

Investigating Engagement and Learning Differences between Native and EFL students in Active Video Watching

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Abstract: Video-based learning (VBL) requires good listening and reading comprehension skills, which could be challenging for English as a foreign language (EFL) students. In this paper, we investigate the differences between EFL and Native English speakers in a VBL platform called AVW-Space, in order to identify potential interventions that would be helpful for EFL students. AVW-Space provides note-taking, peer-reviewing, visualisations and personalised nudges to support engagement in VBL. Although previous studies on AVW-Space showed these supports were effective for increasing engagement, we discovered significant differences in learning outcomes and engagement between EFL/Native students, which stem from different learning strategies, background knowledge and language barriers. This research contributes to using learning analytics to understand better the differences between EFL and Native students, and providing more specialised support for EFL students in VBL.

Keywords: Video-based learning, English as a foreign language students, Learning analytics, Personalised support, Student equity and inclusion

1. Introduction

Using videos for learning has become very popular due to platforms such as YouTube and Massive Open Online Courses (MOOCs). Online video-based learning (VBL) platforms provide easy access to educational materials to people from all over the world. VBL is an effective method of learning since it combines visual, textual and auditory modes. However, VBL requires good listening and reading comprehension skills, which could make VBL challenging for English as a foreign language (EFL) students. Thus, in order to have adaptive VBL platforms (Giannakos, Sampson, & Kidziński, 2016), the needs and abilities of EFL students should be taken into account. To identify what kind of support would be helpful for EFL students in VBL, we first need to understand the differences between EFL and Native students in terms of their learning strategies, engagement and learning outcomes.

This research investigates the differences between EFL/Native students in AVW-Space. AVW-Space (Mitrovic et al., 2016) is an online VBL platform that supports engagement via note-taking, micro-scaffolds for reflection, reviewing comments made by peers, visual learning analytics and personalised nudges (Mitrovic et al., 2017; Mitrovic et al., 2019). In AVW-Space, the student can watch a video, pause it to write a comment and tag the comment with one of the aspects defined by the teacher, which encourage reflection. An early study with AVW-Space (Mitrovic et al., 2017) in the context of presentation skills found that students who commented on videos learned more than their peers who watched videos passively. In order to support active video watching, personalised Reminder nudges were added to AVW-Space to encourage students to write comments and use various aspects (Mitrovic et al., 2019). Later on, personalised Quality nudges were introduced in order to encourage students to write high-quality comments. The Quality nudges automatically assess the quality of comments students write (Mohammadhassan et al., 2020) and guide students toward critical thinking and self-reflection (Mohammadhassan et al., 2021). AVW-Space also supports social learning: the student can review and rate comments made by their classmates using the rating options that the teacher defines. However, AVW-Space has no specialised support for EFL students. Thus, this research investigates the differences between EFL and Native students who used AVW-Space for learning presentation skills. Based on the findings, we discuss potential modifications for EFL students. The paper addresses the following research questions:

- RQ1:** Do Native and EFL students have different self-reported learning strategies?
- RQ2:** Is there a difference in engagement and learning outcomes for EFL/Native students?
- RQ3:** What are the differences in the subjective opinions of EFL/Native students on interactions with AVW-Space?

2. Related Work

Studies show that despite the overall increasing number of disadvantaged learners in higher education, disadvantaged students are still under-represented in many countries, and their educational outcomes are not equal to other students (Bennett, Southgate, & Shah, 2016; Pitman et al., 2019; Harris et al., 2020). The growth of online learning in recent decades raises questions about access, equity and ethics (Zawacki-Richter, 2009). Online learning environments are a potential solution for widening access to education for diverse learners, such as students from low socioeconomic backgrounds, students with disabilities, and students from different regions. A qualitative study on online students followed by interviews with academic staff provided guidelines for providing an inclusive online learning environment (Stone, 2017). These guidelines emphasise the importance of understanding the nature and diversity of the online students, providing early intervention with students to engage and leveraging learning analytics to provide effective intervention and personalisation.

There have been several studies on under-represented students in online learning platforms. A recent study investigated the linguistic differences of self-reflections made by female and male students in an online chemistry class and analysed gender differences in the relationship between these linguistic features and learning outcomes (Lin, Yu, & Dowell, 2020). Another study investigated how a gameful LMS (Learning Management System) for five courses (sociology, communication, education, Honors program, movement science) at a large university have impacted the performance of under-represented students (Hayward, Schulz, & Fishman, 2021). This study showed that under-represented minority students were proportionally under-represented among A-earning students. Another study analysed the clickstream of students in an online chemistry course to investigate the self-regulated learning differences between first-generation students (who are the first in their family studying at the university) and traditional students (Rodriguez et al., 2021). The study revealed that first-generation college students classified as Early Planners (visited and watched the most videos when assigned) performed as well as their non-first-generation peers, but first-generation students in the Low Engagement group (had the lowest number of lecture video visits and a high number of watched videos closer to the due date) had the lowest average grades. This shows that minority students may benefit from utilising self-regulated learning strategies.

Language is identified as an important factor of dropout in MOOCs (Henderikx, Kreijns, & Kalz, 2018; Said, 2017). An early study on MOOCs reported language barriers non-native speakers experience, such as low reading speed, information overload and cognitive process and stress related to the visibility of their written responses (Sanchez-Gordon & Luján-Mora, 2014). Although delivering learning materials, providing translations and interface customisation in different languages have been successful in supporting EFL students (Colas, Sloep, & Garreta-Domingo, 2016; Murugesan, Nobes, & Wild, 2017; Navarrete & Luján-Mora, 2018), such approaches are time-consuming and require a lot of resources and effort (Lambert, 2020). According to the language barriers discussed earlier, simpler approaches were suggested for supporting EFL students, such as providing the ability to pause or regulate the video speed, giving access to a downloadable transcript or a specialised glossary and learning materials which use colour and visualisations (Sanchez-Gordon & Luján-Mora, 2015). However, adapting learning resources to the student's language competency requires a comprehensive investigation of characteristics of Native and EFL students, which is the focus of the work presented in this paper.

3. AVW-Space

AVW-Space aims at supporting engagement in two phases: 1) Personal space (Figure 1), where students watch videos and make comments, and 2) Social space (Figure 2), where students review and rate comments made by their peers. AVW-Space provides interactive visualisations of comments

written by previous students in Personal space, which show the distribution of comments over various parts of the video. Students can also see the comment text when hovering over the comment (Mitrovic et al., 2019). Regarding supports suggested for EFL students, AVW-Space allows students to pause or restart videos, adjust the speed and enable auto-generated closed caption of the video. Additionally, comments shown to the whole class for rating in the Social space are anonymised to reduce the stress related to the visibility of comments.

AVW-Space provides nudges in the Personal space, which are personalised interventions to enhance constructive behavior. The nudges have been designed based on the results of initial studies with AVW-Space (Dimitrova et al., 2017; Mitrovic et al., 2019) to encourage students to write comments, use various aspects and improve the quality of comments. For instance, if a student is passively watching the video and has made no comments, the student will receive a Reminder nudge, stating that writing comments is beneficial for learning. Also, if the student used only one aspect in her/his comments, a Reminder nudge will be shown to draw the student's attention to other aspects. If a student often writes comments which only repeat the content of the video, he/she will receive a Quality nudge, asking the student to think about the causes/effect or cons/pros of the tips covered in the video. Also, a student who is watching the last part of the video and has made no self-reflective comments will be given a Quality nudge to think about his/her previous experience and plan for future improvements using the taught tips. Previous studies showed that Reminder nudges increased the number of comments (Mitrovic et al., 2019). A recent study on the Quality nudges also showed a significant improvement in the quality of comments (Mohammadhassan et al., 2021). However, these supports are generic, and more investigation on the differences of EFL/Native students is required to provide more specialised support for them.

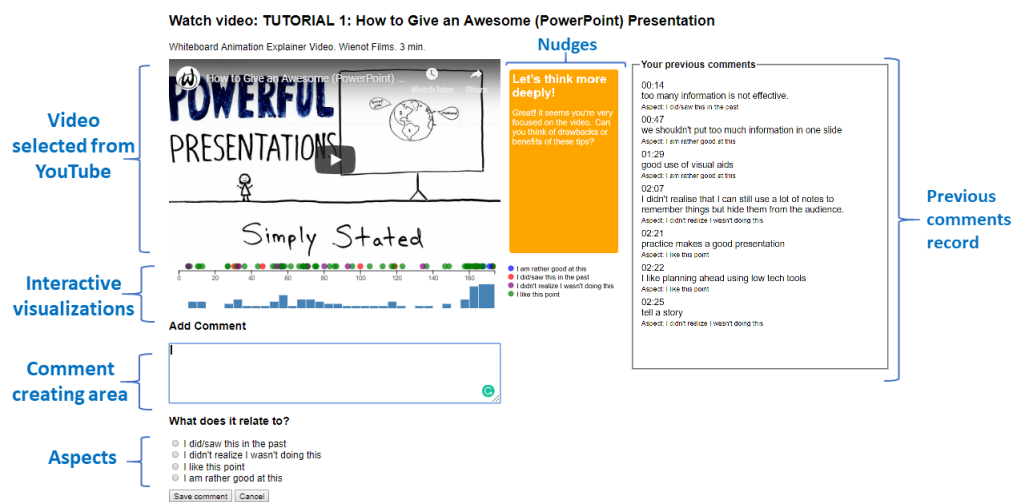


Figure 1. A Screenshot of Personal Space

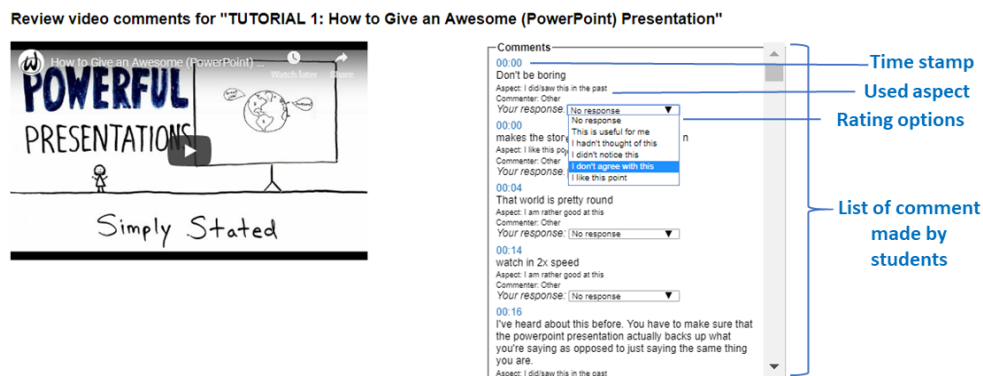


Figure 2. A Screenshot of Social Space

4. Materials and Methods

In order to compare EFL and Native students, we used the data from three previous studies with AVW-Space. Study 1 was conducted with an early version of AVW-Space with no nudges. Study 2 was conducted with the version providing only Reminder nudges, while in Study 3 both Reminder and Quality nudges were provided. The three studies were conducted in the same first-year engineering course at the University of Canterbury, in three consecutive years. In each study, students were invited to use the online training for presentation skills using AVW-Space to prepare for the presentation of their final project. The use of AVW-Space was voluntary. The participants were first invited to complete Survey 1, and were then instructed to watch and comment on the provided videos. There were four tutorial videos on giving presentations, and four examples of real presentations. Nudges were provided during this phase (in Studies 2 and 3). In the second phase, students were instructed to review and rate the comments made by their peers. Finally, Survey 2 was released to students.

Survey 1 contained demographic questions, questions about the participant's knowledge on giving presentations, experience and training in giving presentations, how often they used YouTube generally, and how often they used YouTube for learning. The last part of Survey 1 included the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich & de Groot, 1990). Survey 2 included the same questions about giving presentations to investigate whether students have increased their knowledge. Survey 2 also included two other questionnaires: NASA-TLX (Hart, 2006) to analyse the cognitive load of interacting with AVW-Space, and the Technology Acceptance Model (TAM) (Davis, 1989) to evaluate the perceived usefulness of AVW-Space. For knowledge questions in both surveys, the participants were asked to write everything they knew about visual aids, structure and delivery (one minute per question). The students' answers were marked automatically, using the ontology of presentation skills (Dimitrova et al., 2017). The marks for conceptual knowledge questions are used as the pre/post-test scores (CK1/CK2).

5. Results

There were 986 students (133 EFL and 853 Native) in all three studies who completed Survey 1. The first language of the majority of EFL students (44.92%) was Chinese and Vietnamese, while 17.39% spoke European languages (e.g. Dutch and Spanish) and 14.49% Indian languages (e.g. Hindi and Punjabi). Table 1 shows the distribution of EFL/Native students in the three studies and their CK1 scores. As Study 3 was conducted in 2020, there were fewer EFL students due to the COVID19 travel restrictions. We ran ANOVA on CK1 with study and Native/EFL as two factors. The test of between-subject effects showed that the study had no significant effect on CK1. However, whether students were Native speakers of English or EFL had a significant effect on CK1 ($F = 40.44, p < .001$); EFL students had significantly lower CK1 scores compared to Native students. As there are no differences in CK1 scores from the three studies, we combined all Native and EFL students, and report analyses done in the following sections.

Table 1. *Distribution of EFL/Native Students in Three Studies and Their CK1 (means and standard deviations in parentheses)*

	#All	#EFL	#Native	EFL CK1	Native CK1
Study 1	355	63	292	10.52 (6.48)	12.90 (5.62)
Study 2	338	42	296	8.19 (5.37)	13.55 (5.86)
Study 3	294	29	265	11.44 (6.39)	14.25 (5.38)
Total	986	133	853	9.99 (6.25)	13.54 (5.64)

5.1 Self-reported Learning Strategies

There were no significant differences between Native and EFL students on the scores for training/experience in giving presentations and using YouTube. Table 2 shows the scores on the MSLQ dimensions. We found significant differences in extrinsic goal orientation ($t = 4.40, p < .001$), rehearsal ($t = 4.96, p < .001$), self-regulation ($t = 2.23, p < .01$), organisation ($t = 2.46, p < 0.05$) and critical

thinking ($t = 2.99, p < .001$). Thus, EFL students reported strong meta-cognitive strategies, but reasons such as grades, rewards, evaluation by others, and competition motivate EFL students more than Native students.

Table 2. *MSLQ scores for EFL and Native Students, using a Likert scale from 1 (lowest) to 7 (highest).*

MSLQ Score	EFL	Native
Control of learning	5.65 (0.85)	5.61 (0.77)
Effort regulation	4.73 (1.04)	4.84 (0.98)
Elaboration	5.10 (1.06)	5.03 (0.89)
Extrinsic goal orientation***	5.80 (0.94)	5.38 (1.04)
Intrinsic goal orientation	5.28 (0.99)	5.12 (0.85)
Self-Regulation**	4.68 (0.92)	4.42 (0.70)
Organisation *	4.89 (1.10)	4.63 (1.12)
Rehearsal***	4.60 (1.16)	4.11 (1.09)
Self-efficacy	5.07 (0.96)	5.01 (0.93)
Task value	5.43 (0.95)	5.49 (0.80)
Critical thinking***	4.73 (1.13)	4.35 (1.07)

* $p < .05$, ** $p < .01$, *** $p < .001$

5.2 Engagement

To investigate students' engagement, we compared the number of comments students made, the number of videos they watched and the number of comments they rated (Table 3). We applied ANOVA on these activities, with study and EFL/Native as two fixed factors. The test of between-subject effects showed that the study had significant effect on the number of videos ($F = 41.93, p < .001$), comments ($F = 5.49, p < .01$) and ratings ($F = 6.48, p < .01$), due to the effect of nudges (Mitrovic et al., 2019, Mohammadhassan et al., 2021). However, EFL/Native only had a significant effect on the number of comments ($F = 11.17, p < .05$). Native students made significantly more comments than EFL students in Study 3 ($F = 3.88, p < .05$). In Study 3, which included Reminder and Quality nudges, the EFL students received significantly fewer nudges than Native students ($F = 3.95, p < .05$), but there was no significant difference in the number of nudges received by EFL/Native students in Study 2. The difference between EFL/Native students in Studies 2 and 3 could indicate that the model which triggers Quality nudges is tailored to the behavior of Native students more than EFL students.

Table 3. *Statistical Description of Activities for EFL and Native Students*

		Videos	Nudges	Comments	Ratings
Study 1	Native	6.86 (4.93)	None	4.13 (7.72)	3.79 (18.43)
	EFL	6.77 (4.52)	None	2.90 (6.97)	10.17 (46.25)
Study 2	Native	6.68 (3.96)	9.70 (10.30)	6.72 (10.26)	4.00 (19.05)
	EFL	7.40 (4.38)	9.43 (5.59)	5.38 (8.04)	1.16 (4.06)
Study 3	Native	7.03 (4.77)	20.38 (16.26)	11.43 (0.67)	21.75 (72.08)
	EFL	5.72 (3.90)	14.17 (12.71)	3.24 (2.02)	21.69 (85.91)

We also computed the linguistic and psychological features for comments using LIWC (Linguistic Inquiry Word Count) (Pennebaker et al., 2015, p. 201). LIWC takes a word count approach using dictionaries collected from various psychological constructs such as cognitive processes and perceptual process (Tausczik & Pennebaker, 2010). There were 273 comments made by 66 EFL students, and 2,318 comments made by 649 Native students on tutorial videos. After applying an independent t-test on LIWC features of the tutorial comments, we found no significant difference in the comment lengths, but the number of words per sentence in comments made by EFL students was significantly lower than for Native students. Table 4 shows the mean and standard deviation of LIWC features with significant differences for comments made by EFL and Native students on tutorial videos. EFL students used the first-person singular pronouns ("I", "my", etc.) and auxiliary verbs (such as

“will” or “could”) significantly less than Native students. Since comments showing self-reflection and self-regulation usually contain first-person pronouns (Gašević, Mirriahi, & Dawson, 2014; Jung & Wise, 2020), the differences in LIWC scores for EFL and Native students could mean that the Native students wrote more self-reflective and self-regulating comments. There were no significant differences in cognitive process features such as insight, certainty and differentiation. However, EFL students had a significantly higher score for causation (e.g. “because”, “effect”, etc.). There were no significant differences in the perceptual process such as seeing, feeling and hearing. However, comments made by EFL students had significantly higher positive emotion scores, as well as significantly lower scores for non-fluent words such as “hm” or “umm”. In addition to LIWC features, we calculated the domain-specific ratios (Dimitrova et al., 2017) to measure how relevant comments are to the domain. The domain-specific ratio is the number of words from the domain ontology appearing in the comment, divided by the total number of words in the comment. The independent t-test on the domain-specific ratio showed no significant difference for the comments made by EFL and Native students on tutorial videos.

We also compared the linguistic features of comments made on example videos using independent t-test (Table 5). There were 149 comments made by 51 EFL students and 1,383 comments made by 307 Native students on example videos. Similar to tutorial comments, comments made by EFL students had significantly lower scores for non-fluent words. Also, comments made by EFL students lower score in using verbs and adverbs with present focus, but significantly higher domain-specific ratios. This could mean EFL students listed good practices of oral presentation rather than making complete sentences critiquing the presentation in the example video.

Table 4. *Significantly Different LIWC Features for Comments on Tutorial Videos*

LIWC Features	EFL	Native	Significance
First single pronoun	0.43 (1.93)	0.87 (3.15)	t = 3.22, p < .01
Auxiliary verbs	5.33 (8.17)	6.73 (9.14)	t = 2.64, p < .01
Causation	4.91 (8.11)	3.70 (6.95)	t = 2.35, p < .05
Positive emotions	9.97 (18.68)	7.50 (13.16)	t = 2.12, p < .05
Affiliation	1.78 (8.15)	0.74 (3.17)	t = 2.05, p < .05
Non-fluency	0.05 (0.55)	0.18 (1.75)	t = 2.61, p < .01
Word per Sentence	9.61 (7.81)	10.70 (8.40)	t = 2.06, p < .05

Table 5. *Significantly Different LIWC Features for Comments on Example Videos*

LIWC Features	EFL	Native	Significance
Focus present	8.59 (10.27)	10.99 (11.03)	t = 2.53, p < .05
Non-fluency	0.16 (0.75)	0.87(4.51)	t = 5.18, p < .01
Domain-specific proportion	0.34 (0.26)	0.29 (0.24)	t = 2.14, p < .05
Unique Domain-specific proportion	0.34 (0.26)	0.30 (0.24)	t = 2.11, p < .05

We classified students post-hoc into different categories based on ICAP framework (Chi & Wylie, 2014). The ICAP framework classifies learners’ overt behaviours into four categories: Interactive, Constructive, Active and Passive. Passive learners receive information by only watching videos. Active students perform additional actions like note-taking, but their annotations merely repeat the received information. Constructive learners add new information that was not explicitly taught, by reflecting on their knowledge or making inferences. The Interactive category is not applicable in our research since AVW-Space does not support direct interaction between students. We labelled students as Constructive if they had at least three comments showing critical thinking, self-reflection or self-regulation (based on the median number of such comments). Students who had less than three comments of that type were labelled as Active. Finally, students who only watched the videos and did not make any comments were classified as Passive.

Table 6 shows the distribution of EFL/Native students in the Passive, Active and Constructive categories. A chi-square test of homogeneity revealed a significant difference (Chi-square = 16.76, p < .001), with the effect size (Phi) of .13 (p < .001) on all three studies (the *Overall* column in Table 6). We applied a post-hoc analysis to compare different categories using the z-test with a Bonferroni

correction. For EFL students, the proportion of the Constructive category was significantly lower ($p < .05$) than other categories, while for Native students, the proportions of the different categories were similar. It can be seen that the majority of EFL students were passive, which indicates the need to provide more focused support for them.

Table 6. *Distribution of EFL/Native Students in ICAP Categories for Different Studies*

		Study 1	Study 2	Study 3	Overall
EFL	Passive	34 (54.0%)	19 (45.2%)	15 (51.7%)	68 (50.7%)
	Active	26 (41.3%)	15 (35.7%)	9 (31.0%)	50 (37.3%)
	Constructive	3 (4.8%)	8 (19.0%)	5 (17.2%)	16 (11.9%)
Native	Passive	161 (55.1%)	108 (36.5%)	60 (22.6%)	329 (38.6%)
	Active	95 (32.5%)	107 (36.1%)	105 (39.6%)	307 (36.0%)
	Constructive	36 (12.3%)	81 (27.4%)	100 (37.7%)	217 (25.4%)

We investigated the effect of nudges on EFL/Native students' engagement. A chi-square test of homogeneity between the studies and the ICAP categories of EFL students revealed a significant difference (Chi-square = 6.16, $p < .05$) with the effect size (Phi) = .21 ($p < .05$). Adding Reminder nudges in Study 2 raised the percentage of constructive EFL students significantly compared to Study 1 ($p < .05$), but the percentage of constructive EFL students was not significantly different between Studies 2 and 3. Also, there was no significant difference in the proportion of passive EFL students between the studies.

We also applied a chi-square test of homogeneity between the studies and ICAP categories for Native students, which showed a significant difference (Chi-square = 76.39, $p < .001$) with effect size (Phi) of .29 ($p < .001$). The percentage of constructive students increased significantly by including the Quality nudges in Study 3, compared to Study 1 with no nudges and Study 2 with only Reminder nudges. Unlike EFL students, the percentage of passive students decreased significantly by adding the Reminder nudges (Study 2) and Quality nudges (Study 3). Thus, the nudges were more effective for Native students than EFL students.

5.3 Learning

We compared the CK2 of EFL and Native students to find out whether there was a difference in learning. Since only 622 of students completed Survey 2, we only have CK1 and CK2 for 80 EFL students and 542 Native students. We ran an ANCOVA on CK2 scores, with CK1 as a co-variate, and study and being EFL/Native as two fixed factors. We found no significant difference in learning between different studies. After applying the mean adjustment on CK2 using Bonferroni, we found that EFL students learned significantly less ($12.17 \pm .64$) than Native students ($14.37 \pm .23$); ($F = 10.37$, $p < .001$). However, lower CK1 and CK2 scores in EFL students could be due to language barriers that EFL students might struggle with in answering the conceptual knowledge questions in Surveys 1 and 2, while they might have learnt the skill.

In order to find the factors influencing learning for EFL/Native students, we ran a generalised linear regression using CK1 and the number of comments made to predict CK2, with being EFL/Native as the fixed factor. The models fitted with Akaike's Information Criterion (AIC) = 3,793.12 (Table 7). CK1 and the number of comments were significant predictors. Each additional point on CK1 has a 0.15 extra effect on CK2 for Native students (the interaction effect of CK1 *Native is 0.14).

Table 7. *Significant Predictors of CK2 for EFL/Native Students*

Variables	Coefficient	Significance
Intercept	4.96	$p < .001$
CK1	0.50	$p < .001$
CK1*Native	0.15	$p < .005$
Comment	0.21	$p < .001$
CK1*Comment	-.007	$p < .05$

5.4 Subjective Opinions

We investigated the responses of EFL/Native students to the NASA-TLX and TAM questionnaires. TLX-NASA uses a Likert scale from 1 (lowest) to 20 (highest), and TAM uses a Likert scale from 1 (highest) to 7 (lowest). In all studies, NASA-TLX questions asked participants to report their perceived cognitive load during commenting on videos and rating comments written by their peers. There was no significant difference in the perceived mental demand, required effort and confidence in performance for the two tasks between Native/EFL students. However, EFL students found the rating task significantly more frustrating ($8.81 \pm .65$) than Native students ($7.30 \pm .24$); ($F = 4.70, p < .05$). Also EFL students perceived frustration during commenting ($8.85 \pm .66$) significantly more than Native students ($7.43 \pm .24$); ($F = 4.08, p < .05$). We also found that students had no significantly different opinions on the usefulness of AVW-Space based on the responses to the TAM questionnaire, except that the EFL students had lower scores ($3.55 \pm .19$) for “I think I would like to use AVW-Space frequently” ($F = 9.65, p < .01$) and “If I am provided the opportunity, I would continue to use AVW-Space for informal learning” ($3.50 \pm .19, F = 5.60, p < .05$) compared to Native students ($4.17 \pm .07$ and $4.00 \pm .07$, respectively).

We also looked at the feedback EFL students provided on nudges. Some EFL students reported that the nudges distracted them from videos (e.g. “not very useful, took away from the video”) or they were not confident in writing comments (e.g. “I am not confident”, “They were not useful since I did not know what to do to start with”). Also, some responses from passive EFL students showed that they misunderstood the purpose of nudges, such as: “[nudges helped me] to understand some features I did not know”. There was also some positive feedback from passive EFL students, reporting nudges were useful (e.g. “Give me directions”, “Somewhat helpful to remind the user to write a comment”). However, given that these students were in the Passive category, the nudges were not effective enough for these students to encourage them to make comments.

6. Discussion and Conclusions

We investigated the differences between EFL and Native students in their learning strategies, engagement and learning outcomes in AVW-Space. We found that majority of EFL students watched educational videos without writing comments. Furthermore, EFL students had lower conceptual knowledge scores before and after the study in comparison to Native students. Although adding Reminder nudges increased constructive behaviour in EFL students, including Quality nudges was not effective for EFL students compared to Native students. Linguistic analysis of comments showed significantly fewer indicators of self-reflection in comments made by EFL students than Native students. The linear regression revealed the importance of commenting for EFL/Native students. The comparison of subjective opinions of the EFL student showed confusion about nudges, lack of confidence in making comments and frustration in commenting and reviewing task. Therefore, more focused support should be provided to EFL students to help them benefit from VBL as much as Native students.

The identified significant differences between these two categories of students allow for specifying tailored support for EFL students. Comparing learning strategies of EFL and Native students showed that EFL students are more oriented towards extrinsic goals. One way to increase their motivation to write comments is to provide a dashboard which visualises their progress or allows them to compare themselves with the class, since visualisation has been effective in increasing motivation in various learning activities (Aguilar et al., 2021). We found that EFL students reported stronger metacognitive strategies than Native students. However, only a minority of them wrote comments showing self-reflection and self-regulation. Therefore, including more self-regulatory activities, such as goal setting and monitoring previously received nudges and written comments, could activate self-regulation in EFL learners.

Providing downloadable transcripts for videos could be helpful to EFL students, as suggested in the literature. Additionally, showing each nudge for a longer period of time could be helpful to EFL students to comprehend nudges. Adding a glossary of main concepts could also help EFL students in understanding videos and improving their vocabulary. Finally, providing information and feedback using colours and signs could also reduce the cognitive and information load for EFL students.

The main limitation of this research was the context of this study (oral presentation skills), since the nature of this domain involves language proficiency. Thus, applying similar analysis in the contexts of technical skills such as programming could result in different insights. Another limitation of this research is the low percentage of EFL students in the study population. Also, the analysis of the learning outcomes of EFL/Native students in this research was only based on the students' written responses to the conceptual knowledge questions, which again require English competency. Therefore, a more sophisticated approach is required to assess the students' presentation skills before and after using the system, regardless of their English competency.

This research contributes to understanding the requirements for improving inclusiveness in computer-assisted learning environments and improving equity in the learning experience and outcomes for non-native English speakers. Although this research focused only on a particular video-based learning platform, the important findings obtained in this research encourage researchers to investigate the equity for non-native English speakers in other platforms and propose effective approaches to achieve this goal.

References

- Aguilar, S.J., Karabenick, S.A., Teasley, S.D., Baek, C., (2021). Associations Between Learning Analytics Dashboard Exposure and Motivation and Self-regulated Learning. *Computers & Education*, 162, 104085.
- Bennett, A., Southgate, E., & Shah, M. (2016). *Chapter 15—Global Perspectives on Widening Participation: Approaches and Concepts*. Chandos Publishing.
- Chi, M. T. H., & Wylie, R. (2014). The ICAP Framework: Linking Cognitive Engagement to Active Learning Outcomes. *Educational Psychologist*, 49(4), 219–243.
- Colas, J.-F., Sloep, P. B., & Garreta-Domingo, M. (2016). The Effect of Multilingual Facilitation on Active Participation in MOOCs. *The International Review of Research in Open and Distributed Learning*, 17(4), 280–314.
- Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319–340. JSTOR. <https://doi.org/10.2307/249008>
- Dimitrova, V., Mitrovic, A., Piotrkowicz, A., Lau, L., & Weerasinghe, A. (2017). Using Learning Analytics to Devise Interactive Personalised Nudges for Active Video Watching. *Proceedings of the 25th Conference on User Modeling, Adaptation and Personalization*, pp. 22–31. Bratislava, Slovakia: ACM.
- Gašević, D., Mirriahi, N., & Dawson, S. (2014). Analytics of the Effects of Video Use and Instruction to Support Reflective Learning. *Proceedings of the 4th International Conference on Learning Analytics And Knowledge*, 123–132. New York, NY, USA: ACM.
- Giannakos, M. N., Sampson, D. G., & Kidziński, Ł. (2016). Introduction to smart learning analytics: Foundations and developments in video-based learning. *Smart Learning Environments*, 3(1), 1–9.
- Harris, R. B., Mack, M. R., Bryant, J., Theobald, E. J., & Freeman, S. (2020). Reducing achievement gaps in undergraduate general chemistry could lift underrepresented students into a “hyperpersistent zone”. *Science Advances*, 6(24), eaaz5687.
- Hart, S. G. (2006). Nasa-Task Load Index (NASA-TLX); 20 Years Later. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 50(9), 904–908.
- Hayward, C., Schulz, K., & Fishman, B. (2021). Who Wins, Who Learns? Exploring Gameful Pedagogy as a Technique to Support Student Differences. *Proc. 11th International Learning Analytics and Knowledge Conference*, 559–564. New York, NY, USA: Association for Computing Machinery.
- Henderikx, M., Kreijns, K., & Kalz, M. (2018). A Classification of Barriers that Influence Intention Achievement in MOOCs. In V. Pammer-Schindler, M. Pérez-Sanagustín, H. Drachsler, R. Elferink, & M. Scheffel (Eds.), *Lifelong Technology-Enhanced Learning* (pp. 3–15). Cham: Springer International Publishing.
- Jung, Y., & Wise, A. F. (2020). How and How Well Do Students Reflect? Multi-Dimensional Automated Reflection Assessment in Health Professions Education. *Proceedings of the Tenth International Conference on Learning Analytics & Knowledge*, 595–604. New York, NY, USA: Association for Computing Machinery.
- Lambert, S. R. (2020). Do MOOCs contribute to student equity and social inclusion? A systematic review 2014–18. *Computers & Education*, 145, 103693.
- Lin, Y., Yu, R., & Dowell, N. (2020). LIWCs the Same, Not the Same: Gendered Linguistic Signals of Performance and Experience in Online STEM Courses. In I. I. Bittencourt, M. Cukurova, K. Muldner, R. Luckin, & E. Millán (Eds.), *Artificial Intelligence in Education* (pp. 333–345). Cham: Springer International Publishing.
- Mitrovic, A., Dimitrova, V., Lau, L., Weerasinghe, A., & Mathews, M. (2017). Supporting Constructive Video-Based Learning: Requirements Elicitation from Exploratory Studies. In E. André, R. Baker, X. Hu,

- Ma. M. T. Rodrigo, & B. du Boulay (Eds.), *Artificial Intelligence in Education* (pp. 224–237). Springer International Publishing.
- Mitrovic, A., Dimitrova, V., Weerasinghe, A., & Lau, L. (2016). Reflective Experiential Learning: Using Active Video Watching for Soft Skills Training. *Proceedings of the 24th International Conference on Computers in Education*, 192–201. Asia-Pacific Society for Computers in Education.
- Mitrovic, A., Gordon, M., Piotrkowicz, A., & Dimitrova, V. (2019). Investigating the Effect of Adding Nudges to Increase Engagement in Active Video Watching. In: S. Isotani et al. (Eds.) Proc. 20th Int. Conf. AIED 2019, LNAI 11625, pp. 320-332, Springer Nature Switzerland.
- Mohammadhassan, N., Mitrovic, A., Neshatian, K., Dunn, J. (2020) Automatic quality assessment of comments in active video watching using machine learning techniques. In: So, H.J. et al. (Eds.) Proceedings of the 28th International Conference on Computers in Education, pp. 1-10. Asia-Pacific Society for Computers in Education.
- Mohammadhassan, N., Mitrovic, A., Neshatian, K., & Dunn, J. (2021). Investigating the Effect of Nudges for Improving Comment Quality in Active Video Watching (under review).
- Murugesan, R., Nobes, A., & Wild, J. (2017). A MOOC approach for training researchers in developing countries. *Open Praxis*, 9(1), 45–57.
- Navarrete, R., & Luján-Mora, S. (2018). Bridging the accessibility gap in Open Educational Resources. *Universal Access in the Information Society*, 17(4), 755–774.
- Pennebaker, J., Boyd, R., Jordan, K., & Blackburn, K. (2015). *The Development and Psychometric Properties of LIWC2015*. Austin, TX: University of Texas at Austin.
- Pintrich, P. R., & de Groot, E. V. (1990). Motivational and Self-Regulated Learning Components of Classroom Academic Performance. *Journal of Educational Psychology*, 82, 33–40.
- Pitman, T., Roberts, L., Bennett, D., & Richardson, S. (2019). An Australian study of graduate outcomes for disadvantaged students. *Journal of Further and Higher Education*, 43(1), 45–57.
- Rodriguez, F., Lee, H. R., Rutherford, T., Fischer, C., Potma, E., & Warschauer, M. (2021). Using Clickstream Data Mining Techniques to Understand and Support First-Generation College Students in an Online Chemistry Course. *Proc. 11th International Learning Analytics and Knowledge Conference*, 313–322. New York, NY, USA: Association for Computing Machinery.
- Said, G. R. E. (2017). Understanding How Learners Use Massive Open Online Courses and Why They Drop Out: Thematic Analysis of an Interview Study in a Developing Country. *Journal of Educational Computing Research*, 55(5), 724–752.
- Sanchez-Gordon, S., & Luján-Mora, S. (2015). Accessible blended learning for non-native speakers using MOOCs. *International Conference on Interactive Collaborative and Blended Learning*, pp. 19–24.
- Sanchez-Gordon, S., & Luján-Mora, S. (2014). MOOCs Gone Wild. *Proceedings of the 8th International Technology Education and Development Conference.*, 1449–1458.
- Stone, C. (2017). *Opportunity through online learning: Improving student access, participation and success in higher education* (pp. 26–48). Perth: The National Centre for Student Equity in Higher Education (NCSEHE). Curtin University.
- Tausczik, Y. R., & Pennebaker, J. W. (2010). The Psychological Meaning of Words: LIWC and Computerized Text Analysis Methods. *Journal of Language and Social Psychology*, 29(1), 24–54.
- Zawacki-Richter, O., Bäcker, E.M., Vogt, S. (2009). Review of Distance Education Research (2000 to 2008): Analysis of Research Areas, Methods, and Authorship Patterns. *International Review of Research in Open and Distributed Learning*, 10(6), 21–50.