

## Online Language Learning Using Virtual Classrooms and Knowledge Building Forums

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**TESI DOCTORAL – TESIS DOCTORAL- DOCTORAL THESIS  
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This doctoral dissertation is dedicated to Robert N. McKerrell.



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I, Dra. Mar Gutiérrez-Colón Plana, STATE the present study entitled “Online Language Learning Using Virtual Classrooms and Knowledge Building Forums,” presented by Marni Lynne Manegre for the award of the degree Doctor has been carried out under my supervision at the Department of Pedagogy at the University Rovira i Virgili, Tarragona. This thesis and the associated research fulfill the conditions for the award of DOCTORATE in accordance with the current Spanish Legislation.

Doctoral Thesis Supervisor



I, Dra. Mercè Gisbert Cervera, STATE the present study entitled “Online Language Learning Using Virtual Classrooms and Knowledge Building Forums,” presented by Marni Lynne Manegre for the award of the degree Doctor has been carried out under my supervision at the Department of Pedagogy at the University Rovira i Virgili, Tarragona. This thesis and the associated research fulfill the conditions for the award of DOCTORATE in accordance with the current Spanish Legislation.



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## **Abstract**

This dissertation is comprised of three projects where areas of Computer Assisted Language Learning (CALL) have been investigated. The first project describes the features and functions of virtual classroom systems in online language learning (OLL) instruction. The second project presents the initial phase of a study analyzing the conversations in a Knowledge Building (KB) forum for evidence of foreign language acquisition (FLA). The findings from this project were used to create the method for the third project of this dissertation. The objectives of the third project were to determine whether FLA occurs during the KB process.

The method of this dissertation used both method triangulation and data triangulation in the analyses. In the first project, 35 OLL teachers that work for private companies teaching English as a Foreign Language (EFL) were surveyed using an online digital survey on their perceptions of teaching in these environments. In the second project, an ad hoc analysis of the posts in a forum was completed, where the posts were analyzed using a plagiarism and grammar checker for evidence of FLA. Finally, the third project included testing 60 students at a Spanish school using a pre-questionnaire, a pre-test, a post-test, and a post-questionnaire. In conjunction with the testing, in-class observation was included to watch the students as they advanced through the stages of knowledge.

The results of the initial project show that the teachers believe they get to know the students better on a more personal level using a virtual classroom than in a face-to-face (F2F) environment, they believe the students learn at the same rate or faster when using virtual classrooms, and they would like to see more subjects offered in this online environment. In addition, the teachers surveyed believe that virtual classrooms could replace traditional classrooms for most subjects.

The analysis of the second project found evidence that the students passed through the construction of knowledge stages; however, confounding variables, a small number of posts

by participant, and inconsistent error types made it difficult to determine whether there was evidence of FLA for each student.

The results of the final project show the strongest increases in subject comprehension and writing abilities in FLA. Additionally, the results show that foreign language skills do not equalize among the students in knowledge building tasks as other skills tend to.

Finally, the main contribution of this research is that it investigates an area of CALL, specifically FLA in virtual classroom systems, that has not previously been extensively studied where the findings report that these systems are effective not only for language learning but virtual classroom systems can be used to replace traditional classroom teaching and learning for other subjects. In addition, this thesis has addressed FLA in knowledge building tasks. Previous studies of knowledge building addressed content learning and how students learn and teach each other in these student-centric environments. Since English is used as a lingua franca in knowledge building tasks, this thesis has addressed FLA as part of the knowledge building process, which was not a focus of former studies on this topic.

## Resumen

Esta tesis se compone de tres proyectos con los que se han investigado distintas áreas del Aprendizaje de Lenguas Asistidas por Ordenador (ALAO). El primer proyecto describe las características y funciones de los entornos virtuales en el aprendizaje/ enseñanza de lenguas extranjeras asistidas por ordenador. El segundo proyecto presenta la fase inicial de un estudio que analiza las conversaciones en un foro de “construcción de conocimiento” (conocido en inglés como “knowledge building forum” (KB) con el objetivo de encontrar evidencias sobre la adquisición de una lengua extranjera en este tipo de entornos virtuales. Los hallazgos de este segundo proyecto se han utilizado para crear el método de investigación para el tercer proyecto que se presenta en esta tesis. Los objetivos del tercer proyecto son determinar si mediante el uso de la metodología del foro de construcción del conocimiento se puede adquirir una lengua extranjera.

Para realizar el análisis de los datos de esta tesis, se han utilizado tanto la triangulación del método como la triangulación de datos en los análisis. En el primer proyecto, 35 profesores que trabajan para empresas privadas que enseñan inglés como lengua extranjera (EFL) contestaron una encuesta sobre sus percepciones sobre la enseñanza en estos entornos. En el segundo proyecto, se realizó un análisis ad hoc de las publicaciones en un foro, cuyo objetivo fue comprobar si había plagio y comprobar la gramática para encontrar evidencias sobre la adquisición de lengua extranjera. Finalmente, en el tercer proyecto se evaluaron 60 estudiantes en una escuela española utilizando un pre-cuestionario, un pre-test, un post-test y un post-cuestionario. Junto con las pruebas, se incluyó las observaciones en clase para poder ver los cambios de los estudiantes a medida que avanzaban por las etapas de conocimiento.

Los resultados del proyecto inicial muestran que los docentes creen que llegan a conocer mejor a los estudiantes a un nivel más personal utilizando un aula virtual que en un entorno presencial, creen que los estudiantes aprenden al mismo ritmo o más rápido cuando

usan aulas virtuales, y les gustaría que se ofrecieran más asignaturas en línea. Además, los profesores encuestados creen que las aulas virtuales podrían reemplazar las aulas tradicionales para la mayoría de las materias.

El análisis del segundo proyecto nos muestra que los estudiantes han pasado por las distintas etapas de construcción de conocimiento; sin embargo, algunas variables, el tamaño de la muestra (la poca cantidad de publicaciones por participante) y los tipos de error inconsistentes, hicieron difícil determinar si había suficientes evidencias para poder asegurar que había habido adquisición de lengua extranjera.

Los resultados del proyecto final muestran una mayor comprensión de la asignatura, así como un aumento en la competencia escrita en lengua extranjera. Pero los resultados muestran que los niveles de competencias en lenguas extranjeras adquiridos por los estudiantes durante las tareas realizadas en los entornos virtuales del “knowledge building fórum” no son siempre los mismos, mientras que el nivel de adquisición de otro tipo de competencias suele ser más o menos el mismo para todos los estudiantes.

Finalmente, la principal aportación de esta investigación es que investiga un área de ALAO, específicamente la adquisición de lenguas extranjeras o L2 en sistemas de aula virtual, que no ha sido previamente estudiada de manera extensa, y donde, según los resultados obtenidos en este trabajo, son sistemas efectivos no solo para el aprendizaje de idiomas sino que los entornos virtuales pueden utilizarse para reemplazar la enseñanza y el aprendizaje tradicionales en el aula. Además, esta tesis ha abordado la adquisición de la lengua extranjera o L2 en tareas de construcción de conocimiento. Estudios previos sobre la construcción de conocimiento abordaron el aprendizaje de contenido y cómo los estudiantes aprenden y se enseñan entre sí en estos entornos centrados en el estudiante. Dado que el inglés se utiliza como *lingua franca* en las tareas de construcción de conocimiento, esta tesis ha abordado la



adquisición de la lengua extranjera como parte del proceso de construcción de conocimiento, en un estudio único, ya que no hay estudios anteriores que aborden este tema.

## Resum

Aquesta tesi es compon de de tres projectes amb els quals s'han investigat diferents àrees de l'Aprenentatge d'Idiomes Assistit per Ordinador (ALAO). El primer projecte descriu les característiques i funcions dels entorns virtuals en l'aprenentatge/ensenyament de llengües estrangeres assistides per ordinador. El segon projecte presenta la fase inicial d'un estudi que analitza les converses en un fòrum de "construcció de coneixement" (conegut en anglès com "Knowledge Building fòrum" (KB) amb l'objectiu de trobar evidències sobre l'adquisició d'una llengua estrangera en aquest tipus d'entorns virtuals. Les conclusions d'aquest segon projecte s'han utilitzat per a crear el mètode de recerca per al tercer projecte que es presenta en aquesta tesi. Els objectius del tercer projecte són determinar si mitjançant l'ús de la metodologia del fòrum de construcció del coneixement es pot adquirir una llengua estrangera.

Per a realitzar l'anàlisi de les dades d'aquesta tesi, s'han utilitzat tant la triangulació de mètodes com la triangulació de dades en les anàlisis. En el primer projecte, es van enquestar 35 professors de llengua estrangera que treballen per a empreses privades, mitjançant una enquesta digital sobre les seves percepcions sobre l'ensenyament en aquests entorns. En el segon projecte, es va realitzar una anàlisi ad hoc de les publicacions en un fòrum, l'objectiu del qual va ser comprovar si hi havia plagi i estudiar la gramàtica per a trobar evidències sobre l'adquisició de la llengua estrangera. . Finalment, el tercer projecte es van avaluar 60 estudiants en una escola espanyola mitjançant un pre-qüestionari, un pre-test, un post-test i un post-qüestionari. Juntament amb les proves, es va incloure l'observació a classe per poder veure els canvis dels estudiants a mesura que avançaven per les etapes del coneixement.

Els resultats del projecte inicial mostren que els docents creuen que arriben a conèixer millor coneixen millor a als estudiants a un nivell més personal mitjançant una aula virtual que en un entorn presencial, creuen que aprenen al mateix ritme o més ràpid quan usen aules virtuals i els agradaria que s'ofereixin més assignatures en aquest entorn en línia. A més, els

professors enquestats creuen que les aules virtuals podrien reemplaçar les aules tradicionals per a la majoria de les assignatures.

L'anàlisi del segon projecte ens mostra que els estudiants passat per les diferents etapes de la construcció de coneixement; no obstant això, algunes variables, la grandària de la mostra (el baix nombre de publicacions per participant) i el tipus d'error inconsistents, van fer difícil determinar si hi havia suficients evidències per a poder assegurar que havien assolit algun grau de llengua estrangera.

Els resultats del projecte final mostren una major comprensió de l'assignatura així com un augment en la competència escrita en llengua estrangera. Però els resultats mostren que els nivells de competències en llengües estrangeres adquirits pels estudiants durant les tasques realitzades en els entorns virtuals del "knowledge building fòrum" no són sempre els mateixos, mentre que el nivell d'adquisició d'una altra mena de competències sol ser més o menys el mateix per a tots els estudiants.

Finalment, la principal aportació d'aquesta recerca és que investiga una àrea de ALAO, específicament l'adquisició de llengües estrangeres o L2 en sistemes d'aula virtual, que no ha estat prèviament estudiada de manera extensa, i on, segons els resultats obtinguts en aquest treball, són temes efectius no sols per a l'aprenentatge d'idiomes sinó que els entorns virtuals poden utilitzar-se per a reemplaçar l'ensenyament i aprenentatge tradicionals a l'aula. A més, aquesta tesi ha abordat l'adquisició de la llengua estrangera o L2 en tasques de creació de coneixement. Estudis previs sobre la construcció de coneixement van abordar l'aprenentatge de continguts i com els estudiants aprenen i s'ensenyen entre sí en aquests entorns centrats en l'estudiantat. Atès que l'anglès s'utilitza com a *lingua franca* en tasques de creació de coneixement, aquesta tesi ha abordat l'adquisició de la llengua estrangera com a part del procés de creació de coneixement, en un estudi únic, ja que no hi ha estudis anteriors que abordin aquest tema.

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## Declaration

I, Marni Lynne Manegre, hereby declare that this thesis is entirely my own work, carried out at University Rovira i Virgili for the Degree of Doctor in Educational Sciences, specifically for the program of Education and Technology in the area of Computer Assisted Language Learning.

The current thesis and its contents have not been submitted for a degree at any other university.

Where other sources of information have been used, they have been acknowledged. Some parts of this thesis have been previously published or are in process to be published in:

Manegre, M., & Gutiérrez-Colón, M. (2019) Second Language Learning in Knowledge Forums: an analysis of L2 acquisition of students participating in the Knowledge Building International Project. *EUROCALL, Call & Complexity. Proceedings*. DOI: 10.14705/rpnet.2019.38.1021

Manegre, M., Gutiérrez-Colón, M. & Gisbert, M. (2019). Foreign Language Learning in Knowledge Forums: using a knowledge building forum in an EFL Classroom. *EUROCALL Review*. 27(1). DOI:10.4995/eurocall2019.11150

Manegre, M., & Sabiri, K. A. (2020). Online Language Learning Using Virtual Classrooms: an analysis of teacher perceptions. *Computer Assisted Language Learning*. DOI: 10.1080/09588221.2020.1770290



Marni Manegre  
Tarragona, September 28, 2020

**Disclaimer**

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All other figures used for the data analysis are captures of the analyses from either SPSS or Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)). The information in these figures is specific to this study and is not subject to copyright.

In addition, all of the photography used in this dissertation were downloaded from Pexels ([www.pexels.com](http://www.pexels.com)), and the author has legal permission to use these images without subject to copyright infringements.

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The initial project of this thesis involved gathering the perceptions of online teachers. I am very grateful for the responses received for this investigation and I would like to thank the online language teachers who participated in the survey. They provided valuable feedback regarding their experiences teaching online, and their contributions are much appreciated.

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Without the contributions of the participants and the support of my supervisors and spouse, this dissertation would not be possible.



## **Publications from this Dissertation**

During the development of this dissertation, several of the results have been published, as used in the preparation of this report. The publications are as follows.

### **Articles**

Manegre, M. (2020). The influence of foreign language exposure in EFL classroom collaborative writing tasks. *The EuroCALL Review*. Accepted and in Copyediting.

Manegre, M. (2020). Foreign language exposure in knowledge-building forums using English as a foreign language *The Canadian Journal of Learning and Technology*. 46(2).

Manegre, M., & Gutiérrez-Colón, M. (2020). Foreign language learning through collaborative learning in knowledge building forums. *Interactive Learning Environments*. 28(7). DOI: 10.1080/10494820.2020.1836499

Manegre, M., & Sabiri, K. A. (2020). Online Language Learning Using Virtual Classrooms: an analysis of teacher perceptions. *Computer Assisted Language Learning*. DOI: 10.1080/09588221.2020.1770290

Manegre, M., & Gutiérrez-Colón, M. (2019) Second Language Learning in Knowledge Forums: an analysis of L2 acquisition of students participating in the Knowledge Building International Project. *EUROCALL, Call & Complexity. Proceedings*.

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Manegre, M., Gutiérrez-Colón, M. & Gisbert, M. (2019). Foreign Language Learning in

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### **Conference Presentations**

Manegre, M. (2019). *Using Knowledge Building Forums in EFL Classrooms*. International Conference on Intercultural Learning in the Digital Age: Building up Telecollaborative Networks (iTECLA 2019). Faculty of Philology, Translation and Communication, Universitat de València, València, Spain.

Manegre, M. & Gutiérrez-Colón, M. (2019). *Second language learning in knowledge forums. An analysis of L2 acquisition of students participating in the Knowledge Building International Project*. EUROCALL 2019, Call and Complexity, UCLouvain, Louvain-la-Neuve, Belgium.

Manegre, M., Gutiérrez-Colón, M., & Gisbert, M. (2019). *Using Knowledge Building Forums for FLA in Classrooms*. Fòrum Internacional d'Educació I Tecnologia (FIET) 2019. La Intel·ligència Artificial en l'Educació. Universitat Oberta de Catalunya, Barcelona, Spain.

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## **Glossary and List of Abbreviations**

AI – Artificial Intelligence

ANOVA – Analysis of Variance

CAI – Computer-Aided Instruction

CAL – Computer-Assisted Learning

CALI – Computer-Aided Language Instruction

CALL – Computer-Assisted Language Learning

CEFR – Common European Framework of Reference for Languages

CMC – Computer-Mediated Communication

CMS – Course Management Software

dfB – Degrees of Freedom Between

dfW – Degrees of Freedom Within

EFL – English as a Foreign Language

ELE – English Language Exposure

F2F – Face-to-Face

FL – Foreign Language

FLA – Foreign Language Acquisition

Fstat – F statistic for F-tests

Fcrit – Critical F-value

GRE – Graduate Record Examination

IC – Intercultural Competence

KB – Knowledge Building

KBIP – Knowledge Building International Project

KF – Knowledge Forum

L1 – First Language, often used to describe a native language

L2 – Second Language, often used to describe a foreign language

MALL – Mobile-Assisted Language Learning

MOOC – Massive Open Online Course

MSSB – Mean Squares Between

MSSW – Mean Squares Within

OLL – Online Language Learning

PLATO - Programmed Logic for Automatic Teaching Operations

SLA – Second Language Acquisition

SNS – Social Networking Sites

SNSLL – Social Networking Sites for Language Learning

Tcrit – The T critical value

TEFL – Teacher of English as a Foreign Language

TICCIT - Time-Shared Interactive Computer Controlled Information Television

Tstat – The T statistic - the ratio departure of the estimated value from the hypothesized value

# 1. Introduction: Research Problems and Objectives

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## 1.1. Introduction of the Problem

Foreign language education should play a prominent role in grade school education and should be regarded as a core subject, due to both the academic and cognitive benefits received from foreign language learning. Learning a foreign language in school not only increases students' reading and writing abilities in their native language (Garfinkel & Tabor, 1991), but there are various other cognitive benefits, such as critical thinking and problem-solving skills, that affect student academic achievement (Galovska, 2020). The benefits of foreign language education not only impact grade school students, but these benefits continue into adulthood where multi-lingual adults have adapted much better to both their professional and social lives, as part of having not just a better memory and concentration, but also having more cognitive flexibility (Yu, 2020), such as the ability to think of multiple concepts simultaneously.

While most students in Europe have access to foreign language education, in some countries, such as the United States, access to foreign languages in grade schools is becoming rare. According to the National K-12 Foreign Language Enrollment Survey Report (2017), only 20% of students between kindergarten and grade 12 in the United States are studying a foreign language, and that number decreases in university. This is largely due to foreign languages no longer being required for university entrance in this country and, therefore, foreign language education is not regarded with the same level of importance it once had.

Education of foreign languages is not only important for the cognitive benefits, but also for the socio-cultural benefits. Such benefits include an increased understanding of awareness, sympathy, sensitivity, and tolerance (Carr, 1999). Learning a foreign language not only teaches how to process information better, but also how to understand the world around us. Through

foreign language education, we develop a better understanding of ourselves and our neighbouring communities.

This thesis serves to bridge the theme of education and technology with foreign language acquisition. More specifically, it centres on recent developments of Computer Assisted Language Learning (CALL) by introducing and analyzing two trending topics of CALL, such as learning a foreign language in a context-based environment of telecollaboration in the Knowledge Building International Project (KBIP) and the emergence of virtual classroom systems in the private sector. As both of these areas are relatively new, they have not been extensively studied. This thesis will explain these methods in detail in conjunction with several analyses regarding their effectiveness in language education.

## **1.2. General Format of the Thesis**

This thesis is a summary of the work accomplished for the completion of the doctoral degree in the Education and Technology program in the area of Computer Assisted Language Learning (CALL). The work presented in this thesis is based on several published articles and conference presentations that were completed during the course of the doctoral study period. Thus, this is an article-based thesis; however, the format is not in a standard article-based thesis format. Rather, the articles have been rewritten and summarized together, as is required for the program of Education and Technology.

Thus, the literature review contains the review for the three projects and includes a theoretical framework of CALL, the background information for online learning using virtual classroom systems, and the theoretical background of the Knowledge Building International Project.

In addition to the theoretical framework, the methods, results, and discussions sections are summarized together for all three of the projects. The thesis was formatted in this manner as required by the program, although the methods and scopes vary greatly. The conclusion

serves to summarize the entire thesis, which includes further recommendations and limitations of the included projects.

### **1.3. Objectives of the Thesis**

This thesis serves to identify contemporary methods of foreign language learning in computer-assisted environments.

#### ***1.3.1. General Objective***

This general purpose of this thesis is to present and analyze two areas of CALL that have not previously been extensively studied. The general objective can be broken down into specific objectives that are related to the research questions stated in this thesis. These research questions and the specific objectives, which are described below, have guided the process of the research.

#### ***1.3.2. Specific Objectives***

##### ***1.3.2.1. Specific Objective 1***

The first specific objective is to describe and analyze the perceptions of teachers employed to use virtual classroom systems.

*Research Question 1:* Do teachers enjoy using virtual classrooms for foreign language instruction?

*Research Question 2:* Is there perceived learning, that is, do teachers see evidence that the students are learning and how?

*Research Questions 3:* Would the teachers recommend Online Language Learning (OLL) using virtual classroom systems or do they prefer other methods?

##### ***1.3.2.2. Specific Objective 2***

The second specific objective is to describe KBIP and to look for evidence of language learning in KBIP forums by analyzing existing posts after the discussions have been completed.

*Research Question 4:* Can children become more proficient in a FL using the 12 steps



of knowledge building in the KBIP forums?

*Research Question 5:* Is it possible to determine FLA from analyzing the existing posts within a forum, or is a study with a more extensive scope necessary?

#### *1.3.2.3. Specific Objective 3*

The third specific objective is to look for evidence of foreign language learning in KBIP by testing the students both before and after their participation in KBIP to determine whether there is an increase in performance of the foreign language. Further, the goal is to investigate whether class assignment is a confounding variable on performance and whether the students believe they have learned the content and the foreign language through their participation in KBIP.

*Research Question 6:* Does participation in KBIP increase in FLA, since students are communicating using a lingua franca?

*Research Question 7:* Since the students are working in a student-centric environment, and they are engaging with their peers, does the class assignment and the groups the students are working with affect their overall performance in KB?

*Research Question 8:* Do the students enjoy participating in KB?

*Research Question 9:* Do the students feel they are learning more about the discussion topic or about the foreign language through participation in KB?

#### *1.3.2.4. Specific Objective 4*

The fourth objective is to analyze how exposure to the foreign language and culture outside the classroom impacts performance in KBIP.

*Research Question 10:* Do the students' linguistic backgrounds and exposure to the FL outside the classroom influence their performance and understanding of the topics in the FL while participating in KB?

*Research Question 11:* Since KBIP studies have shown that students with higher-level knowledge on a subject share this knowledge with the students with lower-level knowledge throughout the KB process, do students with greater knowledge of the FL at the onset of the study share their knowledge of the FL with their peers in KB tasks?

The objectives, along with the research questions, will be addressed in the subsequent chapters. The research questions have been presented with the corresponding chapters in conjunction with the related publications. The design of this thesis is based on three specific projects or studies, which are outlined in Table 1 below.

**Table 1.** *Summary of the Thesis Projects*

<b>Project</b>	<b>Online Language Learning Virtual Classrooms</b>	<b>The Preliminary Knowledge Building Study</b>	<b>Foreign Language Acquisition in the Knowledge Building International Project</b>
<b>Background</b>	Virtual classroom systems are used mainly in the private education sector for foreign language education. These systems allow for teachers and students to interact using video conferencing, annotate on a textbook, and chat in translation boxes with various other features.	KBIP allows for students to collaborate, discuss, and exchange ideas in a forum using a lingua franca. The Knowledge Building International Project (KBIP) uses online forums to connect students around the globe so they may share ideas and create knowledge. KBIP uses knowledge forums, which is the technology to map	This project was designed based on the recommendations of the preliminary Knowledge Building Study. The recommendations included a mixed-method design to evaluate whether the students show increases in performance in their foreign language in a knowledge building classroom. Additionally, factors

		and sort ideas allowing for the students to work through the stages of knowledge building. This study investigates the posts in the forum to analyze how the lingua franca, English, was used.	such as class assignment and background language and cultural exposure are analyzed in relation to the knowledge building process and foreign language acquisition.
<b>General Objective of this Project</b>	To explain the emergence of this technology and to gain an understanding of the perceptions of qualified teachers who are employed to teach in these environments.	To describe and explain the KBIP methodology and to analyze existing forum discussions for evidence of foreign language acquisition.	To conduct an investigation using method and data triangulation and to analyze the data for evidence of foreign language acquisition
<b>Research Process</b>	A digital survey was sent to 35 online EFL teachers to inquire on their experiences and impressions when teaching in online classroom systems using the whiteboard technology. The data was summarized in the survey software and the analysis used descriptive statistics. A thematic analysis was done, which divided the responses into three themes: <i>enjoyment level &amp; preferences</i> , <i>perceptions of student learning</i> , and <i>teachers' recommendations</i> .	An analysis of the posts in an online forum discussion was completed to search for evidence of language acquisition. The researcher had access to the analytics and the data but did not have to opportunity to observe the procedure in the classroom. The posts were sorted, and the grammar was checked using a digital grammar program. The errors were sorted by student to look for common errors. A digital questionnaire was also sent to the students to inquire on their experiences and linguistic backgrounds.	A mixed-method design was used which included in-class observation, a pre-study questionnaire detailing the students' linguistic background information, a pre-test and post-test analysis, to measure improvement, and a post-questionnaire to gather qualitative data on the students' experiences. Both a t-test and Cohen's <i>d</i> were used to measure the difference in FL growth from the pre-test to the post-test. In-class observation determined there was a difference in performance by class and the Levene statistic and an

			ANOVA was used to compare the two classes. The pre-questionnaire information was used to classify the students into groups based on their background information and these groups were compared on both the pre- and post-tests to measure whether the students' backgrounds influences their overall performance in the study.
<b>Discussion</b>	The results show that teachers generally favour teaching online using virtual classrooms, they perceive the students to be learning at either the same rate or faster than in a traditional environment, and they would recommend this method of teaching and learning to others.	Due to several confounding variables revealed through the questionnaire and the analysis, in conjunction with the fact that the students were working in groups, it was difficult to determine from an ad hoc analysis whether there is evidence of foreign language acquisition	The results show an increase in both comprehension and writing abilities in the foreign language. In addition, contrary to other KBIP studies, foreign language skills, unlike content knowledge, do not appear to transfer from more competent students to less competent
<b>Conclusion</b>	Corporations in the private sector will likely continue to provide these educational resources to students due to their monetary successes. The analysis of the teachers' perceptions verify that these classrooms appear to be successful tools	From this analysis, it was not possible to determine how the students arrived at their forum questions and organized their ideas. Further, it was not possible to establish from this ad hoc analysis whether the students passed through the	The qualitative analysis determined that the students generally enjoyed participating in the knowledge building class and they felt this was an effective way to learn both a foreign language and the material they were discussing in the forums.

	<p>for language education and the consensus is that the teachers feel these virtual classrooms should be extended beyond foreign language education.</p>	<p>12 stages of knowledge building. Because the students were working in groups, individual growth in the FL could not be measured. Therefore, to analyze FLA in KBIP, it is best to use a mixed-method research design.</p>	<p>In general, the students showed improvement in their foreign language skills, particularly in their writing abilities and their comprehension of the subject matter in the FL. From this study, KBIP appears to be a satisfactory tool not only for knowledge building, but to improve foreign language writing skills.</p>
<p><b>Recommendations &amp; Proposals</b></p>	<p>A further analysis of student perceptions should be implemented and compared to the teacher perceptions in a qualitative design. Additionally, a quantitative analysis that measures performance in a pre-test and post-test design comparing the learners in a virtual classroom to those learning the same material in a traditional F2F classroom would provide greater details on the comparison of learning environments. Furthermore, longitudinal studies that measure student growth over time in virtual classrooms would help to better understand the student learning</p>	<p>An experimental study is required using a mixed-method to determine whether there is an increase in foreign language output. More specifically, the recommendations from this study are to employ a pre-study questionnaire to collect background information on the students' exposure to the foreign language and foreign culture both in- and outside the classroom, a pre-test to determine the students' performance baseline and a post-test to compare the knowledge at the onset of the study to the conclusion of the study. Additionally, a post-questionnaire to evaluate the</p>	<p>A control group, such as a class learning the same content in a traditional lecture style, should be used to compare the effectiveness of student learning in a knowledge building class to traditional learning methods. In addition, in order for students to potentially learn the pragmatics of a language, they should be exposed to native speakers of this language in this learning environment. KBIP was created to connect students internationally. Thus, the students should be building knowledge with other students from other countries. If the goal is to also advance in FL production, a foreign</p>

	processes in this online environment.	students' perceptions and in-class observation should be used to collect qualitative data.	language classroom should be paired with a classroom of native speakers of that language
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#### 1.4. Project I Overview – Online Language Learning in Virtual Classrooms

This project pertains to the study of online learning using virtual classroom systems. These systems allow for students to learn online in a teacher centric environment in either individual or small classes. The goal of this chapter is to answer the following research questions.

- 1) *Do teachers enjoy using virtual classrooms for foreign language instruction?*
- 2) *Is there perceived learning, that is, do teachers see evidence that the students are learning?*
- 3) *Would the teachers recommend Online Language Learning (OLL) using virtual classroom systems?*

The information from this project was presented in the following conference presentations listed below. All citations to the information pertaining to this project should be made to reference the published research article in CALL, which is as follows.

Manegre, M., & Sabiri, K. A. (2020). Online Language Learning Using Virtual Classrooms: an analysis of teacher perceptions. *Computer Assisted Language Learning*. DOI: 10.1080/09588221.2020.1770290

#### ***Conference Presentations:***

Manegre, M., & Sabiri, K. A. (2020). *Online Language Learning Using Virtual Classrooms*. Fòrum Internacional d'Educació I Tecnologia (FIET) 2018. Educació, ètica i civisme digital. Universitat Ramon Llull, Barcelona, Spain.

Manegre, M., & Sabiri, K. A. (2020). *Foreign Language Learning in Online Virtual Classrooms: an analysis of teacher perceptions*. EUROCALL 2020. EUROCALL Gathering Online (formerly CALL for Widening Participation, Copenhagen, Denmark)

### **1.5. Project II Overview – The Preliminary Knowledge Building Study**

This project describes the background information of the Knowledge Building International Project in conjunction with the pilot study. The goal of this project is to answer the following research questions.

- 1) *Can children become more proficient in a FL using the 12 steps of knowledge building in the KBIP forums?*
- 2) *Is it possible to determine FLA from analyzing the existing posts within a forum, or is a study with a more extensive scope necessary?*

The information from this project was presented in the following conference presentations listed below. All citations to this chapter should be made to reference the published research article in the EUROCALL Review, which is as follows.

Manegre, M., Gutierrez-Colon, M. & Gisbert, M. (2019). Foreign Language Learning in Knowledge Forums: using a knowledge building forum in an EFL Classroom. *EUROCALL Review*. 27(1). DOI:10.4995/eurocall2019.11150

#### ***Conference Presentations***

Manegre, M. & Gutiérrez-Colón, M. (2019). *Second language learning in knowledge forums*.

*An analysis of L2 acquisition of students participating in the Knowledge Building International Project.* EUROCALL 2019, Call and Complexity, UCLouvain, Louvain-la-Neuve, Belgium.

Manegre, M., Gutiérrez-Colón, M., & Gisbert, M. (2019). *Using Knowledge Building Forums for FLA in Classrooms.* Fòrum Internacional d'Educació I Tecnologia (FIET) 2019. La Intel·ligència Artificial en l'Educació. Universitat Oberta de Catalunya, Barcelona, Spain.

### **1.6. Project III Overview – Foreign Language Acquisition in the Knowledge Building International Project**

This final project explains the process of investigation which analyzes the use of Knowledge Building in classrooms to enhance foreign language acquisition. This is an extensive study that uses method triangulation and data triangulation to obtain an accurate picture of how participating in a computer mediated writing task through KBIP influences the production and comprehension of the foreign language used as the lingua franca for communication.

The goal of this project is to answer the following research questions.

- 1) *Does participation in KBIP increase in FLA, since students are communicating using a lingua franca?*
- 2) *Since the students are working in a student-centric environment, and they are engaging with their peers, does the class assignment and the groups the students are working with affect their overall performance in KB?*
- 3) *Do the students enjoy participating in KB?*
- 4) *Do the students feel they are learning more about the discussion topic or about the foreign language through participation in KB?*



- 5) *Do the students' linguistic backgrounds and exposure to the FL outside the classroom influence their performance and understanding of the topics in the FL while participating in KB?*
- 6) *Since KBIP studies have shown that students with higher-level knowledge on a subject share this knowledge with the students with lower-level knowledge throughout the KB process, do students with greater knowledge of the FL at the onset of the study share their knowledge of the FL with their peers in KB tasks?*

The information from this project was presented in the following conference presentations listed below. All citations to this chapter should be made to reference the published research in the following articles.

Manegre, M. (2020). The influence of foreign language exposure in EFL classroom collaborative writing tasks. *The EuroCALL Review*. Accepted and in copyediting.

Manegre, M., & Gutiérrez-Colón, M. (2020). Foreign language learning through collaborative learning in knowledge building forums. *Interactive Learning Environments*. 28(7). DOI: 10.1080/10494820.2020.1836499

Manegre, M. (2020). Foreign language exposure in knowledge-building forums using English as a foreign language *The Canadian Journal of Language and Technology*. 46(2)

Manegre, M., & Gutiérrez-Colón, M. (2019) Second Language Learning in Knowledge Forums: an analysis of L2 acquisition of students participating in the Knowledge Building International Project. *EUROCALL, Call & Complexity. Proceedings*.

DOI: 10.14705/rpnet.2019.38.1021

### ***Conference Presentations***

Manegre, M. (2019). *Using Knowledge Building Forums in EFL Classrooms*. International Conference on Intercultural Learning in the Digital Age: Building up Telecollaborative Networks (iTECLA 2019). Faculty of Philology, Translation and Communication, Universitat de València, València, Spain.

Manegre, M. & Gutiérrez-Colón, M. (2019). *Second language learning in knowledge forums. An analysis of L2 acquisition of students participating in the Knowledge Building International Project*. EUROCALL 2019, Call and Complexity, UCLouvain, Louvain-la-Neuve, Belgium.

Manegre, M., Gutiérrez-Colón, M., & Gisbert, M. (2019). *Using Knowledge Building Forums for FLA in Classrooms*. Fòrum Internacional d'Educació I Tecnologia (FIET) 2019. La Intel·ligència Artificial en l'Educació. Universitat Oberta de Catalunya, Barcelona, Spain.

## 2. Theoretical Framework

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### 2.1. The Emergence and Trends of CALL

Traditionally *language learning* was thought to be done in a classroom with a teacher where the approach to learning is intentional (Krashen, 1982). In contrast, *language acquisition* occurs in a natural environment where the language learner is immersed in a foreign language, and the acquisition of the language occurs naturally. As the world changes and becomes more digitalized, it becomes challenging to distinguish between these two terms. As an example, if a foreign language class moves their instruction to an avatar world, like Sim School (<https://www.simschool.org>), as students navigate through this virtual world using a foreign language, can we precisely say that this student is *learning* the foreign language, or, because this is a simulated world, are they, in fact, *acquiring* new language skills? In such situations where there is a cross-over between a virtual world and a traditional class, the language we use to define *learning* and *acquisition* not only needs to be re-examined, rather the means of instruction should adapt to the changing world.

Adapting language instruction is not just necessary due to the advances in technology, but also because of changes in globalization. As the business world has become more globalized, this has increased the need for language education, not just in schools and universities, but also for the business and economic sectors. With the emergence of the COVID-19 crisis, many schools and businesses had to resort to teleworking, which required an immediate transition to online work. As the world transitions out of the pandemic, a reported 84% of employees who have shifted to teleworking indicated that they want to continue this new style of work (Chini, 2020). This suggests that online work and online instruction may accelerate in popularity due to the recent rapid changes in both business and education.

As we are adapting to become more flexible in how we learn and how we conduct business, it helps to understand where the trend of remote learning started, more specifically, to understand the history of online language learning. This chapter will outline the types of instruction used in language learning and will then explain a brief history of the field of Computer Assisted Language Learning (CALL). The importance of online exchanges, including the need for intercultural competence integration in language instruction, will be explained in the latter part of this chapter.

## **2.2. Types of Instruction**

While course styles tend to vary, in conjunction with the amount and types of technology used in classroom environments, the types of classrooms tend to fall into the following categories, as defined by Goertler (2016).

### *1) Traditional face-to-face offline instruction*

These courses are conducted in traditional classrooms and face-to-face (F2F) using minimal technology. The technology used in such classrooms may include Smart Boards (<https://www.smarttech.com/>), audiovisual files, or they may simply provide the course information online or further information using a course management system (CMS), such as moodle (<https://moodle.com/>).

### *2) Technology Enhanced Instruction*

These courses function in a F2F environment but have a heavier focus on technology. They tend to include homework tasks to be completed online, the use of mobile technology, such as gaming apps like Kahoot! (<https://kahoot.com/>) and may have a small portion of the classes or course activities online.

### *3) Blended Instruction*

Blended instruction is a hybrid of F2F and online instruction. In a blended class, anywhere between 20 and 80% of the course work is done using online instruction, such as the

methods described below.

#### 4) *Online Instruction*

Online courses deliver the course content over the Internet using one or more of the formats below.

##### *i) MOOCs*

A MOOC is a Massive Open Online Course which anyone can register for. This is usually done using a combination of videos, reading assignments, and online quizzes. Examples of MOOCs can be found with Coursera (<https://www.coursera.org/>) or edX (<https://www.edx.org/>). Students enrolled in MOOCs are typically not registered as students with the university or institution that created the MOOC.

##### *ii) Online Courses*

Online courses, which have limited human interaction, can be completed for anything from High School courses, University Degrees, such as with Athabasca University (<https://www.athabascau.ca/>), or language learning, such as with parla.cat (<https://www.parla.cat/>). These courses may require an abundance of reading, have embedded videos, or have interactive features.

##### *iii) Virtual Classroom Systems*

Virtual classroom systems are relatively new. These systems are elaborated on in Part II of this thesis. They are used most often with the private sector for language instruction and have several features such as teleconferencing, an interactive whiteboard, and translating chat boxes.

The projects included in this thesis focus on Computer-Mediated Communication (CMC) in Technology Enhanced Instruction, such as KBIP, where the students are in the classroom participating in a telecollaboration tasks but using technological tools to

communicate online and build knowledge collectively, along with online instruction using virtual classroom systems. Further information on the history of KBIP as a telecollaborative task can be found in chapter seven, Part II, while the background for online instruction using virtual classroom systems can be found in chapter three, Part I of this thesis. While these projects are cotemporary topics in CALL research, the following sub-section will discuss the emergence of CALL to elaborate on how the current trending topics have evolved over the years, including the fundamental origins.

### 2.3. The Emergence of CALL

When CALL is described, it often mistakenly cited as a new or novel research area; however, the emergence of CALL dates back to the 1960s when the first computer-assisted instruction program, known as PLATO (Programmed Logic for Automatic Teaching Operations) was created at the University of Illinois (Bitzer, 1986). PLATO was initially designed to teach Russian using a grammar-translation method, stressing direct translations with short explanations (Butler-Pascoe, 2011). PLATO was later offered in several other languages.



**Figure 1.** *Image of PLATO*

Another advancement in CALL came in 1968 with the development of TICCIT (Time-

Shared Interactive Computer Controlled Information Television). This system focused on computer-based instruction, and this project, in conjunction with PLATO, created and tested the techniques of CALL that were still used through the 90s (Motteram, 1999) and that continue today. The main difference between PLATO and TICCIT is that TICCIT placed the control of instruction in the hands of the learner using the Component Display Theory, which classifies learning into context and performance (Merrill, 1980). An example of the equipment used for the TICCIT software can be seen in Figure 2 below.



**Figure 2.** *An Example of the Hardware Used for TICCIT*

While the creation of ELIZA is not commonly discussed in the emergence of CALL, ELIZA was one of the first *chatterbots*, also known as *chatbots*, created in the MIT Artificial Intelligence Laboratory by Joseph Weizenbaum (see Figure 3). ELIZA is a natural language processing system that uses pattern matching (Weizenbaum, 1976). The program was named after the character Eliza Doolittle in the play ‘Pygmalion’ by George Bernard Shaw. The creation of ELIZA allowed for the development of other artificial intelligence systems, such as the voice response systems used today on most mobile telephones. Versions of ELIZA are still available online, where users can engage in conversations with this virtual psychiatrist who can

respond to the users' statements and provide advice (<http://psych.fullerton.edu/mbirnbaum/psych101/Eliza.htm>).

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E        L      I        Z        A    A
E        L      I        Z        A    A
EEEEEE   L      I        Z        A    A
E        L      I        Z        AAAAAAA
E        L      I        Z        A    A
EEEEEEEE LLLLLLL IIIIIII ZZZZZZZ      A    A
=====
ELIZA > (PLEASE TYPE IN ALL CAPS) WHAT'S YOUR NAME DEAR ?
AMIT
ELIZA > HI, I'M ELIZA. WHAT DO YOU WANT TO TALK ABOUT ?
AMIT > CAN I TALK ABOUT MY PROBLEM ?
ELIZA > SURE... !
AMIT > DUE TO ON GOING EXAMS IN COLLEGE, I HAVE A LOT OF STRESS.
ELIZA > PLEASE RELAX A LITTLE. SLEEP WELL.
AMIT > THANKS FOR YOUR ADVICE.
ELIZA > NO MENTION.
AMIT > BYE
ELIZA > BYE AND KEEP IN TOUCH...
=====

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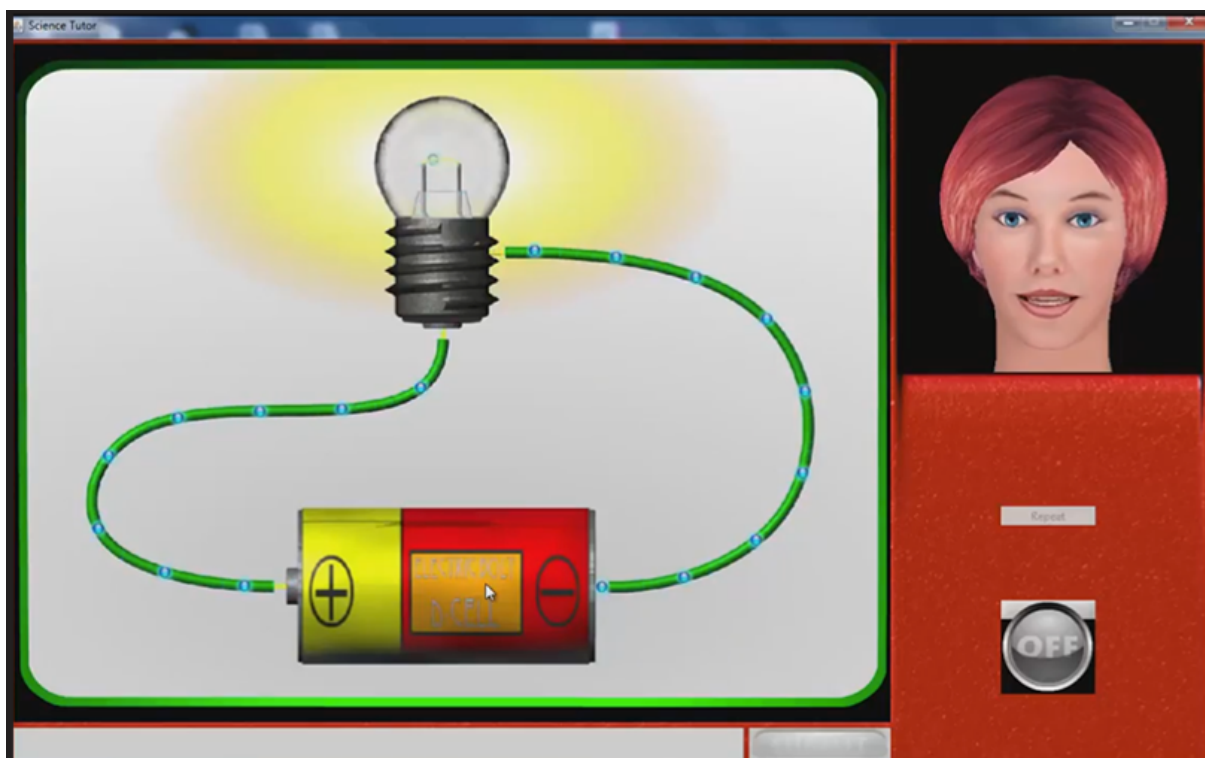
**Figure 3.** *Example of the ELIZA Software*

The ELIZA program was not only the foundation for Artificial Intelligence (AI), but also lead the way for AI in CALL. An example of this are the former chatbots used in the Duolingo application (see Figure 4) for mobile-assisted language learning (MALL), as an attempt to simulate natural language. In addition, AI has made its way to virtual classroom systems in an attempt to replace online teachers for language learning, along with mathematics, science, and literacy education (Bolaños, Cole, Ward, Tindal, Hasbrouck, & Schwanenflugel, 2013, Ward & Cole, 2013), as can be seen in Figure 5 below from Boulder Learning Systems (<https://boulderlearning.com/>).





**Figure 4.** *Duolingo Chatbot*



**Figure 5.** *Online AI Instructor in a Virtual Classroom*

Prior to the 1980s, all CALL programs were only available to the academic community, and they were primarily based on university campuses (Higgins, 1983). At this time, there were several terms used to describe CALL, such as Computer-Aided Instruction (CAI),

Computer-Aided Language Instruction (CALI), and Computer-Assisted Learning (CAL). These additional terms were replaced by CALL in the mid-1980s. The name CALL appears to initially be published in Davies & Steel (1981), and it became the most commonly used acronym by the following year.

Throughout the 1990s, CALL programs became more readily available to the public; yet, the majority of the programs available had a heavy focus on grammar skills and vocabulary (Alzahrani, 2017), with no attention paid to pragmatics, language in social contexts, or intercultural competence. However, after 2000, researchers began to investigate other areas of CALL, such as language learning through blog writing, podcasting, distance learning, social media, gamification, virtual worlds, and, further, mobile-assisted language learning.

While there are many areas of CALL currently under investigation, this thesis focuses on collaborative learning in computer mediated environments and online learning with a foreign language teacher. With both of these areas of CALL, the students are interacting with foreigners in a digital environment. Cross-cultural communication highlights the need for intercultural competence (IC) in online exchanges. The following section of this chapter will discuss in detail IC in CALL.

#### **2.4. Intercultural Competence in Online Exchanges**

Due to the current global changes, not just the shift to digital environments to support teleworking, but also the shift to globalization, a focus of CALL has moved towards intercultural competence in online language learning. As businesses and organizations are more than ever operating on a global scale, this increase in globalization has led to a growing need for a multicultural focus in foreign language education (Kramer, Moeller & Nugent, 2014). It is not only essential to have an understanding of other cultures, but when other cultures are being acknowledged through representation, and teachers create a multicultural environment for the class, the students exhibit higher levels of motivation, and they feel more empowered

and encouraged to share their ideas (Boesch, 2014; Benediktsson & Ragnarsdottir, 2019). Multicultural education theory is comparable to *constructivist theory*, where an environment is created that values the students' prior experiences; these students are then encouraged and feel empowered to discuss their thoughts and ideas (Banks & Banks, 2010). The constructivist theory emphasizes the students' skill sets and centers around the students, as opposed to teacher-centric methods, where the instructor stands at the front of the class and presents the information to the students (Benediktsson & Ragnarsdottir, 2019). This student-centred approach permits students to become critical thinkers and to create knowledge as they engage in active discussions with their classmates (Brown, 2003). When students are allowed to participate in multicultural group work, they feel empowered, and their academic performance improves during the promotion of cross-cultural exchanges. (Kimmel & Volet, 2010).

Intercultural competence is not only the readiness to participate in cross-cultural exchanges; rather, it is the preparation of individuals to engage with those from foreign cultural backgrounds effectively while using appropriate manners (Sinicrope, Norris, & Watanabe, 2007). The challenge in introducing interculturality is that it has frequently relied on subjective and biased comparisons between countries and cultures where individuals may not have a strong understanding of the cultures they are comparing (Li & Dervin, 2018). Introducing interculturality to a foreign language classroom allows the students to learn what is culturally appropriate, and it teaches them to understand how to use language appropriately and build relationships across cultures. (Kramer Moeller & Nugent, 2014). Facilitating communication and exchanges across cultural boundaries allows students to better negotiate meaning as they learn to connect their societal, cultural, and individual knowledge about the world in a meaningful way (Álvarez & Fernández, 2017).

Using an online exchange to share viewpoints with those from another culture is one of the best methods to build interculturality in the classroom. As an example, Furstenberg (2010)

used the MIT *Cultura* program, which permitted students in the United States who were studying French to engage in online discussions with students from France who were studying English. The students were directed to online forums and asked to share contemporary American and French materials. They then engaged in online discussions about the materials in the forums, they asked questions, created hypotheses, and later revisited the issues collectively to understand the other viewpoints. The students from both of these cultures not only developed an understanding of the foreign culture through the sharing of viewpoints, but they also developed a deeper understanding of their own culture through presenting their points of view and analyzing their own perspectives. The participating students additionally acquired valuable negotiating skills through the online forum discussions, and this assisted them in better understand themselves and others (Furstenberg, 2010).\_Online forums allow for opportunities to share ideas and facilitate a discussion where students can explain their beliefs formed from being immersed within their own cultures. As students share information and ideas, inquire about problems, and explain their perceptions, they develop a higher and more profound sense of self-awareness and a better understanding of interculturality through this process (Álvarez & Fernández, 2017). Additionally, Furstenberg (2010) explains that when students are allowed to connect with others through online exchanges, their attitudes and perceptions transform along with their understanding of foreign cultural norms

Other studies have examined interactions on Social Network Sites for Language Learning (SNSLL). These online interactions allow language learning students to simultaneously interact with foreigners from multiple cultural backgrounds (Álvarez, 2016a, 2016b). SNSLL, such as Busuu (<https://www.busuu.com/>), iTalki (<https://www.italki.com/>), and Babbel (<https://www.babbel.com/>), are sites that connect language learners from different cultures by providing a platform for users to engage in intercultural communication. Álvarez & Fernández (2018) investigated online exchanges in Livemocha

(<https://www.livemochas.com/>) in conjunction with feedback from the participants. They discovered strong evidence of the skills of knowledge (knowledge of the process of interaction and understanding social group practices) and skills of attitude (openness and curiosity). However, there was less evidence for the skills of discovery and interaction and the skills of interpreting and relating. These findings, in conjunction with previous research, conveys that CMC and IC are relevant to telecollaborative exchanges by providing opportunities for intercultural engagement (O'Dowd, 2007; Thorne, Black, & Sykes, 2009).

Additionally, in a blog writing task, Lee (2010) determined that students can better elaborate on the subject of discussion in the L2 after receiving peer feedback. Further, for the students to focus more on language accuracy, feedback from the instructor was necessary. However, Sert & Balaman (2018) found that when students engage in online task-oriented interactions, the students work together to examine the existing rules and then co-construct new rules for the L2 and instructor feedback is not necessary. Digital writing tasks and online exchanges are not only a means of socialization, but they also create spaces for students to learn about language and culture (Melo-Pfeifer & Schmidt, 2013). Students are able to assist their peers to help them understand the grammatical rules of the L2, and through discussion, they can increase their level of cultural awareness.

## **2.5. Collaborative Processes**

Most collaborative processes require leadership, which may be in the form of a supervisor, teacher, or manager and the processes are typically structured. Such structured methods of collaboration involve introspection of behaviour and communication, which increases the success of the teams as they work towards problem-solving (Spence, 2006). Often teams that work collaboratively access greater resources, recognition and rewards (Wagner & Leydesdorff, 2005). In some cases, collaboration involves lengthy discussions, but in other cases, it is *stigmergic*, where no discussion is necessary (Rezgui & Crowston, 2018). An

example of such would be in bricklaying. If one bricklayer rests, another may take his/her place and resume the process with no required discussion. Coordination relies on language where shared meaning is necessary, but collaboration does not necessarily require communication since people can work together without talking (Rezgui & Crowston, 2018).

In some cases, such as a collaborative project for a business assignment or a classroom assignment, there is a defined end to the project once the team has reached their goal. In other cases, such as in the collaborative construction and editing of Wikipedia articles, the collaborative process is *autopoietic*; once the process is started, it keeps going on with no end in sight. When editors see content in Wikipedia, they are triggered to add more content (Chhabra & Iyengar, 2018). Where the process is autopoietic, there are three classical theories as to why this happens. The classical theories, as per Chhabra & Iyengar (2018), are as follows.

- 1) The concept of cognitive conflicts – If what participants see conflicts with what they believe they are motivated to add content
- 2) Perturbations – Participants continue making changes until the knowledge in the article matches that of the mind.
- 3) Knowledge Frames – This is a network of knowledge and the nodes are the knowledge frames, and they are connected to each other. Somebody adds something and whatever is connected to it will be added to the revisions.

Parts II and III of this thesis focus on collaboration in education, which is not autopoietic, since the process must end at either the completion of an assigned project or the completion of the school term. The process examined in this thesis is also not stigmergic since the students will be engaging in discussions on the assigned topic and there will be required communication among the participants where they will discuss and build upon each other's ideas. Further, the main focus of this thesis is OLL using both a teacher-centric approach in a virtual classroom

and a student-centric approach in an online collaborative writing task. Thus, the following section of this chapter focuses on the collaborative learning process for OLL.

## **2.6. Online Collaborative Language Learning**

*Collaborative learning* is defined, in the broadest sense, as a situation where multiple people come together to learn something (Dillenbourg & Fischer, 2007; Dillenbourg, 1999). This definition is general, and for several reasons, it is not always agreed on. First, multiple people can refer to a single pair up, but it may also refer to thousands or millions of participants. Second, the term *learning* is ambiguous and can take on multiple meanings and vary depending on the context. Finally, the notion of *coming together* or even *working together* could involve synchronous actions with all of the participants working simultaneously on the same tasks, but it is also possible that they may be working on separate tasks (Dillenbourg & Fischer, 2007).

Research in online collaborative learning tends to study the interactions in online learning communities. An online learning community is a virtual community designed to facilitate learning by encouraging interaction among the associated members of this community (Cook & Smith, 2004; Zhan, Xu & Ye, 2011). In these communities, the participants share knowledge and work together (Cook & Smith, 2004). This act of sharing knowledge and collaboration allows for the members of the community to learn from each other. These communities are built to support both the traditional idea of in-classroom learning or *formal learning* and *informal learning*.

Formal learning research is advantageous to that of informal because formal learning environments tend to grant access to the researcher allowing them to access the participant data. On the other hand, informal learning communities, such as social networking sites (SNS) or blog writing, usually do not allow the researchers access to the analytics or data. Therefore, the findings of informal learning studies are often based on qualitative data collected through interviews and questionnaires (Lin, Warshouer, & Blake, 2016; Stevenson & Liu, 2010).

Early research on foreign language acquisition (FLA) in SNS focus on the frequency of use, perceptions and attitudes, and perceived progress, as opposed to fluency, advancements of knowledge of grammar rules, and the acquisition of vocabulary (Stevenson & Liu, 2010; Pinkman, 2005). Informal learning is common in language learning due to the lack of limits on space and time. Examples of this occur when foreign language learners listen to the radio, watch films, engage in conversation, or read the news. They are learning without intention by using these methods (Comas-Quinn, Mardomingo & Valentine, 2009).

There are many approaches to analyze collaborative writing; however, these studies do not tend to focus on individual L2 learning. According to Bikowski & Vithanage (2016), technology-enhanced collaborative tools evolved greatly, but the research focuses on specific aspects, such as the technological tools used, the environment, and relationships between pairs. Bikowski & Vithanage have stated that “no research has been published to date; however, focusing on the possible individual English language learning gains via technology-enhanced collaborative writing projects” (p. 79). While the forums in KBIP are mainly set in formal classroom learning environments, the participants tend to behave similarly to participants in a study using informal learning environment, where students acquire knowledge unintentionally when they collaborative online (Thorne, Black & Sykes 2009). The students not only show gains in literacy, but they also show evidence of more persuasive collaborative writing skills with enhanced content and organization, especially in foreign language contexts (Yim & Warschauer, 2017).

Social Networking Sites for Language Learning (SNSLL) are multimodal online platforms that provide access to pedagogical materials and activities in multiple languages (Álvarez, 2016a, 2016b.) whereby speakers of different languages engage in language exchanges (O’Rourke, 2007) or establish telecollaborative partnerships.” (Álvarez &



Fernández, 2017). Examples of SNSLL studies where the researchers relied on qualitative data collected through questionnaires or interviews are as follows. Pinkman (2005) studied language learning and writing tasks using blog contributions outside of the classroom. The participants responded to questionnaires and interview questions regarding their experiences. Likewise, Stevenson & Liu (2010) reported perceived progress in vocabulary acquisition with their subjects who were using the program Babbel for foreign language learning. They did not have access to the Babel analytics. Therefore, quantitative data could not be collected, and their conclusions were based on participant perceptions.

Similarly, Lin, Warshouer, & Blake (2016) found that their participants felt more comfortable communicating with native speakers in language learning forums on Livemocha than F2F. Their data showed perceived progress in listening and speaking; however, they did not have access to the Livemocha data, and they could not compare the progress of the participants in each skill with their perceived progress. Their findings are consistent with the findings of Al-Jarf (2007), who found that the participation levels of students in computer-assisted discussions were higher than in face-to-face discussions, due to an increase in comfort level. Students become more comfortable in online discussions, giving their opinions, and forging closer relationships with their classmates (Promnitz-Hayashi, 2011). Golonka et al. (2015) reviewed 350 articles on online language learning. They found that technology enhances learners' output and interaction. Evidence from this review suggests that, with online chat, language production and language complexity increases. Further, in a study of University students using a forum in their L2, Yim (2005) found that the forum allowed the students to have more power over discourse and more confidence to extend their roles as equal contributors to academic discussions than traditional face-to-face settings where foreign language students often felt left out on the periphery of the community due to limited speaking comprehension in the foreign language (English). In forums, students play a major role as information providers,

and they demonstrate their knowledge more efficiently by taking the time to formulate their thoughts and edit their language.

Other studies of FLA in collaborative writing tasks have found that when analyzing the meaning-making process, access to online resources influenced the production of the FLA (Hsieh, 2020). Additionally, a study examining Chinese students' conversations in an online forum designed to improve their English proficiency as they prepare to write the GRE found substantial evidence of social presence, teaching presence, and cognitive presence amongst the students as they communicated with each other (Sun, Franklin, & Gao, 2015). Further, Yim (2005) found that a forum allowed university students to have more power over discourse in their L2. They also exhibited higher levels of confidence as they were able to extend their roles as equal contributors to the academic discussions. In traditional F2F settings, these students often felt left out, and that they were on the periphery of the community because of their limited speaking abilities and language comprehension in the L2.

Researchers have not only analyzed FLA in online forums, but they have also investigated the use of language learning applications and websites to study FLA in collaborative writing tasks (Çiftçi, & Aslan, 2019). Similar to many studies using SNSLL, these studies often have limitations due to a lack of access to platform analytics. Additionally, Pinkman (2005) studied FLA writing tasks in student blog contributions. This study relied on questionnaires and interviews to gather qualitative data on the students' experiences. Stevenson & Liu (2010) also reported perceived progress in the acquisition of vocabulary. Their subjects used the program Babbel. They did not have access to any analytics with this program; therefore, the analysis relied on qualitative data regarding the participants' perceptions as opposed to quantitative data showing user progress. Likewise, Lin, Warschauer, & Blake (2016) determined that their participants were more comfortable communicating with native speakers using Livemocha than F2F. Their analysis was based on the perceived progress

of their participants in listening comprehension and speaking production; however, Livemocha does not provide quantitative data, and they could not measure data showing actual progress.

Having access to analytics is a valuable asset because it allows researchers and educators the ability to view the actual progress of the participants, along with the processes of collaboration throughout a project. This can be seen in a study utilizing Web 2.0 technologies, Liu, Wang, and Tai (2016) found increases in the students' vocabulary and oral fluency in the L2 by the end of the study. These students played a major role in the forums as information providers and being allowed time to formulate and edit their thoughts; they demonstrated their knowledge more efficiently in their L2. These findings are due to having access to analytics.

The KBIP project in this thesis analyzes both quantitative and qualitative data. This is possible due to the mixed-method design and access to classroom analytics. While the students are asked for their perceptions of learning, the focus of the analysis is on the quantitative data using both the KBIP analytics and the differences in scores collected on the students' pre-tests and post-tests. The KB platform has advantages as an educational tool in that it allows access to the teachers and the researchers to view the data and the progression of the KB process. Further information regarding this project is presented in both Part II and Part III of this thesis.

While the OLL in Virtual Classrooms project does not follow a mixed-method design and relies mainly on questionnaire data, the focus of this project is to introduce the virtual classroom systems in conjunction with discussing teacher perceptions. This project, in conjunction with the KBIP projects, involves intercultural communication. In the former, the communication is done through teleconferencing, where the students and teachers have different cultural backgrounds. In the latter, the communication is done in a manner to connect students from one school to students in another school in a foreign country. Although the projects in this thesis vary in design and analysis, they are similar in that they are trending topics in CALL (CMC in Telecollaboration and Virtual Classrooms) that allow for the

participating students to develop their IC through online exchanges and gain a better understanding, not just of other cultures, but of their own culture and their own identity.

## **2.7. History of KBIP**

The idea of Knowledge Building (KB) was created through decades of research on the knowledge creation process. KB is the process where children collectively share their insights, solve problems, and create expertise (Bereiter & Scardamalia, 2014; Bereiter & Scardamalia, 2010; Bielaczyc & Collins, 2005; Scardamalia & Bereiter 1991). Bereiter and Scardamalia (2010) found that children can work together to create knowledge while addressing problems on a variety of subjects and themes.

The term *knowledge forum* was coined to identify the software (<https://www.ikit.org/>) designed for *knowledge building communities* that could be used in classrooms (Scardamalia & Bereiter, 1994, 1991). Knowledge Forums were based on the work of W. Edward Deming (1986), who created the idea of the *System of Profound Knowledge*. Deming's work suggests that each employee in a company must be seen as an integral component of the business, in order for the business to run efficiently. That is, the business environment should be set up in a way that allows everyone to work together to reach a common goal (Maguad, 2011). This system was initially proposed to revolutionize businesses; however, it can also be applied to education systems. Through collaboration, students become engaged in the learning process, and they make purposeful advances. When this happens, learning becomes conscious and intentional (Kim, Tan, & Bielaczyc, 2015; Bielaczyc & Collins, 2005). When children collaborate, this also results in a deeper understanding of the theoretical process where connections are made between theories and facts (Chuy, Scardamalia, Bereiter, Prinsen, Resendes, Messina, Hunsburger, Teplovs, & Chow, 2010). Students not only teach each other factual information, but they also develop a deeper understanding of the procedure of

connecting facts and theories, which is a “necessary condition for cognitive development,” (Nami, Marandi, & Sotoudehnama, 2018, p. 377),

*Knowledge building* is considered synonymous with *constructivist learning* and *inquiry learning* (Kimmerle, Moskaliuk, & Cross, 2011), where there is a focus on individual knowledge construction. Individual learning is not the focus of community learning; rather, it is a by-product (Scardamalia & Bereiter 2006). Knowledge building initially materialized in the learning science literature, where knowledge creation ideas appeared similar to those in the organizational literature (Scardamalia & Bereiter 1991a, Scardamalia et al., 1992) representing knowledge as the result of purposeful acts of creation shaped through building ideas out of ideas (Bereiter & Scardamalia 2014). An analysis of student discussion of mathematics problems discovered that students identified numerous rules for the problems, provided justifications for them and revised their assumptions about these rules over an extended period (Moss & Beatty, 2006). These studies exhibit that when children collaborate, they develop a deeper understanding of both the topic and the knowledge building process.

The theory of KB allowed for the creation of the Knowledge Building International Project (<https://ikit.org/kbi/>), where the network of ideas and discussions are spread around the globe (Laferriere & Law, 2010). KBIP was created from the concept of the classroom-as-a-knowledge-creation-organization where students in participating schools work together internationally in digital learning environments (Laferriere, Law, & Montane, 2012). Students from participating countries in KBIP, such as Canada, Colombia, Greece, Hong Kong, Mexico, Spain, and the United States of America, work together online by asking questions and sharing their ideas in a forum (Laferriere, Law, & Montané, 2012). The different classes work as a collaborative community where they answer questions and share their ideas after researching the questions, adding new information, and participating in discussions until they have collectively reached a conclusion that answered the initially posed questions. Through these

ideas, they are not only consciously collaborating to resolve a problem or answer a question, but they are also working through the 12 Knowledge Building Principles (see Table 2) as identified by Scardamalia and Bereiter (1991).

**Table 2.** *The 12 KBIP Knowledge Building Principles*

1) Real Ideas, Authentic Problems – problems arise from an effort to understand the world
2) Improvable Ideas – advance ill-conceived ideas to improve them
3) Idea Diversity – improve ideas through comparison, combination and alignment with other ideas
4) Rise Above – work with complexity, diversity, & messiness to improve ideas
5) Epistemic Agency – participants recognize personal and collective responsibility for knowledge building efforts
6) Community Knowledge – aim to produce knowledge as a value to others
7) Democratizing Knowledge – all participants are legitimate contributors to shared goals.
8) Symmetric Knowledge of Advancement – expertise is distributed within and outside the community
9) Pervasive Knowledge Building – creative working with ideas
10) Constructive Use with Authoritative Sources – report and understand the sources of knowledge
11) Knowledge Building Discourse – knowledge is defined and transformed through discussion
12) Concurrent, Embedded, and Transformative Assessment – the community has an internal assessment

## 2.8. Knowledge Building Through Collaborative Writing

The primary goal of KBIP is for students to work together and teach each other. When this project is used in a classroom, the students become the center of focus, and the teacher acts as a guide or a mentor to help them work through the collaborative process (Laferrriere & Law, 2010). This creates a student-centric environment where the teacher acts as “an aid and go beyond the information given” (Tillema, van der Westhuizen, & van der Merwe, 2016, pp.1) to assist the students in the knowledge construction process. The general idea for the forums is based on the *constructivist theory*, where knowledge creation is the main focal point, and the students are at the centre of the education process (Benediktsson & Ragnarsdottir, 2019; Bereiter & Scardamalia, 2010).

While most of the KB research focuses on the creation of knowledge, further research of KB has examined literacy and writing skills in the forums. Students have shown substantial gains in literacy without paying particular attention to it while participating in knowledge forum discussions (Zhang & Sun, 2011; Scardamalia et al. 1992). In addition to showing gains in literacy, they have shown increases in vocabulary (Chen, Ma, Matsuzawa, & Scardamalia, 2015) and there is further evidence of advancements in collaborative writing skills, where both the content and organization have improved, especially in FL contexts (Lin, Ma, Chang, Hong, & Lin, 2018; Yim & Warschauer, 2017). This is considered a *content-based learning method* because it focuses on the content or topic of discussion, and content-based methods show increases in FL production (Vanichvasin, 2019). A further example of a content-based writing study was recently completed by Del-Moral-Pérez, Villalustre-Martínez, & Neira-Piñero (2018), where they had participants collaborate in digital storytelling tasks. All of the participants in this study showed increases in written compositions. This included improvements in the elaboration of scripts and the greater details of the storylines. While these studies focused on other forms of content-based methods, they are not specific to knowledge building. The students in these studies showed improvements in their reading and writing abilities through online collaborative writing tasks; however, gains in foreign language acquisition as a product of the knowledge creation activities were not explored. The main difference between these content-based tasks and KBIP is that KBIP was created with knowledge building in mind; it was not designed for the purpose of teaching a foreign language.

Online collaborative writing frequently requires the utilization of a lingua franca to communicate among the participants (Laferriere, Law, & Montané, 2012). The goals of collaborative writing tasks are commonly not for the purpose of improving writing skills; rather, they often have other goals, such as sharing information, forming communities, and creating knowledge. Knowledge Building (KB) forums are examples of such digital

environments where participants work together to share ideas and create knowledge (Bereiter & Scardamalia, 2014; Bereiter & Scardamalia, 2010; Bielaczyc & Collins, 2005) and these discussions are “facilitated by networked scaffolding technologies” (Cober et al., 2013, pp.1).

A *knowledge community* is an assembly of people or an organized group that engages in knowledge related activities. (Paavola, Lipponen, & Hakkarainen, 2004). The definition of collaborative learning may vary, and, likewise, the stages of the construction of knowledge can differ from the 12 KB principles (see Table 2 above) identified by Scardamalia and Bereiter (1994, 1991). As an example, Gunawardena, Lowe, & Anderson (1997) identified only five stages of knowledge construction. These are: sharing and comparing information, discovery & exploration among inconsistency of ideas/concepts/statements, negotiate meaning and construction of knowledge, testing and modification of proposed synthesis, and agreement & application of new meaning (see Table 3).

Kimmerle, Moskaliuk, Brendle, & Cress (2017) also analyzed the stages people travel through when they reach decisions and share opinions in collaborative writing tasks. They conducted a quantitative analysis of the five stages identified by Gunawardena et al. (1997) and determined through their statistical analysis that there are merely three main stages. These stages are knowledge introduction, restructuring, and shared opinion (see Table 3).

Kimmerle et al. (2017) used inferential statistics to identify the stages of collaborative activities. Their analysis concluding there are only three stages in collaborative writing is supported by their calculations, since their findings are statistically significant. The knowledge building scaffolding identified by Scardamalia & Bereiter (2006, 1994, 1991) structures the individual contributions and uses registration and communication supported by holding constructive discussions. The majority of these principles fall in the first stage of the construction of knowledge identified by Kimmerle et al. (2017), and these relate to the discussion, creation, and clarification of ideas. The following table demonstrates how the 12



KB principles align with the other proposed stages of the construction of knowledge. From this comparison, KB principles 1 – 9 are considered as Knowledge Introduction, the principles 10 and 11 are considered as Restructuring, and KB principle, 12 is considered as Shared Opinion. The 12 KB principles are within the three subheadings of the construction of knowledge.

**Table 3.** *Comparison of the 12 KB Principles with the Stages of Construction of Knowledge*

<b>Knowledge Building Principles (Scardamalia &amp; Bereiter, 1991)</b>	<b>Five Stages of Construction of Knowledge (Gunawardena et al. 1997)</b>	<b>Three Stages of Construction of Knowledge (Kimmerle et al., 2017)</b>
1) Real Ideas, Authentic Problems – problems arise from an effort to understand the world	1) Sharing and Comparing Information - This occurs when participants are stating observations and opinions; asking and answering questions; defining and describing a problem.	1) Knowledge Introduction- This is the long stage at the beginning of collaboration, where ideas are shared.
2) Improvable Ideas – advance ill-conceived ideas to improve them		
3) Idea Diversity – improve ideas through comparison, combination and alignment with other ideas		
4) Rise Above – work with complexity, diversity, & messiness to improve ideas		
5) Epistemic Agency – participants recognize personal and collective responsibility for knowledge building efforts		
6) Community Knowledge – aim to produce knowledge as a value to others		
7) Democratizing Knowledge – all participants are legitimate contributors to shared goals.		
8) Symmetric Knowledge of Advancement – expertise is distributed within and outside the community	2) Discovering and Exploring among Inconsistency of Ideas - this happens when participants identify areas of disagreement & clarify the extent of disagreement.	
9) Pervasive Knowledge Building – creative working with ideas		
10) Constructive Use with Authoritative Sources – report and understand the sources of knowledge	3) Negotiate Meaning and Construction of Knowledge - Participants clarify the meaning of terms and identify areas of agreement.	2) Restructuring- This occurs when the participants engage in the revising of the article to clarify the meaning.

11) Knowledge Building Discourse – knowledge is defined and transformed through discussion	4) Testing and Modification of Proposed Synthesis and testing of an achieved conclusion against existing cognitive schemas & personal experiences	
12) Concurrent, Embedded, and Transformative Assessment – the community has an internal assessment	5) Agreement and Application of New Meaning - comprise summarizing agreements and metacognitive statements that illustrate that people’s way of thinking has changed.	3) Shared Opinion - This is the end of the collaboration process.

## 2.9. OLL in Virtual Classrooms

While two of the research projects addressed in this thesis concern knowledge building, this thesis also addresses another popular theme of CALL, which is learning language in virtual classroom systems. Over the past decade, the private sector began capitalizing on online language learning (OLL) lessons using virtual classroom systems. A market research study in China, iResearch (2018), identified their national spend on online education with companies using virtual classroom systems to exceed 200 Billion Yuan within one year, 2017. This shows a year after year increase with a growth of 29.7% from the previous year, and the estimated trend shows the total spending should continue to increase to 543.4 Billion Yuan (approximately 86 Billion USD) by the year 2022. Private online education companies have brought educational resources, which were previously unavailable to students around the country. Such online education brands in China include 51Talk (<https://www.51talk.com>), VIPKid (<https://www.vipkid.com>), MagicEars (<https://www.tmmears.com>), DaDaABC (<https://www.dadaabc.com>), and HiTalk Kids (<https://www.kids.hitalk.com>), which have used

online virtual classroom systems to meet the demand for additional education resources in OLL (Zhang, 2019). It is estimated that more than 86% of parents in China have expressed a desire to enroll their school-age children (between 4- and 15-years) in such online education courses in the future (Zhang, 2018). These parents either feel that their children are learning and progressing with the help of the virtual classrooms as educational tools or they feel that their children may fall behind their peers academically, should they not participate in classes with private education companies. The Gaokao (the High School departmental examination in China) tests three core subjects, one of which is English; thus, TEFL is the main focus of the private online education companies, and EFL is the main subject of the overall spend in online education in this country (Khan, 2019). Chinese students are able to connect with native speakers of English from across the globe in virtual classrooms, and these classrooms have broken the space-time restriction allowing students to access their classes and schedule their lessons according to their availability. They are also free to access the classrooms from any location using mobile devices or portable computers (Zhang, 2019).

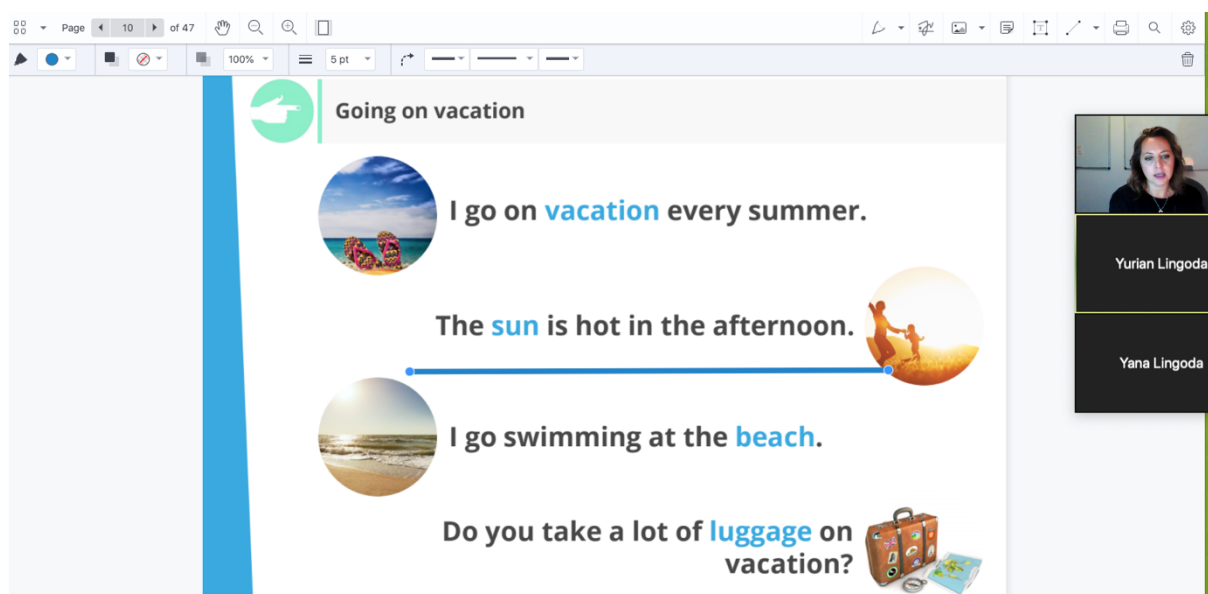
Private corporations using OLL virtual classrooms are not limited to students in China; rather, private education brands exist in many countries. Such companies promote quality learning environments for the foreign language learner, where the learners have increased accessibility and decreased inhibitions (Blake, 2011) only available to students in China, but they are also emerging in markets around the globe where private education brands promote an increase of accessibility and decreased inhibitions for better learning environments for foreign language users (Blake, 2011). Examples of such education brands include, but are not limited to, Lingoda (<https://www.lingoda.com>), EF Education First (<https://www.ef.com>), Learnship (<https://www.learnship.com>), Rosetta Stone (<https://www.rosettastone.com>), and Berlitz (<https://www.berlitz.com>).

The purpose of this chapter is to describe the virtual classroom systems being used by private education brands and to discuss the benefits of virtual classrooms for OLL. The perceptions of the OLL teachers currently employed to teach in EFL virtual classrooms are

presented, which includes their enjoyment of teaching and learning in virtual classrooms, the effectiveness of teaching in these environments, and whether teachers recommend virtual classes as an appropriate method of learning. This chapter primarily focuses on the introduction of this technology and whether language teachers perceive teaching in virtual classrooms positively. Primarily, this chapter discusses the emergence of the private sector virtual classrooms and whether EFL teachers perceive teaching in virtual classrooms positively for OLL and for other subjects.

## 2.10. Virtual Classroom Systems

Virtual classroom systems are learning platforms created using several key features to enhance the learning experiences for the students (Charles & Babatunde, 2014). Online education companies originally used video conferencing software, such as Adobe Connect, Skype, or QQ, but most companies have created their own proprietary virtual classrooms that have not only the video conferencing software but also a digital whiteboard where the learning material or textbook is automatically loaded (Wang & Chen, 2007). While most companies design their virtual classrooms, others contract digital companies that offer similar classroom systems (see Figure 6), such as Zoom (<https://www.zoom.us>), Microsoft Teams (<https://www.microsoft.com/en/microsoft-365/microsoft-teams/group-chat-software>), or LearnCube (<https://www.learncube.com/>).



**Figure 6.** *Online Class Taught Through Zoom*

When a student signs up for lessons, the student accesses the company website, creates an account and then registers for classes that accommodate their language learning needs and their schedule. When the class begins, the student may log in to the class using a mobile device or their computer. They could both hear and see the teacher, and the textbook is loaded automatically. The student and the teacher can use the whiteboard tools to draw or type on the textbook to communicate or complete the textbook activities. While the features vary depending on the company platform, most classrooms, such as those with 51Talk, DaDaABC, and VIPKid, have the following features (see Table 4).

**Table 4.** *Virtual Classroom Features*

<b>Feature</b>	<b>Function</b>
<b>chat box</b>	Allows the students and teachers to type notes to each other. Chat boxes with most Chinese companies translate the text automatically and allow for the use of emojis.
<b>running timer</b>	The timer in the lesson allows the teacher to pace the lesson appropriately and allows both the student and teacher to see how much time is left in the lesson.
<b>reward system</b>	Teachers may give rewards or stars to model good behaviour
<b>class recording</b>	The lessons are usually recorded so that the students and teachers, along with the company employees, can review the lessons after class.
<b>typing on screen</b>	Typing on the screen allows for the students and teachers to complete the textbook activities
<b>highlighting on screen</b>	Highlighting text allows for the teachers to draw attention to a specific word or area of the text
<b>pointer</b>	A pointer allows for the teacher to point to an area of the text
<b>pen</b>	The pen allows for drawing on the screen to illustrate the necessary information to the student. It also allows the student to draw and works as a communication tool.

When compared to traditional video conferencing software, using virtual classrooms is advantageous to the company since it allows the company to monitor the classroom and provide quality assurance. With virtual classrooms, monitors can enter and exit the classroom during the lesson and evaluate whether the teacher is performing to the expectations and standards of the company. Companies previously had staff pose as students so they could *mystery shop* teachers, and this is no longer required. The ability to monitor classes in real-time allows the

companies to deal with complaints, identify any training opportunities, and verify whether the students and teachers are (Marshall, 2019).

The class sizes for language classes are typically small and range from having an individual student to a group setting with between two and eight students. The textbooks created by companies tend to follow a logical order. Students and teachers become familiar with the order and sequencing of the texts as they gain experience using the company platform. An example of a virtual classroom can be seen in Figure 7.

The screenshot shows a virtual classroom interface for a lesson titled "第六课 Jimmy的新宠物 Jimmy's New Pet". The interface is divided into several sections:

- Instructions (Left Sidebar):**
  - 1 Basic Ask the student to look at the picture and talk about it.** TT: Let's look at the picture. What/Who can you see?
  - 2 Basic Read and role-play with the student.** Help the student read and correct their pronunciation when needed. Then, role-play with the student.
  - 3 Basic Emphasize the keyword(s), sentence pattern(s) and expression(s).** TT: Can you read these words for me? \*Circle the keywords.
  - 4 Basic Ask the question.** TT: Let's answer the question.
  - 5 Extra Ask the student:**
    - What animals are nocturnal?
    - What animals are diurnal?
- Reading 2 (Center):**

**Read with the teacher.**

So why did you get an owl and not a dog?

Sam, dogs are a lot of work. Plus, they are **diurnal**. I wanted a **nocturnal** animal.

What do you mean?

Well, diurnal means to sleep at night and be **awake** during the day. Nocturnal means to sleep during the day and be awake at night.

Are humans nocturnal or diurnal?

Next Reading >>
- Chat Window (Right):**

2019-02-04 10:02:16

Marni Lynne

diurnal [daɪˈɜːnəl]  
adj. 白天的; 每日的, 一日间的  
n. 日报; 日报, 日报

Marni Lynne

nocturnal [nɒkˈtɜːnəl]  
adj. 夜的; 夜曲的; 夜间发生的

Marni Lynne

awake [əˈweɪk]  
vt. 唤醒, 意识到; 醒来; 被唤起  
vi. 唤醒; 使觉醒; 激起, 唤起  
adj. 醒着的

Marni Lynne

band [bænd]  
n. 带; 环; (物) 波段; (乐队) 流行音乐的乐队  
vi. 用带绑扎; 沿...边缘  
n. 乐队; 队; 一样

Marni Lynne

Teacher offered you one magic star.

Marni Lynne

Marni Lynne

Marni Lynne

pet shop

Hyper Translate

Figure 7. Example of a Virtual Classroom.

## 2.11. Benefits of Virtual Classrooms for OLL

The main benefit of virtual classroom systems is that it connects language learners with language teachers without having restrictions on time and space. These classrooms offer flexibility with both the students' schedules and locations, along with interaction with a teacher, and assistance from the company employees, which is an asset for learners with a lack of local resources or limited mobility (Kobzar & Kuriata, 2015; Arbaugh, 2000).

Even though the classroom is virtual, the features, specifically the video conferencing and chat features, allow for constant interaction between the students and teachers. This provides the students with a sense of community and increases the students' engagement

(Barry, 2019). This is possible because the relationships formed in the classrooms amongst the students, their peers, and the teachers are real (Hitz & Wellman, 1997). Even in small group classes, the students often receive individual attention because of their direct contact with the teacher. In countries, such as China, this is found to be particularly attractive because a proportionately large number of students studying English learned mute-English, a phenomenon by which students have studied English for a number of years in a traditional classroom, and they have acquired excellent comprehension skills in written English, but they are unable to speak English (Chang, 2012).

In many East Asian countries, such as China, learning English is considered to be a necessity in order to excel in both business and education. This is different from the perception of language learning in Europe and North America. In Europe, educational institutions, such as grade schools and universities, are the main resources that provide students with the opportunity to learn languages. According to Foreign Language Learning Statistics (2019). Even though foreign languages mainly studied through formal education and not actively studied upon the completion of the diploma, linguistic diversity tends to be encouraged in the workplace in Europe (Devlin, 2015).

Unlike most European countries, the United States does not have foreign language education mandated nation-wide at any level. Students in the United States underperform in foreign language education when compared to Asian and European students, who are normally required to learn at least one other foreign language during compulsory education (Sterniak, 2008). According to Devlin (2015), only 25% of adults in the United States speak a language other than English. From this 25 %, only 7% have indicated that the main setting where they have learned this language was at *school*.

The introduction of OLL companies using virtual classrooms helps to not only solve the unbalance of education in countries like China, but it also addresses the issues in the United

States by providing foreign language opportunities in areas where there is a lack of foreign language education in the public systems. In addition, European adults may benefit from OLL virtual classrooms, since they would allow for access to learn foreign languages that may not have been offered in their educational institutions. They would also be able to improve their foreign language skills beyond the classroom to enhance their business acumen.

Since the early 2000s, OLL has become more available to language learners as a language learning method (Blake, 2011). During the past two decades, the popularity has also increased in part because, once students are familiar with the technology, they perceive online learning positively (Zhao & McDougall, 2008). Student participation in online language learning increases if they are adequately trained in how to use technology (Lai, Shum, & Tian, 2016). As students become more comfortable using online media and online learning platforms, they are likely to continue to use this method of learning.

The majority of students have indicated that they prefer to learn under the guidance of an experienced teacher regardless of whether language learning occurs in a traditional classroom or a digital environment (Kobzar & Kuriata, 2015). Not only is having a teacher important, but the critical factor in predicting overall achievement is also the effectiveness of the teacher (Harris, Rutledge, Ingle, & Thompson, 2010). The idea of *language learning* suggests that it occurs when the receiving of input and production of output is conscious, and the output is monitored and corrected. The *interaction hypothesis* (Long, 1996) for language learning suggests that face-to-face communication is necessary, and for second language acquisition (SLA) to occur, interaction is needed. Virtual classrooms allow for face-to-face communication through video conferencing technology and this would permit language learners to receive immediate feedback on their grammar and language production, which is essential for self-correction and assessment. This technology allows the learner to ask questions with time to process the information learned. In addition, Kobzar and Kuriata (2015) found



that 70% of students prefer to learn the language with an instructor than without. Positive student achievement is highly correlated with effective teaching, and teaching is linked to effective instruction (Balsamo, 2018). According to these findings, optimum SLA is achieved through the help of proper language pedagogy.

A negative experience for online language learners may be created by poor internet connections or interruptions from failing programs or poor internet connections. However, these interruptions should be minimized year after year through continuous advances in technology. OLL appears to be popular for SLA; however, when examining other subjects, most students show a preference for online education with what they consider to be easier subjects, while they prefer face-to-face instruction for difficult or important subjects (Smith Jaggars, 2014). Should more challenging subjects become available in virtual classrooms, this general opinion may change. In addition, students generally exhibit more respect for teachers in a face-to-face environment than in an online environment. These findings suggest that learning is optimal when an instructor is present in a traditional classroom (Zhao & McDougall, 2008) and not online. Thus, it is necessary to ensure that both students and teachers have adequate internet connections and that guidance and instruction presence are built into the online course for OLL to be effective.

Not only do virtual classrooms have advantages for students with limited access to educational resources or limited mobility (Kobzar & Kuriata, 2015), OLL in virtual classrooms allow students to have more talk time than is possible in typical traditional classroom settings. Evidence suggests that OLL improves student motivation, along with the benefit of accessing the lesson where and when it is convenient for the student. Using technology at home has been found to assist in motivating and enhancing EFL students' learning and acquisition FL vocabulary (Al-Jarf, 2007). Yen, Hou, and Chang (2015) found that OLL enhances writing and speaking skills, especially where cultural and environmental factors inhibit language

learning, such as foreign language anxiety, focus on test scores, and the lack of interactive speaking environments. They also found that the participation levels of students in computer-mediated discussions to be higher than in face-to-face discussions. Golonka, Bowles, Frank, Richardson, & Freynik (2015) reviewed 350 articles on OLL and technology. Their findings suggest that language learners using online chat show increases in language production and complexity. In conjunction, the technology enhanced both the learners' interaction and output. These findings suggest that OLL that utilizes online discussions with a teacher, or an instructor would increase overall performance at a faster rate over time.

The benefits of OLL in virtual classrooms include learning from teacher talk, learning from interaction, and a decrease in inhibitions due to lack of performance anxiety in front of peers or other students. For these reasons, students who learn languages online should show improvement in their second language production.

### 3. Method

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#### 3.1. Introduction

This chapter begins with the methodology used for the project of analyzing the teachers' perceptions in OLL using virtual classroom systems. Following the method of the OLL study, the method of the preliminary KBIP study and the main KBIP study will be presented. The sample, procedure, and limitations of the method for each of the projects are described in the subsequent sections below.

#### 3.2. OLL in Virtual Classrooms Method

##### 3.2.1. *OLL in Virtual Classrooms Sample*

The sample for this study (N = 35) consists of EFL instructors who were teaching online using virtual classrooms at the time of this study. All of the participants were recruited through social media participation requests from groups that verified they were online teachers as part of their group membership. To ensure confidentiality, the participant names were not collected, and the data collection was done through a private account in a private network. All of the participants were over the age of 18 years at the time of the study, and they were all native speakers of English. Additional information for the participants is as follows.

- 91.42% of the participants have a bachelor's degree or higher. The majority of online companies require that their teachers have, at minimum, a bachelor's degree in conjunction with a TESOL certificate (120 hours). Preference for employment is given to teachers with degrees in Education, English, Linguistics, and TEFL/TESL. The participants were not specifically asked about their degrees, although the majority would be educated in the above-mentioned fields.

- 32% of the participants migrated to a different country, while the remaining 68% reside in their birth countries. The participants reside in 13 countries and are of 11 nationalities.
- 68.53% of the participants are female, and the remaining 31.43% are male.
- 60% of the participants teach not only English, but various other subjects, such as social sciences, mathematics, sciences, and the arts. The remaining 40% of participants teach English as the only subject.
- Most of the participants (65.71%) are relatively new to teaching English online, where they have been teaching online for a duration between six months and three years. Five of the participants have taught English for less than six months, while seven of the participants are more experienced and have taught English online for greater than three years.
- The majority of the participants (57.14%) have not only taught online, but they also have experience teaching in traditional classrooms in public schools. Additionally, 31.43% of the participants have experience teaching in community colleges, universities, or private institutions.
- Over half of the participants (57.14%) not only have experience teaching online, but they have also been students learning a language online in a virtual classroom.

### ***3.2.2. OLL in Virtual Classrooms Procedure***

Each of the participants completed an online questionnaire containing 30 questions. This questionnaire was reviewed by four experienced EFL teachers and modified based on the feedback prior to sending it to the participants. A digital questionnaire company (Survey Monkey; [www.surveymonkey.com](http://www.surveymonkey.com)) was used to create the questionnaire, and the link was sent to the participants through messages on either Facebook (<https://www.facebook.com>) or LinkedIn (<https://www.linkedin.com>). The participants were each verified to be currently

employed with an online education company at the time of the study. Their consent to participate was then requested, and they were provided with verification that all personal information would be kept confidential. There were 35 participants who responded to this study, and all of the participants completed the study and all of their responses were included; none of the responses were eliminated. There were two sections to the questionnaire, where the initial 14 questions were used to collect the background information of the participants, which included questions regarding their teaching experience, native languages, exposure to foreign languages, and nationality (see Appendix A). The remaining 16 questions of the questionnaire requested the opinions of the participants from their experiences teaching online using virtual classrooms (see Appendix B).

### **3.2.3. OLL in Virtual Classrooms - Limitations of the Method**

While the sample size for this study (N= 35) is large enough to be considered significant when conducting a qualitative analysis, this study draws the conclusions based on this sample size. A larger sample would be more accurate to make conclusions governing the entire population of online teachers.

Also, this study only examines one side of the equation. The teachers' perceptions are analyzed, whereas the students' perceptions have not been investigated. A more thorough analysis would include the perceptions of the students, along with any measures of quantitative data that could support the perceptions outlined in this qualitative data analysis.

### **3.3. KBIP Procedure**

The KBIP methodology remains consistent among participating classrooms, which is outlined by the Consell Superior d'Avaluació del Sistema Educatiu (2015). The steps in the KBIP procedure are as follows. First, the students decide on a theme or a real problem that they find interesting, and they introduce this problem to the knowledge-construction community. They

do so by discussing in groups questions relating to the topic that they want to find the answers to. Then, they post the questions on the classroom blackboard and the class collectively decides which questions are the best questions to research and find the answers. These questions are then entered in the knowledge building forum. Second, scaffolding is used to organize and identify the level of knowledge students have on the topics, the development of their ideas, and any potential problems that may require further attention (see Table 5). They use these scaffolds to express their ideas, respond to other ideas, and to present new information based on their research findings.

**Table 5.** *KBIP Scaffolds*

Scaffold	Purpose
<b>I need to understand</b>	Identifies the question the students want to answer or the problem the students want to solve.
<b>My theory</b>	Allows the students to engage in discourse to express their ideas and opinions before researching the information.
<b>This theory cannot explain</b>	Allows the students to refute other ideas and explain why an idea may not work.
<b>New Information</b>	Identifies factual information that was researched and this information, along with the source, is shared
<b>Putting our knowledge together</b>	Summarizes the discussion and explains the answer to the question or solution to the problem based on a general consensus formed through the discussion.

The scaffolding allows for the students to create a visual web of ideas (see Figure 8). Third, learning is achieved through student participation, and the 12 principles of the co-production of knowledge are applied (see Table 2). The students actively engage in the teaching and learning process and they share the information they find collectively through the online forum discussions. Finally, the teachers should act as guides for the knowledge-construction process and behave as stimulators of learning, researchers, modulators, assessors, and facilitators as necessary in order to assist in the students' acquisition of expertise. It is the teachers' role to demonstrate adequate leadership qualities and to help the students become

stimulated throughout the learning process, since having a encouraged framework assists student engagement in learning (Chen-Chung, Pin-Ching & Shu-Ju, 2016). Upon completion of the knowledge building discussion, the students summarize and present their ideas together (an example can be viewed at <https://www.youtube.com/watch?v=3YKjaYTzf4c>). These presentations have previously been performed through digital story-telling, blog posts, or the use of avatars (an example of a Rise Above avatar can be viewed at <https://www.youtube.com/watch?v=O7qwU62P1JA>). These presentations are often recorded and posted to YouTube so the findings can be shared (see Figure 9).

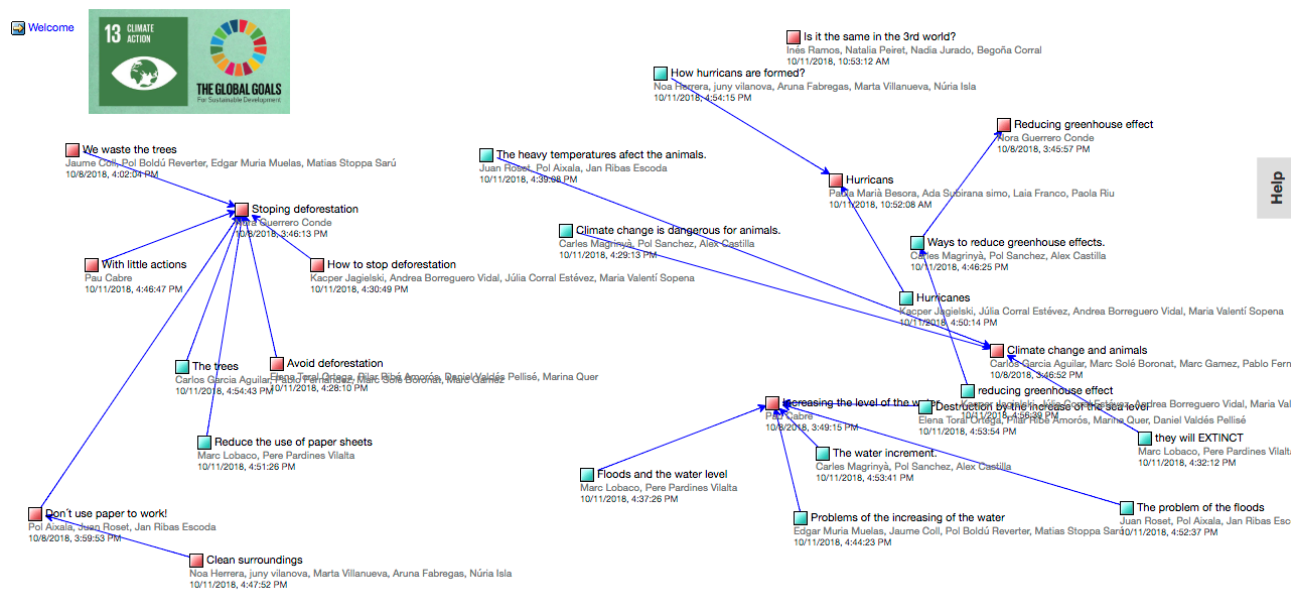
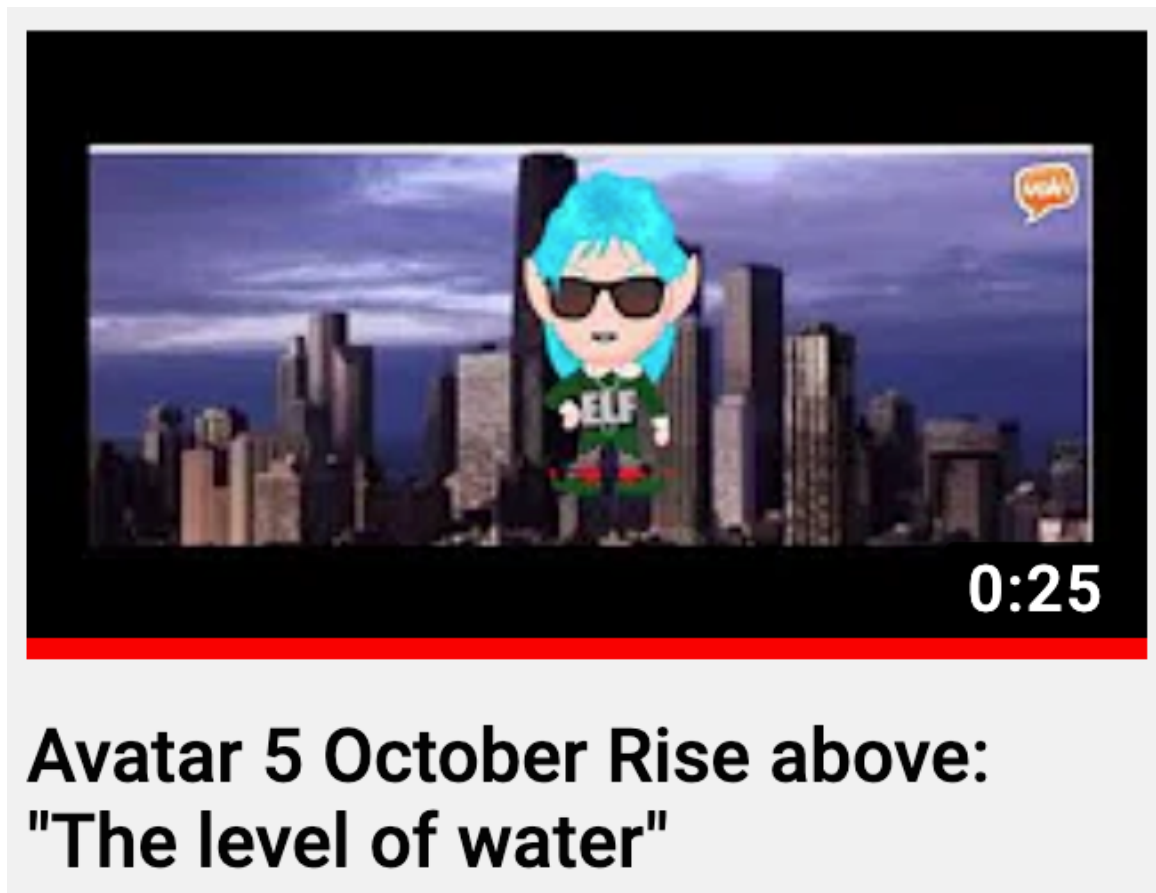


Figure 8. Example of KB Discussion Web



**Figure 9.** *Example of KB Rise Above Avatar*

### **3.4. The Preliminary KBIP Study Method**

This section presents the method used for the preliminary KBIP study, that is, the pilot study that serves as the background for the final project of this thesis. This study was conducted to analyze existing data in KBIP forums for SLA evidence. The information from this analysis provides guidance for the setup of the following KBIP studies. While there are studies designed where pre-tests and post-tests are assigned to the participants (Hamel, Turcote, Laferriere, & Bisson, 2016), many other studies are designed to provide specific instructions to the participants and the posts are analyzed upon completion (Chen, 2013, Comas-Quinn et al., 2009). Since the project is international, several participating schools encourage their students to post in the forums using a foreign language. However, foreign language learning in the



KBIP has not been extensively studied.

The preliminary study was executed as an ad hoc analysis of KBIP forum posts for the purpose of investigating whether there is evidence of language learning throughout the KBIP process. The discussions for this study were in progress between October 2015 and February 2016. During the discussion period, the participants' actions were not being monitored and there was no pre- and post-testing conducted. An analysis of the data in the forums will determine whether it is possible to identify growth in SLA. Because students feel more comfortable in online discussions than face-to-face discussions (Al-Jarf, 2007), an increase in their writing skills in their L2, such as spelling, syntax, and vocabulary acquisition, should be observed. The information in the forums will also be used to assess how and when the 12 KB principles and the three stages of knowledge construction occur in relation to SLA. The findings provide a comprehensive overview of digital foreign language collaborative learning.

#### ***3.4.1. Preliminary KBIP Participants***

The sample for the preliminary study consists of secondary students in a Tarragona, Catalonia school, who have participated in online collaborative learning within the classroom. They had collaborated with students in a Greek school; however, only the posts from the students in the Catalan school were analyzed. While there were 35 students in the class, only 12 of the students entered posts in the knowledge forum (see Table 6). Therefore, only the responses from these 12 students could be included. Of these 12 students, ten are female and two are male. They are all in the same grade and were around 16-years at the time they participated in the forum. They should all be at the same developmental stage.

**Table 6.** *Preliminary KBIP Study Participants*

<b>School and Location</b>	<b># of Students</b>	<b>Forum Participation</b>	<b>Participation in Discussions without Posting the Forums</b>
<b>Kalamata, Greece</b>	35	21	14
<b>Sant Pau, Tarragona</b>	35	12	23

### ***3.4.2. Preliminary KBIP Materials and Procedure***

The students from both schools in Spain and Greece participated in the knowledge building process by researching and entering posts while in their school classrooms. They followed the 12 KB principles, and they engaged in several discussions to seek answers to questions on the topics of historical Mediterranean fashion and archaeology. They initially posted questions in the forums and then worked together to engage in discussions using their own ideas. The students were instructed to write in their L2 (English), and the forum discussions lasted through the fall 2017 semester. Instructions were given to the students on how to use the KB tool from their teachers. Having proper instruction is necessary because students should be given explicit information about the platform and methodology, as well as trained in that specific communication technology (Heiser, Stickler & Furnborough, 2013, p.231) in order to have effective online communication.

The participants had been given a questionnaire to understand their linguistic backgrounds better (see Appendix 1). The questionnaire inquired on the participants' native languages, languages spoken with family members, exposure to English outside of the classroom, and their history of foreign language learning.

All of the posts in the forums were sorted by date and time in a spreadsheet to follow the students' flow of ideas. Each post was checked first in Google for evidence of copying from a website and second with a plagiarism checker in order to determine whether the posts were novel, created using the students' words. It is recognized that, even by copying text, students are learning, and they may be learning more about their L2; however, SLA cannot be determined from copied text. Therefore, it is necessary to remove such posts from the analysis.

Once the posts from the students in the Greek school were removed, the remaining posts were then sorted by student and analyzed for errors, evidence of repetition of chunks, learning phrases from peers, and modifications to language over time.

### ***3.4.3. Preliminary KBIP Context of Testing***

Each of the posts was checked with both a plagiarism checker and in search engines to determine whether the posts were novel and created using the students' words or copied from a website or piece of online text. This is because it is challenging to determine if SLA has been achieved through copied text. Any posts that were flagged as being copied from another source were removed from the analysis. The remaining posts were checked with a digital grammar checker to identify any syntax errors or grammatical errors. They were then analyzed for repetition of chunks, learning phrases from peers, and modifications to language over time. This was completed by following the flow of ideas using the sequential order from the timestamps of the posts. Since permission was only granted to work with the Spanish students, the posts from the students in the Greek school were removed and excluded from the study. Fortunately, the majority of the posts from the Spanish students were novel, and with the exception of two of these posts, all of the posts from the Spanish students were analyzed in the study.

### ***3.4.4. Preliminary KBIP Method Limitations***

The main limitation to the method in this study design was that it was not possible to observe what the students were doing as they progressed through the knowledge building process. After analyzing the forum data, it was apparent that the students were working in groups. Thus, it is not possible to determine whether the students showed improvement over the duration of KB from only looking at these posts.

## **3.5. The Main KBIP Study Method**

This section's contents include the method of the main KBIP study, which was designed to follow the recommendations of the preliminary study. Data triangulation and method triangulation were used, including multiple methods and multiple means of analyzing the data.

Unlike the preliminary study, this study included classroom observation, testing, and access to the analytics. Both quantitative data and qualitative data were collected and analyzed.

This chapter serves to outline the method used in this study. The sections below describe the participants, the context of testing, and the data gathering procedure, including the pre- and post-questionnaires, the pre- and post-tests, and the in-classroom observation. Following the general method of this study is a description of the KBIP method, which describes in detail the general procedure for participation in KBIP.

### ***3.5.1. Main KBIP Participants***

The study sample consisted of two classes of grade nine students in the Catalonia region of Spain. There were 30 students in each class that participated in the study (N=60). The students are bilingual in both Catalan and Spanish, and they were all 14-years-old at the time of the study. The classes were taught by the same teacher, who had identified the students as being at an A2 – B1 level of English according to the Common European Framework of Reference for Languages scale (CEFR) when they participated.

All of the students, along with their parents, were provided with a letter of consent for the study (see Appendix D). While their participation was voluntary and they were advised of the in-class observation and procedure of the study, they had all elected to participate. The total number of included in the study is 60; however, there were initially 67 students enrolled. The results for seven of the students were omitted from the analysis. The results from two of the students were omitted because they were absent during the pre-testing. The results from five of the students were also omitted because they were considered *special needs* as determined by their local school board tests, and their teacher requested that their results be omitted. Although the results of these seven students were omitted from the analysis, these students were unaware that their scores were not included, and they participated along with their classmates (see Table 7).

**Table 7.** *Main KBIP Project Participants*

	<b>Total Number of Students</b>	<b>Results Omitted per Teacher Request</b>	<b>Absent During Pretest</b>	<b>Number of Participating Students</b>
<b>Class A</b>	34	3	1	30
<b>Class B</b>	33	2	1	30
<b>Total</b>	67	5	2	60

### 3.5.2. Main KBIP Materials and Procedure

#### 3.5.2.1. Context of Texting

All of the classes participating in KBIP at the time of this study, which was in Autumn of 2018, were requested to choose a topic from the United Nations Sustainable Development Goals (<https://www.un.org/sustainabledevelopment/sustainable-development-goals/>). The students participating in this class chose to discuss goal 19, Climate Action (<https://www.un.org/sustainabledevelopment/climate-change/>). The students first had to work in groups to think of questions. Each group posted their questions on the blackboard, and collectively the classes decided on which questions they wanted to find the answers to (see Table 8).

**Table 8.** *The Questions Posed in the KB Forums*

<b>Question Theme</b>	<b>Question</b>
Reducing the Greenhouse Effect	How can we reduce the greenhouse effect?
Stopping Deforestation	How can we stop deforestation?
Climate Change and Animals	How does climate change affect animals?
Hurricanes	How are hurricanes formed?
Climate Action and Poverty	How do we stop pollution from factories in the 3rd world countries?
Ocean Level Rise	How many problems can cause the increase of the level of the water all over the world?

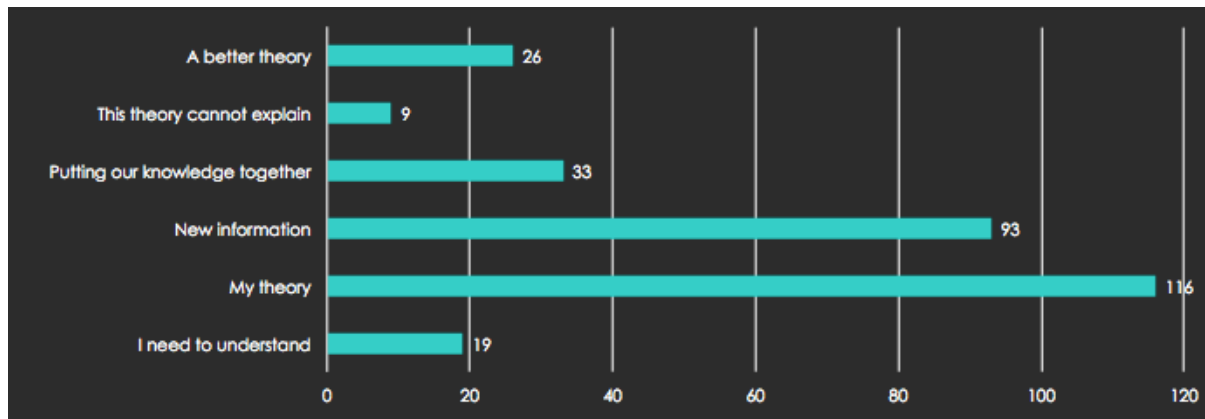
Once the questions were agreed on collectively, they posted in the forum using the scaffold *I need to understand*. The students then worked in groups using appropriate scaffolds

to answer the questions, as described in the KBIP Procedure in section . When providing an opinion, they used the scaffold, *My theory* or *This theory cannot explain*. When they had completed an investigation to find the answer or more information, they used the scaffold *New information*. After a web of information was posted in the forum to answer the questions (see Figure 10), their findings were summarized using the scaffold *Putting our knowledge together*. The students had then reached a mutual consensus on the response to the question that had been asked. An example of a discussion from the forum can be seen in Table 9 showing both the scaffold used and the posts from the students.

**Table 9.** *KBIP Climate Action Examples From the Student Forum*

Scaffold	Examples of Forum Posts
<b>I need to understand</b>	How can we reduce the greenhouse effect?
<b>My theory</b>	I think that we don't have to put more factories, we have to put oil factories.
<b>This theory cannot explain</b>	The point of putting less factories is that we reduce the contamination and the oil we use. If we put more oil factories we are contributing to the contamination.
<b>New Information</b>	Tarragona have some oil refinery and according to the law 50 years later we can have less production
<b>Putting our knowledge together</b>	Without the greenhouse effect, the temperature of the planet would be similar to conditions experienced on the moon. We've found a project to reduce greenhouse effect from an American company that wants to send a satellite to collect data about pollution that is warming the planet. If people know the real effect of our pollution in the atmosphere, they'll react. They want to cut the methane pollution by 45% by 2025. We can reduce the greenhouse effect by different ways: -Using renewable energy -Avoid using the car -Planting more trees to reduce the carbon footprint -Stop using diesel cars and use electric cars - Search for a balance of using machines and humans in the first sector -Save electricity -Stop paper banks statements -Avoid using paper -Buy from companies that have sustainable practices and don't harm the environment -Report online bullies -Use the different types of containers (blue, yellow, green, brown and gray) Some consequences of the greenhouse effect are: -Natural resources are disappearing -Pollution is increasing - Ecosystems and habitats are disappearing -





**Figure 12.** *Frequency of Scaffolds Used from KBIP Analytics*

### 3.5.2.2. Preliminary Questionnaire

Similar to the preliminary study, the students were given a questionnaire regarding their exposure to English outside the classroom (see Appendix E). The questionnaire was administered using a private account on a digital questionnaire platform (Survey Monkey), and the link was sent to the students by the teacher. From the questionnaire data, the students were assigned an English Language Score where points were granted based on whether the students had studied in English speaking countries, travelled to English Speaking countries, spoke English with friends or family outside of school, and were enrolled in after-school programs for additional English education (see Table 10).



**Table 10.** *English Language Exposure Points*

English Language Exposure	Response	Point Value
<b>Which languages do you speak at home and with family?</b>	English	2
<b>How many years have you studied English in school?</b>	2 – 4 years	1
	4 – 6 years	2
	6 years +	3
<b>Do you speak English outside school? If yes, with whom?</b>	No	0
	Yes, on vacation	1
	Yes, with my friends	1
	Yes, with tourists	1
	Yes, with community or sports groups	1
<b>Where have you travelled outside of Spain?</b>	Yes, in an afterschool program or with a tutor	1
	For each mentioned country where one of the main languages is English	1
<b>Have you been an exchange student?</b>	If yes to a country where one of the main languages is English	2

Once the scores were calculated, the students were assigned to one of three groups based on their English Language Exposure (ELE): *Low ELE*, *Medium ELE*, and *High ELE* (see Table 11). The students in the Low ELE group received three or fewer points, the students in the Medium ELE group received four to six points, and the students in the High ELE group received greater than seven points.

**Table 11.** *ELE Groups*

<i>Group</i>	Low ELE	Medium ELE	High ELE
<b><i>Number of Students</i></b>	12	30	18

### 3.5.2.3. *Pre-Test and Post-Test*

Since the preliminary study identified the student worked in groups, and it was, therefore, difficult to measure individual improvement in English language production and comprehension, a pre-test and post-test were given to the students so that their growth in FLA

could be measured. The pre-test was given at the onset of the study following the pre-questionnaire. This was done to create a baseline of their English language skills in relation to the topic of discussion. It was conducted in class using a pen and paper method.

As the teacher had identified the students to be between levels A2 and B1 in English, the tests were designed based on an appropriate level for the class. A B1-English textbook was used as a guide to create the tests using a chapter that contained material on the subject of climate action, which was the subject chosen for the forum discussion. The test contained four sections: *grammar and modal verbs*, *free answer*, *vocabulary fixed choice*, and *multiple-choice*. These sections were included to measure the students' overall comprehension of the topic in the foreign language, along with their general English proficiency. In addition, the test was created to require different types of responses (forced-choice and free-answer) to eliminate a bias created by *testwiseness* (Millman, Bishop, & Ebel, 1965). The test was also reviewed by four EFL teachers prior to administering it to the students.

The pre-test consists of four sections that used either a forced-choice paradigm or a free-answer paradigm. The sections that followed a forced-choice paradigm were the grammar, vocabulary, and multiple-choice sections, where the long answer section followed a free-answer paradigm. The grammar section measured comprehension of modal verbs. Each of these questions had one possible correct answer. The vocabulary section included the vocabulary taught relating to this topic in EFL texts at this level. This section was a matching section where there was only one possible correct answer for each question. The multiple-choice section was designed to measure vocabulary and comprehension. Similar to the grammar and vocabulary sections, there was only one possible correct answer for the multiple-choice section. Unlike the other sections, the long answer section was graded on whether the students demonstrated comprehension of the questions and responded appropriately in English using proper syntax and orthography.

The post-test was identical to the pre-test, and it was administered at the end of the study (see Appendix F) also using a traditional pen and paper method. The purpose was to measure the difference in scores, or growth in performance using the pre-test as a baseline and the post-test as the students' understanding of the topic in English upon completion of the study.

#### 3.5.2.4. *In-Class Observation*

In conjunction with monitoring the interactions through the KBIP analytics and measuring language production through testing, student participation was also observed in class. While the KB process was being monitored to follow the flow of ideas, notes were also recorded on general behaviours of the students (see Appendix H). Through observations, it was noted that the students in the two classes had different levels of engagement when participating in this project. The students in Class B posted less in the forum and they also appeared to be more distracted throughout the semester (see Table 12). Both classes had the same teacher and approximately the same number of students. The only main difference between the two classes was the class time, where Class A attended their English class on Monday and Thursday afternoons, and Class B attended their class on Thursday and Friday mornings.

**Table 12.** *Engagement Level of Class A & Class B*

<b>Class</b>	<b># of Posts</b>	<b>% of Posts</b>	<b>Classroom Observations</b>
<b>Class A</b>	142	61 %	Higher Engagement
<b>Class B</b>	90	39 %	Lower Engagement

#### 3.5.2.5. *Post Questionnaire*

Once the KBIP study was completed, along with the completion of the post-test, the students were given a link to a digital questionnaire (see Appendix G). The questionnaire was written in Catalan to ensure the questions were understood and it was reviewed by the teacher and two other researchers before it was sent to the students. Similar to the pre-questionnaire, the post-

questionnaire was created a digital questionnaire company (Survey Monkey), and the link sent to the students by the teacher. The questionnaire contained simple questions inquiring on the students' experiences of participating in KBIP, along with their levels of satisfaction, whether they felt their English language production and comprehension improved, and whether they felt they learned more about the forum topics. 54 of the 60 participants responded to the questionnaire and their responses were used in a qualitative analysis.

### **3.5.3. Main KBIP Method Limitations**

In general, KBIP was designed to connect classrooms around the globe so students could share ideas and learn from each other. In this study, the participating students were assigned to work with a class of students from Colombia. While the Colombian students enrolled in this project, they did not post in the forum, and the Catalan students were only able to learn from each other.

Additionally, prior to the study, a request was made to have another class participate as a control group. For this to happen, another class would need to be tested and taught similar material through a traditional teacher-centric method. Unfortunately, another class was not able to participate, and there was no control group for this study. The initial proposal also included a delayed post-test to measure whether the information learned in KBIP was retained after a longer duration of time, however, without a control group, there would be nothing to compare the delayed post-test results to; therefore, this test was not used in this study.

## 4. Results

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### 4.1. Introduction

This chapter begins with the results from the OLL in virtual classrooms study. This includes a discussion of the thematic analysis. The results from the KBIP studies follow beginning with the preliminary KBIP study and finally the results from the main KBIP project.

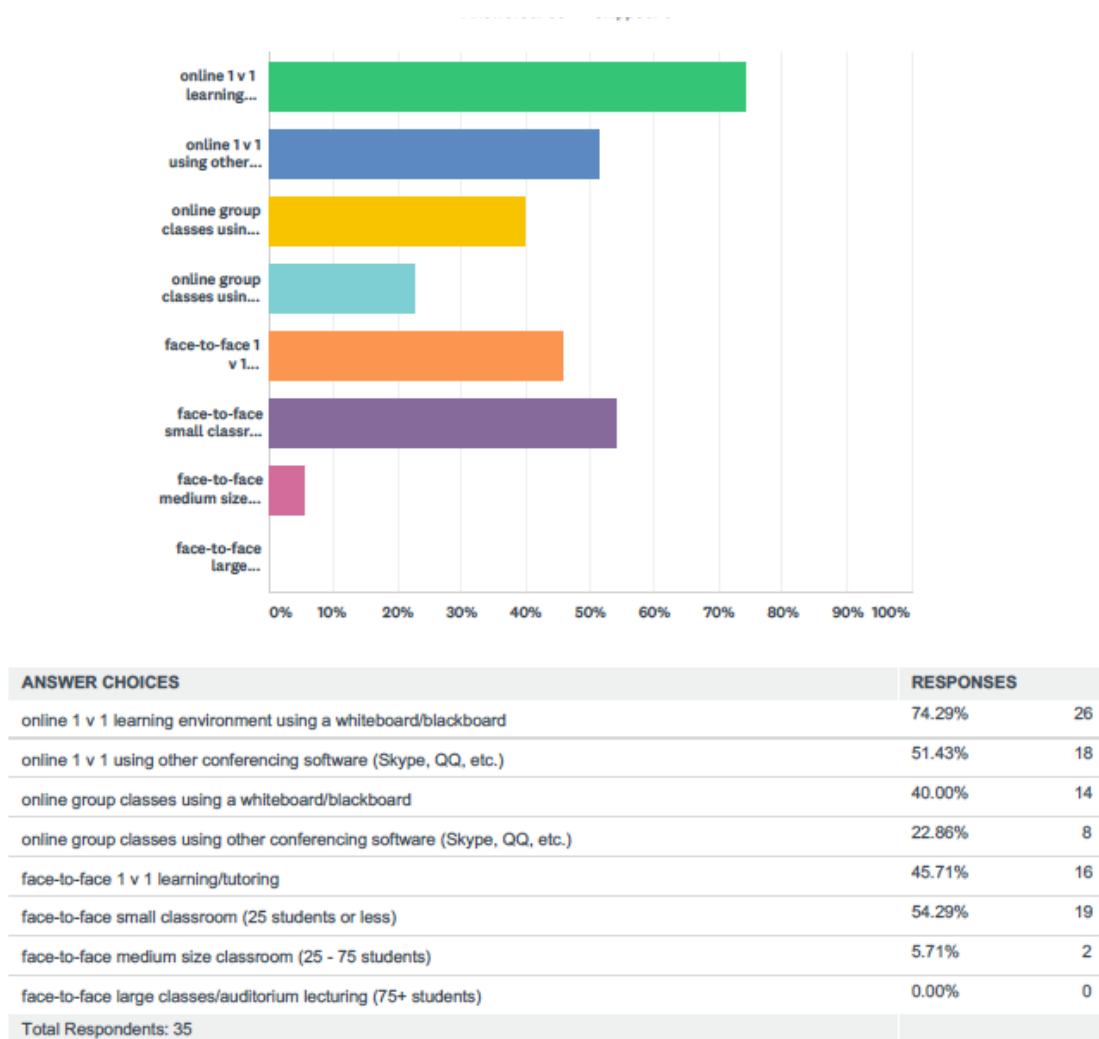
### 4.2. OLL in Virtual Classrooms Results

A thematic analysis of the responses was completed, and the responses were divided into themes, such as enjoyment level and preferences, perceptions of student learning, and teacher recommendations (see Appendix B). Each of these themes is detailed in the sections below. Descriptive statistics, such as measures of central tendency, were used in the analysis of the data since this study was created as a descriptive research study. Because of this, percentages were used to describe the frequencies of the responses. These percentage amounts were automatically calculated in the software used for each of the forced-choice questions.

#### 4.2.1. *Enjoyment Level and Preferences*

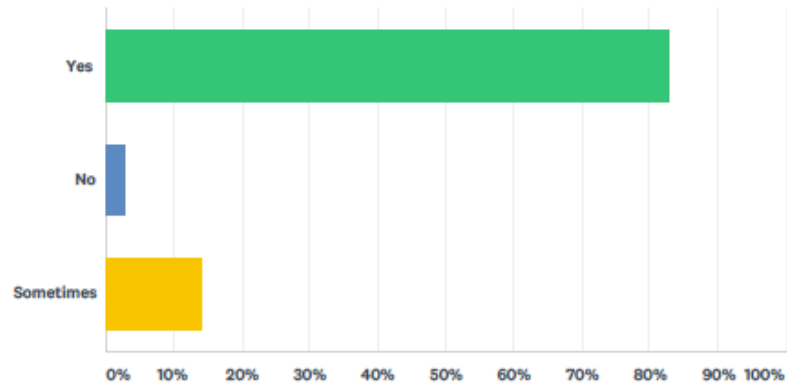
The participants generally responded favourably to teaching online using video conferencing software, such as Skype (<https://www.skype.com>), QQ (<https://www.im.qq.com>), or virtual classrooms. There was a greater preference for online teaching (58.97%) to offline teaching, such as teaching in traditional classrooms or face-to-face tutoring (41.03%). When looking specifically at online teaching, the participants showed a slight preference for using virtual classrooms over other types of video conferencing software. The participants also showed a preference for teaching individual classes online (86.96%) as compared to small group classes of two to eight students. Regardless of whether the participants were teaching online or offline, they indicated that the size of the class matters.

While online teaching showed a strong preference for individual classes, offline teaching showed a preference for small classes with less than 25 students (see Figure 13).



**Figure 13.** *Teaching Environment Preference.*

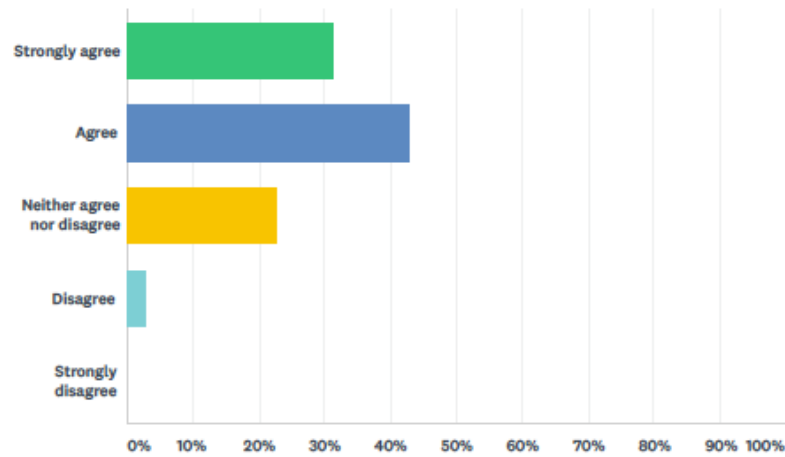
Most of the participants indicated they enjoy online teaching (82.86%), while few of the participants indicated that they enjoy this occasionally (14.29%), and only one participant indicated they do not enjoy online teaching (see Figure 14).



ANSWER CHOICES	RESPONSES	
Yes	82.86%	29
No	2.86%	1
Sometimes	14.29%	5
TOTAL		35

**Figure 14.** *Online Teaching Enjoyment*

The majority of the participants (74.29%) also felt that using a virtual classroom system with a digital whiteboard helps them to better structure their lessons. Only 2.86% of the participants disagreed, while the remaining 22.86% of the participants remained neutral (see Figure 15).



ANSWER CHOICES	RESPONSES	
Strongly agree	31.43%	11
Agree	42.86%	15
Neither agree nor disagree	22.86%	8
Disagree	2.86%	1
Strongly disagree	0.00%	0
TOTAL		35

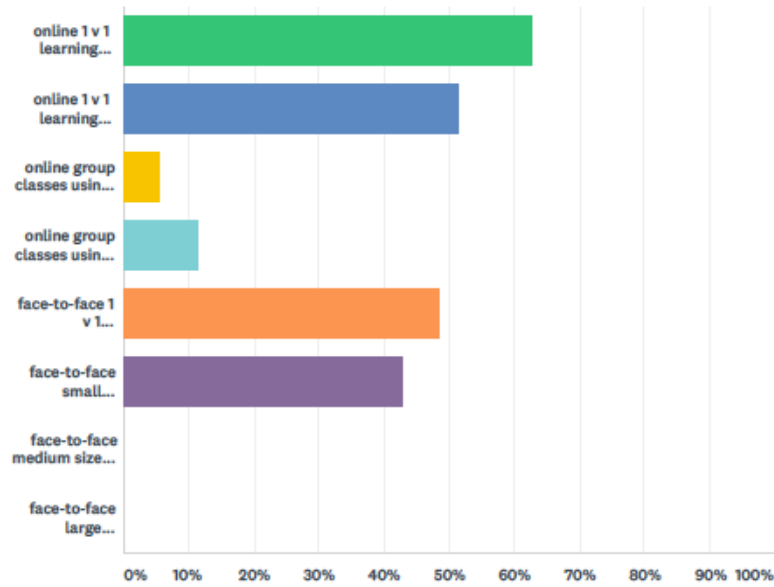
**Figure 15.** Responses to Whether Using a Virtual Classroom Helps to Structure Lessons

To summarize, the participants generally prefer to teach individual classes online using virtual classrooms, and they not only enjoy teaching online, but they also feel the virtual classrooms assist in better structuring the lessons.

#### ***4.2.2. Perceptions of Student Learning***

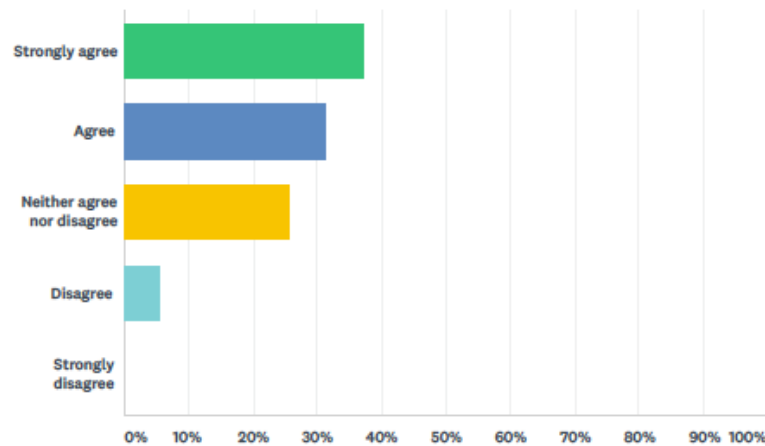
The majority of the participants (68.57%) feel they get to know their students better in individual online classes using virtual classrooms, even when compared to individual face-to-face instruction (see Figure 16). Additionally, 68.57% of the participants indicated that the students appear more engaged in online virtual classrooms when compared to traditional offline classrooms. Only 5.71% of the participants disagreed, while the rest remained neutral (see Figure 17).





ANSWER CHOICES	RESPONSES	
online 1 v 1 learning environment using a whiteboard/blackboard	62.86%	22
online 1 v 1 learning environment using other conferencing software (Skype, QQ, etc.)	51.43%	18
online group classes using a whiteboard/blackboard	5.71%	2
online group classes using other conferencing software (Skype, QQ, etc.)	11.43%	4
face-to-face 1 v 1 learning/tutoring	48.57%	17
face-to-face small classrooms (25 students or less)	42.86%	15
face-to-face medium size classroom (25 - 75 students)	0.00%	0
face-to-face large classes/auditorium lecturing	0.00%	0
Total Respondents: 35		

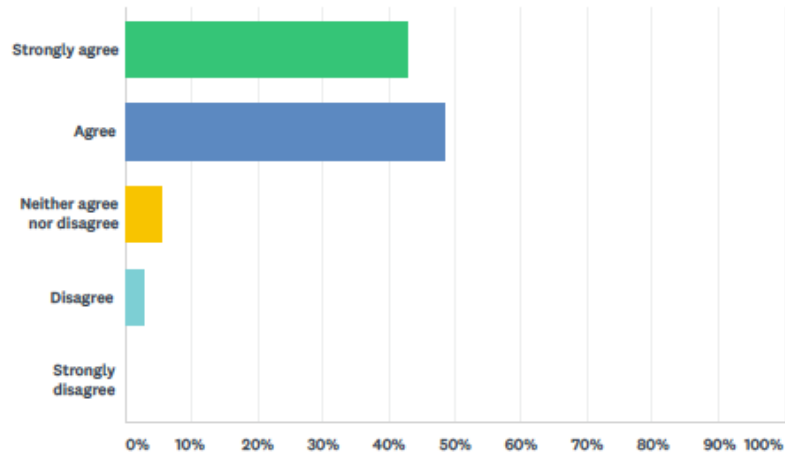
**Figure 16.** *Best Environment for Getting to Know Students on a Personal Level*



ANSWER CHOICES	RESPONSES
Strongly agree	37.14% 13
Agree	31.43% 11
Neither agree nor disagree	25.71% 9
Disagree	5.71% 2
Strongly disagree	0.00% 0
TOTAL	35

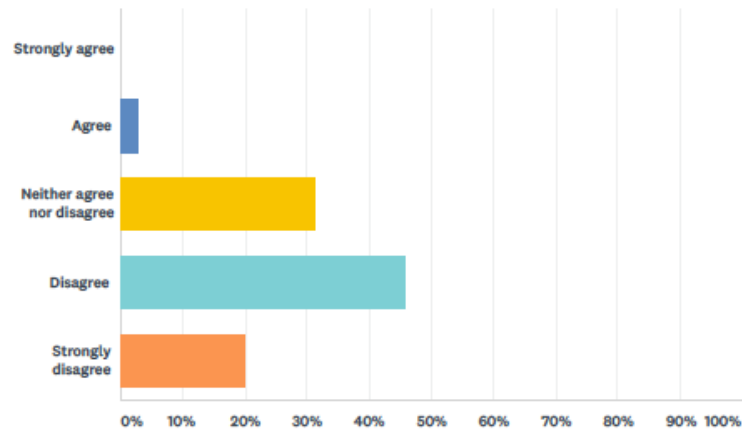
**Figure 17.** Responses to Whether Student Engagement is Highest when using a Virtual Classroom

The participants believe that learning in virtual classrooms strengthens the students' knowledge and comfort with technology (see Figure 18), and it does not slow down the students' computational skills. In addition, the majority of the participants (82.86%) believe that teaching online in a virtual classroom allows teachers to teach identical content to what is taught in traditional offline classrooms either at a faster rate or at the same pace, while only 8.57% of the participants believe the opposite (see Figure 19).



ANSWER CHOICES	RESPONSES	
Strongly agree	42.86%	15
Agree	48.57%	17
Neither agree nor disagree	5.71%	2
Disagree	2.86%	1
Strongly disagree	0.00%	0
TOTAL		35

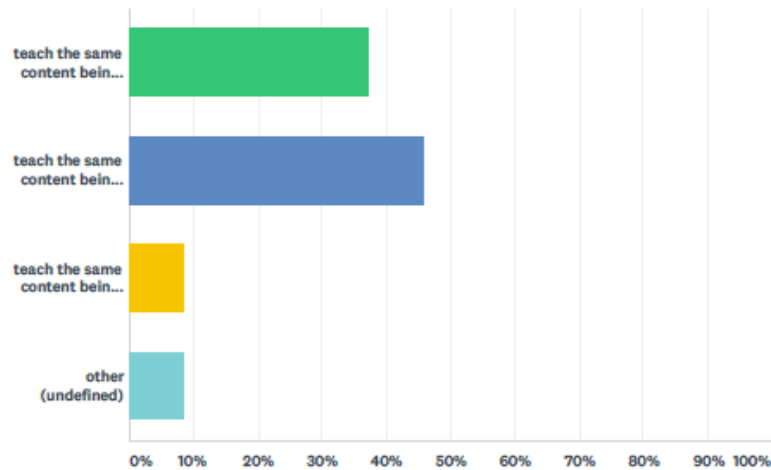
**Figure 18.** Responses to Whether *Using a Virtual Classroom Online Strengthens Students' Knowledge with Technology*



ANSWER CHOICES	RESPONSES	
Strongly agree	0.00%	0
Agree	2.86%	1
Neither agree nor disagree	31.43%	11
Disagree	45.71%	16
Strongly disagree	20.00%	7
TOTAL		35

**Figure 19.** Responses to Whether Using a Virtual Classroom Slows Down Students' Writing, Thinking, and Computational Skills

Most of the participants (80%) believe that the students learn at a similar or faster rate online using a virtual classroom than in other classrooms. A few of the participants (8.57%) believe that the students learn at a slower rate, while the rest were undecided (see Figure 20).



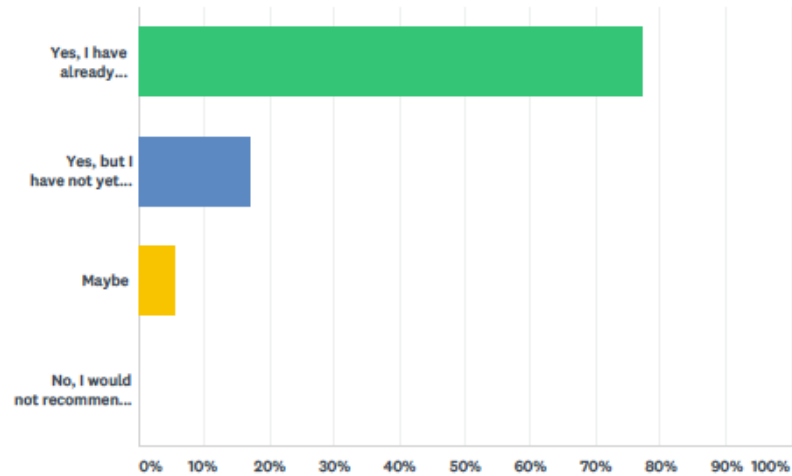
ANSWER CHOICES	RESPONSES
teach the same content being taught in a classroom, but at a faster rate	37.14% 13
teach the same content being taught in a classroom at a similar rate	45.71% 16
teach the same content being taught in a classroom, but at a slower rate	8.57% 3
other (undefined)	8.57% 3
TOTAL	35

**Figure 20.** *Rate of Teaching Content While Using a Virtual Classroom System*

To summarize, the participants generally believe that using virtual classrooms for online learning allows them to know their students personally, allows the students to be more engaged in the lesson, and the students learn the material at the same rate or faster than using other teaching methods.

#### **4.2.3. Teachers' Recommendations**

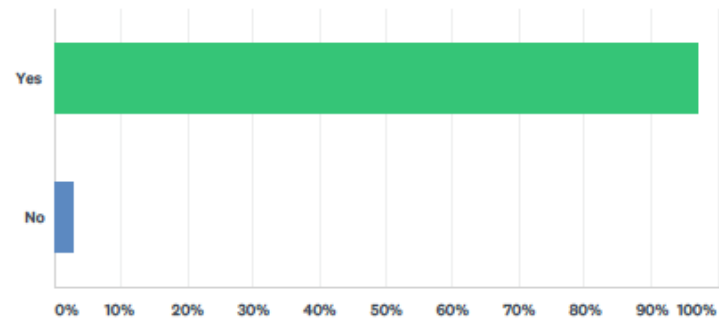
When asking the participants whether they would recommend teaching online using a virtual classroom system to a friend or colleague, the majority of participants (77.14%) said *yes* and that they had already done so. An additional 17.14% said *yes*, and they intend to but have not already done so. A small number of participants (5.71%) were undecided, and 0% said *no* to this question (see Figure 21).



ANSWER CHOICES	RESPONSES
Yes, I have already recommended online teaching to my friends or colleagues	77.14% 27
Yes, but I have not yet recommended anyone	17.14% 6
Maybe	5.71% 2
No, I would not recommend online teaching using a whiteboard/blackboard	0.00% 0
TOTAL	35

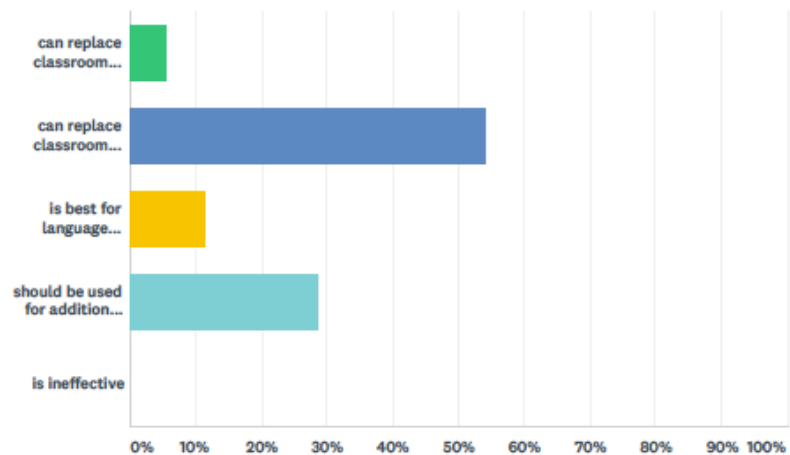
**Figure 21.** Responses to Whether Online Teaching Using a Virtual Classroom Would be Recommended to Colleagues and Friends

When asking the participants whether they would recommend to students to enroll in courses using online virtual classrooms, 94.17% responded *yes*, while only 2.86% responded *no* (see Figure 22). In addition, the majority of participants believe that virtual classroom learning could replace offline teaching of all grade school core subjects, such as languages, sciences, mathematics, and social sciences, while only 11.43% believe that virtual classroom systems should be reserved for language learning only. A small fraction of the participants feels that virtual classroom systems are best used as an additional learning method to complement offline traditional classroom learning, while 0% of the participants feel this method of learning is ineffective (see Figure 23).



ANSWER CHOICES	RESPONSES	
Yes	97.14%	34
No	2.86%	1
TOTAL		35

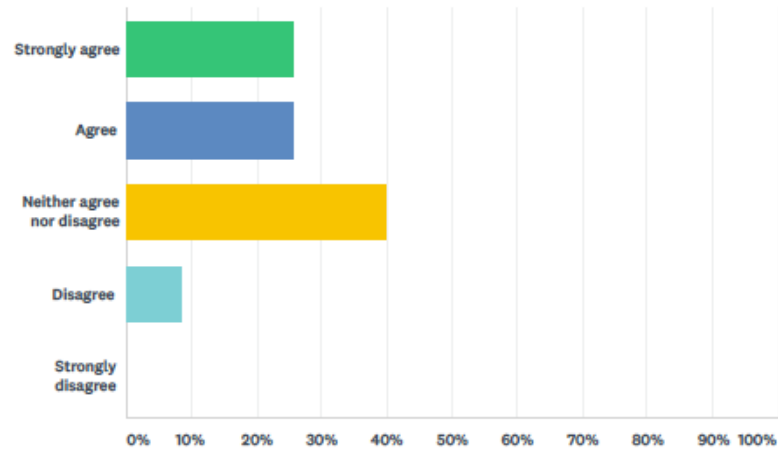
**Figure 22.** Responses to Whether Online Teachers Would Recommend Students Enroll in Online Classes Using a Virtual Classroom



ANSWER CHOICES	RESPONSES
can replace classroom learning for all subjects	5.71% 2
can replace classroom learning for most subjects (languages, mathematics, sciences, social sciences) but not for certain subjects (music, drama, band, physical education, etc.)	54.29% 19
is best for language learning, but would not be as effective for other subjects	11.43% 4
should be used for additional supplementary learning only. Online learning cannot replace traditional classrooms.	28.57% 10
is ineffective	0.00% 0
TOTAL	35

**Figure 23.** Responses to Whether Online Learning With Virtual Classrooms Can Replace Traditional Learning Classrooms and For Which Subjects

In addition, more than half of the participants believe that online learning with certified and educated teachers is a better option for school-age children than home-schooling with a parent, where 51.42% agree, and only 8.57% disagree. The rest were undecided (see Figure 24).

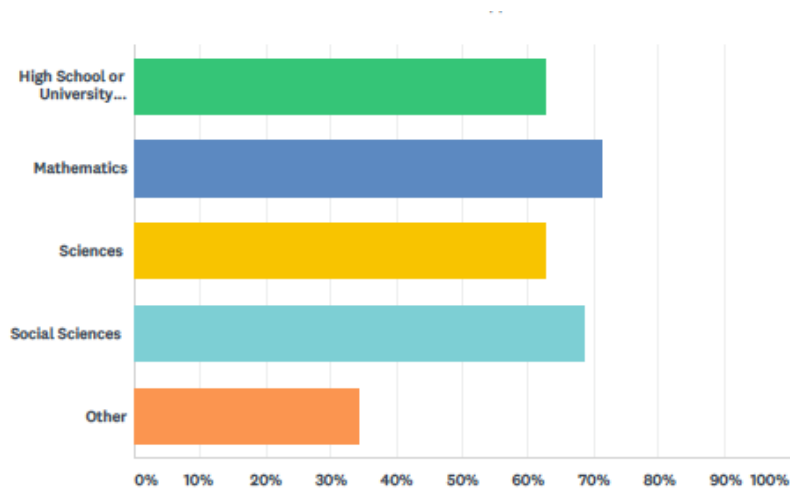


ANSWER CHOICES	RESPONSES	
Strongly agree	25.71%	9
Agree	25.71%	9
Neither agree nor disagree	40.00%	14
Disagree	8.57%	3
Strongly disagree	0.00%	0
TOTAL		35

**Figure 24.** Responses to Whether Learning Online with a Certified Teacher is a Better Option Than Home-Schooling

The participants were asked which subjects they would like to see taught online using virtual classrooms and the preference was highest for mathematics (71.43%) followed by social sciences, science, then literature or essay writing (see Figure 25).

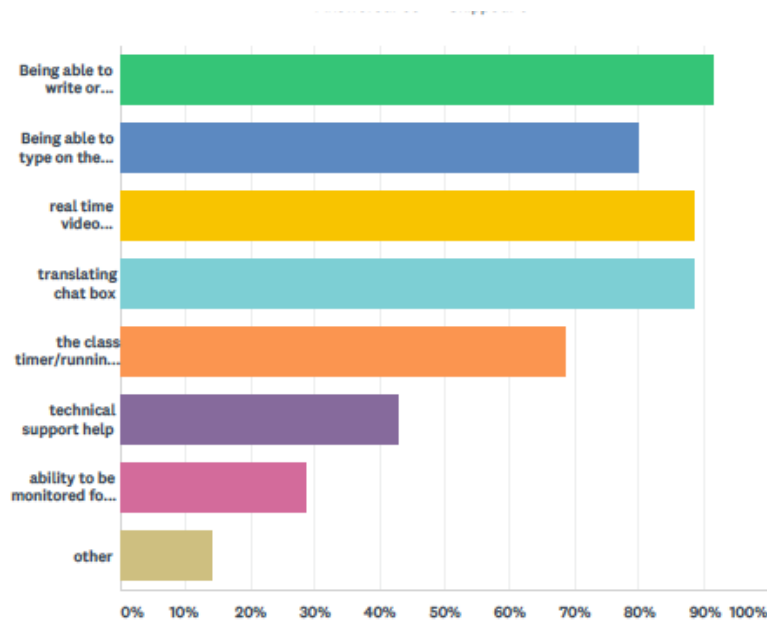




ANSWER CHOICES	RESPONSES
High School or University English (literature/essay writing)	62.86% 22
Mathematics	71.43% 25
Sciences	62.86% 22
Social Sciences	68.57% 24
Other	34.29% 12
Total Respondents: 35	

**Figure 25.** Responses to Which Other Subjects Teachers Would Like to See Taught Online in Virtual Classrooms

The participants were further asked which features of the virtual classrooms are the most helpful while teaching (see Figure 26). The most popular features are the ability to write or highlight in the textbook (94.43%), video conferencing in real-time (88.57%), the translating chat box (88.57%), and being able to type in the textbook (80%).



ANSWER CHOICES	RESPONSES
Being able to write or highlight on the textbook	91.43% 32
Being able to type on the textbook	80.00% 28
real time video conferencing and ability to see the textbook on one screen	88.57% 31
translating chat box	88.57% 31
the class timer/running clock	68.57% 24
technical support help	42.86% 15
ability to be monitored for coaching	28.57% 10
other	14.29% 5
Total Respondents: 35	

**Figure 26.** Responses to Which Features are the Most Helpful in a Virtual Classroom

To summarize, the participants generally recommend both teaching and learning using virtual classrooms online, and the majority also believe that virtual classrooms can replace both traditional classroom-learning as well as home-schooling. The participants would also like to see other core subjects taught in this learning environment.

### 4.3. Preliminary KBIP Results

This section serves to describe the results from the preliminary KBIP study. As previously discussed in the process of investigation, with the exception of two posts from the Catalan students, all of the posts provided novel descriptions using the students' own words to provide further information. Thus, all but two of the posts from the Catalan students were eligible for analysis. While there were 35 students in the class, only 12 of the students entered posts in the knowledge forum (see Table 13).

**Table 13.** *Forum Participation*

<b>School and Location</b>	<b># of Students</b>	<b>Forum Participation</b>	<b>Participation in Discussions without Posting the Forums</b>
<b>Kalamata, Greece</b>	35	21	14
<b>Sant Pau, Tarragona</b>	35	12	23

Even though there were 35 students that participated, only the responses in the forum from the 12 students could be analyzed and included in this study. All of the participants were in the same grade and around 16-years at the time they participated in the knowledge building discourse. Therefore, they should all be at the same developmental stage. The Spanish students posted 52 times, and with the exception of two posts, all of the posts provided novel descriptions using the students' own words to provide further information. Therefore 50 of these posts were eligible for analysis. The posts per student were then isolated to determine the frequency the students were participating in the forum (see Table 14).

**Table 14.** *Number of Posts by Student*

<b># of posts</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b># of students</b>	2	2	2	1	1	1	1	1	0	1

The questionnaire data revealed that there are confounding variables, which could influence the production of English in the posts. Some of the students have private English

tutors after school, some have travelled to English-speaking countries, and three of the students claim to be native speakers of English and speak English in the home (see Table 15).

**Table 15.** *English Language Background*

<b>L2 Background</b>	<b>Number</b>	<b>Travel to English Speaking Countries</b>	<b>Private English Tutor</b>
<b>Native English Speaker</b>	3	2	1
<b>Non-Native English Speaker</b>	9	4	3
<b>Total</b>	12	6	4

The mean number of posts by student is 4.33 and the median is 3.5. Through organizing the data and removing irrelevant information, it became apparent that the number of posts and the number of participants were much smaller from what was thought to exist at the onset of this study.

#### **4.3.1. Analysis of Posts**

Finally, the error types were analyzed to determine whether there were any trends and whether any errors were consistent amongst the participants (See Table 16).

**Table 16.** *Types of Errors by Student*

<b>Error Type</b>	<b>Total</b>	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4</b>	<b>S5</b>	<b>S6</b>	<b>S7</b>	<b>S8</b>	<b>S9</b>	<b>S10</b>	<b>S11</b>	<b>S12</b>
<b>Punctuation or Comma Use</b>	20	0	2	3	7	1	4	0	2	0	0	1	0
<b>Spelling Error</b>	19	1	1	2	3	4	3	0	2	0	2	0	1
<b>Word Order</b>	16	1	0	1	3	0	4	1	1	1	1	2	1
<b>Singular/Plural Inflection</b>	9	2	1	1	2	0	2	0	0	0	1	0	0
<b>Incorrect Word</b>	8	1	1	1	1	0	0	0	0	0	1	2	1
<b>Incorrect Verb Tense</b>	8	1	0	0	0	0	1	0	0	0	3	1	2
<b>Capitalization Error</b>	7	0	1	0	2	1	1	0	1	0	1	0	0
<b>Missing Pronoun</b>	6	1	0	0	0	0	0	0	1	0	1	1	2
<b>Missing Determiner</b>	5	1	0	1	0	1	0	0	2	0	0	0	0
<b>Missing Conjunction</b>	4	2	0	0	1	0	0	0	0	0	0	1	0
<b>Total</b>	102	10	6	9	19	7	15	1	9	1	10	8	7

The number of errors and types of errors were not consistent amongst the participants, and the majority of errors appeared similar to what is seen when using mobile devices, such as an omission of punctuations, or typos (Cingel & Sundar, 2012).

#### **4.4. Main KBIP Results**

This chapter discusses the results of the main KBIP study pertaining to the method section of the previous chapter. The following sections include a comparison to the two classes, which was done because of an observation of a difference in class engagement, a comparison of pre-test to post-test scores, which was done to determine whether there was a general increase in English language proficiency over the course of the project, and a comparison of the ELE groups from pre-test to post-test, which was done to see whether foreign language skills transfer from one group to another, which is common for other skills in KB tasks.

#### 4.4.1. Analysis of Class Engagement

From the in-class observations, it was noticed that Class A showed a higher level of engagement in the KBIP process and activities throughout the study. Because of this, the Levene's Test for Homogeneity of Variance was conducted to determine whether the two classes were considered to be equal upon conclusion of the study. The post-test scores were used for this analysis (see Table 17). Because the significance values from the Levene Statistic are greater than 0.05; the test is not significant. This means that equal variances are assumed and the performances of both Class A and Class B on the post-test are considered equal.

**Table 17.** *Homogeneity of Variance*

Post-Test	Levene Statistic	df1	df2	Sig.
<b>Based on Mean</b>	1.64	1	58	.206
<b>Based on Median</b>	.57	1	58	.454

Additionally, an ANOVA was used to verify that the class assignment did not influence the post-test results (see Table 18). Similar to the Levene Statistic, the results of the ANOVA were not significant. Thus, even though Class A appeared to be more engaged in the KBIP process and the posted more in the forums, the performance of Class A and Class B are similar, and there was no influence in overall performance based on the class assignment,  $F(1, 58) = .92, p = 0.341$ .

**Table 18.** *ANOVA Class Assignment vs. Post-Test*

	df	Sum of Squares	Mean Square	F	Sig.
<b>Between Groups</b>	1	381.53	381.53	.92	.341
<b>Within Groups</b>	55	23981.19	413.47		
<b>Total</b>	59	24362.71			

Because the class assignment had no influence on the final test performance, the classes were analyzed as one group in the subsequent sections.

#### 4.4.2. Analysis of Pre-Test to Post-Test Scores

Both the preliminary study and the in-class observation showed the students were working in groups, therefore, to measure whether the students increased in their English language production and comprehension of the subject matter, the results focus on the comparison of the pre- and post-test scores using a paired sample t-test. The t-test results show there was a significant difference in the scores between the pre-test ( $M = 58.05$ ,  $SD = 20.23$ ) and the post-test ( $M = 64.87$ ,  $SD = 20.32$ )  $t(59) = -4.982$ ,  $p = .001$ . This means the student performance increased from the pre-test to the post-test. Cohen's  $d$  was also used to analyze the results, and it was estimated at  $-6.81$ , which is a *medium effect*. This is based on Cohen's (1992) guidelines.

The test was divided into four sections; therefore, the performances of each of these sections were also analyzed to determine the specific areas where the students showed improvement. These sections, as outlined in chapter 6, are the grammar section, long answer section, vocabulary section, or multiple-choice section. The paired results can be seen in the following table shows the paired results for these sections (see Table 19).

**Table 19.** Paired Differences by Test Section

	<b>df</b>	<b>Mean</b>	<b>SD</b>	<b>t</b>	<b>Sig.</b>
<b>Grammar</b>	59	-.20	2.11	-.73	.467
<b>Long Answer</b>	59	-2.18	2.13	-7.93	.001
<b>Vocabulary</b>	59	.01	2.24	.03	.977
<b>Multiple-Choice</b>	59	-1.12	2.76	-3.14	.003
<b>Full Test</b>	59	-6.81	10.59	-4.98	.001

From this analysis, the results show there is no significant difference for the grammar section between the pre-test ( $M = 7.71$ ,  $SD = 3.19$ ) and the post-test ( $M = 7.91$ ,  $SD = 3.19$ ),  $t(59) = -0.73$ ,  $p = .467$ . Likewise, there was also no significant difference for the vocabulary section between the pre-test ( $M = 4.64$ ,  $SD = 2.16$ ) and the post-test ( $M = 4.63$ ,  $SD = 2.46$ ),  $t(59) = 0.03$ ,  $p = .977$ . There was, however, a significant difference for the long answer section from the pre-test ( $M = 4.74$ ,  $SD = 3.04$ ) and the post-test ( $M = 6.92$ ,  $SD = 3.10$ ),  $t(59) = -7.93$ ,

$p = .001$ . Cohen's  $d$  was estimated at  $-1.024$  for the long answer section, which is considered a very *high effect*. Additionally, there was a significant difference for the multiple-choice section from the pre-test ( $M = 10.55$ ,  $SD = 3.37$ ) and the post-test ( $M = 11.67$ ,  $SD = 2.77$ ),  $t = 3.14$ ,  $p = .003$ . For this section, Cohen's  $d$  was estimated at  $0.41$ , which is considered a *low effect*. From this analysis, the students show strong increases in their FLA in the long answer section, where the focus was on grammar and comprehension of the subject in the foreign language. Additionally, there is a significant increase in performance in the multiple-choice section, but, according to the Cohen's  $d$  statistic, this change is not as strong as in the long answer section.

#### 4.4.2.1. Analysis of Vocabulary and Grammar Sections

From the t-test analyses, it was noticed that the students did not show a significant improvement in the grammar section or the vocabulary section. Therefore, the posts in the forums were analyzed to look at the frequency of the modal verbs from the grammar section, and the vocabulary from the vocabulary section was used in the forum posts. From the KBIP analytics, it was evident that only three of the words from the vocabulary section were used by the students (see Table 20). The vocabulary the students were tested on vary from the most frequently used words in the forum posts, as noted in Figure 19 in chapter 6. The most frequently used words by the students were: *pollution*, *reduce*, *hurricanes*, *temperature*, *problems*, *deforestation*, *water*, and *greenhouse*.

**Table 20.** Vocabulary Used in the Forums

Vocabulary	Frequency in the Forums
<b>Bio products</b>	0 posts
<b>Solar</b>	1 post
<b>Ecological Impact</b>	0 posts
<b>Wind Energy</b>	0 posts
<b>Carbon Footprint</b>	5 posts
<b>Green Cars</b>	0 posts
<b>Hydro Power</b>	0 posts
<b>Global Warming</b>	8 posts
<b>Environmental Problems</b>	0 posts



In addition to variances in the vocabulary, there were also variances in the modal verbs the students chose to use in the forums when compared to the modal verbs that were tested. While the students used a variety of modal verbs in the writing task, the majority of the posts included *can* and *have to* (see Table 21).

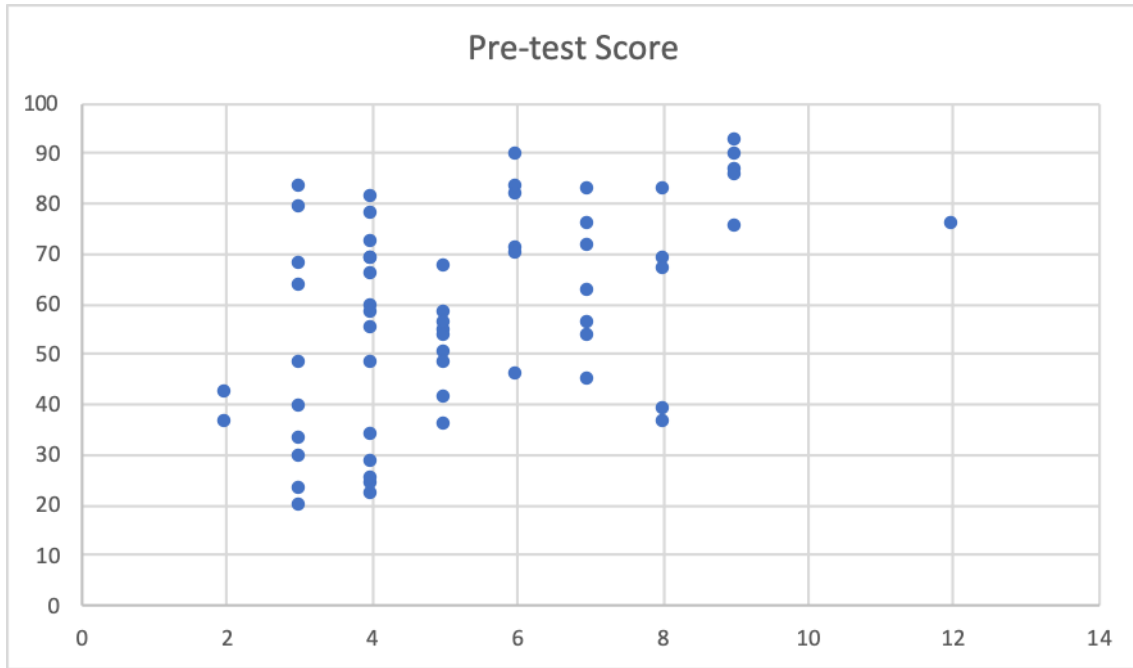
**Table 21.** Modal Verbs Used in the Forums

<b>Modal Verb</b>	<b>Frequency in the Forums</b>
<b>Should</b>	8 posts
<b>Could</b>	8 posts
<b>Would</b>	7 posts
<b>Must</b>	5 posts
<b>Have to/Has to</b>	34 posts
<b>Can</b>	81 posts
<b>May</b>	2 posts

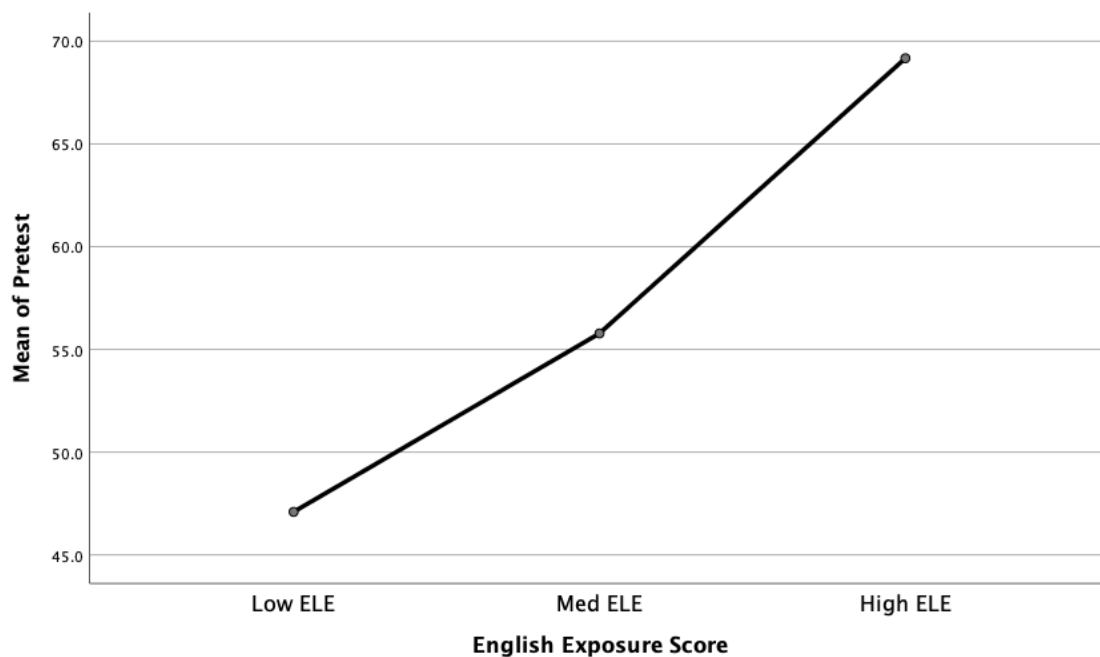
From the forum posts, it is evident that, even though there are common words used for discussions on the topic of climate actions, the students may paraphrase their responses and find different ways to explain their thoughts to their classmates. The paraphrastic devices they may choose to use in the writing tasks were not tested on the pre-test nor post-test. Predicting the vocabulary and grammatical structures the students would use in writing was not possible prior to this study.

#### ***4.4.3. Analysis of ELE Groups***

A comparison of the ELE scores to the pre-test results shows a plausible positive correlation (see Figures 27 & 28). Because of this, a one-way ANOVA was conducted with the three ELE groups (low ELE, medium ELE, and high ELE) as an independent variable and the pre-test results as the dependent variable.



**Figure 27.** Scatterplot of Pre-Test Performance and ELE Scores



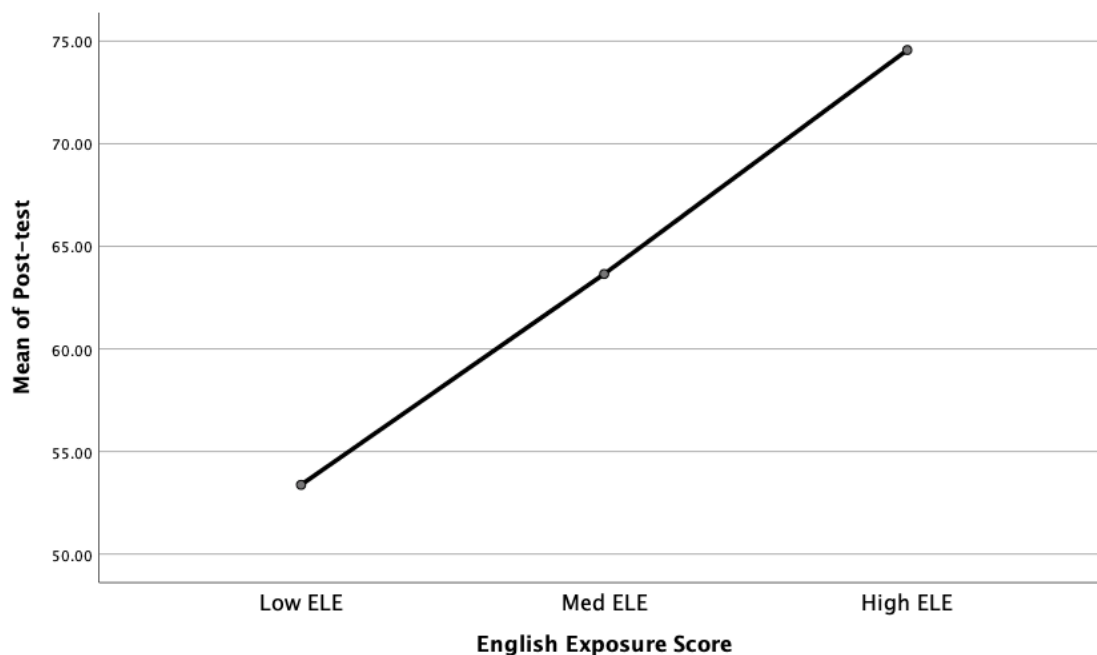
**Figure 28.** Line Graph of Pre-Test Mean Performance and ELE Group

For the ANOVA between the pre-test and ELE scores, the null hypothesis is that the means of the three groups (*low*, *medium*, and *high*) are equal, and the alternative hypothesis is that the means of the three groups are not equal. The results show  $F(2, 57) = 5.358$ ,  $p = 0.007$ ; therefore, the null hypothesis has been rejected in favour of the alternative hypothesis (see Table 22).

**Table 22.** ANOVA Pre-Test Scores and ELE Scores

	df	Sum of Squares	Mean Square	F	Sig.
<b>Between Groups</b>	2	3822.271	1911.135	5.358	.007
<b>Within Groups</b>	57	20331.113	356.686		
<b>Total</b>	59	24153.384			

Similar to the pretest results, there appears to be a strong positive correlation when looking at a graph of the post-test results and the ELE scores (see Figure 29).

**Figure 29.** Line Graph of Post-Test Mean Performance and ELE Group

The ELE scores were also compared to the post-test results with a one-way ANOVA. Similar to the pre-test comparison, the null hypothesis is that the means of the three groups (*low, medium, and high*) are equal, and the alternative hypothesis is that the means of the three groups are not equal. The results show  $F(2, 57) = 4.501$   $p = .015$ ; therefore, the null hypothesis has been rejected in favour of the alternative hypothesis (see Table 23).

**Table 23.** ANOVA Post-Test Scores and ELE Scores

	df	Sum of Squares	Mean Square	F	Sig.
<b>Between Groups</b>	2	3322.728	1661.364	4.501	.015
<b>Within Groups</b>	57	21039.985	369.123		
<b>Total</b>	59	24362.714			

When comparing the pre-test to the post-test, each of the groups (*low, medium and high*) increased in their English language proficiency from the pre-test to the post-test, and the increase appeared to around 5% to 8 % per group (see Table 24). This indicates that each group increased at roughly the same amount and that the knowledge from a higher-level group did not transfer to the lower level groups, as is common with other types of knowledge in KB tasks.

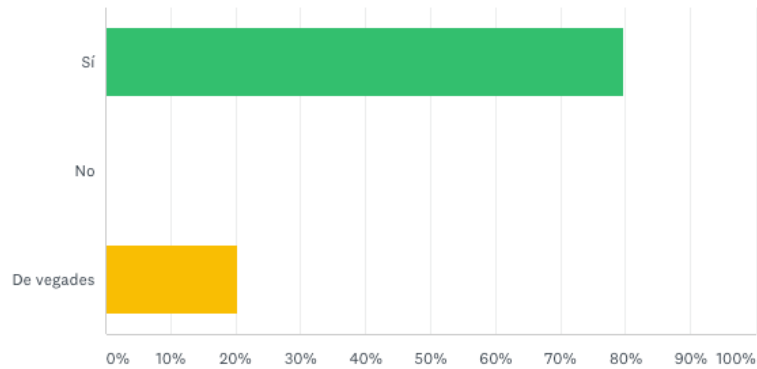
**Table 24.** *Differences in Means by ELE Group*

<b>Group</b>	<b>Number</b>	<b>Pre-test Mean</b>	<b>Post-test Mean</b>
<b><i>Low ELE</i></b>	12	47.09	53.37
<b><i>Med ELE</i></b>	30	55.78	63.65
<b><i>High ELE</i></b>	18	69.17	74.57
<b><i>Total</i></b>	60	58.06	64.87

#### **4.4.4. Analysis of Qualitative Data**

Upon completion of quantitative data analysis, the qualitative data from the post-questionnaire was reviewed and analyzed. The questionnaire was created as a descriptive questionnaire; therefore, descriptive statistics, such as percentages, were used in the analysis. The interest is in the central tendency of the responses. Thus, percentage totals were used to describe the responses. These totals were automatically calculated by the digital software used to collect the data (Survey Monkey). The results of the questionnaire are described in the subsequent paragraphs.

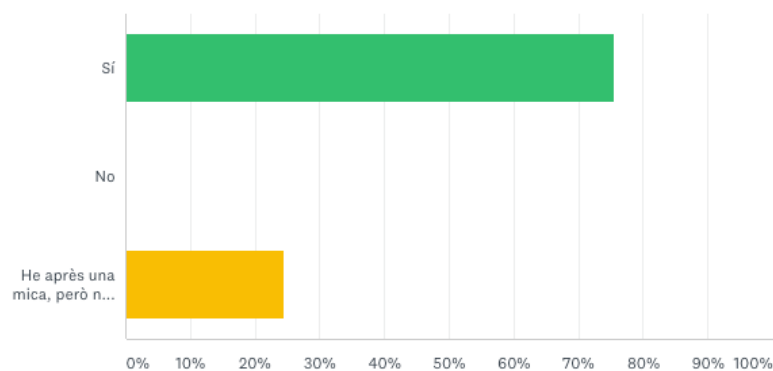
The majority of the students (79.63%) reported that they generally enjoyed participating in this knowledge building project, while 20.37% of the students reported that they enjoyed it sometimes. None of the students noted that they disliked the project (see Figure 30).



ANSWER CHOICES	RESPONSES
▼ Sí	79.63% 43
▼ No	0.00% 0
▼ De vegades	20.37% 11
<b>TOTAL</b>	<b>54</b>

**Figure 30.** *Student Enjoyment in Participation in KBIP*

Regarding the theme of *climate action*, 75.47% of the students indicated they learned a lot about the topic, 24.53% answered that they learned a bit, but not a lot, where none of the students reported that they did not learn anything regarding the topic (see Figure 31).

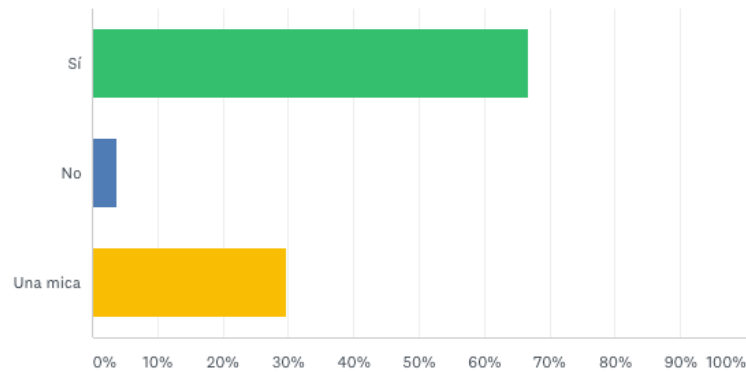


ANSWER CHOICES	RESPONSES
▼ Sí	75.47% 40
▼ No	0.00% 0
▼ He après una mica, però no gaire.	24.53% 13
<b>TOTAL</b>	<b>53</b>

**Figure 31.** *Students' Report on Learning the Material*

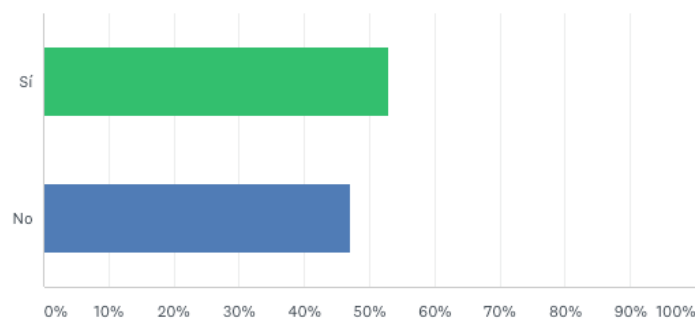
In relation to the topic of discussion, most of the students found it to be interesting (66.67%), whereas only 3.7% of the students reported it was not interesting. The remaining

students were undecided (see Figure 32). Additionally, over half of the students (52.83%) said they adapted their behaviours and habits outside the classroom because of their participation in this project (see Figure 33).



ANSWER CHOICES	RESPONSES
▼ Sí	66.67% 36
▼ No	3.70% 2
▼ Una mica	29.63% 16
<b>TOTAL</b>	<b>54</b>

**Figure 32.** Student Interest in the Topic of Climate Action

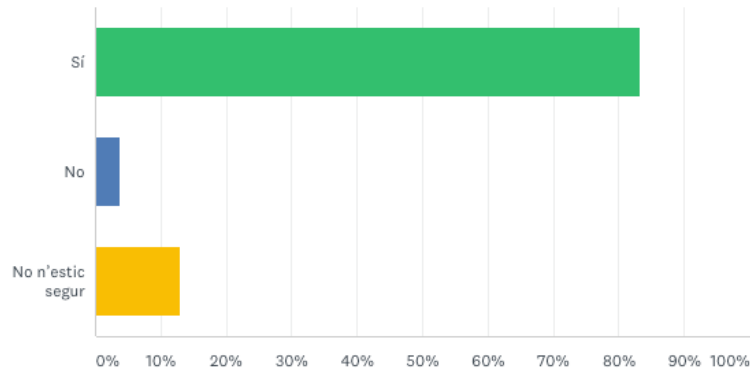


ANSWER CHOICES	RESPONSES
▼ Sí	52.83% 28
▼ No	47.17% 25
<b>TOTAL</b>	<b>53</b>

**Figure 33.** Student Reported Behaviour Changes Due to Participation in KBIP

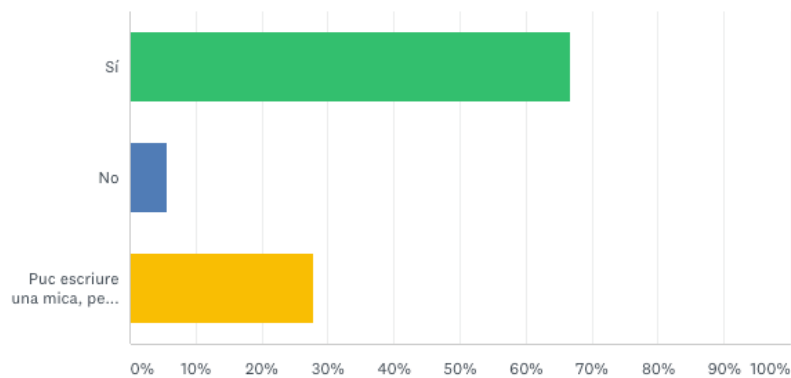
In general, the students felt they understood the topic of climate action better after participating in the KB writing tasks. Most of the students (83.33%) reported that using KB is an effective tool to help them understand the topic they were discussing or other topics (see

Figure 34). Additionally, the students reported that, after completing their participation in KB, they could discuss this topic online in social media posts where 66.67% said they could discuss this topic in their native language (see Figure 35) and 48.15% reported they could discuss this topic in English (see Figure 36).



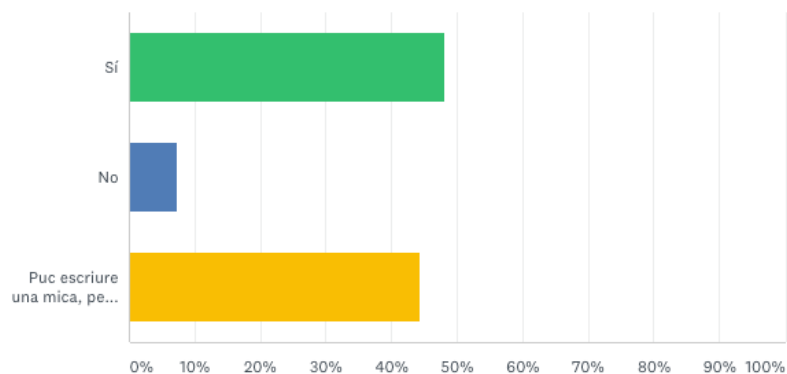
ANSWER CHOICES	RESPONSES
▼ Sí	83.33% 45
▼ No	3.70% 2
▼ No n'estic segur	12.96% 7
<b>TOTAL</b>	<b>54</b>

**Figure 34.** Student Participation in KBIP Helps to Understand the Topics of Discussion



ANSWER CHOICES	RESPONSES
▼ Sí	66.67% 36
▼ No	5.56% 3
▼ Puc escriure una mica, però no gaire	27.78% 15
<b>TOTAL</b>	<b>54</b>

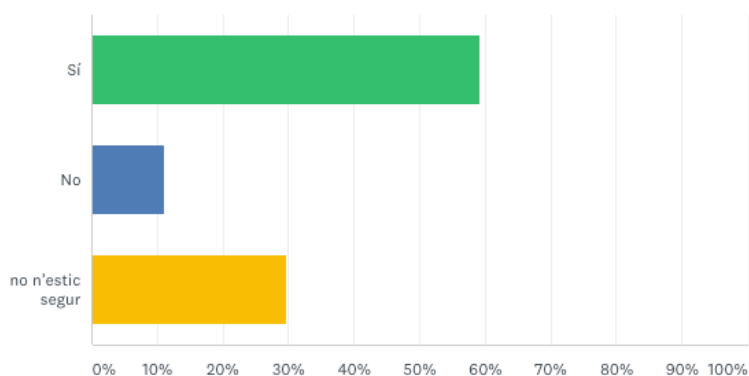
**Figure 35.** Students' Report of Ability to Discuss the Topic Online in Native Language



ANSWER CHOICES	RESPONSES
▼ Sí	48.15% 26
▼ No	7.41% 4
▼ Puc escriure una mica, però no gaire	44.44% 24
<b>TOTAL</b>	<b>54</b>

**Figure 36.** *Students' Report of Ability to Discuss the Topic Online in English*

Regarding using a lingua franca in the forums, such as English, more than half of the students (59.26%) felt that this student-centric approach to learning helped them to improve their FLA (English), where only 11.11% of the students did not feel their English production improved (see Figure 37).



ANSWER CHOICES	RESPONSES
▼ Sí	59.26% 32
▼ No	11.11% 6
▼ no n'estic segur	29.63% 16
<b>TOTAL</b>	<b>54</b>

**Figure 37.** *Participation in KBIP Helps to Improve English Skills*



## 5. Discussion

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### 5.1. Introduction

This chapter serves to summarize the results of the analysis. As with the previous chapter, the discussion will begin with the OLL in virtual classrooms project followed by the KBIP preliminary study and finally the main KBIP project. The discussion of the preliminary KBIP study includes the recommendations for further research and the conclusions from this study. This information was used in the design of the main KBIP project.

### 5.2. OLL in Virtual Classrooms Discussion

Virtual classrooms have increased in popularity over the past decade as a primary tool for instruction with major online education brands (Zhang, 2019). Such brands in the private sector are trending with increasing profits each year in countries such as China, where students and parents have shown an increasing desire to enroll in online classes using virtual classroom systems (Zhang, 2018).

This thesis chapter summarizes the investigation where 35 online EFL teachers who work for private education companies that use virtual classrooms for OLL. This study highlights the perceptions of the teachers who use this technology regularly. The survey analysis shows that the teachers generally prefer teaching online with this software to teaching offline in traditional environments. When considering the teachers' choices of employment, this trend is to be expected. These teachers prefer using virtual classroom technology over other types of video conferencing software. This may be due to the ease of the application, which allows for the guided textbook to automatically appear when launching the classroom in conjunction with the whiteboard features. Additionally, the participants showed a preference for smaller class sizes, both online and offline, where there was a preference for individual classes online and classes with fewer than 25 students offline.

The participants generally felt that they are able to get to know their students on a more personal level using online virtual classrooms. Additionally, these classrooms allow the students to be more engaged in the lesson. They also believe that this software enables the rate of both teaching and learning to be similar to that of offline classes. Because of this, the majority of the participants indicated that they would recommend both teaching and learning in these online classroom environments.

Additionally, the majority of participating teachers feel that the virtual classroom software could replace home-schooling and traditional classroom-learning for the core grade school subjects. They have also indicated that they would like to see more subjects offered in these online environments. As 60% of the participants teach more than EFL, which includes a range of subjects, in both online and offline environments, it is assumed the bias in this study is lower than it would have been had the participants only had experience teaching EFL online with this software.

Corporations in the private sector will continue to provide educational resources to students (Zhang, 2019), and the current trend of online education in the private sector should double between 2017 and 2022 (iResearch, 2018). As it is uncertain whether the content and material of online classes in the private sector meet the standards of education boards, educational institutions and public education boards should be aware of the rise in popularity of this online education software and the growth within the private sector.

### **5.3. Preliminary KBIP Discussion**

As the data in this study was analyzed two years after the students participated in the knowledge building project, observation within the classroom was not possible. There was no means of observing how the students arrived at their main questions, nor how they organized their ideas and further built on the ideas to answer their questions and discover new information.

However, from this analysis, it is easy to determine which posts fall into the Three Stages of Knowledge Construction (Kimmerle et al., 2017) since the posts can be reduced to the introduction of the questions, the responses to the questions, and the arrival at a shared opinion (See Appendix C).

It was later determined that the students were working in groups. This meant that only one of the students from each group typed on behalf of the group and posted in the forums. Because of this, it cannot be determined from this analysis whether these students discovered and explored ideas and negotiated meaning, as in the Five Stages of Construction of Knowledge (Gunawardena et al. 1997). It is also not possible from this analysis to effectively identify when the students may have advanced from one Knowledge Building Principle (Scardamalia & Bereiter, 1991) to the following since the majority of their idea sharing was the result of group discussions prior to the entry of the posts.

### ***5.3.1. Recommendations for Further Research Used in the Main KBIP Study***

Based on the analysis of the initial study data, analyzing the ad hoc data in discussion forums for evidence of SLA is not recommended. While the original thought would be to collect more data, it appears that, should we follow the same method, we would likely have a larger volume of similar information. Instead, to determine whether posting in collaborative forums is useful, it is best to use a design containing both method triangulation and data triangulation (Sun, 2014; Bratlinger et al., 2005). Bratlinger et al. (2005) coined the term *method triangulation* for the use of multiple research methods to explore a research question. It is recommended to use methods that collect both qualitative and quantitative data for analysis. In conjunction, it is also recommended to compare the students in the KBIP class to students in a control class, where they would learn the same material through the traditional lecture style. Once the topic is determined for use in the forum, a pre-test, post-test, and delayed post-test may be created

to test the participants' knowledge of vocabulary relating to the subject, relevant grammar at the participants' CEFR (Central European Framework of Reference) level, and general knowledge of the subject. An initial questionnaire is necessary to assess the linguistic background of the participants, and a post-study interview can be implemented to collect qualitative data relevant to the experiences and thoughts of the participants.

The objectives of these methods are as follows:

- 1) The initial questionnaire is designed to collect background information, which will determine the participants' exposure to the L2 (English) along with exposure to other languages. The information of this questionnaire is not the study's primary foci; however, should a trend or correlation appear, the information may be subject to statistical analysis.
- 2) The pre-test will be the same as the two post-tests, and it is designed to create a baseline of knowledge that the students have of the subject matter in English. It will be comprised of long-answer, multiple-choice, matching, and fill in the blank questions so that the test does not favour students who are test-wise for a certain test type. The multiple-choice section will also have equal parts of each selection to avoid responses based on being test-wise for multiple-choice exams. The test will be administered in pen and paper form so that the participants do not have access to any web pages that may influence their responses. The test will be scored for syntactic accuracy and word choice in the long-answer sections and for correctness in the fill in the blank and matching sections. The scores will be entered in percentage form and will not count towards the student grades. The test will be designed and based on a chapter in a B1.1 EFL text discussing the subject matter. The test will also be shown to native-speakers

of English to assess the accuracy of the questions and potential responses, along with the expected duration of completion.

- 3) The Post-Test is designed to measure the growth in knowledge of the subject matter and the growth in English vocabulary, along with any changes in syntax form from the beginning of the project to the completion. The same test will be used; however, the sections will be scrambled from the original test. This will measure the difference in knowledge and acquisition of English terms relating to the subject matter. Since the questions of the test will be the same, it is anticipated that the participants should naturally perform better on the post-test due to an experience bias. However, the scores of the tests will be statistically analyzed to determine whether the growth is more significant for the participants who participated in the KBIP.
- 4) The Post interview/questionnaire is designed to collect qualitative data on the students' experiences in learning through this method. This will analyze their level of enjoyment using this teaching technique, as compared to the standard lecture style of teaching.
- 5) The final delayed post-test is designed to measure how much information has been retained three months after the completion of the project. The difference in information retention and vocabulary will be compared across the groups to determine which teaching method, collaborative learning or traditional lecturing, is most effective over a long-term period.

In conjunction with using method triangulation, it is recommended to use data triangulation. *Data triangulation* was coined by Bratlinger et al. (2005) to refer to the use of multiple data sources to explore a research question. To analyze whether an increase in performance between a pre-test and post-test is statistically significant, T-Tests and Cohen's D may be used. Should there be any found data, such as data not initially collected for the purpose

of the study, to have correlations among this data and other variables, an analysis of variance may be conducted for evidence of an interaction effect.

While both qualitative and quantitative data should be collected, the main focus is on the quantitative data and language output. The forums' data will be assessed for an increase in language relevant to the topic of the forum discussion. Levels of improvement throughout the study will also be measured and compared across the participants.

Additional analyses will assess the difference in backgrounds of the students and their intrinsic motivations, factors that are not the study's primary foci, and how they contribute to language learning in the proposed conditions. Where necessary, these variables will be included as covariates or control variables in the analyses.

### ***5.3.2. Preliminary Study Conclusion***

The present study analyzed data from a discussion forum where the participants were writing and collaborating using their L2 (English). From this analysis, it was possible to identify how the students moved through the Three Stages of Knowledge Construction (Kimmerle et al., 2017) from the posts. However, without classroom observation, it was possible to precisely identify the manner in which the students transitioned through the Knowledge Building Principles (Scardamalia & Bereiter, 1991). However, it was possible from this study to determine that the students who participated have developed knowledge on the topic of historical fashion based on their forum discussions within a foreign language classroom. Nevertheless, due to the small sample size, confounding variables, inconsistencies in error types, and the small number of posts by participant, there is not enough information to determine whether there is evidence of foreign language acquisition. There is also not sufficient

enough information to positively determine the process of which the students moved through the stages of knowledge construction.

A recommendation for proposed research has been outlined, which would better determine whether collaborative learning environments facilitate foreign language learning and language production when compared to traditional lecture environments. The proposed design would use both method triangulation and data triangulation to ensure that multiple methods and analysis provide the most accurate results. The design would also require the investigator to be involved at the onset of the study and to be present within the classroom to determine what the students are doing as they pass through the stages of knowledge construction. The analysis of the post-test results, in comparison to the pre-test results, in conjunction with the qualitative information collected, will prove to be a better method for determining the presence of SLA in knowledge building.

#### **5.4. Main KBIP Discussion**

Knowledge Building allows students to work together in a student-centric environment to collectively create knowledge (Bereiter & Scardamalia, 2010). This study explored the KB process, which is part of the KBIP, to discover the relation between KBIP and FLA. The preliminary study was an analysis of existing data in KB forums, and the recommendations from this study were used as the blueprint for the design of the main KBIP study. The research questions of this main study were as follows.

- 1) Does participation in KBIP increase in FLA, since students are communicating using a lingua franca?

- 2) Do the students' linguistic backgrounds and exposure to the FL outside the classroom influence their performance and understanding of the topics in the FL while participating in KB?
- 3) Since KBIP studies have shown that students with higher-level knowledge on a subject share this knowledge with the students with lower-level knowledge throughout the KB process, do students with greater knowledge of the FL at the onset of the study share their knowledge of the FL with their peers in KB tasks?
- 4) Since the students are working in a student-centric environment, and they are engaging with their peers, does the class assignment and the groups the students are working with affect their overall performance in KB?
- 5) Do the students enjoy participating in KB?
- 6) Do the students feel they are learning more about the discussion topic or about the foreign language through participation in KB?

The subsequent sections discuss the findings from the results in relation to the above research questions.

#### ***5.4.1. Discussion of Class Engagement***

The challenge in analyzing engagement for the appearance of learning is that it cannot be determined simply from observation whether the students understand and are absorbing the material they are presented with and reading. While one of the two classes participating in this study appeared to be much more engaged in the entire knowledge building process, as noted by their attentiveness in class and a higher number of posts in the forum, the overall results show that these observations have little to no impact on performance.



This analysis answered the fourth research question, of whether the class assignment and peers the students were working with affected their overall performance in KB. Both the Levene statistic and ANOVA were used to compare the two classes. The Levene statistic was greater than 0.5 (Mean = 1.64, Median = 0.57) and  $f$  statistic for the ANOVA was  $F(1,58) = 0.92$   $p=0.314$ . Therefore, both of these tests were not statistically significant, and Class A and Class B show similar performances on the testing. From this analysis, it can be concluded that, regardless of how engaged the students may appear while participating in KB, the outcomes of learning, are constant.

#### ***5.4.2. Discussion of Pre-Test to Post-Test Scores***

From the recommendation of the preliminary study, a pre-test and post-test were used to determine whether FLA increases through participation in KB. The analysis of pre-test and post-test scores addresses the first research question above. This quantitative data analysis, which used both  $t$  statistics and Cohen's  $d$ , discovered improvements in writing skills in the FL. In addition to showing improvements in the writing skills, it also shows an improvement in the comprehension of the material in the foreign language. Both the long answer section and the multiple-choice section show significant differences in the testing from the pre-test to the post-test where the results for the long answer section were  $t(59) = 7.93$ ,  $p = .001$  with a high effect on the Cohen's  $d$  and the results for the multiple-choice section were a bit lower, but still significant showing  $t(59) = 3.14$ ,  $p = .003$  with a low effect on the Cohen's  $d$ .

Our testing does not show that this method of instruction is effective for grammar or vocabulary acquisition since the comparisons of the pre-test to the post-test were not significant for either of these sections. An analysis of the vocabulary tested shows that very few of these words were used in the KB writing tasks. While it can be assumed that the students acquired vocabulary through the writing process, it is difficult to measure which words each student has

added to their foreign language vocabulary. It is also to predict the words the students will use in a writing task, as they will likely use their existing knowledge of the FL to express their thoughts and ideas. The students often use paraphrastic devices in order to be communicatively competent. These paraphrastic devices, while they are explanatory, are likely not consistent neither with the tested vocabulary nor through grammar testing.

#### **5.4.3. Discussion of ELE Groups**

As can be expected, the students with higher exposure to the English language and culture outside of the classroom performed better on the initial testing. When the students were separated into different ELE groups (high, medium, and low), the analysis showed that these three groups performed differently on the pre-test,  $F(2, 57) = 5.358, p = .007$ . This, in part, answers the second research question, that additional outside exposure to English impacts the performance at the onset of the study.

When students work in the KBIP project, the students with the most knowledge in an area share knowledge with the other students (Bereiter & Scardamalia, 2010). This is the basis behind KBIP that students working together will teach each other, and the knowledge will equally be dispersed. This suggests that student knowledge should be at similar levels at the end of the project. However, when analyzing the post-test scores, the results from this study do not support that claim. The students in the *high* ELE group outperformed the students at lower levels, not just on the pre-test, but throughout the project. Based on the eighth KB principle of *Symmetric Knowledge of Advancement*, where the expertise is distributed within the community (Scardamalia & Bereiter, 1991), it could be assumed that the null hypothesis would be accepted for the post-test results and that the three ELE groups would be the same. For the post-test, the results show  $F(2, 57) = 4.501, p = .05$  and the null hypothesis was rejected in favour of the alternative hypothesis. This indicates the three ELE groups are not equal at the

end of the study, and the students at the *high* ELE level did not pass on their knowledge of the foreign language with the students at lower ELE levels.

All three of the ELE groups (low, medium, and high) showed increases from the pre-test to the post-test and these increases were roughly 5% to 8%. This indicates that the KB method is beneficial for increasing both writing abilities and comprehension of a topic within a FL; however, the linguistic and cultural knowledge acquired outside the class cannot be shared nor distributed evenly amongst the students. Rather, the students with high ELE scores increase their writing abilities and their comprehension of the subject matter in the FL at roughly the same rate as the students with lower ELE scores. These results answer the third research question noted above.

From this analysis, it can be concluded that the factor in determining success in foreign language production when participating in the KBIP is exposure to the foreign language and foreign culture outside the classroom. The results of the ELE group analysis show that the students with higher exposure to foreign language and culture outside the classroom generally perform better in the foreign language classroom. In addition, this knowledge is not easily transferred to students with lower or limited exposure to that foreign language and culture.

#### ***5.4.4. Discussion of Qualitative Data***

The qualitative analysis of the post-questionnaire served to address research questions five and six above. The qualitative results show that the students generally enjoyed participating in the KBIP; they generally felt that this method allowed them to learn about the topic. The majority of the students felt that their participation in this project also improved their English language production.

## **6. Conclusion and Further Recommendations**

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### **6.1. Introduction**

This thesis presented three different projects, each unique in their methodology. Each of these projects will be concluded below, in conjunction with a description of the limitations of the research. The conclusions will summarize the findings, which answer the research questions, as identified in chapter one. A general summary will follow.

### **6.2. OLL In Virtual Classrooms**

This project was designed to answer the questions of whether teachers enjoy using virtual classroom systems, do they see evidence of student learning in virtual classrooms, and would they recommend virtual classrooms to other teachers and students.

The results of this study have addressed the objectives and answered the posed research questions. The analysis shows that teachers generally prefer to teach online using virtual classrooms and that there is a preference for smaller class sizes. From their observations, the teachers believe the students are learning the material in the virtual classrooms at the same rate or faster than the students would learn the material in a traditional F2F classroom environment. Additionally, the participating teachers not only recommend using this technology to other teachers and students, but most have done so prior to participating in this study.

From the feedback of the participating teachers in conjunction with the current trend in online education, especially regarding online education companies that use virtual classroom systems, it is estimated that the popularity of OLL in this manner will continue to grow.

### **6.3. The Preliminary Knowledge Building Study**

The second project was designed to analyze existing KBIP forum discussions for evidence of language learning. It was designed to find the answers to whether children become more proficient in the foreign language as they progress through the stages of knowledge building

and whether evidence of FLA is present in the forums or if a further investigation is necessary. These research questions were addressed through the method and results of this study.

From the analysis, it was possible to identify how the students moved through the stages of knowledge construction (Kimmerle et al., 2017); however, without in-classroom observation, it was not possible to observe the students as they moved through the twelve knowledge building principles (Scardamalia & Bereiter, 1991). It appears that the participating students have a good understanding of the forum discussion topic. Although, because of the presence of confounding variables, inconsistencies in error types, and that is was discovered the students were posting in the forum as small groups, it cannot be concluded whether the students have shown any gains in their foreign language comprehension and production.

#### **6.4. Foreign Language Acquisition in KBIP.**

The final project was designed based on the findings of the preliminary KBIP project. The main objective was to determine whether there is evidence of foreign language acquisition when students participate in KBIP. As there were several research questions to address from this project, these research questions are listed in Table 25 below.

**Table 25.** *FLA in KBIP Research Questions*

	<b>Research Question</b>
<b>1)</b>	Does participation in KBIP increase in FLA, since students are communicating using a lingua franca?
<b>2)</b>	Since the students are working in a student-centric environment, and they are engaging with their peers, does the class assignment and the groups the students are working with affect their overall performance in KB?
<b>3)</b>	Do the students enjoy participating in KB?
<b>4)</b>	Do the students feel they are learning more about the discussion topic or about the foreign language through participation in KB?
<b>5)</b>	Do the students' linguistic backgrounds and exposure to the FL outside the classroom influence their performance and understanding of the topics in the FL while participating in KB?
<b>6)</b>	Since KBIP studies have shown that students with higher-level knowledge on a subject share this knowledge with the students with lower-level knowledge throughout the KB process, do students with greater knowledge of the FL at the onset of the study share their knowledge of the FL with their peers in KB tasks?

The final project analyzed the collaborative writing tasks in KBIP for FLA. The quantitative data analysis applied two methods, which both indicated that foreign language proficiency increased; in particular, the ability to understand the material and write about the topic was at a higher level for the students at the completion of the study. The qualitative data analysis confirmed that the majority of students felt their English language skills improved throughout the study, and they learned much more about the topic.

When analyzing whether the class assignment or the groups the students were working in influenced the overall performance, the results indicated that there was no difference between the groups, and the performance is independent of how engaged the students appear to be.

As would be assumed, the results show that additional exposure to English outside the classroom influenced the pre-test scores. This was also true with the post-test scores. In the KBIP, other studies have shown that the students with higher-level knowledge share this knowledge among the group, and, at the end of the study, the students have a mutual understanding of the topic and the level of knowledge has equalized across the group. However, this is not the case with foreign language knowledge. Regardless of the level of knowledge of the foreign language outside of the classroom, the students show increases at about the same rate and the language knowledge does not transfer to the students with lower level-knowledge at the onset of the study.

Similar to Part I and Part II of this thesis, the research questions in Part III were addressed by the methodology employed and the analysis of the data. The projects in this thesis have met the objectives defined at the onset of the studies.

## **6.5. Limitations of the Study and Recommendations for Further Research**

### ***6.5.1. Online Language Learning in Virtual Classrooms***

This project was designed to study the perceptions of teachers, but it did not include the perceptions of students. Many of the conclusions drawn are based on opinions, as this was a

qualitative analysis. Further analyses of student perceptions are recommended to see whether they are similar to teacher perceptions. This should be done using an online form with similar questions to eliminate any biases. The students' responses could then be compared to the teachers' responses to validate whether the perceptions of learning in these virtual environments are identical for the teachers and the students.

Moreover, a quantitative analysis with evidence of student improvement, especially when compared to learning the same material in a traditional F2F environment would greatly enhance the arguments. The quantitative analysis should be designed using a F2F class as a control group and employ both a pre-test and a post-test to measure student improvement. If the analysis is conducted over a longer period, such as a school year, progress tests at three to four month intervals should also be used. Additionally, a longitudinal study could be implemented to measure student growth over time in virtual classrooms. A longitudinal study would facilitate in understanding the student learning processes in this online environment.

#### **6.5.2. *FLA in KBIP***

The results of the KBIP preliminary study determined that an experimental design is necessary to measure FLA in knowledge building classrooms, due to several factors that include the collaboration of groups, differences in outside exposure to foreign language, and the lack of ability to observe the students as they pass through the stages of the construction of knowledge (see section 5.3.1.). This study revealed that using a mixed-method would better assist in measuring increases in foreign language output. Specifically, the results of this study recommend that further studies employ a pre-study questionnaire to collect background information on the students' outside exposure to the foreign language and foreign culture. This should be followed by a pre-test to determine the students' performance baseline and a post-test, which could be used in an analysis to compare the students' knowledge at the onset of the study to the conclusion of the study. Additionally, a post-questionnaire should be used to

measure the students' perceptions. In-class observation should also be used to collect qualitative data and monitor the classroom behaviour as the students pass through the stages of the construction of knowledge.

These suggestions were used in the main KBIP study. This research study involved two classes in a school in the Catalan region of Spain that had agreed to work with a class of students from Colombia. Unfortunately, the Colombian students did not post in the forum and did not participate; therefore, this study, which involves telecollaborative exchanges, was limited to students working locally. Additionally, prior to the study, it was requested to have an additional class participate as a control group. However, this class was not available to participate; therefore, the study proceeded without a control group. A control group, such as a class learning the same content in a traditional lecture style, would be effective to compare the overall performance of the students learning in a knowledge building class to those learning in traditional F2F classroom. In addition, the students should be exposed to native speakers of the target language in the forum so that they learn how to use the language effectively, including learning more about the pragmatics of this language. If KBIP is being used in a foreign language classroom with a goal of FLA, these students should be paired with a class of students who are native speakers in that target language. However, should a class of native speakers not be available, it is better to be paired with a class of students from another country where a lingua franca is used. The goal of KBIP is to connect students internationally; therefore, students should be building and creating knowledge with other students from other countries.

## **6.6. Summary**

Foreign language learning is beneficial to cognitive development allowing the brain to mature faster as a whole (Galonvska, 2020). Additionally, increased globalization has increased the demand for multilingual and multicultural offices, further highlighting the importance of FLA. As both teleworking and online learning increase in popularity, the transition from traditional



F2F learning to CALL is inevitable.

This thesis investigated the effectiveness of two trending topics of CALL. The main contributions of the research presented in this study are the investigations into areas of CALL, specifically FLA in virtual classrooms and in knowledge building forums, that have not extensively been studied. While there were several research questions posed, all of which have been met and addressed above, the results not only show improvement in FLA in both KBIP and virtual classroom systems but also that these language-learning environments are enjoyable. Being both effective tools of learning and having user satisfaction is imperative for the longevity of these learning environments. Thus, it is expected to see further advancements in the topics of CALL presented in this thesis going forward.

**Ethical Statement**

This study was conducted according to the standards of research in Spain and Catalonia. The participants volunteered for this study. The parents were informed of the testing procedures and agreed to their child's participation (see Appendix D). The experimental design did not cause stress or harm to the participants, and the participant information has been kept confidential. There was no funding provided, and there are no conflicts of interest.

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## Appendix A

**Online Language Learning in Virtual Classrooms: Questions Regarding Participant Profile**

Questions Regarding Participant Profile	Question Type
<b>1. What is your chronological age?</b>	Forced-Choice
<b>2. What is your highest level of education?</b>	Forced-Choice
<b>3. How would you describe your gender?</b>	Forced-Choice
<b>4. What is your nationality?</b>	Free Answer
<b>5. Where are you currently residing?</b>	Free Answer
<b>6. Would you describe yourself as a native speaker of English, bilingual, or a native speaker of another language?</b>	Forced-Choice
<b>7. Which languages (other than English) do you speak/understand at a C1 level or higher (if applicable)?</b>	Free Answer
<b>8. Which languages (other than English) do you speak/understand at a B1 or B2 level (if applicable)?</b>	Free Answer
<b>9. Which languages (other than English) do you speak/understand at a A1 or A2 level (if applicable)?</b>	Free Answer
<b>10. How long (duration) have you been teaching English online?</b>	Forced-Choice
<b>11. How long have you been teaching English in general?</b>	Forced-Choice
<b>12. Which other subjects do you teach?</b>	Forced-Choice
<b>13. Which environments have you taught in?</b>	Forced-Choice
<b>14. Have you ever been a student using in a virtual classroom using videoconferencing and a digital whiteboard?</b>	Forced-Choice

## Appendix B

### Online Language Learning in Virtual Classrooms: Questions Regarding Opinions on OLL Using Virtual Classrooms with Video Conferencing and Whiteboard Technology

Questions Regarding Opinions on OLL using a Virtual Classroom with Video Conferencing and Whiteboard Technology	Analysis Theme	Question Type
1. Which learning environments do you prefer for teaching English?	Enjoyment Level & Preferences	Forced-Choice
2. Which learning environments do you feel you get to know your students more personally?	Perceptions of Student Learning	Forced-Choice
3. Online Language Learning in a virtual classroom using videoconferencing and a digital whiteboard can: teach the same content as in a classroom at a faster rate; teach the same content as in a classroom at the same rate; teach the same content as in a classroom at a slower rate; other	Perceptions of Student Learning	Forced-Choice
4. Online Language Learning in a virtual classroom using videoconferencing and a digital whiteboard can: replace classroom learning for all subjects; replace classroom learning for most subjects (languages, mathematics, sciences) but not for some subjects; is best for language learning but not for other subjects; should be used as supplementary material only; is ineffective	Teachers' Recommendations	Forced-Choice
5. Which other subjects would you like to see taught using virtual classrooms with videoconferencing and a digital whiteboard?	Teachers' Recommendations	Forced-Choice
6. In general, when students take classes in the virtual classroom environment, they: learn at a faster rate; learn at the same rate; learn at a slower rate; other	Perceptions of Student Learning	Forced-Choice
7. Do you enjoy teaching online?	Enjoyment Level & Preferences	Forced-Choice
8. Would you recommend teaching online using videoconferencing and	Teachers' Recommendations	Forced-Choice

a digital whiteboard to a friend or colleague?		
9. Would you recommend students enroll in online classes that use videoconferencing and a digital whiteboard?	Teachers' Recommendations	Forced-Choice
10. Which features of the digital whiteboard are most helpful when teaching online?	Teachers' Recommendations	Forced-Choice
11. Does using the digital whiteboard technology in virtual classrooms help teachers to better structure their lessons?	Enjoyment Level & Preferences	Forced-Choice
12. Do the students appear more engaged when participating in a virtual classroom using videoconferencing and a digital whiteboard than they appear in a traditional classroom?	Perceptions of Student Learning	Forced-Choice
13. Does participating in a virtual classroom with videoconferencing and digital whiteboard help the students strengthen their knowledge and feel more comfortable with technology overall?	Perceptions of Student Learning	Forced-Choice
14. Can teaching in a virtual classroom with videoconferencing and a digital whiteboard slow down the students thinking, writing, and calculation skills?	Perceptions of Student Learning	Forced-Choice
15. Do you agree with this statement: Online learning in a virtual classroom with a certified teacher using videoconferencing and digital whiteboards is a better option for school-age children than home-schooling?	Teachers' Recommendations	Forced-Choice
16. If you could change anything about the virtual classroom technology or digital whiteboards, what would you change?	Teacher Recommendations	Free Answer

## APPENDIX C

**Foreign Language Learning In Knowledge Forums: Questionnaire for Preliminary Study**

<b>Questions in Catalan</b>	<b>Translations in English</b>
<b>Quin és el teu nom?</b>	What is your name?
<b>Quina és la seva edat?</b>	What is your age?
<b>Quina és la teva llengua materna?</b>	What is your native language?
<b>Quins idioms parles a casa o amb familiars?</b>	Which languages do you speak at home or with family members?
<b>Quins idioms estrangers has estudiat a l'escola?</b>	Which foreign languages have you studied at school?
<b>Quants anys has estudiat l'anglès?</b>	How many years have you studied English?
<b>Parles anglès fora de l'escola? On? Amb qui?</b>	Do you speak English outside school? If so, where and with whom?
<b>On has viatjat a Catalunya?</b>	Where have you gone for vacation in Catalonia?
<b>On has viatjat a la resta d'Espanya?</b>	Where have you gone for vacation in the rest of Spain?
<b>On has viatjat fora d'Espanya?</b>	Where have you gone for vacation outside of Spain?
<b>Has estudiat en algun país estranger?</b>	Have you ever been an exchange student?
<b>En cas afirmatiu, quin país / països?</b>	If yes, to which country or countries?
<b>Gaudeixes d'estudiar anglès o altres idiomes estrangers?</b>	Do you enjoy studying English or other foreign languages?
<b>Vols continuar estudiant anglès?</b>	Do you wish to continue studying English?



## APPENDIX D

### Letter of Consent

LETTER OF CONSENT  
Marni Manegre, Doctoral Candidate  
Education & Technology  
Universitat Rovira i Virgili

September 27, 2018

Dear Parents:

Your child is being invited to participate in a research study on learning foreign languages (English) using knowledge forums. In particular, we are interested in how collaborative learning in foreign language English classes helps to increase proficiency in foreign language production.

This research will require about 2 hours per week between the months of October and December 2018. The study will be conducted during class time. During this time, your child will respond to a questionnaire about their language background, participate in three written tests on the subject matter, participate in classroom activities, and finally respond to a questionnaire about their experiences.

Your child will not be video recorded or audio recorded. To ensure privacy, once the data is collected from the questionnaires and tests, each child will be assigned a participant number and their names will be removed from the study. There are no anticipated risks or discomforts related to this research.

The results from this study will be presented in writing in journals read by teachers, administrators, and linguists, to help them better understand the experience of foreign language learning through collaboration. The results may also be presented in person at academic conferences.

At no time, however, will your child's name be used, or any identifying information revealed. If you wish to receive a copy of the results from this study, you may contact your child's teacher, Pere Bolunda, or you may contact me directly at the email given below.

If you require any information about this study, or would prefer that your child be excluded from the testing, please email Marni Manegre at [Marnilynne.Manegre@estudiants.urv.cat](mailto:Marnilynne.Manegre@estudiants.urv.cat) at the Universitat Rovira i Virgili.

Sincerely,

Marni Manegre  
Doctoral Candidate  
Education & Technology  
Universitat Rovira i Virgili

CARTA DEL CONSENT  
Marni Manegre, Candidat de doctorat  
Educació i tecnologia  
Universitat Rovira i Virgili

27 de setembre de 2018

Estimats pares:

Seu nen és convidat a participar en un estudi d'investigació sobre l'aprenentatge de llengües estrangeres (anglès) usant fòrums de coneixement. En particular, estem interessats en com l'aprenentatge col·laboratiu en classes de llengua estrangera contribueix a augmentar la competència en la producció de llengües estrangeres.

Aquesta investigació requerirà unes 2 hores setmanals entre els mesos d'octubre i desembre de 2018. L'estudi es realitzarà durant la classe. Durant aquest temps, el seu fill respondrà un qüestionari sobre el seu antecedent lingüístic, participarà en tres proves escrites sobre el tema, participarà en les activitats de l'aula i, finalment, respondrà un qüestionari sobre les seves experiències.

El teu fill no es gravarà en vídeo ni s'emetrà l'àudio. Per garantir la privadesa, un cop recollides les dades dels qüestionaris i les proves, cada nen se li assignarà un número de participant i els seus noms seran eliminats de l'estudi. No hi ha riscos o incomoditats relacionades amb aquesta investigació.

Els resultats d'aquest estudi es presentaran per escrit en revistes llegides per professors, administradors i lingüistes, per ajudar-los a comprendre millor l'experiència de l'aprenentatge d'idiomes a través de la col·laboració. Els resultats també es poden presentar en persona a les conferències acadèmiques.

En cap moment, però, s'utilitzarà el nom del vostre fill o es revelarà qualsevol informació d'identificació. Si voleu rebre una còpia dels resultats d'aquest estudi, podeu posar-vos en contacte amb el professor Pere Bolunda del vostre fill o contactar-me directament al correu electrònic que es mostra a continuació.

Si necessiteu informació sobre aquest estudi o preferiu que el vostre fill quedi exclòs de les proves, envieu un correu electrònic a Marni Manegre a [Marnilynne.Manegre@estudiants.urv.cat](mailto:Marnilynne.Manegre@estudiants.urv.cat) a la Universitat Rovira i Virgili.

Atentament,

Marni Manegre  
Candidat de doctorat  
Educació i tecnologia  
Universitat Rovira i Virgili

## APPENDIX E

## Pre-Questionnaire for KBIP Main Study

<b>Questions in Catalan</b>	<b>Translation in English</b>
<b>Quina és la teva llengua materna?</b>	What is your native language?
<b>Quins idiomes parles a casa o amb familiars?</b>	Which languages do you speak at home or with family members?
<b>Quins idiomes estrangers has estudiat a l'escola?</b>	Which foreign languages have you studied at school?
<b>Quants anys has estudiat l'anglès?</b>	How many years have you studied English?
<b>Parles anglès fora de l'escola? On? Amb qui?</b>	Do you speak English outside school? If so, where and with whom?
<b>On has viatjat fora d'Espanya?</b>	Where have you gone for vacation outside of Spain?
<b>Has estudiat en algun país estranger? En cas afirmatiu, quin país / països?</b>	Have you ever been an exchange student? If yes, to which country or countries?
<b>Gaudeixes d'estudiar anglès o altres idiomes estrangers?</b>	Do you enjoy studying English or other foreign languages?
<b>Vols continuar estudiant anglès?</b>	Do you wish to continue studying English?

## APPENDIX F

## Pre-Test &amp; Post-Test for KBIP Main Study

## I. Grammar – Expressing Obligation or Opinion

Circle the best answer to complete these sentences.

1. You \_\_\_\_\_ play with fire.  
a. must not                      b. couldn't                      c. would
2. I \_\_\_\_\_ clean my room before my friends come over or my mother won't let me play with them.  
a. would                      b. must                      c. can
3. He \_\_\_\_\_ call his grandmother on her birthday.  
a. can                      b. could                      c. should
4. David \_\_\_\_\_ drink more water to stay healthy.  
a. couldn't                      b. shouldn't                      c. should
5. You \_\_\_\_\_ stop interrupting me!  
a. must                      b. can                      c. shouldn't
6. I \_\_\_\_\_ get up for school early tomorrow, because we have a field trip.  
a. couldn't                      b. should                      c. may
7. You \_\_\_\_\_ come to the party, if you want to.  
a. must                      b. might                      c. may
8. I \_\_\_\_\_ see a doctor about my illness.  
a. must not                      b. can                      c. should
9. You \_\_\_\_\_ talk so loud in the library.  
a. shouldn't                      b. should                      c. might
10. I \_\_\_\_\_ spend so much time in the sun, because I burn easily.

- a. can't                      b. must not                      c. might not

11. I \_\_\_\_\_ play more sports this week, because I hurt my ankle.

- a. might                      b. can                      c. can't

12. We \_\_\_\_\_ go to that restaurant, if you want to.

- a. could                      b. must                      c. should

13. I \_\_\_\_\_ finish my homework before the deadline.

- a. can                      b. must                      c. may

## II. Long Answer

Answer the following questions in complete sentences.

1. What are some well known environmental problems affecting the planet?
2. What are some of the causes of climate change?
3. Why is recycling important?
4. In Tarragona, there are 5 bins on the streets for rubbish (waste). How do you sort your waste for each of the 5 bins?
5. Are there products that cannot be recycled in the bins on the streets? If so, where do you take them for recycling?

## III. Fill in the blanks

Choose the correct word for each sentence from the word bank. Each word or phrase may only be used once.

### Word Bank

bio products    solar    ecological impact    wind energy    carbon footprint  
green cars    hydro power    global warming    environmental problems

1. \_\_\_\_\_ energy is power harnessed from the sun.

2. The use of dams to generate electricity is commonly referred to as \_\_\_\_\_.
3. The planet is facing a range of \_\_\_\_\_.
4. 40% of Denmark's electricity is generated using \_\_\_\_\_.
5. Consumers can relieve environmental pressure by purchasing \_\_\_\_\_.
6. Environmentally aware drivers can invest in \_\_\_\_\_.
7. The use of traditional energy sources contributes to \_\_\_\_\_.
8. Mines, dams, and other projects have severe \_\_\_\_\_ on the environment.
9. You would do well to lessen your \_\_\_\_\_.

#### IV. Multiple-Choice

Circle the correct answer.

1. Some of the consequences of human-made \_\_\_\_\_ include an increase of extreme weather conditions.
  - a. waste
  - b. climate change
  - c. weather
  - d. vehicles
2. Greenhouse gas emissions are contributing to \_\_\_\_\_.
  - a. global warming
  - b. poor odors
  - c. recycling
  - d. solar energy
3. Carefully considering your transport options is one way to lower your \_\_\_\_\_.
  - a. finances
  - b. height
  - c. carbon footprint
  - d. distance of travel
4. We need to make a greater effort to \_\_\_\_\_ in order to help the environment.

- a. preserve natural habitats
  - b. consume more animal products
  - c. destroy forests
  - d. emigrate
5. One of the greatest threats to ocean life is \_\_\_\_\_.
- a. sharks
  - b. air pollution
  - c. hurricanes
  - d. plastic waste
6. \_\_\_\_\_ is obtained by harnessing sunlight.
- a. solar energy
  - b. hydro power
  - c. wind energy
  - d. nuclear energy
7. Polar ice caps are melting due to \_\_\_\_\_.
- a. polar bear migration
  - b. global warming
  - c. the northern lights
  - d. earthquakes
8. Plastic is not \_\_\_\_\_.
- a. recyclable
  - b. reusable
  - c. readily available
  - d. biodegradable
9. I don't like to use \_\_\_\_\_ coffee cups, so I brought my own.
- a. environmentally friendly
  - b. reduce
  - c. disposable
  - d. reusable
10. We must learn more about the \_\_\_\_\_ of the ecosystem.
- a. strength
  - b. longevity
  - c. fragility
  - d. scarcity
11. The government revealed a range of new \_\_\_\_\_ to help preserve the environment.
- a. environmental discussions
  - b. borders
  - c. ecosystems
  - d. environmental policies
12. Computers, cell phones, and televisions are referred to as \_\_\_\_\_ when we want to dispose of them.

- a. environmental waste
  - b. electronic waste (e-waste)
  - c. bio-waste
  - d. nuclear waste
13. I always bring my own bags to the grocery stores and I don't use plastic straws, because I want to be \_\_\_\_\_.
- a. wasteful
  - b. rapid
  - c. environmentally friendly
  - d. environmentally hazardous
14. Deforestation has a severe \_\_\_\_\_ on the Amazon Rainforest.
- a. economical impact
  - b. financial impact
  - c. migration
  - d. ecological impact
15. An invisible human-made problem is \_\_\_\_\_, which threatens the health of citizens in urban areas.
- a. air pollution
  - b. landfills
  - c. e-waste
  - d. plastic waste
16. Burning fossil fuels, such as coal, to produce energy releases \_\_\_\_\_ . This traps heat in the atmosphere, raising the temperature of the planet.
- a. black smoke
  - b. greenhouse gases
  - c. a terrible odor
  - d. solar pollution



## APPENDIX G

## Post-Questionnaire for KBIP Main Study

Questions in Catalan	Translations in English
M'ha agradat participar en la classe de creació de coneixement.	I enjoyed participating in the knowledge creation class.
He après molt sobre el tema de l'acció climàtica en aquesta classe.	I have learned a lot about the topic of climate action in this class.
He trobat que el tema del canvi climàtic és interessant.	I found the topic of climate change interesting.
Participar en aquesta classe ha fet que el meu anglès millorés.	Participating in this class has made my English better.
Després d'aquesta classe puc informar a les xarxes socials sobre el canvi climàtic en llengua anglesa.	After this class, I can talk about climate change on Social Media in English.
Després d'aquesta classe, puc informar sobre el canvi climàtic a les xarxes socials en català o castellà.	After this class I can talk about climate change on Social Media in Catalan or Spanish.
Com que he après sobre el canvi climàtic, he canviat alguns dels meus comportaments per ajudar el planeta.	Since I have learned about climate change, I have changed some of my behaviours to help the planet.
La construcció del coneixement és una eina efectiva per ajudar-me a conèixer què està succeint amb el canvi climàtic o altres temes.	Knowledge building is an effective tool to help me know what is happening about climate change and other issues.
COM conèixerés una eina efectiva per ajudar-me a millorar el meu anglès.	KBIP is an effective tool to help me improve my English.

## **APPENDIX H**

### **Researcher Notes From In-Class Observations**

#### **KBIP General Observations**

##### **Monday, October 1, 2018**

The students appear a bit stressed and tired with the pre-test – not a lot of happy faces

They were told before the test it should be difficult and to do their best, because this is information they have not learned yet. They were not told that their score on this test did not contribute to their overall grade.

Approximately half the class said it was difficult and the other half said it was okay.

They were not told until after the test that it did not count towards a final grade.

One outlier and one student absent

Duration = first completion = 3:29 pm Last completed at 3:50 pm

##### **Thursday, October 4, 2018**

Second class – looked a bit less stressed while completing the test and asked more questions while writing the test. 2 questions were on what a dam is, one was on what the colour gris is in English. Mainly had clarification questions to make sure they understood the questions as to what was being asked.

Approximately 10% thought it was difficult, the majority thought it was okay and one thought it was easy.

Duration = first completion = 10:30 Last completed = 10:50

One outlier and one student absent

First class – watching Bill Nye climate change National Geographic in Spanish

Based on the responses on the pre-test, it was determined that only about 20% of the students may understand the subject matter in English and it was important for them to gain a good understanding of the topic for this course before we start discussing it in English.

One student fell asleep for a short period. A few other students put their heads down on their desks.

### **Friday, October 5, 2018**

Second class – watching Bill Nye film – the students appear more engaged and are working in groups to take notes.

### **Monday, October 8, 2018**

The students were asked to get into groups and come up with questions they would like to investigate. They were to be in groups of 2 or 3, but several students forgot their laptops, so the groups today are a bit larger. There are 8 of the 16 laptops here. The questions they wrote on the board are:

- 1) How does climate change affect animals?
- 2) How many problems cause the increase in the levels of water all over the world?
- 3) What material is more polluting than petrol?
- 4) How can we reduce the greenhouse effect?
- 5) Is it possible that everyone will be dead in 2030?
- 6) Who said that in 2030 we are going to be dead?
- 7) Which are the 10 most contaminated countries in the world?
- 8) What can make humans avoid climate change?
- 9) How can we implement renewable energies in everyday life?
- 10) Which are the 5 steps of the climate change?

11) How can we stop deforestation?

12) How does climate change affect Miami?

The highlighted are the chosen questions and the students then worked in groups to start putting the questions in the forum.

**Thursday, October 11, 2018**

Class B

Today this class will be working in groups on their Big Questions. The four chosen questions from the other class were put on the board and the students assembled in their groups. They're working on creating new questions that are different from the ones on the board. The students are working in groups sizes of 3 or 4 for discussions of the big questions.

Any time the students are caught speaking in Catalan or Spanish, they're asked to speak in English.

A dragonfly entered the classroom, which caused a lot of commotion. The students were distracted by the dragonfly and it caused an outbreak of screaming. One of the groups asked me for assistance to word their question, which I had helped them to form. The students then added their questions to the board.

1) How much time we have until the ozone cape disappears?

2) How much time we have until the global warming affects will be irreversible?

3) Why did the hurricane happen in Florida and not Spain?

4) Why did the hurricane happen? >How are hurricanes formed?

5) How does climate change affect persons?

6) How do we stop pollution from factories in 3<sup>rd</sup> world countries?

7) How can we convince people to help stop pollution?

8) When will the pollution stop?

The two groups who created these questions were asked to type the questions in the forum and the other students were asked to start answering questions already in the forums.

Class A

The class was asked to work in groups and to look at the questions and come up with ideas. The students worked in groups of 3 or 4. They managed to make several posts to the forum and worked very productively. They were also shown the photos from Algeria.

### **Monday, October 15, 2018**

The students were asked to get in to their groups and they were going to produce a film today for the other schools. Two of the students (Kacper and Marina) will be reading a script on camera while the rest of the class will be researching Goal 13 of the UN sustainable goals – Climate Action.

### **Thursday, October 25, 2018**

Class B – 10 am

The students moved in to their groups to work. Some of the students forgot their computers and had to run to the library to borrow school computers. 10 minutes in to the class, they still had not created any new posts. Only 2 posts were created during this class.

Class A – 4 pm

This afternoon the students watched the video they had made in the last class. They then formed groups and posted several posts in the forum. I had written their big questions on the board and the groups selected questions they want to summarize for next class. I took a photo of their selections.

**Friday, October 26, 2018**

Class B – 8 am

Today the students were in their groups working on answering the big questions. They were asked to focus on the question of helping third world countries reduce their climate impact, as this question had the least amount of posts. They had created approximately 10 posts within this class. Some of the students appeared not to be working. They are less engaged than the other class. The students sitting closest to the desk were socializing the entire class and not on task. The posts from this class don't seem to be researched, rather are personal opinions or jokes. The other class is providing links to the sites where they have found new information and evidence of research.

**Monday, October 29, 2018**

Class A

The students were given summaries of the responses from the teacher. I had sent him the summary information in a spreadsheet and he printed each big question to distribute to the students. They worked in groups to establish their summaries. The students chose which Big Question they wanted to summarize by writing their name on the board last class.

The students from Columbia have yet to participate. The teacher received a message saying the students in Columbia look forward to reading the rise above. They must not understand how to participate. In this case, there is unlikely to be any evidence of Intercultural Competence.

**Monday, November 5, 2018**

Class A

In the morning, one of the students, Jordi, created 3 Avatars with the text of the rise above. One of the Avatars was not working, and it will be redone. The Avatars will be loaded to YouTube, so they may be shared.

The students were then instructed to go through TedTalks and the UN climate change (sustainable goals) to find new information of what can be done. One group is posting more information in KBIP, but the rest are working in groups researching for ideas of what they can do to stop or slow down climate change.

There was a bit of discussion and goofing off in some of the groups, but for the most part, the students were working diligently. 5 of the groups are sourcing information from TedTalks and three of the groups are sourcing information from UN Sustainable Development goals. At this time, there are 3 students not working on the project, because they're rearranging the seating chart.

The students are now working on Promising Ideas, which is a new scaffold structure in KBIP.

### **Thursday, November 8, 2018**

10:00 AM

Class B

The students in this class have not made as many contributions to the forum, since there were several holiday days during their KBIP class time. They were asked to work in groups to read the forum posts and to contribute and write responses to the posts. They were also asked to look at the UN Sustainable Goals and TedTalks to find further information.

The Avatars created by the other class were posted to the WhatsApp group and the Columbian teachers has not responded, therefore, it appears the students are collaborating together between the two classes, but without international collaboration. It doesn't appear that this class has seen the Avatars yet. Approximately half of the students appear to be working. It may be that

the performance of this class is compared to the other class, which has had more class time, created the video, created the Avatars, and posted in the forum the majority of the time.

Overall, the environment for learning is relaxed. The students assessed as “special needs” are involved (with a couple of other students) in the making of the Avatars. This was done by the teacher to make sure these students feel as though they are equally contributing. The fifth Avatar was created in this class.

4:00 pm

Both Class A and B were in the auditorium to listen to a presentation from an industry expert on Oil & Gas Production (Bob McKerrell). The presentation lasted for about 35 – 40 minutes and it was followed by a couple of questions. The students were then asked to work in groups to discuss further ideas.

Additional questions were asked when Bob went for photographs with the students.

### **Friday, November 9, 2018**

8:00 am

Class B

The students were asked to work in groups and add additional information to the forums. Two of the students were asked to work on the Avatar. So far, one of the students has moved the posts around, but has not contributed any posts. I can see the students are reading the existing information. At 8:24 am, 2 new posts appeared. They managed to add quite a few posts within this class.

### **Monday, November 12, 2018**

3:00 PM

Class A



The students were asked to work in groups and review the UN Sustainable Goals site, the information from the presentation on Friday with Bob McKerrell, the video of pollution in New Dehli, and Ted Talks videos. The students moved into groups for discussions. The group discussions tend to be in Catalan, so even though the instructions and lectures are in English and the written work is in English, the students do their group work in their L1.

One of the groups is working on creating a summary of the presentation by Bob McKerrell.

The teacher has expressed interest to have the students present the information to the younger grades in English.

Two summaries need to be completed for December; one presentation for the experts and one for the students in younger classes.

#### **Thursday, November 15, 2018**

10:00 AM

Class B

The students were asked to work in groups and read an article about Spain's objective to be 100% fossil fuel free by 2050. They assembled in groups and worked on posts for the forum. They appear to be working and there is a bit of chatter in the classroom.

4:00 PM

Class A

The students were working in groups, similar to in the morning and they made some very good progress with their posts.

#### **Friday, November 16, 2018**

8:00 AM

Class B

I was unable to make it to the classroom today, as I have a foot injury and my ride cancelled. The students were to work in groups and make some new posts in the forums. As they worked in the classroom, I was working at home and following and sorting their posts to the spreadsheet. There were about 10 new posts this morning.

**Monday, November 19, 2018**

3:00 PM

Class A

Class for KBIP was cancelled, because the students were attending a theatre production in Barcelona.

**Thursday, November 22, 2018**

10:00 AM

Class B

The students were asked again to work in groups and add new posts. They worked in groups of 3 or 4 and about 12 posts were added to the forum over the hour. One group was asked to summarize the posts, which they found to be difficult, because there were so many, and they weren't connected.



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