English language learning for engineering students: application of a visual-only video teaching strategy

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ABSTRACT: Community colleges in the USA are one of the best institutions for international students, English language learners (ELLs), non-traditional students, returning students, and those without a pass in standardised examinations to complete their two-year university coursework and an associate degree. However, the limited proficiency in English language skills has made it a hard topic for international and non-native English speakers, particularly engineering students. In this study, the application was investigated of a visual-only video teaching strategy (VOVTS) as a teaching and learning tool for English language teaching at a community college in California, USA. The results demonstrate that after the semester-long freshman English class for ELL engineering students, which incorporated the VOVTS, both the instructor and the students expressed significantly positive opinions for the teaching strategy that made use of a social media learning platform. These findings contribute to the knowledge on alternative teaching strategies through social media learning platforms for language learning classrooms for engineering students.

Keywords: Community college, engineering education, English language learner, English language teaching and learning, visual-only video teaching strategy

INTRODUCTION

Higher education institutions are places for adults to train to become intellectual individuals [1]. University graduates must engage themselves in purposes that provide them with a sense of achievement [2]. The United States attracts a large number of international and non-native English-speaking students to university education. In recent decades, more than one-third of American students at K-12 and tertiary levels have had additional needs in regard to language learning [3]. More than half of American classrooms will be filled with English as a second language (ESL) students or English language learners (ELLs). During the past decade, the immigrant population has become the largest minority population in the United States, representing almost one-third of the total population [4]. Within the K-12 school environment, native and heritage Spanish speakers' populations have increased to almost 20 percent of all students [5].

Appropriate schooling is one of the fundamental rights of people in the United States, in order to enable them to excel in terms of their own abilities. Therefore, a large number of schools and educational institutions offer various language assistance programmes for ELLs. Community colleges in the United States are one of the best institutions for international students, ELLs, non-traditional students, returning students, and students who have not taken the standardised examinations necessary to complete their two-year university coursework and an associate degree at the same rigorous education level [6].

California is one of the Pacific states with the highest number of students from all 50 states, territories and international locations. The current research gathered information from a community college in the northern California region, focusing on associate degrees in the field of engineering. At present, more than 30 different languages are present in the targeted community colleges. Although no public statistics have been released about the ethnic backgrounds of students, the international and ELLs populations are vital and significant at community colleges in California [7].

International students and ELLs experience difficulties interacting with native English-speaking students due to their language abilities, cultural understandings, lifestyles and communication skills [8]. This is particularly true for engineering students; although more than half of the coursework in this field concerns mathematics and science subjects, advanced English skills are still essential to understand and master the textbook knowledge necessary. English language learners and students with weak English skills are more likely to experience stress and burnout during their engineering education [9]. Although community college graduates usually continue their education at the university level after

completing an associate degree, their inability to communicate well in English has been considered one of the causes of negative learning experiences and unemployment in current society.

International and ELL graduates usually reach a competent English language level (i.e. an overall score of 6.0 in the international English language testing system (IELTS)) before graduation [10]. However, engineering graduates usually lack verbal communication and interpersonal skills at the industrial level, where professional exchanges are hardly conducted. In fact, Chinese and Spanish are the most spoken languages in the present decade. Despite this, most international, professional, industrial, and commercial exchanges and communication tend to be conducted in English. It is therefore essential for engineering graduates to master English and be able to use English to further their education and career development throughout their lives [11].

As of 2018, there were more than 20,000 enrolled students at the community college under study in this research, and more than one-third of the students were ELLs. Based on the present enrolment profiles of the community college, about 15 percent of enrolled students are studying on one of the engineering associate degree programmes. In other words, approximately 3,000 community college students are enrolled in engineering programmes. This study is a response to demands to assess the potential of social media and technology teaching strategies with scientific learning materials for engineering ELL community college students, in order to improve their English skills. In particular, there is a need to examine the potential of social media and technology teaching strategies with scientific learning materials to not only increase the overall language skills and language outcomes of students, but also to prove that they are potentially an effective way to increase the motivation and learning experience of engineering students at the community college level.

LITERATURE REVIEW

The academic subject of engineering was originally created in Western society, at tertiary-level institutions and laboratories [12]. Therefore, English is one of the leading languages in the field of engineering, even in terms of international and intercultural exchange and research. Therefore, engineering students need to acquire an advanced level of English in order to attend conferences, participate in advanced research projects and work at international laboratories [13]. Engineers without advanced English skills are limited to their own regional research laboratories, which could prevent them from advancing their skills and passing them on to the next generation [14].

Before the innovation of technological learning, ELLs usually learnt English at their educational institutions and within regional communities, which often prevented engineering students from acquiring a particular language [14]. The frequency of use of social media and technology teaching strategies in ELL courses has grown significantly in the present decade. Currently, a large number of Web sites, videos and textbook learning platforms exist in order to cater to ELLs who want to improve their English skills in a general direction. Although textbooks for English for academic purposes (EAP) and related on-line learning platforms are available, less than 30 percent of students log in to their accounts and complete the available exercises [15].

During the past decade, research has been carried out on the distance learning education of 97 students completing on-line courses with optional face-to-face social interactions on-line or via the Internet. Most of the students indicated that the social interactions with peers and instructors were one of the factors that increased their satisfaction and learning experience during the distance learning course [16]. Second language learning should not only be limited to the traditional classroom, but should also be incorporated into the learners' lives and social situations. For example, social media, YouTube, and social networking Web sites are some of the potential platforms that non-liberal arts and vocational students can use to absorb knowledge about second languages. In addition, on-line discussion forums and message boards may increase learners' interest in holding conversations in English outside the classroom environment [17].

Both teachers and students, particularly non-traditional age students, might encounter difficulties in technological and social media techniques in second language teaching and learning. The study also pointed out that some teachers were often concerned about providing proper teaching strategies and materials to learners with various backgrounds and learning styles. However, it has been determined that using technology as a teaching tool is essential for second language learners in regard to maintaining their motivation and interest outside of the classroom [18].

Although technology in second language learning is useful in regard to increasing the motivation and interest of students, language teachers should continue to pay attention to grammatical structure, verbal language and written comprehension as students need to be guided with appropriate instructions in these areas. This is particularly true for science students, who may have less interest in learning liberal arts and language subjects [19]. These learners, without appropriate instruction, may fall prey to long-term linguistic and grammatical confusion, errors and problems due to bilingual and cultural conflicts [20].

METHODOLOGY

Visual-only Video Teaching Strategy

As the aim of this study, the use of social media and technology is one of the innovative teaching strategies employed in contemporary English language learning classrooms [21]. The current study employed the visual-only video teaching strategy (VOVTS) to evaluate the ways in which visual-only videos on social media discussion forums increase the

interest and motivation of engineering students with regard to learning at the chosen community college in the northern California region of the United States [22].

Unlike traditional English language learning classrooms, which incorporate both general and broad directions and materials (i.e. general training materials), the teaching and learning materials for this pilot study employed tailor-made materials that matched the professional needs of engineering students. In other words, the teaching materials mainly focused on comprehensive skills oriented around science and engineering.

The instructor captured appropriate pictures from laboratory experiments, field work, textbooks and the natural environment to create visual-only videos [23]. The captured pictures relate to each individual chapter. Instructors may capture pictures that are related to each chapter, topic, discussion and case study for a particular weekly class. Each video should be kept under four minutes in length. Each individual video should only contain one set of targeted knowledge (e.g. present tense) with one engineering fact (e.g. *Biomedical engineering is about biology, health science and engineering*). Depending on the level of the course, instructors may increase the level of English in order to match the learning outcomes and expectations.

Besides the knowledge background, the instructors should also be aware that obvious topic sentences should be outlined at the beginning of the videos. The videos should have an eye-catching picture and present a topic sentence within the first 10 seconds. The videos should have the same word size, font and style throughout the series, within the course duration, unless particular knowledge or a specific message must be more obviously delivered. It is worth noting that all of the visual-only videos should be posted on the social media learning platform before the course starts. As each individual has different learning styles and patterns, some learners may find it beneficial to be fully prepared before each lesson starts.

Social Media Learning Platform instead of the On-line Learning Platform

One of the features of this study is the use of a social media platform instead of the traditional on-line learning platform (e.g. Moodle). Only a very few university students log in to their on-line learning platform account on a daily basis [24].

A large number of studies indicate that youths, university students and professionals spend at least 10 hours on social media platforms, watching videos and networking. Based on this fact, placing interesting and eye-catching learning materials on the social media platform used for the course is one of the potential ways to encourage students to learn the textbook knowledge outside of traditional ways of doing so (e.g. classroom, textbook learning platform) [25]. In order to attract students, particularly engineering students who have interests in technology-enhanced learning styles, a social media learning platform is essential. To increase the effectiveness of VOVTS with the social media learning platform, five weekly steps are recommended, as follows.

- All of the enrolled students must create a social media account and join a social learning group for the English language learning course.
- The instructor should have posted all the visual-only videos on the social media learning group under the weekly learning file. Each student is free to access, watch and comment on each video.
- Students are required to post at least two comments on each video and respond to each of their peers at least once.
- Instructors and students are encouraged to post comments and feedback.
- Instructors may show the visual-only videos during face-to-face social interactions on-line or via Internet meetings, to encourage further discussion.

Research Background of Students and Site

The study worked with three traditional on-campus freshman English comprehensive skills courses exclusively for engineering associate degree students at a community college in the northern California region of the United States.

The researcher invited the course instructor to employ the VOVTS in the curriculum and instruction during the semester. In total, 18 visual-only videos for 12 chapters and six case studies were used. Although the targeted English comprehensive skills courses are designed for engineering students, these three courses only enrolled ELL students who are non-native speakers of English, a total of 79 students (N = 79). As a weekly requirement, each student was required to watch and comment on the visual-only video on the social media learning platform. Furthermore, each student needed to comment on at least three other peers' feedback, to encourage discussion. In addition to the VOVTS, students also needed to attend the weekly three-hour on-campus lesson (i.e. three semester credit hours), a mid-term examination, and a final examination and participate in various projects (i.e. normal physical requirements).

Data Collection and Analysis

A summative assessment is one of the most common ways to evaluate students' performance. However, for this English course, the instructor decided to employ formative and portfolio assessments, which may make it more difficult to evaluate the quantitative results. Therefore, the researcher decided to conduct a qualitative research method with interview and focus group tools and invite both the instructor and all 79 students to participate.

The opinions of the instructor and students formed the key information in this study [26]. At the beginning of the semester, the researcher invited both the instructor and the students to participate in the individual interviews and focus groups by the end of the semester. The two steps below were applied:

- The researcher invited the instructor to a one-on-one semi-structured interview, which lasted 36 minutes.
- The researcher created six sections of focus group activities, with 13-14 students in each group. All participants (i.e. the instructor and the students) agreed to participate in the qualitative research data collection groups, which lasted around 40-50 minutes each. After the interviews, the researcher narrowed down the interview and focus group transcripts through open-coding and axial coding procedures, to produce meaningful themes. As a result, five themes were identified.

RESULTS AND DISCUSSIONS

After the semester-long freshman English class for ELL engineering students, which incorporated the VOVTS, both the instructor and the students expressed significantly positive opinions for the teaching strategy that made use of a social media learning platform. The following section will outline the findings and results based on the data collected from the participants. The first two themes are the instructor's opinions; the last two themes are the students'.

From the Instructor's Perspective

Applicable to the Real Society

One of the formative assessments that can help to build up a student's portfolio involves gathering together all the comments and feedback from the social media learning platform [27]. Although traditional learning platforms provide systematic grading charts, comment forums, and feedback features, the comments and discussions from the social learning platform served as one of the most important factors used to evaluate students' linguistic skills outside the classroom setting [25]. The instructor stated that this English for specific purposes (ESP) course for engineering students aimed …*to improve the four skills and evaluate students' language abilities outside of the classroom, as well as show them how to use the language properly in society.*

Individual students were allowed to post comments and vocabulary from their lessons to …*the platform, to communicate with people outside of the classroom, so the learning platform allows them to chat with others.* The instructor further stated that the point of language is to communicate and chat with other people in society, not only in the classroom and school environment. The VOVTS offers the …*visual learning tools for visual learners who can view and review the knowledge during their leisure time.*

Motivated due to the Familiar Social Environment and Pictures from their Community

Most of the students participating in these English courses are international students and immigrants. The surrounding communities become their most familiar social environment during their first few years at the community college. Although the textbook features a large number of international landmarks that may reflect the home communities of students, the instructor found that most of the students enjoyed learning about the local communities in which they are at present living. The instructor suggested that the …*local art museum does not only reflect contemporary fine art; the structure of the gate and the building, the pool with different fish, the insects on the ground also reflect different engineering knowledge in the English language.* Therefore, to increase the motivation of those learning English, instructors should employ real-world examples and the real social environment, involving students' living communities, instead of textbook knowledge.

From the Students' Perspectives

Flexibility and Non-pressured Learning Styles

All 79 students involved in the VOVTS teaching strategy gave positive feedback regarding their lessons. For those who had some experience of textbook-based English language learning courses, the VOVTS provided …*alternative learning methods which can be incorporated into the daily activities of learners* (student #65). Some students also expressed similar ideas in regard to the flexibility of the VOVTS; the course allowed them to access the learning platform at any time. Student #34 said, *My cell phone is always connected to social media apps, so I can access the learning platform on the social media apps, no pressure.* It is shown that the VOVTS provided an alternative learning platform and opportunities for contemporary students to access the knowledge stage.

Students can access the material from their cell phones without additional accounts, which is another successful advantage of the VOVTS. Many of their responses mentioned the convenience of this, as well as the *no-pressure* learning styles involved. For example, student #43 said, …*On traditional platforms, I have to post at least 100 words, read the textbook with black and white pictures, and watch old videos. The VOVTS is like a chatroom. We share what we have learned from the classroom and even daily practices. We share without borders.* Sharing what they had learned

from the classroom and daily life without specific requirements was one of the most discussed topics during the focus group activities. Student #12 said:

> I learned some slang and new vocabulary from my part-time workplace. I don't think I could share this on a traditional platform but, on this social media platform, I can share what I want to say with my classmates and teachers. It is a learning method without pressure.

In short, contemporary students believe convenience is one of the priorities for tertiary education. Unlike the traditional learning styles with textbooks and face-to-face instructions, students tend to employ the learning opportunities in their daily practice. Therefore, the VOVTS satisfied the needs and desires of students, particularly for engineering students, who like to employ Internet-based learning platform [28].

Materials Match their Majors and Expectations

In regard to understanding the teaching materials and videos in the VOVTS, the predominant strategy used was to help students to learn the English language associated with their subject matters, majors and expectations. Two sub-groups and themes were identified. First, for example, in the *Unit 5 Present Tense* exercise, the instructor created videos about the relationship between animals and biology. More than 70 students indicated that the VOVTS and the related videos on the social media learning platform connected with the specific purposes of engineering and science ELL students.

For example, student #2 described the VOVTS and the videos as being *...the keys to applying English grammar and written skills for engineering and science major students*. In another focus group activity, all 13 students echoed how the VOVTS connected with their engineering major and scientific knowledge. For example, student #45 said, *...the visual-only videos from our lessons are connected to our major and other engineering courses at the college*. Student #46 further said:

> Other ESL videos with voiceovers are not connected to our major and pre-made videos from textbooks and online tend to be general. They're not specifically for engineering or our major. These tailor-made videos are interesting and help us to learn engineering and science knowledge at all levels.

Besides the way in which the VOVTS and its related videos connect to the majors of and relevant knowledge for engineering ELL students, another majority group of students described how the VOVTS met the expectations of their needs as engineering students. The first of two points can be made: one significant finding regarding the VOVTS concerns the language acquisition expectations of currently enrolled engineering students.

More than 70 students indicated that, after the completion of their associate degree, they intended to enrol directly in a Bachelor's degree programme in engineering. To achieve this goal and gain the grades necessary for their associate degree, a solid foundation in engineering and science English language is essential, as student #38 indicated: *The VOVTS and its videos helped me to gain a strong foundation in engineering English, with applied knowledge for my academic goals.*

More than half of the students stated that the admissions interview for a Bachelor's degree in engineering requires strong English-speaking skills related to engineering. Without the ESP training in English related to engineering, they are less likely to be admitted into a Bachelor's degree programme in engineering at the university level, as student #67 indicated:

> The VOVTS and its video training are solid. I can learn vocabulary related to engineering and applied sciences daily via social media platforms. The visual-only videos assisted me in learning and applying engineering English in regard to my academic goals.

It is shown that the tailored-made visual-only not only assists students to gain particular knowledge, but also enhances their social and professional skills.

Second: another significant piece of feedback regarding the VOVTS was the English language training and preparation for potential employment after university graduation. A total of 68 students indicated that appropriate English language training in the field of engineering allowed them to seek employment in the Bay Area after graduation (i.e. at both associate and Bachelor levels). Student #33 said, *Engineering English is absolutely needed for engineering graduates.* Student #21 shared a similar idea: *General English is good, but without knowledge of engineering English, I cannot communicate with other co-workers.*

It is worth noting that more than half of the students stated that the VOVTS, with its use of tailormade visual-only videos related to engineering, increased their self-efficacy and self-confidence in regard to seeking internships and postgraduate career pathways that required a strong grasp of engineering-related English. This idea is echoed by the researcher, who opined that science and engineering students tend to apply to liberal arts courses based on the demands of the relevant professions, instead of their personal interests [20]. For example, student #9 said, *I think the engineering English specifically allowed me to seek a better career. It met my expectations.*

Critical thinking, self-directed learning and time management are significant factors for college-level students in regard to gaining an associate degree [29]. Although more than four-fifths of the students were traditional-aged students, several of the students were non-traditional students with different responsibilities. Therefore, logging into the school-based learning platform and making use of the afterschool discussion tutorial may not be suitable for such students. The VOVTS, with its related videos, allowed students to learn the English language through a self-directed learning style. Student #33 shared his ideas about the benefits of this, saying, *I can access the learning platform and the pages 24/7 without any problems*. Student #73, who is a parent of two children, also suggested that the self-directed learning style of the platform increased his interest in learning: *I cannot attend tutorials on campus, but I can learn the same knowledge on my cell phone without physically reading the textbook and attending the tutorial*.

LIMITATIONS AND IMPLEMENTATIONS FOR ENGINEERING ENGLISH

This study provided researchers with an impression of English language learning for engineering ELL students at the first-year level of a community college in the United States. However, there are significant limitations that should be discussed. Four points are expressed below:

- The sample size was small and limited to one community college in the United States. With a larger student population and a more diverse background among the participants, the study would have gained a wider perspective of how the VOVTS and its related videos can be beneficial to engineering students with different demands and desires [30].
- The course participants and student population tended to be ELL students with an upper-intermediate or advanced-level understanding of the English language. However, the VOVTS may be applicable to English courses for any non-native English language speakers who are enrolled in the engineering programme. In fact, drawing a comparison between ELL and native speaker students in regard to the VOVTS teaching strategies used in engineering English courses would also allow the researchers to gain a better understanding of the learning outcomes and results.
- This study gathered feedback on the VOVTS from both perspectives of instructor and student. However, no grading, academic improvements or increases in language proficiency were captured. Further research is needed to explore how the programme may impact the grades and language proficiency of learners after the completion of the VOVTS. For the purpose of English language courses for engineering students, the increase in language proficiency is a significant reason for students completing the course. Therefore, demonstrating improvements in language proficiency may also be interesting for other English language teachers.
- A mixed-method approach incorporating survey and questionnaire data and interviews from both instructors and students with ELL engineering backgrounds would broaden the direction of this research and allow for an evaluation of the hypotheses [26].

CONCLUSIONS

The completion of this study provides three academic areas that can be recommended to readers and learners in the field of English language learning for engineering students. First, communication in the English language is vital in the field of engineering, as English is an international language of exchange in the field [11]. However, learning the language and liberal arts subjects are not the learning priority of engineering students. To increase the interest of engineering students in learning English, the VOVTS may implement ESP, applied sciences and engineering knowledge into semester-long English courses, with a social media learning style. The findings of this study indicate that the VOVTS has successfully increased the interest in learning English and met the expectations of the students involved [22].

Second, the pilot study employed the VOVTS application. This in-practice paper successfully employed the application and gathered the users' understanding and perspectives of it [22]. The findings suggest that students can access the social media learning platform from their cell phones without additional login procedures. Students therefore were likely to access, comment on, and learn the English language in regard to engineering knowledge disseminated through visual-only videos. Therefore, this study provides a teaching strategy for English language instructors in various subjects and fields with regard to implementing ESP elements in English language courses [28][29].

Third, students can benefit from having a collection of applied science and engineering learning videos and tools that reflects their academic major for their degree programme [29]. When students completed the English language courses, they may thereby apply and transfer the English language skills they have acquired to other courses and career pathways outside the classroom environment.

The findings also indicate that few students believed the knowledge from their English textbook could be applied to their academic study. However, the VOVTS applied textbook knowledge to real-world social practice within the living communities of the students. For example, the visual-only videos described the structures and buildings of students' local communities, which increased both their English and engineering knowledge on a daily basis. The VOVTS enabled students to understand textbook and classroom knowledge not just on a textbook level, but also on a practical and social level.

Finally, the VOVTS has been demonstrated to be a successful teaching strategy for English language instructors to use in the field of engineering study. It is worth noting that engineering students usually do not have an interest in learning languages and liberal arts subjects. However, if an appropriate teaching strategy (i.e. the VOVTS) is employed, students may achieve positive learning outcomes [22].

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BIOGRAPHY

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