Analysing Tertiary Students' Reading Proficiency of CEFR Aligned Texts via Online Discussion Forum in a Learning Management System

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https://doi.org/10.24191/ajue.v19i1.21236

Received: 6 June 2022
Accepted: 29 December 2022
Date Published Online: 31 January 2023
Published: 31 January 2023

Abstract: Learning has taken a new dimension for students in higher institutions because they are now required to read large amounts of online materials constantly for academic purposes. Despite the use of technology, students are unable to take advantage of its full potential to read effectively online. This study investigated ESL learners' use of Online Discussion Forums (ODFs) in a Learning Management System (LMS) to aid reading of texts aligned within Common European Framework of Reference for Languages (CEFR). This study employed a mixed method approach of collecting data within the context of a 14-week semester. Data collection consists of pre and post-tests as well as ODF threads from 55 ESL students enrolled in various courses at the university. Descriptive and content analyses were performed using SPSS and NVivo programs, respectively. Content analysis was confirmed using Cohen Kappa analysis that gave an almost perfect score, suggesting that the findings were reliable. Data analysis on online discussion threads confirms that students can achieve higher level conversations and discuss ideas to achieve comprehension. Post-test scores reveal ODF's interactive heuristic approach to learning has enhanced learners' ability to comprehend online materials. This becomes significant for instructors and program developers to integrate materials selection as well as relevant ODF topics to maximize learning potential.

Keywords: Common European Framework of Reference for Languages, Interactive Analysis Model, Learning Management System, Online Discussion Forum.

1. Introduction

Online discussion forum is one of the many tools currently used in Learning Management System (LMS) and is known to be one of the most representative e-learning applications. This is because the feature allows learners to interact online, exchange ideas, opinions, and knowledge (Farah Damia et al., 2021; Ruhil Amal et al., 2022). Moreover, active participation in online discussions enables learners to negotiate meaning, rectify their output, obtain comprehensible input, and gain feedback (Chew & Ng, 2015). However, current studies are primarily concerned with evaluating the effectiveness of ODF as a pedagogical tool. There has been little emphasis on the effectiveness of ODF to facilitate reading of CEFR aligned online materials in higher institutions (Jamali & Krish, 2021; Luthfia et al., 2022). For example, students develop digital and linguistics skills of language learning (Jamali & Krish, 2021; Ruhil Amal et al., 2022). Therefore, using LMS such as Google Classroom (GC) as a pedagogical platform, this study aims to address the following research questions:

1. How does Online Discussion Forum assist students to achieve phases of knowledge construction in reading CEFR aligned online materials?
2. Is there a significant difference in test scores among the students after ODF implementation?

ODF creates a setting where learners can freely express their opinions and thoughts in a confidential and non-restrictive manner beyond what can be done in a conventional classroom. It has been hypothesized that ODF provides a forum for sharing different perspectives, expressing sense, and recognizing knowledge gaps, which can raise discussion to a higher level of critical thinking (Afify, 2019). For example, Ruhil Amal et al. (2022) investigated student interaction in ODF and found that, when students used ODF, they demonstrated better knowledge construction and analysis skills. Hence, this study intends to investigate phases of knowledge construction within ODF and identify significant differences after the implementation of ODF as a pedagogical tool in LMS.

2. Literature Review

2.1 Online Discussion Forums as a learning platform

In the age of technology, computer-mediated conferencing that is used as a learning platform has become an integral part of modern human life. It is where knowledge can be shared and co-created in a comfortable and casual way, as well as more formal forums for the purpose of teaching and learning. The potential and effectiveness of ODF in teaching and learning have been researched and proven throughout many studies (Buraphadeja & Kumar, 2012; Ruhil Amal et a.l., 2022; Xiaoxing & Farhana Diana, 2022) in both local and international educational settings (Afify, 2019; Jamali & Krish, 2021; Li, 2004; Ruhil Amal et al., 2022). It is one of the most important mechanisms in a blended learning environment, as it offers convenience and flexibility.

The potential and effectiveness of ODF in teaching and learning have been researched and proven throughout many studies. For example, in a study by Jamali and Krish (2021) shows that ODF enables students to develop skills such as critical thinking, discipline, leadership, time management, and computer proficiency. The study involving 26 undergraduate students at a public university in Malaysia found that the use of digital technologies such as ODF was essential for promoting learning and developing digital skills, which is crucial within the current educational environment.

2.2 CEFR-aligned online reading materials

The Common European Framework of Reference for Languages or CEFR was designed to provide the guideline to identify the language learning needs among language learners. It facilitates the development of assessments as well as teaching and learning of languages. CEFR was created to establish international standards with New Descriptors to understand and design online materials for learners (Gadomska, 2019). The new descriptors were, amongst others, able to profile learners and help to mediate or facilitate the communication between two opposing parties.

According to the CEFR, language users are grouped into three main classes: Proficient users (levels C1 & C2), Independent users (levels B1 & B2) and Basic users (levels A1 & A2). The learners' ability across the language skills (listening, writing, reading, and speaking) are described as the "can do" statements. Teachers can use the descriptors to determine the level of proficiency among the learners during online discussion. Basically, CEFR Framework or descriptors can be a potential guideline to create more effective and suitable online reading materials for the learners since the tutors can track the level of their learners through CEFR. CEFR descriptors are also used to design the learning materials and strategies, such as the Extensive Readings based on the CEFR Framework (Luthfia, Methy, Intan & Nur, 2022).

2.3 Theoretical Discussion

Community of Inquiry (CoI) and Connectivism are the two main guiding principles of this study. According to Garrison, Anderson, and Archer (2000) the three domains of CoI which are social presence, cognitive presence and teaching presence are said to be interacting during online learning. Social presence reflects the ability to connect with members of a community of learners on a personal level while cognitive presence is the process of constructing meaning through collaborative inquiry. Hence, supporting discourse shows that the integration and connection to both the material and other learners is important.

Meanwhile, the most crucial integrating force that structures and manoeuvres the process of education in a constructive, collaborative, and sustainable manner is the teaching presence. This is where the design and facilitation of the learning experience is guided to achieve the learning goals and the learning outcomes that are developed in an online environment. Setting climate refers to setting your learning objectives or goals in developing an online learning experience with learners. Selecting content will require instructors to select content that provide interactive opportunities for learners that address critical thinking and the exchange and connection of ideas. The combination of these three elements can create a community of inquiry and achieve a collaborative constructivist learning experience.

Fig. 1 The Community of Inquiry Model (Garrison, Anderson, and Archer, 2000)

Connectivism is based on the idea that perceive information as a network in need of constant update and information acquisition (Siemens, 2004). It is elaborated as "a new learning theory heavily influenced by technology" (p. 4). It advocated the idea that the use of digital technology can resolve a problem and deepens the comprehension of an issue. According to the definition, online discussion forums could be seen as a tool that creates a network where learners can acquire and share their knowledge actively by performing reading skills.

3. Methodology

This study adopted a mixed-method approach because the qualitative data gained from the content analysis was intended to support the data gained from the quantitative data. There were more concerns about processes and complexity than about outcomes (Creswell, 2014). In other words, the goal was to explain how people read online text and used ODF to achieve comprehension.

3.1 Participants

A purposive sampling method was employed to collect data from 55 ESL students from various engineering and technical courses at a public university in Malaysia. According to Creswell (2014), purposeful sampling is the deliberate selection of a sample that investigates the major concept being examined. Being the instructor for these students, the instructor had access to the class (Ezihaslinda Ngah et al., 2022). These students completed both pre-test and post-tests and took part in using GC as part of the learning process during the semester. The students ranged in age from 21 to 23 and were all enrolled in English for Academic Communication. They agreed to participate in the study, where classes consist of a two-hour tutorial and a one-hour lab class attended twice a week online. They were also given the option to withdraw from the research if they were no longer interested in taking part. This was done to assure voluntary involvement and that there would be no consequences if they did not wish to be involved in the study.

3.2 Instruments

3.2.1 Pre-test & post-tests

This study utilized the Edinburgh Project on Extensive Reading (EPER) as it was accessible to the students and EPER tests and materials are already aligned with CEFR. The test was created to measure English language proficiency of students before placing students in a reading program that is tailored according to the CEFR levels. Pre-tests from EPER were conducted in Week 1 to identify reading proficiency of students to determine materials suitable for an online reading program that utilized ODF. The pre-test was a modified cloze test that consists of 12 passages of about 70 words with a total of 141 gaps. Students did the test online via GC and were given 60 minutes to complete the test. Based on the pre-test scores students were reading CEFR A2 to B2 online materials in GC. Post-tests were conducted after the reading program to determine significant differences in reading proficiency among the students. The post-test comprises 6 passages with 76 gaps. Students were given 30 minutes to complete the test which was conducted through GC in Week 14. A different post-test was used mainly because time was limited for students.

3.2.2 Online Discussion Forum via Google Classroom

Data from online discussion threads were obtained using the Google Classroom platform. While this LMS includes several online tools, the present research focuses solely on the ODF as the primary component. Students' online posts were collected from ODF where students responded about the reading materials that were posted online. As students read the materials and posted opinion or viewpoints in ODF, they were also encouraged to provide responses or comments on their friend's posts. Each posting was considered as a unit of analysis, where interpretations of the postings were analysed based on the phases of knowledge construction (refer to Table 2). This gives an overview of the degree of knowledge construction that occurred among students in an online environment.

3.2.3 Reading materials

All the reading materials were selected from CEFR aligned reading references obtained from British Council level A2 – B2. Two reading materials consisting of about 200 words each were posted fortnightly, which were in Week 4, 7, 10 and 13. This is because students were also occupied with the course curriculum that was needed to be covered throughout the semester. Hence, in total students were reading 8 reading materials online. The reading materials were selected based on general interest and cultural background of students. The titles of each reading material are illustrated in Table 1.

3.3 Data collection/ Procedure

This study was embedded as part of a compulsory English course that students were enrolled in during a 14-week semester. In week 1, pre-tests were conducted to determine students' level of proficiency. Since it was during the pandemic, the reading program was conducted online through Google Classroom (GC). In GC, students were required to read pre-selected CEFR aligned reading materials obtained from the British Council online database and respond to ODF questions posted. The ODF topics would relate to the online reading materials posted and students' personal experiences. In total, there were 8 reading materials and 8 ODF equally distributed during the semester. Table 1 summarizes the data collection procedures.

Table 1. Phases of data collection

Week	Data collection
Week 1	Pre-test
Week 4	Reading 1: The Golden Boys Reading 2: Two peas in a pod
Week 7	Reading 3: Elephants, bananas & Aunty Ethel Reading 4: The interesting most boring man in the world
Week 10	Reading 5: The comeback Reading 6: The broken mirror, the black cat and lots of good luck
Week 13	Reading 7: King of the pumpkin Reading 8: Scarlett
Week 14	Post-test

In week 14, post-tests were conducted to identify significant differences after the implementation of ODF as a pedagogical tool.

3.4 Data analysis

As advocated by Miles and Huberman (1994), the analysis model was utilised where the research process analysis is done through 4 stages, the data collection, data reduction, data presentation and data conclusion. Based on this form of data analysis, this study initially gathers as much data as possible from the online discussion thread. Figure 2 illustrates the data analysis conducted.

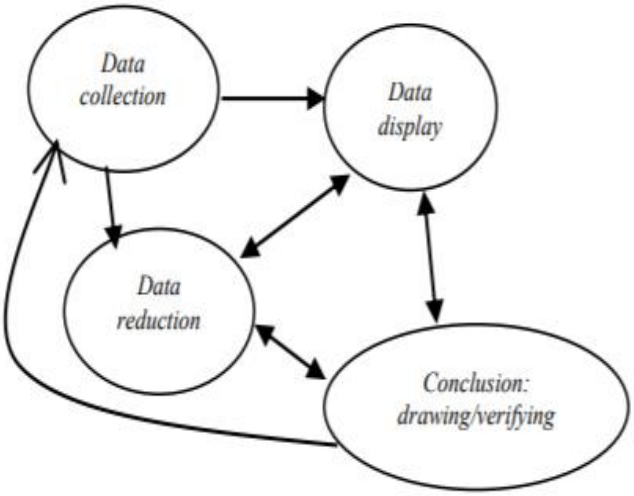

Fig. 2. The Analysis Model (Miles & Huberman, 1994)

A key factor in determining knowledge construction in online reading environments is by understanding the different levels of occurrence using content analysis models. One of the most suitable content analyses in terms of social constructivist and collaborative learning environments is interactive analysis model (IAM) by Gunawardena et al. (1997). The transcripts of the online discussion threads were analyzed thematically using the five phases to determine phases of knowledge constructions among the students. Table 2 illustrates the descriptions for each phase of IAM.

Table 2. Interactive Analysis Model (Gunawardena et al., 1997)

Phases	Descriptions
Phase I	**Sharing/ comparing information**
	A statement of observation or opinion
	Corroborating examples provided by one or more participants
	Asking and answering questions to clarify details of statements
Phase II	**The discovery and exploration of dissonance or inconsistency among ideas, concepts, or statements**
	Identifying and stating areas of disagreement
	Asking and answering questions to clarify the source and extent of disagreement
	Restating the participants position, and possibly advancing arguments in its support by references to the participants experience, or analogy to illustrate point of view
Phase III	**Negotiation of meaning/ co-construction of knowledge**
	Negotiation or clarification of the meaning of terms
	Identification of areas of agreement or overlap among conflicting concepts
	Proposal of integrating or accommodating metaphors or analogies
Phase IV	**Testing and modification of proposed synthesis or co-construction**
	Testing the proposed synthesis against "received fact" as shared by the participants and/ or their culture
	Testing against existing cognitive schema
	Testing against personal experience
Phase V	**Agreement statement (s)/ Applications of newly constructed meaning**
	Summarization of agreement (s)
	Metacognitive statements by the participants illustrated their understanding that their knowledge or ways of thinking (cognitive schema) have changed because of the conference interaction

Each discussion thread was treated as a unit of analysis, where it was interpreted according to the five phases of knowledge construction. SPSS software was used to validate the themes using Cohen Kappa inter-rater reliability analysis. Cohen Kappa was used to calculate similarity probabilities between the raters. The Cohen Kappa inter-rater reliability analysis was used to validate the themes obtained. The Kappa value of the themes created was calculated using the following formula.

$$k = \frac{fa - fc}{N - fc}$$

The Cohen Kappa value for each rater was computed and the average Kappa value for the discussion page was .81, indicating an almost perfect score. This shows that the data analysis had high reliability.

This research also uses quantitative data analysis using t-test, which is a type of statistical test that is used to compare the means of two groups (Kyu Kim, 2015). We select paired t-test for two dependents pre- and post-tests of students' scores.

A sample of 55 students were given the test before and after using LMS. This was intended to identify any differences which lead to increment of student information findings online performance using LMS. However, only 33 students completed both pre and post-tests. We use SPSS software to test the results from pre and post-test. SPPS gives the results of mean difference, standard deviation of the differences and calculates the standard error of the mean difference. It also calculates the t-statistic tables of the t-distribution to compare the value for T to the t distribution. This will give the p-value for the paired t-test (Shier, 2004).

4. Findings and Discussions

4.1 Demographic Profile

Prior to joining the English for Academic Communication (EAC) course, students selected the classes based on their personal timetable. There were 25 students in one class (Section 17) and 30 students in another class (Section 18). The two classes (Section 17 and Section 18) took the same course at different class times but had the same lecturer, syllabus, and curriculum for English for Academic Communication. Table 3 summarizes the demographic profile of the students according to their faculties.

Table 3. Demographic profile

Faculty	**Responses**	**Percentage (%)**
Electrical & Electronics Engineering (FKEE)	32	58
Mechanical Engineering (FKM)	11	20
Manufacturing Engineering (FKP)	12	22
TOTAL	**55**	**100**

As depicted in Table 3, there were a total of 55 students involved in the current study. More than half (58%) of students were from the Faculty of Electrical and Electronics Engineering (FKEE), 22% were from Manufacturing Engineering (FKP) and 20% were from Mechanical Engineering (FKM).

RQ1: How does Online Discussion Forum assist students to achieve phases of knowledge construction in reading in reading CEFR aligned online materials?

4.1.1 Phases of knowledge construction

Each posting was analysed thematically according to the five phases of IAM by Gunawardena et al. (1997). In total there were 8 ODF conducted during the semester, this paper will highlight all the ODF conducted throughout the semester. The first analysis on the levels of knowledge construction in weeks 4 & 7 was based on 143 ODF postings collected from GC for Phase I, II, III, IV and V. Table 4 illustrates the number of postings made by the students.

Table 4. IAM analysis for online discussion forum in Week 4 & 7

Phase	**Description**	**No of Posts**	**%**
I	Sharing/ Comparing of information	72	50
II	Restating the participants position, and possibly advancing arguments	10	7
III	Negotiation of meaning/ co-construction of knowledge	49	34
IV	Testing and modification of proposed synthesis or co-construction	7	5
V	Agreement statement (s)/ application of newly constructed meaning	5	4

TOTAL	**143**	**100**

As depicted in Table 4, analysis on phases of knowledge construction among the participants in weeks 4 & 7 indicates that lower construction of knowledge in phases I and II were higher (57%) compared to higher levels of knowledge construction which are phases III, IV and V which is 43%. This suggests that students were merely sharing or comparing information, restating position, stating observation and opinion. This finding was consistent with a study that found similar results, where students posting were mostly in Phases I and II, indicating that interactions were mainly exchanging and sharing information (Mohd Helmi & Irfan Naufal, 2015). However, it is interesting to note that the second highest level of knowledge construction was in Phase III (34%). This reflected negotiation of meaning and co-construction of knowledge. In other words, it constituted exploring and discovering inconsistencies among ideas, showing that students were engaged in fairly high levels of knowledge construction. Figure 3 illustrates this notion.

Fig. 3 ODF posting in Phase III

Figure 3 clearly illustrates students' ability to co-construct meaning by identifying analogies and drawing a conclusion based on the story read. Students were able to provide justifications, reflect on the ideas and were involved in social interaction. Hence, this embodies CoI, where ODF creates a community of inquiry that achieves a collaborative constructivist learning experience for learners (Xiaoxing, & Farhana Diana 2022).

Interestingly, in weeks 10 & 13, the data obtained revealed that students were able to achieve higher levels of knowledge constructions. Table 5 illustrates the number of postings made by the students in weeks 10 & 13.

Table 5. Analysis on Phases of Knowledge Construction

Phase	Description	No of Posts	%
I	Sharing/ Comparing of information	31	25
II	Restating the participants position, and possibly advancing arguments	9	7
III	Negotiation of meaning/ co-construction of knowledge	13	11
IV	Testing and modification of proposed synthesis or co-construction	32	26
V	Agreement statement (s)/ application of newly constructed meaning	38	31
	TOTAL	**123**	**100**

Table 5 illustrates analysis on phases of knowledge construction in weeks 10 and 13. Students moved beyond just sharing information and restating ideas. Students were reflecting higher phases of

knowledge construction in Phases IV and V which was 57% compared to phases I and II which was 32%. Figure 5 is a posting in Phase III.

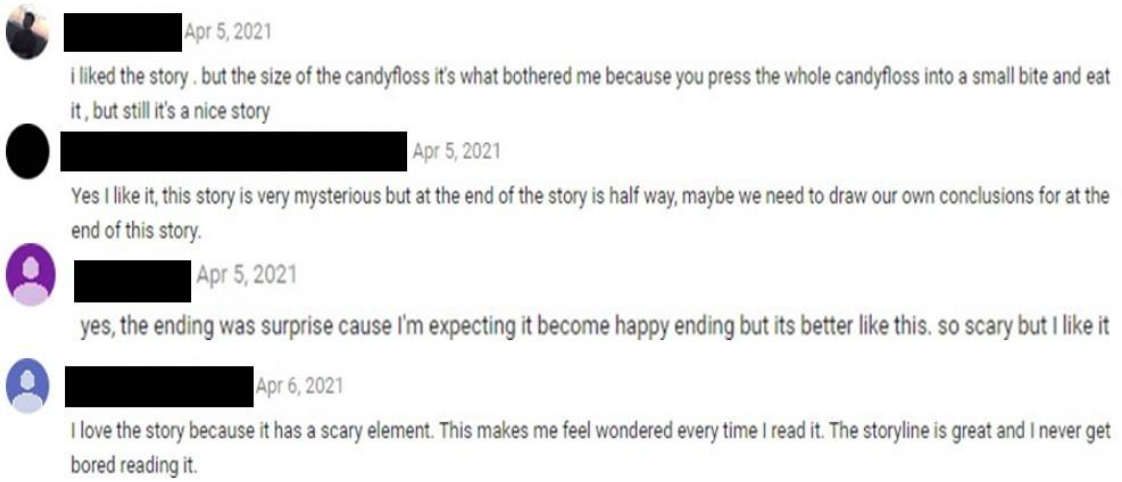

Fig. 4 ODF postings in Phase III

As depicted in Figure 4, students were able to accommodate the metaphors or analogies made in the story and clarify the meaning or the 'twist' in the story. This means that students were moving beyond sharing information but were able to negotiate meaning. This corroborates the notion that the use of asynchronous online discussions facilitates the co-construction of knowledge, since students are more critical and constructive when contributing to the discussion (Ruhil Amal et al., 2022).

In addition, the findings also revealed Phase IV (26%) and Phase V (31%) phases of knowledge construction among the students. This shows that students were able to co-construct ideas and synthesize information. Students were able to receive facts and relate it to personal experience and cognitive schemata. They were able to relate to their own culture based on the information provided. Figure 5 illustrates this notion further.

Fig. 5 ODF posting in Phase IV and V

This is a valid interpretation of Phase IV and V, where students were able to create metacognitive statements that illustrate their understanding or knowledge has changed because of the interaction made. Hence, this illustrates students' ability to achieve a higher level of knowledge construction in an online environment. This supports the idea that asynchronous online discussions encourage constructive

discussion in a more interactive way, which is the embodiment of online collaborative learning (Ruhil Amal et al., 2022).

4.1.2 Pre-test & Post-test scores

This study employed the paired t-test in which the mean difference of values is compared to zero. Haslenda et al. (2015), explained that it depends on three aspects: mean difference, variability of the differences, and amount of data. Students' marks are viewed as continuous (scale) data therefore they are often summarised by giving their average and standard deviation (SD). Comparing two pre and post-tests that have been done derived the results that can be obtained in tables 6 and 7.

An analysis of result based on research question 2 is as stated below:

RQ2: Is there a significant difference in test scores among the students after ODF implementation?

The null hypothesis that has been formed before:

H0: There is no difference in mean of pre-test and post-test among the students,

This can be seen in Table 6 and 7.

Table 6. Pre-test and Post-test Numerical Measures

Type of test	Mean	Standard Deviation	Correlation
Pre-test	55.79	8.223	0.580
Post-test	77.82	18.004	(Sig. value 0.000)

It is seen that the mean score for post-test is slightly higher than the mean score for pre-test, while the standard deviations for pre-test and post-test are 8.223 and 18.004 respectively. From this data, the correlation between both tests is 0.580 which indicates that they are moderately correlated. This is also supported with the Sig. value of $p<0.001$ which indicates hypothesis null is rejected as there is a relationship between these two tests.

H1: There is a difference in mean of pre-test and post-test among the students

Additionally, to answer hypothesis 1 the data is analysed using paired t-test. From the analysis, the results are shown in Table 7.

Table 7. Paired t-test data analysis

	Mean	Standard Deviation	Confidence Interval	t	df	Sig. value
Pre-test-Post-test	22.030	14.838	(16.8, 27.3)	8.529	32	0.000

From Table 6 and 7, There is a significant increase in the post test (M=77.82, SD=18.004) than pre-test (M=55.79, SD=8.223); t (32) = 8.529, p=.000. From this analysis, at significance level of 0.05, the hypothesis is supported ($p < 0.05$). This suggests that there is a significant difference between pre-test and post-test scores among 33 students involved in this study. This is also supported with the correlation value which shows the relationship between these two tests. From this result, we can also see that the mean lies between the interval, at 95% Confidence Interval.

5. Conclusion

This study demonstrated that ODF was beneficial for collaborative learning, student knowledge development, and interactive learning. Having the ability to collaborate helped students improve their reading comprehension. The post-test score differs significantly from the pre-test scores among the students. This indicates that the implementation of ODF as a pedagogical tool in LMS in higher institutions creates a conducive environment that encourages social interaction among the learners. It allows students the opportunity to provide examples and discuss ideas, encouraging the development of individualized internalized principles that go beyond just collecting and memorizing information. As a result, students were able to expand their knowledge by going beyond sharing and exchanging ideas. In this learning environment, students had the ability to construct knowledge across learning communities and technologies and this reflects Connectivism (Siemens, 2004). This is because when students navigated within a Learning Management System, they were able to connect ideas, concepts, and knowledge.

Selection of CEFR aligned materials was an important component in conducting ODF. This study has proven that learners readily adopted and utilized reading online CEFR-aligned materials in GC. Text selection was important because teachers were able to select and utilize more suitable online reading materials for students based on their proficiency levels. Not only does CEFR aligned materials allow teachers to track students' level, it also was able to sustain students' interest to continue reading and respond to the materials through communication and collaboration. Overall, the study demonstrated that both qualitative data was supported by the quantitative data, where higher levels of knowledge construction matched post-test scores.

The present study is one of few studies that examined knowledge construction in reading CEFR aligned online materials in Malaysia. Hence, it cannot be generalized as the number of students was small. Furthermore, teachers' supportive roles in the reading comprehension process should be emphasized by a constructivist approach to encourage the development of concepts, values, activation of schemata, and students' active participation in high cognitive level activities. These high-level cognitive activities, such as problem-solving, deep understanding, and metacognition (Murphy, 2002), aid in the improvement of learners' cognitive structure. Overall, ODF supports collaborative learning that facilitates knowledge construction among students in higher education institutions.

6. Co-author contribution

Ruhil Amal Azmuddin: writing, introduction, original draft preparation, methodology, overall write up; Ainul Azmin Md Zamin: writing, introduction, literature review, reviewing; Hamizah Zahari: writing, data collection & data analysis, final draft preparation; Rahmah Mokhtar: writing, data collection & data analysis; Fatin Aliana Mohd Radzi; writing, introduction, literature review; Daing Nafiz Daing Idris: writing, abstract, conclusion.

7. Acknowledgement

This research was supported by IIUM-UMP-UiTM Sustainable Research Collaboration Grant 2020 (SRCG) ID: RDU200725.

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