
 - a. You will not need to know which specific principle corresponds to which #.

- **Part II: Thinking Like an Economist**
 - a. Thinking like a Scientist
 - i. How/Why We Use Assumptions?
 - b. Circular Flow Model
 - i. What are the relevant markets & parties?
 - ii. Physical vs. Monetary Flows
 - iii. Assumptions?
 - c. **Production Possibilities Frontier**
 - i. **Assumptions?**
 - ii. **General shape & explanation**
 - iii. **Fluctuating opportunity cost/production specialization**
 - iv. **Infeasible, efficient, & inefficient regions**

- d. Positive vs. Normative analysis
- **Part III: Interdependence & The Gains from Trade**
 - a. Comparative advantage vs. Absolute advantage
 - b. “Straight-line PPFs” vs “Bowed-Out PPFs”
 - i) **How to demonstrate the gains from trade utilizing graphs, numerical trades, & straight-line PPFs.**
 - ii) **What is the process to demonstrate these gains.**
 - (1) **Determine who has the comparative advantage based off of opportunity costs**
 - (2) **Have each party specialize based off what they have the comparative advantage.**
 - (3) **Determine trade terms that benefit both parties**
 - (a) **Remember the “trade band” that makes both better off.**
 - iii) **Demonstrate the gains from trade on graphs & make sure both parties are clearly better off.**
- **Part IV: The Market Forces of Supply and Demand**
 - iv) Markets and Competition
 - v) Assumptions of this Market
 - (1) **Demand**
 - (a) **The Demand Curve: The Relationship Between Price and Quantity Demanded**
 - (b) **Market Demand vs. Individual Demand**
 - (2) **Movement Along the Demand Curve vs. Shift**
 - (a) **Demand vs. Quantity Demanded**
 - (3) **Shifts in the Demand Curve**
 - (a) **Factors that Cause Shifts in Demand**
 - (i) **Changes in income**
 - 1. **Normal vs. inferior goods**
 - (ii) **Changes in expectations**
 - (iii) **Number of buyers**
 - (iv) **Change in the price of a related good**
 - 1. **Substitutes vs Complements**
 - (v) **Tastes**
 - vi) **Supply**
 - (1) **The Supply Curve: The Relationship between Price and Quantity Supplied**
 - (2) **Market Supply vs. Individual Supply**
 - (3) **Movement Along the Supply Curve vs. Shift**
 - (a) **Supply vs. Quantity Supplied**
 - (4) **Shifts in the Supply Curve**
 - (5) **Factors that Cause Shifts in Supply**
 - (a) **Technology**
 - (b) **Number of Sellers**

- (c) Expectations
 - (d) Costs of Inputs
- b) **Supply and Demand Together**
 - i) **Equilibrium**
 - ii) **Three Steps to Analyzing Changes in Equilibrium**
- **Part V: Elasticity**
 - a. **The Elasticity of Demand and Its Determinants**
 - i. **What factors impact price elasticity of demand?**
 - ii. **Computing the Price Elasticity of Demand**
 - iii. **The midpoint method**
 - b. **Variety of Demand Curves**
 - i. **Total Revenue and Price Elasticity of Demand**
 - ii. **Elasticity varies along a linear demand curve**
 - c. **Cross-Price and Income Elasticity of Demand**
 - d. **The Elasticity of Supply**
 - i. **The Price Elasticity of Supply and Its Determinants**
 - ii. **What factors impact price elasticity of supply?**
 - iii. **Computing the Price Elasticity of Supply**
 - e. **The Variety of Supply Curves**
- **Part VI: Supply, Demand, and Government Policies**
 - a. **Price Controls**
 - i. **Price Ceilings (definition)**
 - 1. **Binding vs. non-binding**
 - 2. **Graphs**
 - a. **What is the impact?**
 - b. **Is this outcome efficient? Why or why not?**
 - ii. **Price Floors (definition)**
 - 1. **Binding vs. non-binding**
 - 2. **Graphs**
 - a. **What is the impact?**
 - b. **Is this outcome efficient? Why or why not?**
 - iii. **Minimum Wage:**
 - 1. **Impact in the labor market**
 - a. **What is the source of supply & demand in the labor market?**
 - b. **How do market forces create different outcomes?**
 - 2. **Is minimum wage an optimal policy?**
 - a. **Explain in terms of economic efficiency.**
 - a. **Taxes**
 - i. **Tax Incidence/Burden**
 - 1. **Who is the tax “levied on”**
 - a. **How is the burden shared?**

- 2. What is the difference? What affects outcomes?
 - ii. Elasticity and the Tax Burden
 - 1. Graphically, what does the situation look like
 - b. Taxes
 - i. Tax Incidence/Burden
 - 1. Tax levying vs. Tax incidence (Who “puts the money in the bowl” vs “bears the burden of the tax”)
 - ii. Elasticity and the Tax Burden
 - 1. How does elasticity impact tax burden & results of forcing a tax onto a market.
 - iii. Related Graphs
- Part VII: Consumers, Producers, and the Efficiency of Markets
 - a. Consumer Surplus
 - i. Willingness to Pay
 - ii. Using the demand curve to measure consumer surplus
 - iii. Measuring well-being generated for consumers
 - iv. How do price changes impact consumer surplus?
 - b. Producer Surplus
 - i. Willingness to Sell
 - ii. Cost/Measurement of PS
 - iii. Using the supply curve to measure producer surplus
 - iv. How do price changes impact producer surplus
 - c. Market Efficiency
 - i. Total Surplus = CS + PS
 - ii. Value to Buyers – Cost to Sellers
 - iii. Efficiency
 - iv. Equity
 - d. Allocation Observations

Appendix P

Final Project Guideline

Final Project Guidelines: Market Analysis

Objective: One of the primary goals of this course is to apply relevant course concepts/theories to real world events. In addition to the article analysis, this final project will instruct students to continue to apply these theories.

The primary portion of the final project will be a **market analysis**. As we have discussed in class, markets form the foundation of our course and drive almost all of our discussions. This type of market analysis represents the core of the final project.

This project will be relatively free form. However, students should utilize **these guidelines** to ensure their work is complete:

Introduction: The 1st step of this project is to choose a **specific product offered by 1 company** for your market analysis. I highly recommend that students choose a market that they are interested in.

For example, Professor Tung may choose the market for the video game handheld/console hybrid: the **Nintendo Switch** or the figure-to-life product, **amiibo**.

The introduction should include a recent history of the market. This information can include sales data, recent mergers, stock prices, new products/competitors, profit reports, a more in-depth history of the company, or any other information that will introduce this product to me. Do not feel constricted to use only this information. If other pertinent information is found, please include it in your overall market analysis. **Additionally, I highly encourage students to use visual aids (graphs, profit reports, pictures of relevant figures, etc.) in this section.**

Application of Course Concepts: We will cover many different topics throughout this course. Students will be required to use these concepts to analyze their chosen market. **Please make sure to reference material from the entire course to more fully understand this market.** For instance, the market forces of supply & demand, elasticity, surplus analysis and the efficiency of markets, international trade, and externalities.

In addition, future topics include the costs of production, firms in a competitive market, monopoly, monopolistic competition, & oligopoly. These topics will allow for in-depth analysis of the market in which student's chosen company competes in.

Not all of these topics will be relevant for each student's market analysis. However, students should attempt to **maximize** the relevant course concepts that are referenced. There are many ways that students can incorporate key concepts from class including graphical analysis, anecdotes, benefit/cost charts, and research statements. The work

you have been doing on your article analyses will also bolster this aspect of the final project.

Examples of methods of incorporating key course concepts into your final project:

Analyzing a graph with sales data to demonstrate how the market has fluctuated over a short or long period of time. What was the cause?

Referencing elasticity to explain market fluctuations. How does the relative response of consumers or producers affect market outcomes? This is a great method to demonstrate the validity of our relevant course concepts.

*Have taxes had a big impact in your market? What about international trade? Support your statements with **graphs, visuals, and strong critical thinking**.*

Recommendations for Company: The primary purpose of this project is for students to utilize relevant course concepts to derive valuable conclusions. These conclusions should aid companies in making decisions. One primary way that this information can be presented is with a **S.W.O.T.** report.

S.W.O.T. stands for:

Strengths: What are the strengths of the company/product? In other words, does this company have a comparative advantage or other particular abilities this company may have in the production of your chosen product.

Weaknesses: On the other hand, what are the weaknesses this company may have? Do you believe that there are any deficiencies in terms of production capability, marketing, competitive position, or elsewhere?

Opportunities: Are there opportunities for this company to expand in this market or into another one altogether? Expand on these thoughts.

Threats: What kind of threats will this company potentially encounter? These threats may take the form of additional competition (domestic or foreign), government regulations, political turmoil, or shifts in sectors/industry.

-Your statements in your S.W.O.T. analysis should be comprehensive, precise, and well-formed. Companies require this kind of in-depth analysis when making decisions.

If you would like to create your own, original statements for your recommendations, that is also **acceptable**. However, I highly recommend that you see me to double check if your statements are appropriate if you choose to do so.

Produce a concept map for your final project:

-Including the appropriate concept map (for competitive, monopoly, monopolistic competition, or oligopoly) for the specific market that your firm/company competes in for your final project.

General Recommendations:

-Make sure to be **highly professional** in terms of wording, formatting, and presentation. Creating professional work is a valuable asset to have upon graduation.

-The length and form of this project is **up to students**. Though this is unorthodox, I believe students will benefit from having more freedom in terms of decision-making related to this final project.

-Please cite your sources using **MLA format** at the end of your final project.

-If you have **any** questions about this final project, please come see me during office hours.

Grading: The syllabus states that together the final exam and the final project will be worth 30% of your overall grade.

-If your grade on the final project is greater than on your final exam:

Final Project: 15% of your overall grade & Final Exam: 15% of your overall grade

-If your grade on the final project is lower than on your final exam:

Final Project: 10% of your overall grade & Final Exam: 20% of your overall grade

Due Date: The final project will be due on the last day of the **semester:** Thursday, December 10th, 2020. The final project will be submitted on Canvas.

Appendix Q

Codebook

Codebook with Descriptions, Examples

Main Themes and Subthemes	Description and Examples
Additional note-taking strategies used by participants	To investigate other note-taking strategies that participants used for economics learning.
Annotation	“I make an annotation on the book, but it just an annotation.” (Student 2)
Bullet point note	“I typically make bullet point notes; for example, I put the main topic first, and then sub-topics will be the next line. My notes have many layers. I transfer my notes into a map. It's easier for me because I already know what the main idea and subtopics are.” (Student 12)
Highlighting passages in texts	“I usually take to take notes. And I like to use different colors to highlight the important part. And it's really helpful.” (Student 3)
Illustration	“I'd like to draw some illustrations and use different colors to highlight keywords and important points because I've noticed. I tend to memorize to remember more if I draw some sketches.” (Student 10)
Participant-identified advantages of applying the concept-mapping strategies	Participants recognized the benefits of utilizing the concept-mapping approaches for their learning.
Interest	The definition of interest is participants self-identified engage the attention or arouse the interest of applying the concept-mapping strategy.
Color-coding	“I use the same color that teacher used in the class for my notes. I think if I use the same color, which will help me to remember the content.” (Student 20)

Main Themes and Subthemes	Description and Examples
Developed own map	“Because although he (the teacher) provided his notes, it is not my own. He provides the entire content of the lesson; I go through the content and develop a mind map by myself. So I will have my note.” (Student 8)
Increased motivation to learn	“While doing it, I can discover some important points that I may not have noticed in class, reinforcing my learning.” (Student 18)
Sense of accomplishment using key element of C.M.	“There must be a sense of accomplishment after finishing. I think the concept map helps me quite a lot. Now, when I look back, I don’t mind if it cost me much time to develop a concept map.’ (Student 21)
Shape-coding	“I also use different shapes to present other thoughts, for example, squares and circles. It distinguishes different sections or subtopics, or levels. For example, the central circle is the main idea. And then, the next square in the following subsection. And then below that are the circles for like the descriptions.” (Student 12)
Success	The definition of success is participants self-identified applying the concept-mapping strategy he or she can succeed at the coursework.
Increased attention to the course or course material	“I don’t like to read the text very much. Because of the concept maps assignment, which forces me to read the textbook, I think it's helpful.” (Student 21)
Increased retention of course material	“Because I'm a visual learner. For example, when I study for a test, the concept map helps me remember the chapter's section easily.” (Student 12)

Main Themes and Subthemes	Description and Examples
Preparing for quizzes, midterms, and projects	“For preparing the quiz, I review the notes and concept maps. For preparing for the mid-term exam, I will reorganize my notes.” (Student 18)
Review the lecture	“When I need to review or write some arguments for this article, I read the concept map, and then I have a better understanding of each point and each content that needs to be written.” (Student 20)
Usefulness	The definition of usefulness is participants self-identified applying the concept-mapping strategy assist their economics learning whether in the class or after the lecture.
Increased classroom participation	“The concept map assignment helps me to see the overview of the chapter. It gives me a sense of the topic. When the class is going, although I can't understand all of it, I can come out with some make sense questions to ask professor to interact with the professor.” (Student 3)
Answer the questions during the class	“Because it (concept map) gives me an overall view, it helps me understand the lecture. After class, I create my concept map, and next time I go back to the class, I can quickly answer the professor's question.” (Student 7)
Identify vague concepts and ask instructor	“I use this method (concept map) to take notes every time after I finish the class. I am more aware of things that I did not understand in class or that I still need to ask the teacher. If there is something unclear, I will ask the teacher next time or ask my classmates to see if there is anything I can add to their notes.” (Student 2)
Preview the class	“The teacher assigns the concept map assignment before the class and ask you to preview the content of the next class, it helps.” (Student 6)

Main Themes and Subthemes	Description and Examples
Increased comprehension	“It (concept map) can help me better sort out and clarify my thinking, whether it is used in the final project or homework. It is helpful.” (Student 11)
Obtain clarity of thoughts	“Of course, the creating process is more effective for learning. Because creation requires your thinking process, how to create, and structure, if you just copy the text, I think it's just written down the words. Developing the concept map is your creation process; through the steps, you will have more straightforward ideas of the article.” (Student 4)
Clarify ambiguous thoughts	“Yes. It (concept map) can help me better sort out and clarify my thinking, whether it is used in the final project or homework. It is helpful.” (Student 11)
Create visual representations of information	“It is straightforward to make, and I can see the whole picture of the chapter.” (Student 22)
Flexible thinking	“If I apply the concept-mapping method, my thinking process will be more flexible, not fixed.” (Student 6)
Identify key concepts	“Every time I create a concept map, I read the whole chapter first; that is, then I write down the important points, which helps me to remember the key concepts of those lessons better.” (Student 21)
Identify knowledge gap	“When I was drawing my map, I reflect on what concept I missed. I can make it up through this process (developing a concept map).” (Student 8)

Main Themes and Subthemes	Description and Examples
Organization of the information	“Sometimes these visual graphs (concept maps) are important to me. They really help me organize my thoughts.” (Student 13)
Overview the lecture	“I think the concept map is like a significant overview of the lesson. So if I add too much detail to it, I feel it just disrupts the flow of everything.” (Student 10)
Participant-identified willing to use the concept-mapping strategies in the future	To investigate the participants' desire of the concept-mapping method using in the future.
Willing to use the concept map strategy in the future	“Next semester I will have a Microeconomic class, and I think I will use it again.” (Student 20)
Prior knowledge and use of the concept-mapping strategies	To investigate participants' previous experience and application of the concept-mapping approaches.
Biology	“I used it in the biology class. Teachers sometimes developed concept maps for students. The biology teacher created the concept maps to present the content from the textbook. Students knew what teachers are going to teach immediately once they see the concept maps.” (Student 26)
Chinese Writing	“In the Chinese class, we need to analyze the articles. Everyone tries to find the main points, then we analyze the articles and find the supporting ideas.” (Student 18)

Main Themes and Subthemes	Description and Examples
English Writing	“I used it in high school. I remember in an English class; the teacher asked students to analyzed characters and draw the concept map.” (Student 2)
Math	“I use the concept for math. I write down the whole formula. I like to write down the formula in the middle of the paper and write all the formulas that I know. It helps me to review.” (Student 7)
Mental Health class	“I used it in the mental health class when I was in high school... For example, I developed a concept map about traffic safety. I also created a concept map of fire safety.” (Student 6)
Reading Class	“Almost every reading in English reading class, I used the concept map method.” (Student 4)
Science	“It (concept map) helped with my science subjects. I'm not good at science class. So doing concept maps helped me to organize my thought during the course” (Student 13)
Reasons for ambivalence about using the concept-mapping strategies	To investigate reasons for uncertainty about practicing the concept-mapping approach.
Concept map presents limited information	“The concept map is like a perfect way to learn a topic, but the concept map is comprehensive, not in detail.” (Student 10)
Course requirement	“To be honest because the concept map is required for economics class. I felt it's overwhelming.” (Student 7)

Main Themes and Subthemes	Description and Examples
Time-consuming	“I don't do concept maps always it's because sometimes it can be time-consuming.” (Student 13)
Resource for Concept map development	To investigate what are the resources that participants applied for their concept map construction.
Create the map based on personal notes	“I started to read through my notes first. Then I have a scratch paper, and I write down the main idea and subtopics next to the main idea. I keep expanding the map.” (Student 12)
Create the map based on teacher notes	“Before I develop the map, I read his (teacher) notes. I am aware of which part is more important and what I need to learn based on his notes, and then I can refine this information by developing a concept map.” (Student 8)
Create the map based on the textbook	“Every time I create a concept map, I read the whole chapter first; that is, then I write down the important points, which helps me to remember the key concepts of those lessons better.” (Student 21)
Create the map during the lecture	“When I was in the zoom meeting, I started making my concept maps, but only the main ideas or topics.” (Student 10)
Online material	“I create my map by the material I found online, not from the textbook.” (Student 6)

Appendix R

Interview Transcripts

Transcript of Student 2

Researcher: Is the concept map method useful to you?

Student 2: I think it is useful. For example, when I am doing economic homework, I will list some knowledge points to him according to the book catalog so that when I do my homework, I will find some more precise ways to solve the problem.

Researcher: Before this semester, did you use the concept map method?

Student 2: Used. When I was in junior high school, when the Chinese teacher asked us to write an essay, I would record some of my writing ideas and writing order using a concept map method.

Researcher: Do you think the method of careful drawing is effective in English writing?

Student 2: Very effective!

Researcher: Why?

Student 2: Because before I didn't make drawings carefully, my thoughts were quite confused. After using the concept map, I will find that my writing ideas and order will be clear.

Researcher: How many times did you use the heart mapping method this semester?

Student 2: I have a concept map every time I write. When I organize my homework, I also use concept maps, so I use them quite frequently

Researcher: You told me in detail, how do you draw a concept map?

Student 2: For example, I want to write a paper on er economics. I will write this argument first, put it in the middle, and then there will be many scattered points, just write my argument at once. Then there will be scattered points under each argument to write something to collect and support my argument.

Researcher: Do you think it will be easier for you to understand after you draw it?

Student 2: That's super clear.

Researcher: Why?

Student 2: Because the screen on the Internet is only that big, and when you read the information by yourself, it is easy to read the following and forget what is written on it. Then I will use the concept map method to record it, and then when I analyze the article myself, the overall view will be clear. Just one picture tells all the stories.

Researcher: You used a concept map this semester. Can it help you participate more in classroom activities?

Student 2: Yes. I use this method to take notes every time I finish the class. Then you will be more aware of things that you did not understand in class or that you still need to ask the teacher. If there is something unclear, I will ask the teacher next time or ask my classmates to see if there is anything I can add to their notes. I have more opportunities to talk to the teacher

Researcher: Does the concept map help your study?

Student 2: Very helpful. I think the concept map has given me a very clear learning goal, which is the key concepts. I develop maps to remind myself of the assignment deadline. For example, I indicated the due date, which subject, and what homework on the concept map. So I use the concept-mapping method in my daily life, too.

Researcher: Do you have other ways to take notes

Student 2: I usually make comments on the book.

Researcher: Which one do you think is more helpful for you to study? Comment on the book or the concept map?

Student 2: Of course is a concept map.

Researcher: Why?

Student 2: Because when I make an annotation on the book, it just an annotation. Look at a concept map; it presents the whole story on a piece of paper. I understand clearly what the story tells.

Researcher: How do you review your quiz and midterm exams?

Student 2: I usually focus on some concepts that I didn't understand, then review them.

The place when I first went to class, and then I would focus on reviewing. Then I will read the notes from the teacher

Researcher: Do you read your map for preparing for your quiz and midterm exams?

Student 2: I usually use my concept maps when I was doing the homework. Because there is no detailed information on the concept map, I don't use it for the quiz. A concept map helps me to find a specific concept quickly, especially when I do my homework; I use it often.

Researcher: Will you use your concept-mapping method in other classes in the future?

Student 2: Sure! I will always use it. The concept map helped me save a lot of time to organize what I have learned, especially for the homework.

Researcher: Do you look at the teacher's notes when you started to draw the concept map?

Student 2: Yes, I do. I usually look at the textbook first, and then I will add more information from the teacher's notes to my concept map.

Researcher: Do you use many colors for your concept map?

Student 2: Yes. For the concept map of my daily life, I use red if it is urgent, then green if it is not urgent, and yellow if it is relatively moderate. I usually use these three colors.

Researcher: Do you use different colors for your concept map of the assignment?

Student 2: I will mark the argument in red color in the center of the paper, then I will use green for the evidence, and then I will use yellow for the supporting information to support my arguments.

Transcript of Student 3

Researcher: Do you think in general. Do you think the concept mapping method is useful to you?

Student 3: Yes, I think it is quite useful because, for example, the economic class is complicated. The map (concept map) really helped me build a better and clearer structure and understand what the chapter is all about. The purpose I use a concept map is not only for the assignment, but I use it for reviewing.

Researcher: You mean reviewing the quiz and midterm?

Student 3: Yes, for every test or quiz for economic class.

Researcher: Do you think the concept mapping method helps you to participate in classroom activities?

Student 3: Oh yeah, I do think so. It really helps clear my mind. When I listen to the lecture, I feel confused because we have learned a lot in every class. It helps me because it clears my thoughts so that I could participate in class.

Researcher: Can you give me some actual examples of why you feel that?

Student 3: The concept map assignment helps me to see the overview of the chapter. It gives me a sense of the topic. When the class is going, although I can't understand all of it, I can come out with some make sense questions to ask the professor and to interact with the professor.

Researcher: Do you create a concept map before this chapter start or finish?

Student 3: I usually do it after the chapter is finished. Before the Professor talks about it, I would just read a textbook on my own. After the Professor finished the chapter, I could gather general ideas about what the lecture is and add to what I have already known.

Researcher: So creating the concept is helping your review?

Student 3: Yes, it's like organizing the chapter key points together.

Researcher: So what kind of learning strategies do you use?

Student 3: I usually take to take notes. And I like to use different colors to highlight the important part. And it's really helpful.

Researcher: Will you use the concept map method in other courses in the future?

Student 3: Yeah, I think so because I found it quite helpful.

Researcher: Is there anything you don't like about concept maps?

Student 3: No.

Researcher: Ok. Thank you for your time.

Transcript of Student 4

Researcher: Have you ever used a concept map before?

Student 4: No.

Researcher: How many times did you use the concept map method this semester?

Student 4: Quite a few times. Almost every reading in English reading class, I used the concept map method.

Researcher: Why do you use concept maps in English classes?

Student 4: Because sometimes the teacher asks us to analyze the article.

Researcher: How do you analyze the article?

Student 4: She wants us to look at the structures and arguments of the article. Then asks students to write the summary or analyze this article. After I first draw the concept map, I feel that I can understand it better. After that, I only read the concept map I drew, and I don't need to read the original text.

Researcher: Can you tell me in detail the steps of your concept map?

Student 4: First, I just draw a circle which is the topic. Then I look at how many paragraphs it has, and then I draw a few branches first, and then look at what each section is about to find the main sentence. Then I write it first, and then I will see if the main sentence needs to be extended; I will raise that branch again.

Researcher: What was the process when you drew the concept map for economics class?

Student 4: For example, if the teacher wants us to do economic article analysis, then I would first write down the subject, which is the largest circle in the middle of the paper, and then I would draw the branch to see if the article has analyzed it in several ways. Then I draw a few of that branch first and then write down each argument of it.

Researcher: Have you encountered many unfamiliar words?

Student 4: Yes, it often happened in economics classes because some of them are proper nouns.

Researcher: Would you give up developing the concept map because you encountered too many unfamiliar words?

Student 4: Ah! Not really. I think the concept map is quite useful, helps me to understand the text better.

Researcher: How did you feel when you were creating a concept map?

Student 4: Drawing this picture is to make me understand this article better. If I need to re-read this article in the future, I may not need to read the original text; I will just look at this concept map.

Researcher: Then, when you take the mid-term exam and the quiz, you would look at the concept map you draw?

Student 4: I might read it during the review.

Researcher: OK. Do you think concept maps can help your study?

Student 4: Ah, for sure. If I want to review or write some arguments for this article, I look at the concept map, and then I have a better understanding of each point and each content that needs to be written.

Researcher: Do you think you will use concept mapping in other subjects?

Student 4: Yes. For example, if there is that kind of reading content, I will use it.

Researcher: What was your learning method when you didn't learn concept mapping before?

Student 4: Just take notes. If there are some sentences or content I feel it's important, I will copy them down. But I think after copying it, I rarely review (laughs)

Researcher: Do you think that the process of creating a concept map is more effective for learning? Or copy it down to learn more effectively?

Student 4: Of course, the creating process is more effective for learning. Because creation requires your thinking process, how to create, and structure, if you just copy the text, I think it's just written down the words. Developing the concept map is your creation process; through the steps, you will have more straightforward ideas of the article.

Researcher: Thank you for allowing me to visit today.

Transcript of Student 6

Researcher: Have you used the concept map method before?

Student 6: Yes

Researcher: When is it?

Student 6: I used it in the mental health class when I was in high school.

Researcher: The teacher wants you to draw a concept map. Any specific requirements?

Student 6: It is homework. In China, we called a Mind map.

Researcher: Can you give an example of what kind of topic related to your concept map? Or a theme?

Student 6: For example, I developed a concept map about traffic safety. I also created a concept map of fire safety.

Researcher: The teacher asks you to review the traffic safety course. Or asks you to outline traffic safety by concept map?

Student 6: I need to use the concept-mapping method to outline the traffic safety topic.

Researcher: OK. You have to submit your concept map as homework to the teacher. Good. How many times did you use the concept map method this semester?

Student 6: About 5 to 10 times. These are the homework for economics class.

Researcher: Can you describe to me in detail what are your steps when you create a concept map?

Student 6: First, I will put the topic in the middle of the paper, and then expand the branches around, and then follow the order based on the topic and subtopic from the textbook, then and then expand in turn. I drew a concept map about the balance of payments before. The material I online, not from the textbook.

Researcher: After you find the material, do you draw while reading it, or do you draw after reading it?

Student 6: I draw the map while reading the textbook. I look for the headline first, then the subhead line, and finally some keywords from in the article or material, and then I link the keywords with the sub-headline.

Researcher: OK. So while you are reading, what should you do if you read a word you don't recognize?

Student 6: Just check it with a dictionary, and then after knowing the meaning, I write down the word on the concept map and link it to the concept map.

Researcher: How did you feel when you were developing a map?

Student 6: I think drawing a concept map is better than taking bullet point notes.

Researcher: Why?

Student 6: Because I am not good at taking notes, especially using different color pens. But developing a concept map is work for me. First, the concept map presents information concisely. The second is that I feel a sense of accomplishment after I finish constructing.

Researcher: Then, do you think it's easier to understand the learning material by taking traditional notes or developing a concept map?

Student 6: It must be a concept map. Because the concept map is more explicit and perceptive, for example, the text's presentation in a concept map may not be so tight. Still, like traditional notes, if you want to review, it would be many pages, and the text is densely packed.

Researcher: So, you prefer visual learning?

Student 6: Yes.

Researcher: When you draw your concept map, do you feel more positive instead of heavy loading?

Student 6: Yes. I have no negative feelings about concept maps.

Researcher: Do you think concept maps can help your study?

Student 6: I think it can. For me, I pay more attention when drawing concept maps than taking bullet notes. Then I want to remove it better and more discerning. It is very helpful for reviewing and learning.

Researcher: You just said that you pay more attention when drawing concept maps. Is it because you want to understand the relationship between different ideas

Student 6: Right. If you take notes, you just keep copying the teacher's words. But the concept map will extract the essence, comprehend, and then present it on paper. While you were drawing, you think.

Researcher: Do you have any other learning methods?

Student 6: I don't think so. Because the education I received is traditional Chinese-style education, concept maps only existed in elementary school or junior high school. But when it comes to high school, it doesn't exist. Because developing a map is a waste of time for some teachers. All of us have rote memories of all textbooks. In high school, students rote memories of some subjects and keep practicing questions.

Researcher: What are the disadvantages of going to school in the United States if a student received the traditional rote learning education?

Student 6: I think that students would not get used to the U.S. education style

Researcher: Do you think concept maps can help you overcome this obstacle to learning?

Student 6: I think so. If you apply the concept-mapping method, your thinking process will be more flexible, not fixed.

Researcher: Do you think doing a concept map assignment can help you participate in the class?

Student 6: Yes. For example, if the teacher assigns the concept map assignment before the class and asks you to preview the content of the next class, it will help.

Researcher: Okay, thank you for your participation.

Transcript of Student 8

Researcher: Have you used the mind map method before

Student 8: When I was in high school, it was useful when writing essays. When conceiving the composition, the teacher would ask us to draw a mind map to help us create it.

Researcher: How many mind maps did you do this semester?

Student 8: There should be five homework assignments for economics class. I also used it in English writing. Total almost nine times.

Researcher: Do you use the concept-mapping method to help you outline?

Student 8: Yes, yes. This is my writing routine.

Researcher: Do you always draw first and then start writing?

Student 8: Yes.

Researcher: Can you tell me how you start to draw a mind map? And do you draw while reading?

Student 8: When I almost complete the reading, I start to draw the map. After knowing what is in this chapter, then start drawing. I don't read carefully at this moment. I will read more detail when I start to draw the sub-concepts. There are three sections in this chapter; I will write down the three sections' titles and then add more details below it.

Researcher: When you are drawing these mind maps, do you think you enjoy the process?

Student 8: I feel like a robot with no emotions, just completing tasks.

Researcher: Microeconomics is a new subject to you; don't you think you learned something when drawing a map

Student 8: I believe I would definitely learn some new knowledge during the process. However, I have already studied microeconomics in high school. That's why I said I don't feel I learn something new because I already learned before. But when I was drawing my mind map, I reflect on what knowledge I missed; now I can make it up through this process (developing a concept map).

Researcher: You have studied microeconomics in high school!?

Student 8: Well, Yes, it is the AP course.

Researcher: So now, you are kind of reviewing the learning materials.

Student 8: Yes, yes. But my AP course test result is very bad. The teacher did not teach well.

Researcher: So you have the 2nd chance to learn again. Do you feel more comfortable when you develop a map since you are familiar with the learning material?

Student 8: Yes, it is. In other words, some knowledge may be forgotten, but this knowledge is what I have seen before.

Researcher: Do you think this mind map method can help your study

Student 8: I think yes. It allows me to find out the key concepts of this chapter of this subject.

Researcher: You said that the mind map allows you to find the key points. How do you find the key points?

Student 8: When drawing a mind map, it is actually extracting the most refined parts from a large amount of information in the textbook. In the process of searching for the refining part, my comprehension ability is improved.

Researcher: Do you review your maps before the exam?

Student 8: (silence). . . I feel that there is a part of economics content suitable for using mind maps, but some of the content is not suitable. For example, the content of the image may not be drawn in the mind map.

Researcher: For example?

Student 8: Curve. There is no way to combine the content of the image with the mind map.

Researcher: How do you review for the quiz?

Student 8: I usually read the notes given by the teacher. When I take notes, I usually follow his notes. I worked very hard to take notes initially, and then I found out that the teacher would take notes, and I started not to take notes by myself.

Researcher: Does the economics teacher send you notes before you do the mind map or after?

Student 8: Before doing the mind map. So I read his notes and made a mind map. I am aware of which part is more important and what I need to learn based on his notes, and then I can refine this information by developing a concept map. When I review the learning materials, I go back to read those important parts

Researcher: So do you think that the teacher gives you notes and then draws a mind map for you to strengthen your learning?

Student 8: I think so. Because although he (the teacher) provided his notes, it is not my own. He provides the entire content of the lesson; I go through the content and develop a mind map by myself. So I will have my note.

Researcher: In addition to mind maps, what other learning methods do you usually use?

Student 8: I take notes for other classes. I feel the economics teacher provided us with this note, and there are some advantages and some disadvantages. For me, maybe I don't want to take notes by myself. (laugh)

Researcher: Okay, thank you for accepting my interview today.

Transcript of Student 10

Researcher: Have you ever used the concept-mapping strategy before this semester?

Student 10: Yes, I used the concept-mapping method whenever I reviewed for exams when I was in high school. I feel the concept-mapping method works better for me. I used it for science classes like biology because many terms need to be remembered.

Researcher: How many times do you use the concept map strategy for this semester

Student 10: Yeah, more or less like less than ten times

Researcher: Do you use a concept map for other classes?

Student 10: No, I'm an art major. So we don't really need concept maps. But for economics, since we were required to make a concept map for our homework, then that's the only time I would make a concept map. To be honest, it (concept map) is helpful. But I'd prefer making my concept map when I want to, instead of something that I have to do.

Researcher: Do you feel a concept map helps your learning?

Student 10: Yes. I think it does help. But I think for this semester. It didn't help me because I felt like I was forced to make a concept map since it was part of a requirement to get points. So it didn't really help me as much as I'd want to because I felt like I was being forced to do it, but maybe like take the time to do it like on my own. It'll help me.

Researcher: Do you think the concept-mapping method helps you participate in the class activities or engage in the course?

Student 10: Yes, definitely. That's where I start to build my concept map was. I have to listen during class so that I could make my concept map. After I made my map, I could answer the questions in the class. So it did help me. Also, since now we only have Zoom class, it's kind of hard to pay attention. But because of the concept maps, I was able to focus more.

Researcher: Can you describe the process of developing the concept map for your assignment?

Student 10: I'm usually I would create it after class when there's like the homework is like given to us like a week. First, we received the handout from the Professor, and I look at the handout simultaneously. When I was in the zoom meeting, I started making my concept maps, but only the main ideas or topics. And then I branched out to more like subtopics. But I don't like to add too much detail because I feel like it defeats a concept map's purpose. I think the concept map is like a significant overview of the lesson. So if I add too much detail to it, I feel it just disrupts the flow of everything.

Researcher: Do you prefer to read the material while creating your map?

Student 10: Yes, while I read, I make my concept map because if I read everything, I'll forget everything. I usually like to read the textbook and create my concept simultaneously. (LAUGHS)

Researcher: Okay. How do you feel when you create your concept map?

Student 10: Um, I feel very much organized in my brain. My brain is taking too much information, so I'm making a concept map to makes more sense. I think it's just like a sense of organization. The concept map really helps and makes me feel I'm getting the lesson better.

Researcher: Do you think of concept map strategy help your learning?

Student 10: Oh yeah, that definitely helps me learn because I'm a visual learner. I used to make a concept map during high school. So it really helps when I see things and like where it comes from, or like where it connects to. I think it helps everyone, honestly, even if you're a different kind of learner. It's just nice to have an image that shows you where you will get into and the level. Think if I have a 12-page handout, which is super overwhelmed me. But when I have a concept map to read, I feel it's nice to learn. It gets you an organized way to learn.

Researcher: What kind of learning strategy do you use besides of concept map?

Student 10: I just take notes, just like the regular students do. I take notes in my notebook, and then usually, I'd like to draw some illustrations and use different colors to highlight keywords and important points because I've noticed. I tend to memorize to remember more if I draw some sketches.

Researcher: Do you think the concept-mapping method is more efficient for you

Student 10: Yes, the concept map is definitely more efficient because when I draw It's it takes longer, obviously, but it helps me understand more. The concept map is like a perfect way to learn a topic, but the concept map is broad, not in detail. It is very efficient.

Researcher: Will you use the concept-mapping method in another course in the future?

Student 10: Yes, definitely. Again, I'm an art major, so there are more things like an opinion-based. I don't think there are many opportunities that I will use it, though.

Researcher: Do you use different colors In your concept maps?

Student 10: Yeah, I use an app that I can select different colors for different branches. My concept maps are very colorful. Colors help me a lot because the concept map gets too big like there are just too many terms; the color helps me remember everything in place. I usually use it as a standard have like three colors yellow, green, and blue. The main topic will be any color that I want to be different from either of the three. Maybe for like the main subject is like purple and then the sub-topics will just be like yellow or like important stuff will be yellow and then like maybe like a few definitions of that sub-topic will be in green, and then additional information will be blue.

Researcher: I can imagine. There are different layers with different colors.

Researcher: How do you prepare for this quiz and midterm?

Student 10: I'm usually going over my notes. That's why I would usually like to study one week before my exam. I need more time to draw my notes. The day before the exam, I would like to read the concept map that I submitted for my homework, just so that I really remember where everything is, connections between different ideas. I also like to review the teacher's notes.

Researcher: Thank you for meeting me today. If you have any questions, please feel free to contact me.

Transcript of Student 11

Researcher: Have you used the concept-mapping method before?

Student 11: Yes, I have used it. I think it is very effective, that is, it is very effective in both study and life. You see, for the economics paper, I also use concept maps to make a draft. This (draft) is right next to me so that when I write a final project, I can directly use it as my outline. I'm more inclined to clarify my thoughts first and then write later than the kind of thinking while writing.

Researcher: When did you learn concept mapping before?

Student 11: I think my teacher introduced it in junior high school.

Researcher: You just said that you use the concept map method for your studying and life, can you tell me more

Student 11: Yes. For example, in terms of my mathematics, in fact, in mathematics class, the teacher basically lets students learn by themselves. In fact, I didn't know where I should start at the beginning, and the teacher didn't give us some information on Canvas. So I start to read the table of contents and browse through it and then pay attention to its branches. Then there are sub-units under the branches, and then I will list the small tags under the sub-units. In this case, it is more detailed and more comprehensive.

Researcher: You used the concept map for your math class?

Student 11: Yes! The concept map can be used in many situations. For the economic final project, I developed a concept map to outline my final project, and I also used it to present the relevant information for my project. Also, when I go to the supermarket because I j have a bad memory and often forget to buy something. So, I construct a concept map as my shopping list. For example, grocery shopping is my topic, I will draw some branches on paper-like household items or daily necessities or school supplies. Then I draw some branches under the school supplies. This method can avoid feeling flustered and hasty when you do shopping. That is, you can find all the things you want to buy in the stationery area, which is convenient and be more efficient.

Researcher: How many times did you use the concept map method during the semester?

Student 11: More than 20 times.

Researcher: How do you construct a concept map?

Student 11: First of all, it is definitely to determine what is the topic. For example, if we want to learn about resilience today, then I must determine what the subject is. In fact, you can also use five W to do this thing. For example, why? How? Something like that. This will be more efficient and organized. The second step is to lay out the concepts that you want to organize. It's probably the process.

Researcher: What if you encounter a word you don't recognize?

Student 11: I might first read the sentence that the word is in a few times to see if I can guess its meaning. Then look up the dictionary. But I have learned economics before, so I may be more familiar with it, so there is no vocabulary trouble.

Researcher: Do you think you enjoyed it when you create your concept map?

Student 11: If you see creating a concept map as a task, you must feel overwhelmed. But if you see creating a concept map towards a goal, for example, I can only use the concept map method to let me better grasp the knowledge of this unit. So, I towards the goal, I will do it. But most of the time, I still enjoy it. Because the first thing to do is to use my favorite method for studying. And I do not see it (developing a concept map) as homework, but treating it as a better way I like to do it. There are many colors in my concept map. For example, using more colors will make me feel happier. There is nothing you can always enjoying it unless you find ways to make yourself enjoyable.

Researcher: Do you think concept maps help your study?

Student 11: Yes. It (concept map) can help me better sort out and clarify my thinking, whether it is used in the final project or homework. It is helpful.

Researcher: Do you think you will apply this method to other subjects?

Student 11: Yes. I use and will use the concept map method in almost all classes this semester.

Researcher: In addition to the concept map method, what are your other learning methods?

Student 11: Oh, I take notes, wait a minute, I will show it to you. Here it is. I studied chemistry before, look at all the concept maps here. These are all the notes for chemistry class. First of all, I will mark each important point with color, and I will use another color to highlight the less important points. I also like to use Cornell's method to take notes.

Researcher: What is that?

Student 11: You can divide the paper into 3 parts. Then just leave a little bit on the side, wait, I'll show it to you. (Sharing notes) This is an economic note I made. He actually has that kind of subtitle in the column on the left, and the big one on the right, you can remember the important knowledge points, but the bottom part is the summary part for you.

Researcher: Okay, thank you for talking to me today.

Transcript of Student 12

Researcher: There is no right or wrong answer to your response. I am interested in your feedback, your thought, in your opinion about concept mapping method. So please answer the correction, honestly. Your answer will be kept confidential, and they will not be used as part of a final grade assessment for economic class.

Researcher: How's your day?

Student 12: Not bad. How about you.

Researcher: I'm okay. Have you ever use the concept map method before this semester?

Student 12: Yes, I have it back in high school. I think I've used it for like English class.

Researcher: How many times do you use the concept map strategy for this semester.

Student 12: I think I only use it for microeconomics for homework. There were probably 12 times.

Researcher: And generally, do you think I'm concept map metal is useful for your learning?

Student 12: Yes, because I'm a visual learner. For example, when I study for a test, the concept map helps me remember the chapter's section easily.

Researcher: Can you describe more why you think the concept map is helping your learning?

Student 12: It helps me explored the lesson more. It allows the question like what the main idea is and how to connect it to the other lessons like it makes me see the relationship between being the main idea and the subtopic.

Researcher: What's the process you develop a concept map?

Student 12: When I began, I started to look through my notes first. Then I have a scratch paper, and I write down the main idea and subtopics next to the main idea. I keep expanding the map and make sure that I'm getting the whole picture in my concept. I would make sure I get all the subtopics and the essential description of that subtopic, and then I add examples for that, for example, figure or formula.

Researcher: Do you use different colors for your maps?

Student 12: Yes, it helps me distinguish which subsection belongs to so that I won't confuse when I go back to review it. I also use different shapes to present other thoughts, for example, squares and circles. It distinguishes different sections or subtopics, or levels. For example, the central circle is the main idea. And then, the next square in the following subsection. And then below that are the circles for like the descriptions.

Researcher: How do you prepare for your quiz and midterm exam?

Student 12: I usually create a reviewing note for preparing quizzes and midterm exams. Because that's how I study in high school, I typically make bullet point notes; for example, I put the main topic first, and then sub-topics will be the next line. My notes have many layers. I transfer my notes into a map. It's easier for me because I already know what the main idea and subtopics are.

Researcher: Which one is more learning effective for you? The concept map method or the bullet points note?

Student 12: To be honest, it's bullet points. While I am writing the notes, I am memorizing. I repeated it over and over until I can get the idea.

Researcher: Do you enjoy the developing process?

Student 12: Yes. I know it (creating a map) will eventually help me understand and see the bigger picture of the whole like the lesson. But it is quite time-consuming. I typically spend 30 to 45 minutes thinking about what I'm going to put on my paper. Once I have those ideas, I will transfer them to the paper. But it's all good.

Researcher: And then do you think the concept map helps you to participate or engage the class.

Student 12: Oh, I think it's. Because whenever our professor asked some questions. I can find the answer where I draw on the concept maps.

Researcher: Will you use the concept map in other courses in the future.

Student 12: I think I will. It helps me recall the lesson. I heard it (developing a concept map) will help the learning into long-term memory since we see the bigger picture. Is it a top-down approach? I heard that viewing the bigger picture and then separating the other concepts into some sections called the top-down approach. So I think that's a really important approach to

understand when learning the lesson. I major in accounting and finance. I think I will use it even though it's not a requirement.

Researcher: You're ready to answer all questions, and then thank you for meeting with me; our conversation will be confidential, and if you have any concerns, please email me, or you feel. I don't want to participate. This research tells me I can withdraw your data. Okay, thank you so much.

Student 12: Thank you. Have a great day.

Transcript of Student 13

Researcher: Have you ever used the concept map skills strategy before the semester.

Student 13: Yes. In my high school. We would do concept maps or graphic designs often and sometimes even while writing my notes in my high school. Sometimes these visual designs and graphs are important to me. And they really help me organize my thoughts. I've been doing some concept maps or graphic visuals before this semester.

Researcher: Would you like to talk more about your previous experience

Student 13: When I was in high school, I learned well through visual aid and design to organize my notes. I think the concept map was one of them. So I was already experienced in how to create a concept map properly.

Researcher: What subject did you apply to the concept map?

Student 13: Well, it helped with my science subjects. I'm not good at science class. So doing concept maps helped me to organize my thought during the course,

Researcher: How many times do you use the concept map strategy this semester?

Student 13: I only use concepts concept maps for the economics class. I think 12 times.

Researcher: Do you think the concept mapping method is useful to you.

Student 13: Well, to me, it depends on the student because some students learn differently. Some students prefer reading off words next offerings. Yes, but some students like me. It helps to have visualized the information.

Researcher: Okay, so you think concept map metal can visualize that information. Do you think the concept map helps your learning?

Student 13: Yes, but then again, it will depend on how a student learns because each student learns differently. But, it (concept map) helps my learning.

Researcher: Can you describe the process of developing the concept map for your assignment?

Student 13: So, for my economics class, first, I take notes in my economics class, and I have my headings and my subheadings, and everything is written. After that, I start to develop my concept map based on my notes. So I can organize my thoughts together. I start from the inner circle with the main topic, then branch out to its other subtopics, and advantages out to what those other subtopics are. It's like the, but I'm not sure if you're familiar with a tree diagram.

Researcher: tree diagram. Yes.

Student 13: Yeah, but it is just branching out to others. Yeah, that's how I do my concept maps.

Researcher: When you develop a concept map, how do you feel?

Student 13: What helps me sometimes that I play music while I do my concept map so that I don't get bored or don't feel exhausted. But yeah, I just turned on my music, put on my headphones, and start my concept up, and I feel optimistic about it. I feel okay, I guess.

Researcher: Can I say you are willing to create a concept map.

Student 13: Yes.

Researcher: Since you create your concept map, do you think you are a concept map to participate in the course.

Student 13: Well, I think yes, to a certain extent. Because I already take notes beforehand, so doing the concept maps helps my thoughts get organized after the class, but yes, I think it's somewhat helped me with my class engagement.

Researcher: So, the concept that can help you to review the chapter?

Student 13: Yes.

Researcher: Do you think the concept map strategy helps your learning and why?

Student 13: Uh, yes, yes. It definitely helped my learning because it's organized and going back to it, and reviewing my notes. I have fun because it's already there. It's all the organized details and topics. Overall, it helps me organize my thoughts. So yes, and that's how a concept map helps my learning.

Researcher: You mentioned many times you say you take notes, and what kind of note-taking strategy you use?

Student 13: For my economics class, um, since professors spacing on the class was pretty fast. I would just take note of whatever I see on the screen. After class, I would like to organize it. I like color code certain topics that are important points. And I like to use the bold feature or the italicize feature a lot and underlined. And I change the fonts depending on like this is my heading, then it's a bigger font, something like that.

Researcher: Which one do you think is bullet points note-taking is more helpful you or concept mapping method is more help you?

Student 13: Um, well, I think this one (bullet point note-taking method). I guess it's because I've been doing this method ever since. The concept maps were something I did just a few years back, pretty recently.

Researcher: How do you prepare for your quiz and Midterm exam?

Student 13: I just go through my notes and my concept maps, so I understand the less than more than other subjects because the teacher doesn't require a concept map like this one. I just review my notes and memorize the topics, but I can remember those key points.

Researcher: Will you use a concept map in another course in the future if a teacher doesn't require you?

Student 13: Yes, I use it if I don't understand the topic completely. If I really, I really have to organize my thoughts. But if I already understand the subject, then I don't think that I will do it.

Researcher: Will you recommend other international students use a concept map when studying in the US?

Student 13: I think it will depend on them. Some students find it even more confusing, but for me, yes, I will recommend other international students try it out.

Researcher: Do you feel any disadvantage of the concept map?

Student 13: I don't do concept maps always it's because sometimes it can be time-consuming. If I already understand the topic, I feel it's not necessary to do the concept map. But if I struggle with the subject, the concept map will be very helpful.

Transcript of Student 18

Researcher: Have you ever used the method of concept mapping?

Student 18: Yes. In junior high school and senior high school.

Researcher: What's the purpose the teacher teach you about the method of concept mapping method?

Student 18: To understand the outline of this course and to do brainstorming.

Researcher: Which course did you use concept maps in?

Student 18: I have used concept maps in biology courses and Chinese courses. In the Chinese class, we need to analyze the articles. Everyone tries to find the main points, then we analyze the articles and find the supporting ideas. In this way, when we write a summary paper, we can later use these key points as writing material.

Researcher: How many times did you use the concept-mapping method this semester?

Student 18: Around ten times.

Researcher: Please tell me in detail, how do you start to construct a concept map?

Student 18: First, to start with that unit topic. Then I will classify it into several major directions and then write down some key points for each direction. It is to simplify what the teacher teaches. So I understand fully at one glance.

Researcher: Will you finish reading before drawing? Or read while drawing?

Student 18: I usually organize my notes and read them before constructing my concept map.

Researcher: So, the steps for you to construct your concept map is divided into three-stage

Student 18: first read, take notes, and then draw.

Researcher: What's your note-taking method?

Student 18: I usually make bullet points. For those important subtitles, I use different colors of the pen to circle it.

Researcher: How do you prepare for the quiz and mid-term exams?

Student 18: For preparing for the quiz, I will review the notes and concept maps. For preparing for the mid-term exam, I will reorganize my notes.

Researcher: How do you feel when you construct a concept map?

Student 18: Very relaxed. While doing it, I can discover some important points that I may not have noticed in class, reinforcing my learning.

Researcher: You just said that when you were constructing your map, you could find that there were some things you didn't know before. How?

Student 18: Because it's a rush to take notes during the class, I couldn't remember all the important points. After class, when I construct the map and read the notes again, I have a better understanding of the lecture.

Researcher: Do you think concept maps can help you participate more in the classroom?

Student 18: Not really. But I think the concept map is more helpful for review. I usually construct a concept map after class, which can reinforce my learning.

Researcher: Do you think bullet points or making a concept map is more helpful for your study?

Student 18: Bullet points. Because bullet point notes present more information, it can help me to memorize the learning materials.

Researcher: What advantages do you think the concept map has? What are the disadvantages?

Student 18: The concept map is easy to understand at a glance. When looking for the key points, I can find the key points without going through many texts. Also, you can see the relationship between points and points. The disadvantage is that sometimes the concept map doesn't present enough information, so sometimes I can't understand it.

Researcher: Will you use the concept map in other subjects in the future?

Student 18: I think so. Because I am a business major, there are many pieces of stuff talking about relationships, so if I present it as a concept map, it may be easier to understand than I read through a lot of text notes.

Researcher: Do you think concept maps can help you participate in the classroom?

Student 18: If I have a complete concept map before the lecture, I think I will share my thoughts easily because I can find the key points quickly.

Transcript of Student 20

Researcher: General speaking, do you think the concept mapping method is useful for you? If yes, why is it useful? Or why is it useless?

Student 20: I think it is useful. The Economics teacher assigns a concept map as the last question in the homework. It helps me organize my thoughts. The teacher's note is following the textbook order. The teacher asks us to create a concept map, which can help me review the lecture and organize my thoughts.

Researcher: Did you use the concept map method before this semester? When and how?

Student 20: Oh, I used it in high school. It was in a grammar class or a writing class. I forgot how the teacher asked us to use concept maps.

Researcher: Do you continue to use this method after that?

Student 20: No. Because I find it a little troublesome.

Researcher: Why do you find it, troublesome?

Student 20: At that time, our teacher had a lot of requirements. I didn't want to use it at that time, and I didn't feel very useful. But now I feel useful for economics class.

Researcher: What requirements your English teacher asked for at that time?

Student 20: At that time, I didn't remember the subject of that concept map. At that time, the teacher asked us to read an article many times because I don't like reading very much, so I feel a little troublesome.

Researcher: But in your economics class, don't you need to read the chapter before developing a concept map?

Student 20: What I usually do is use the teacher's notes. I develop the concept map based on the teacher's note.

Researcher: So, you are saying if someone sorted the chapter information out for you, and you develop a concept map, is it less challenge for you?

Student 20: Yes.

Researcher: How many times did you use the concept map method during the semester?

Student 20: Maybe ten times.

Researcher: You just mentioned that the economics teacher gave you notes, and then you drew it into a concept map. Can you tell me more about how you draw a concept map?

Student 20: The teacher's notes present bullet points. I will draw a big circle first, based on the topic, and then I will add small points under the big circle for summarizing, and then keep extending it. I use this way for probably every unit.

Researcher: So you use the teacher's notes as a reference for developing the maps?

Student 20: Yes.

Researcher: would you use different colors for your maps? Why?

Student 20: Yes, the economics teacher uses different colors when he teaches. I use the same color that teacher used in the class for my notes. I think if I use the same color, which will help me to remember the content. So I apply the same color that teacher used for the class for my concept.

Researcher: I know you have quizzes and midterm exams. What are your review materials?

Student 20: The teacher gives the review materials.

Researcher: Then, did you review your concept map?

Student 20: No.

Researcher: Why don't you review your concept map?

Student 20: I feel that the reviews given by the teacher are more comprehensive. Then when I review, I prefer to discuss with my classmates. I called my classmates and discuss the Word file and PowerPoint file given by the teacher. So I don't need to review my concept maps.

Researcher: Are the review files that the teacher gave to you all in question format?

Student 20: Oh, no, no. It is similar to the class notes, but it is more concise, and there will be a few sample questions.

Researcher: How did you feel when you were drawing that concept map?

Student 20: I think it's fine. It can help me understand. I think it's pretty good, but not very happy.

Researcher: Not very happy? Why?

Student 20: Well, it's because this is an assignment.

Researcher: Did you feel positive after you finished it?

Student 20: Sometimes, I just can't keep up in class, and then if I draw a concept map, it will make me feel that I have finally learned something in an organizing way.

Researcher: Good. Can a concept map help you participate more in the course?

Student 20: Yes. Doing a concept map can help me understand better. Sometimes I don't quite understand it in class, and then when I do a concept map after class, I feel that I suddenly understand the lecture.

Researcher: Why do you think it helps you understand the course?

Student 20: ok. For example, the monopoly chapter. On that day, I was online learning outside, and I didn't pay too much attention to class. I don't understand the monopoly concept at that time. After I got home, I listed the key points using the concept-mapping method, and then I feel I have a better understanding.

Researcher: But if you look at the teacher's notes, can't you understand it?

Student 20: Sometimes, I feel boring when I read the teacher's notes. If I draw a map by teacher's notes, I feel I understand the learning materials.

Researcher: Can I say that because the teacher wrote it, and when you draw, you can see the relationship between each point and each point, so can it help you understand?

Student 20: Yes.

Researcher: You didn't like to use concept maps when you were in high school, so what is your note-taking method?

Student 20: I like to copy the note. The teacher says I write it down. If I can't remember it, I will write many times until I remember it.

Researcher: OK. Which one is more effective for you, copy the notes, or draw a map?

Student 20: I think drawing a concept map is more effective.

Researcher: Why?

Student 20: Copying notes is very troublesome; in fact, it has to be copied many times. Now I feel that the concept map seems more useful. This semester I feel how to draw concept maps. In the past, I didn't know that much, but now I know better.

Researcher: Do you think you have drawn concept maps more than ten times since the beginning of school? Do you think you are skilled in drawing concept maps?

Student 20: Yes. In the beginning, I had to check the textbook many times. Now, I can summarize the chapter very quickly and find the expanded points.

Researcher: What do you think if you use the way how you study in China in the United States?

Student 20: Not very good.

Researcher: Why?

Student 20: In this case, I maybe feel more tired. The education I received is to memorize and memorize all the time. If I use rote memorization in the class in the United States, I find it more difficult because English is not my native language, and I have more challenges to memorize it.

Researcher: Do you think the concept map might help you overcome the challenge when you study in the U.S.?

Student 20: I think it can.

Researcher: Why do you think it can help you overcome language difficulties?

Student 20: Because of the concept map, present information concisely. I think I can understand what is going on at a glance. If this is the case, even if it is difficult for me to remember it, but when I see it, I can remember it.

Researcher: Will you use this method in other classes in the future?

Student 20: I think I will. Next semester I will have a microeconomic class, and I think I will use it again.

Researcher: Okay, thank you for your visit today.

Transcript of Student 21

Researcher: Do you think concept maps are useful for you?

Student 21: I think it is useful. Because in class, the teacher gives a participation question in the chat box, we have to think about the answer and listen to the lecture at the same time. We might miss some important concepts from the lecture.

Every time I create a concept map, I read the whole chapter first; that is, then I write down the important points, which helps me to remember the key concepts of those lessons better.

I may not listen to him attentively, and then I might just miss some points which I didn't hear.

When I review the lesson, the concept map might help me to remember it (the lesson) better because the concept map helps to review the parts that I might not pay attention to or understand during the class.

I don't like to read the text very much. Because of the concept maps assignment, which forces me to read the textbook, I think it's helpful.

Researcher: Have you used concept maps before this semester?

Student 21: I used it in high school, but I don't remember how I used it clearly. But I remember in English class, the teacher asked students to analyzed characters and draw the concept map.

Researcher: How many times did you use the concept-mapping method during the semester?

Student 21: Use homework as many times as you should.

Researcher: Did you use it in other classes?

Student 21: Sometimes in English class. I use the concept-mapping method. For example, when I write an essay, first, I use the concept map to sort out the points that I want to write and then create an outline before I start to write.

Researcher: What is your process when you develop your concept map?

Student 21: Well, first, I draw the topic of the chapter in the middle of the paper. Then each chapter has the themes; I will develop multiple dots for each theme, for example, one dot for theme A, another dot for theme B, then extends the subpoints from each to themes; that is, each theme has its own frame.

Researcher: Did you look at the index of the textbook when you develop your concept map?

Student 21: No. I just turned to the chapter directly, and the first step is writing down the name of the topic, and then I kept reading, and then kept adding more details.

Researcher: Do you also read the teacher's notes?

Student 21: Well, I just read the teacher's notes before the exam. He actually provides a complete summary of the chapter. If I read the teacher's notes, I will not read the textbook throughout the whole chapter. I would directly use his notes for my concept map assignment, and this it's not a good idea. So I think it's better for me to read the whole chapter by myself, then develop the concept map.

Researcher: Your concept map is very colorful!

Student 21: Right, right. Because I like it. I think it's easier to distinguish key points by identifying colors. Then I can interconnect lines to link points and looks organized.

Researcher: How do you use those colors?

Student 21: For example, I use one color for the first layer circle, another color for the second layer. It makes me feel the thing is developing gradually. I feel like the map led me to see the key points step by step with several layers.

Researcher: Do you think concept maps can help you participate in this course?

Student 21: Oh, what I just said, I think it is definitely possible. Because when we were doing homework, we had to read the textbook. When we develop the concept map, we have to read it (textbook) again. It's (concept map) really help me to remember those points easily. For example, I remember there is one chapter that contained many key concepts in my biology textbook when I was in high school, there are many important concept maps, and I have to memorize them by rote. When time goes by, I forgot. On the other hand, I will remember the key concepts through developing a concept map; after that, the only thing you need to do is read it (concept map) a few times more, and you will remember it.

Researcher: Do you take notes? Like bullet points?

Student 21: Yes. I would look for summary notes online. I like to use summary notes to review because there is no need to read through the whole chapter. For example, after I find the summary note, I develop a concept map, then I wrote all the important concepts on the concept map, so I don't have to look through the book and reread it.

Researcher: What do you think is the difference between a concept map and bullet points?

Student 21: First, the structure is different. If I have a notebook with all text on it, I don't want to read it. But if you have a concept map with different colors that distinguish concepts, and then you have images on it (concept map) to help your memory, there is a saying that a picture is worth a thousand words. The best thing about the concept map is that it contains pictures and colors. On the other hand, if I have many bullet points on my notes, I feel it is no different than a textbook. Textbooks have many texts on them, so make the bullet notes. But if you use a concept map, that would be very different. The concept map is more inclined to understand the images; the bullet points are just text. The concept map is like a picture, which helps me understand better.

Researcher: How did you feel when drawing the concept map?

Student 21: (laughs) It was good at first. In the beginning, I think it's good! Developing a concept map as an assignment. I like it! Later, I discovered that I have to develop two concept maps for every single assignment. You know I have to spend almost 2 hours developing a concept map. There was one time I spend two hours creating a concept map, and after that, I couldn't export it! Then I have to redo it.

Researcher: So it's a technology problem. Do you think constructing a concept map gives you a sense of accomplishment?

Student 21: There must be a sense of accomplishment after finishing. I think the concept map helps me quite a lot. Now, when I look back, I don't mind if it cost me much time to develop a concept map. But if I have assignments for other classes, I feel there are many things I have to be done. Because drawing a concept map takes a lot of time. But drawing a concept map is very helpful; I think it is a good analysis tool.

Researcher: You think that concept maps can help you study, so how do you prepare for the quiz and midterm?

Student 21: I have been taking notes since the sixth grade. I don't like to read textbooks, but I make bullet points. If there is some English vocabulary that I don't understand, I will make a note in Chinese. I said before that I would prepare all the summary notes to help me to review the chapter, so I don't need to read the textbook again. I use this strategy for the two economics midterm exams. Summary notes have more details, but the concept map helped me review the key points for the class.

Researcher: Which one do you think is better for your study?

Student 21: I think bullet points are a very useful method for me; I will keep using it. The concept map is helpful for reviewing. In fact, I feel developing the concept map as homework is helping to review the learning materials. I think bullet points and concept maps both help you to remember those key points more firmly. I think each step is very important, no matter you are creating a concept map or organizing the bullet points. I think they played the same role, that's it.

Researcher: Do you think you will use the concept mapping method in other classes in the future?

Student 21: Yes, I think so. I think the concept map is more commonly used in the business field. My major is business, and I believe for analyzing market streams, I must be used concept maps. There are many business models present in the form of concept maps. Then, I think I will use the concept-mapping method for English class. When I was in high school, every once in a while, the English teacher assigned a poster to every student and ask students to analyze the characters which are from the poster. So I said that when I analyze the characters or read texts, I used concept maps to sort out my mind. I use concept maps for writing essays because I have to organize my thoughts before I start to write. If I don't draw a concept map as my outline before I write, I don't know where I should start. I might write at the beginning, and then what is the next step? So every time I really have to create a concept map, then I start to write.

Researcher: I see. Thank you for meeting with me today.

Transcript of Student 22

Researcher: Do you think the concept mapping method is useful to you?

Student 22: Yes. It is very useful for me because I learned from my concept map. I haven't done this in high school. It was unique for me. But when I started doing a concept map, it was so helpful for me because my concepts get clear when I make a concept map. My concept maps

contain all the important points of the chapter, and even if I don't read the chapter, I just go over the concept map. It makes all my concepts clear. I also use it for preparing for my exam.

Researcher: Approximately how many times do you use the concept map strategy for this semester?

Student 22: 10 to 11 times for economic class. I have rhetoric or USF and business statistics classes. There is no requirement for concept map assignments in those classes, but economics. I used concept maps very accurately.

Researcher: Do you think the concept map helps you to participate in the course activity?

Student 22: Yes, it helps me to participate in the course activity. My concept maps are such a manner that it covers almost every point of the chapter, such as formulas or the key terms associated with the chapter. And because of that, it makes me more confident about what I'm studying.

Researcher: Please describe the process of developing the concept map.

Student 22: Let me show you my concept (exciting).

Researcher: Sure.

Student 22: This notebook is for my concept maps.

Researcher: Wow. Every map is so clear. You use different colors.

Student 22: Yeah, I use different colors for linking different concepts together.

Researcher: When you read the chapter how you start to draw the map?

Student 22: First of all, when I start to draw the concept maps, I generally read the chapter. I also learned some of the key terms during this process. I wrote the chapter name in the middle of the paper—for example, public goods. Next, I separate it with different points like for public goods. I have consumer goods. I have other public goods for private goods. I separate those additional terms in the concept map, and then I also associated them with the examples. I tried to add these details in the same content so that whenever I read the map, it is clearing my mind.

Researcher: How do you feel when you develop a concept map?

Student 22: I like visual learning, and I love the concept map method. Developing a concept map gives me a sense of accomplishment. Also, I feel I'm doing something so creative. Because I always make my concept creative. I am a person to do everything creatively; that is my hobby. In high school, I used to do projects in a very creative way. I am in the highest percentage in high school. (Laugh) And then I keep working on it and it. I feel so good to do it (developing a concept map). I don't get bored with it. Like even if you give me asking concept maps per day. I can do it with no problem.

Researcher: Do you think concept map strategy help your learning

Student 22: Yes. It helped me immensely learning because whenever I go to concept maps to review for the exam. I always use concept maps for preparing for my exam. I feel if I have to study more and more text, I feel stressed. So, if my thoughts are clear with the concept map, then the studies become easy. I can get everything if I do a concept map without any doubt, but I get confused if I only read the texts.

Researcher: What's your learning strategy before you learn the concept map?

Student 22: I used to generally make bullet points like whenever I read a chapter, I used to keep a notebook with me and some of the important points.

Researcher: Which one is more effective for you, bullet points, or a concept map?

Student 22: I think concept maps are more effective. Because when I make bullet points for studying, it was time-consuming, like I have to learn a chapter for a day for another day. I have to copy the note down. But, still, it's challenging for me to organize everything from the textbook. The concept maps are so efficient. And it's not time-consuming; I need to write down the essential key terms and formulas. It is straightforward to make and see the whole picture of the chapter.

Researcher: Would you like to use the concept map in other courses in the future?

Student 22: Yes, I wouldn't use concept maps for my other courses in the future. I have macroeconomics in my second semester and other subjects, so I will be using concept maps in the same way that I used for this semester.

Researcher: So, thank you for meeting with me; our conversation is confidential. So if you have further concerns, please feel free to contact me.

Transcript of Student 26

Researcher: Have you ever used a concept map before?

Student 26: It's a mind map, right?

Researcher: Yes.

Student 26: Well, I used it in the biology class. Teachers sometimes developed concept maps for students. The biology teacher created the concept maps to present the content from the textbook. Students knew what teachers are going to teach immediately once they see the concept maps.

Researcher: How many times did you use this concept mapping method this semester?

Student 26: Once a week, we have 14 weeks in this semester.

Researcher: Do you also use this method in your other classes?

Student 26: No

Researcher: Could you describe how do you develop a concept map?

Student 26: First, I find out those key concepts first, and then classify them. Then connect them with each definition.

Researcher: Do you think concept maps can help you participate in classroom activities?

Student 26: I don't feel much help.

Researcher: Why didn't it help?

Student 26: I feel the concept map is mainly to help me understand the content and memory of the content. So I think the concept map doesn't not much help classroom participation.

Researcher: You just mentioned that you think the concept map helps you understand. Can that be interpreted as you feel the concept map helps you learn?

Student 26: Yes.

Researcher: Why?

Student 26: Because the concept map connects the key points and related words. It's easy to remember. It saves my time memorizing all content. So, it means the concept map represents the concept.

Researcher: In addition to the method of concept mapping, do you have other learning methods?

Student 26: Taking notes.

Researcher: Do you think the method of taking notes or the method of creating this concept map, which one can help your study more?

Student 26: You have to take notes first before you develop a concept map. You need to memorize everything (text) before you can find the key points from the text and then connect them.

Researcher: So you use these two methods together. Will you use this concept map in other classes?

Student 26: If the context is large, maybe I will use it. But if the content amount is not large, generally speaking, I do not use it because it is very troublesome. (Feel annoyed)

Researcher: Why do you find it, troublesome?

Student 26: It is very troublesome, especially to create a concept map for someone else. Because you need to make sure the person could understand your map. I need to spend more time to make it (concept map) clear. If the concept map is a task or homework, you must draw it clearly so that others can understand it. And it takes time.

Researcher: When you were drawing concept maps, how did you feel?

Student 26: Feel I am handling homework (doesn't want to pay more time on it)

Researcher: If the teacher didn't teach you this concept map learning method this semester, what other strategies would you study?

Student 26: Look at the notes, then search for videos on the Internet if I don't understand. Watching Chinese videos will make it easier to understand.

Researcher: Do you think the concept map method is helpful to you?

Student 26: It helps a bit.

Researcher: Why?

Student 26: The concept map helps me remember and sort out concepts and the relationships between them.

Researcher: Will you use the concept map for the future learning?

Student 26: I don't think so. It takes too much time.

Researcher: Okay. Thank you for meeting with me today.