Student perceptions of an engineering course co-taught by an English Instructor at an EMI university in the UAE

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The way engineering students perceive an engineering course that is co-taught between an English instructor and two engineering faculty at an English medium instruction (EMI) university has not been studied. In order to better understand how students perceive such a course, a survey consisting of 12 items with a 5-point Likert-scale and two open-ended questions was distributed to 45 Emirati male and female sophomore engineering students at a UAE university. Ten semi-structured interviews were also conducted. Three themes were identified from the interviews: writing and research skills, language and communication support, and distribution of responsibility. Results also indicate that most students found that having an English instructor co-teach their course was beneficial and made a meaningful impact on their learning and language development. Implications for practice and suggestions for future research are discussed, along with the role instructors from different disciplines can play in developing an effective co-teaching course.

Introduction

While it is relatively rare for an engineering course to be co-taught at the university level, it is even rarer for an engineering course to be co-taught with a non-engineering instructor. Interestingly, the way students perceive co-taught engineering courses, particularly by non-engineering instructors, has not been widely examined. The perceptions of students are often missing (Bacharach, Heck & Dahlberg, 2008) in the analysis of co-teaching at the university level, as these studies tend to focus on instructors and their perceptions and experiences (Anderson & Speck, 1998; Evans, Tindale, Cable & Hamil, 2009; Fennick & Liddy, 2001; Higgins & Litzenberg, 2015; Livy, Yanni, Downton & Muir, 2019; Lester & Evans, 2009; White, Henley & Brabston, 1998). Although some studies have explored how students perceive co-teaching by instructors in the same discipline (Burks-Keeley & Brown, 2014; Dugan & Letterman, 2008), studies that examine how students perceive co-teaching by instructors in different fields, such as English and engineering, are notably absent in the literature.

In this paper, I examine how students perceive a co-taught course designed specifically to benefit English language learners studying engineering. It is the second of two courses all engineering students at my university are required to take. This particular course, *Strategies for Team-based Engineering Problem Solving II* (STEPS II), was taught by a petroleum engineering instructor, a petroleum-geoscience engineering instructor, and me, an English instructor. In reporting on how students perceive such a course, I also suggest ways to make co-teaching an engineering course with non-engineer instructors more effective.

Understanding how students at an English medium instruction (EMI) institution perceive an engineering course that is co-taught between an English instructor and two engineering

faculty is worth considering given the language demands placed on English language learners studying engineering through EMI. According to Ayish (2020), who conducted research on a similar group of students at the same university, EMI can pose particular challenges to English language learners, interfere with their ability to make sense of content, and lead to poor performance and unnecessary frustration. Exploring how English language learners perceive a course like STEPS II that was designed to help them overcome the linguistic challenges inherent in engineering studies can therefore offer meaningful insight and guidance into course design and delivery problems that have received little attention in the research literature.

Literature review

Co-teaching in higher education

Although co-teaching is a relatively common pedagogical practice in K-12 education (Heggen, Raaen & Thorsen, 2018; Loeser, 2019, Murata, 2002; Tsybulsky, 2019), it is much less common at the university level (Ferguson & Wilson, 2011; Kunnari, Ilomäki & Toom, 2018; Lusk, Sayman, Solkoski, Carrero & Chui, 2016; Morelock, Lester, Klopfer, Jardon, Mullins, Nicholas & Alfaydi, 2017). This is due, in part, to the nature and structure of university courses and teaching where instructors tend to plan and deliver their lessons solo and based on their area of specialisation and interest (Buckley 2000; Dyrud, 2010; Perry & Stewart, 2005). However, many of the principles that inform K-12 co-teaching are also applicable to many university courses. This is the case with STEPS II, which was designed to include an English instructor in order to ensure that English language learners studying engineering at this EMI institution receive the language support necessary to succeed.

Most research on co-teaching at the university level is limited to either the pre-college (e.g., Rabin, 2020), graduate level (e.g., Sanchez et al., 2019), or how instructors perceive co-teaching. Few studies consider student perspectives (e.g. Harter & Jacobi, 2018). In particular, I was not able to find any research that examined how students perceive an engineering course that is co-taught between an English instructor and engineering faculty. The closest I could find was a study by Keating & Long (2012) that examined the collaborative teaching process between communication and engineering instructors who teamed up to deliver a capstone project known as the *Technical Thesis*. While students and faculty were surveyed, only instructors were interviewed. Results suggested that students and instructors found the paired teaching between communication and engineering faculty to be positive.

There are a number of co-teaching models practised in higher education and even more definitions of what constitutes co-teaching (Baeten & Simons, 2014; Dugan & Letterman, 2008; Minett-Smith & Davis, 2020; Thousand, Villa & Nevin, 2006; Wenger & Hornyak, 1999). Irrespective of the language used to describe co-teaching, however, many see it as an effective tool used by two or more teachers to increase student learning. While I regard the terms "co-teaching" and "team-teaching" as equivalent, I prefer the term “co-

teaching" because it suggests that my role as the English instructor was equal to that of the engineering instructors.

For the purpose of this research, therefore, co-teaching is defined as two or more instructors of equal status sharing the responsibility for planning, instructing, and assessing one group of students at the same time (Anderson & Speck, 1998).

Co-teaching offers the potential for a number of benefits. In particular, it can "provide a means of focusing more on the process of learning instead of only on accumulating content knowledge" (Shibley 2006, 271). This can lead to deeper and more meaningful learning as well as increased student engagement. In addition, as a number of researchers have noted (Sweigart & Landrum, 2015; Vesikivi, Lakkala, Holvikivi & Muukkonen, 2019; Aliakbari & Nejad, 2013), co-teaching can also support the various learning styles found in the classroom and contribute to a more inclusive learning environment.

English language learners studying engineering

The exceptionally high dropout rate of engineering students globally is a concern for many. While dropout rates for engineering students in the UAE are not readily available, anecdotal evidence suggests that, like in other parts of the world, retention is a major concern. In the United States, for example, nearly 50% of all engineering students drop out (Miller & Euchner, 2014; Simon, Aulls, Dedic, Hubbard & Hall, 2015). The reasons are numerous and complex, but inadequate preparation and challenging content are two key factors identified in some research studies (Alzen, Langdon & Otero, 2018; Burgos, Campanario, Pena, Lara, Lizcano & Martinez, 2018; Meyer & Marx, 2014). Unfortunately, English language learners face additional challenges when studying engineering. As Wyatt, Midraj, Ayish, Bradley & Balfaqeeh (2021) found with a similar group of students at the same university where the present study took place, processing science and math texts in English can be particularly challenging for second language learners because of the linguistic gymnastics they often must perform. Issues, for example, stemming from a student's prior education, the kinds of teaching material and methods used, and inadequate language support can complicate the ability of English language learners to successfully study engineering (Unruh & Obeidat, 2015; Yasmin & Naseem, 2019). Understanding the context in which students in the present study find themselves is helpful in order to fully appreciate how they perceive co-teaching between an English instructor and engineering instructors.

Context of the study

I conducted this study at an engineering university in the United Arab Emirates which offers undergraduate and graduate degrees in a variety of engineering fields. The mission of the university is to provide the oil, gas and energy sectors in the UAE with talented and knowledgeable engineers capable of contributing to the country's economic and social development. To help achieve this mission, the university recruits nearly 500 students a year. At the time of this study (May-June, 2020), it had approximately 1,960 undergraduate and graduate students evenly split between males and females on segregated campuses

(the university has since merged with two other universities and is now co-ed.). All students are on full scholarships and are taught by the same instructors. The vast majority of students, Emirati nationals, also receive a monthly stipend if they maintain good academic standing.

The university has nine bachelor degrees accredited by the ABET Engineering Accreditation Commission. These include aerospace engineering, biomedical engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, industrial and systems engineering, mechanical engineering, and petroleum engineering. ABET accredited programs are required to prepare graduates to meet certain educational objectives, including the ability to communicate effectively and function on multidisciplinary teams (ABET, 2021). Students, therefore, are expected to develop the requisite skills necessary to research, write, present, and work effectively on teams in a variety of settings and in a variety of roles.

Course design and goals

Approximately six years ago, a number of instructors in the English and engineering departments began to meet formally, with the support of various department Chairs, after what had started out as informal conversations about the challenges students encounter as they transitioned from freshman introductory courses to more demanding major courses beginning in year two. It was recognised early on that many of these second-language learners needed additional language support in order to successfully engage with complex written and graphical engineering material. In order to try and address some of the issues identified through these discussions, it was decided that instructors from the English, petroleum, and geosciences departments would collaborate in order to create two new courses that all students, irrespective of major, would take beginning in their sophomore year. (These two engineering departments were chosen because students were already required to take two courses offered by them.) The intent behind this effort was to create best practices that could be applied to other courses across majors.

STEPS II, which is the second of two courses, grew out of these meetings. It introduces students to an authentic engineering problem involving complex environmental issues. Important elements of the course include intercultural communication, oral and written professional technical communication, project management, and discipline specific computer applications.

Students are randomly assigned to teams consisting of 3-4 male or female members (due to the segregated nature of the university). Problems are also randomly assigned. In addition, given that the university is an EMI institution, all activities, from planning to presenting, are conducted in English. While the use of specific information and communications technologies (ICTs) to support teamwork are not required in the course, students have access to a range of ICTs in order to enhance their teaming experience. Most teams, for example, created *WhatsApp* groups and used *Google Docs* to collaborate outside of class.

The course is structured in such a way as to allow each instructor the opportunity to focus on his or her area of expertise during specific class sessions. For instance, I met alone with students twice to focus on their research and preparation for their team presentations. During these classes, I worked closely with teams to ensure that they were making appropriate progress in their written report and offered specific feedback on how best to present their findings. My colleagues also met several times alone with students. However, all three of us were present for 10 of the 16 class sessions. During these sessions, each instructor contributed to different aspects of the class by building on what the others said or did. For example, after the petroleum engineering instructor introduced new technical information, I then explained how that information could be incorporated into student writing.

In terms of formative and summative assessment, my colleagues and I evaluated students according to our areas of expertise (e.g., the engineering instructors focused on the content of a particular task while I focused on the writing). We then met to agree on a final grade for each student. There is a mix of individual and team assessments. A petroleum geology/ seismic test worth 15% is given in week 7, while a petroleum economics quiz worth 15% is given in week 13. Both of these assessments are individually graded. A seismic draft (which includes the introduction and background sections) is due in week 5. Although this draft is not graded, it serves to inform a team-based seismic report worth 15% due in week 8. The final team-based presentation worth 25% is due in week 15. The presentation grade consists of 15% for team effort, 5% for individual presentation and communication skills, and 5% for each team member's ability to appropriately respond orally to technical questions. The team-based written report worth 20% is due in week 16. Finally, attendance counts for 5% and teamwork and class participation counts for 5% of the overall grade.

Collaboration with an English Instructor

Rather than serve in an ancillary role, my responsibilities as the English instructor, along with those of the other two professors, were integrated throughout the semester. This is important to note, because establishing equal status with my colleagues was essential in order to ensure that students did not perceive my role as ancillary to or simply supportive of the engineering faculty. Others have also found that establishing equal status among instructors positively impacts how students perceive co-teaching (Buckley, 2000; Loeser, 2019; Morelock, et al., 2017; Vesikivi, et al., 2019).

Rationale

Given the lack of research into how students perceive an engineering course that is co-taught between an English instructor and engineering faculty, the gap in the literature is one that deserves to be filled. This study, therefore, sought to investigate the following two questions:

1. How do students perceive a co-taught engineering course?
2. Do students feel that having an English instructor co-teach the course with discipline content specialists enhanced their learning and development of key academic literacy skills?

Exploring how students perceive an engineering course such as STEPS II should help educators better understand the potential benefits of bringing together an English instructor and discipline content specialists in order to more effectively meet the needs of language learners.

Methodology

Human subjects review

I obtained ethical approval by my university's institutional review board (IRB Protocol No. H19-030) and informed consent was granted by all subjects via a research consent form.

Data sources and collection

A mixed methods approach using two instruments was used to collect quantitative and qualitative data. Students first completed a survey that contained 12 items and two open-ended questions at the end of the semester (Appendix A). Items were rated according to the following 5-point Likert scale from strongly disagree = 1 to strongly agree = 5. Descriptive statistics were used to analyse the data from the survey, which was divided into 3 sections that focused on:

1. Student perceptions of having more than one instructor teach STEPS II (e.g., "I like the idea of having more than one instructor for my STEPS II course");
2. Student perceptions of STEPS II being co-taught with an English instructor (e.g., "I can see the value of having an English instructor co-teach STEPS II.");
3. Student perceptions of having an instructor that focuses on writing and presentation skills in STEPS II (e.g., "Having an instructor that focuses on writing and presentation skills in STEPS II is very beneficial").

The open-ended questions offered additional insight into student thinking. The two questions were: "Are there any benefits to having an English instructor co-teach with engineering faculty? Please explain" and "Do you think it is a good idea to have STEPS II co-taught with an English instructor? Please explain."

Ten semi-structured interviews were also conducted. A range of questions were asked, from "Please describe your experience in this course" to "What was it like having an English instructor co-teach STEPS II with engineering faculty?" (Appendix B).

Thematic analysis was used to identify the themes that emerged from the interviews (Srivastava & Hopwood, 2009). Reading and rereading the interviews "to obtain a sense of

the whole" (Bengtsson, 2016, p. 11) allowed me to identify keywords, phrases, and, eventually, the following three common themes: writing and research skills, language and communication support, and distribution of responsibility.

Participants

All 45 sophomore engineering students enrolled in STEPS II participated in the study. Thirty (67%) were female, while 15 (33%) were male. All of the students were United Arab Emirates nationals. Twenty-five (83%) female students were petroleum engineering majors and five (16%) were petroleum-geoscience engineering majors. Eleven (73%) male students were petroleum engineering majors, while four (27%) were petroleum-geoscience engineering majors. Their ages ranged between 19 and 24, with a mean age of 20.3.

Results

Survey results, including responses to open-ended questions, are presented below. This is followed by the three themes identified from the semi-structured interviews.

The survey was structured into three categories. The first set of questions tried to understand how students perceive having more than one instructor for STEPS II. As was noted above, STEPS II was taught by an English instructor and two engineering instructors. Most students (66%) liked the idea of having more than one instructor for STEPS II, while only 12% disagreed and 22% were neutral. A slight majority (52%) preferred to have more than one instructor; almost a quarter (23%) had no preference, while 25%, if given a choice, would choose to have just one instructor. Interestingly, the great majority of students (79%) found that there are advantages to having more than one instructor teach STEPS II. Eighteen percent were neutral, while only 3% felt that there are no advantages.

The second set of questions sought to identify how students perceive STEPS II being co-taught with an English instructor. Students were about evenly divided between those who wish all of their courses could be co-taught (32%), those who do not like the idea (36%), and those who are neutral (32%). Most students (70%) also see value in having an English instructor co-teach STEPS II, while only 8% disagree. Almost a quarter of participants (22%) are neutral. A majority of students (59%) indicated that they feel that they are getting two courses in one because STEPS II is co-taught with an English instructor. Eighteen percent indicated that they do not feel this way, while 23% are neutral on the idea. On the other hand, most students (61%) disagree that STEPS II is harder because it is co-taught with an English instructor. Nineteen percent feel that it is harder, while 20% report being neutral. Worth noting is that almost two-thirds of the participants (65%) feel that they are able to learn more because STEPS II is co-taught with an English instructor. Only 10% disagree, while a quarter (25%) are neutral.

The third set of questions explored the benefits of having an instructor focus on writing and research. The vast majority of students (88%) indicated that having an instructor who focuses on writing and research skills in STEPS II is very helpful. Only 3% disagree, while

9% are neutral. Two-thirds of students (66%) also reported that they feel they are better writers and researchers because the course was co-taught with an English instructor. Only 2% disagree, while slightly less than a third (32%) are neutral. A majority of students (69%) report feeling that their writing and language development are supported more in STEPS II because it is co-taught with an English instructor. In particular, (72%) said that their presentation skills improved because they pay more attention to them since there is an English instructor co-teaching. Only 4% felt otherwise, while 24% reported feeling neutral.

Semi-structured student interviews

Three themes emerged from the semi-structured interviews: writing and research skills, language and communication support, and distribution of responsibility. While these themes necessarily share some elements, they each highlight certain aspects of co-teaching that students perceive as noteworthy. Several subthemes were also identified, including: access to an English instructor, being more professional, equal distribution of work, covering all bases, and only two co-teachers needed.

Writing and research skills

Participants identified a focus on writing and research as an important benefit of co-teaching. Students found that having an English instructor co-teach the course elevated the role writing and research played in the course. The first subtheme focused on the benefits and improved skills students identified because more attention was paid to writing and research. The second subtheme highlighted how receiving timely and specific feedback from the English instructor helped improve student writing and research skills.

Access to an English instructor

An essential aspect of the course requires students to research a real-world engineering problem and then write-up a report that details how to solve it. Students noted that in-class support in the form of timely feedback from the English instructor was very helpful and made a meaningful difference in the quality of their writing, presenting, and teamwork.

Indeed, most students noted that their writing and research skills improved during the semester because an English instructor was present and readily available throughout most class sessions. Student 1 said that "It helps, especially when the report requires good writing skills which can be taught and checked by an English instructor who is a professional." This sentiment was echoed by Student 2 who said, "It gives insight from an experienced individual," something that other students noted was important when dealing with complex data and research that would eventually be translated into a team presentation.

According to Student 3, because "reports and presentations are included in the course, an English instructor helps students in a favorable manner" make sense of how best to write. The notion that having an English instructor co-teach STEPS II can help students

develop their writing and presentation skills is noted by several students, including Student 4 who captured the sentiment best: "Having an English instructor helps us improve our writing skills and presentation skills" because students receive timely feedback and support.

Being more professional

Almost all students indicated that they are aware of the need to develop their skills in writing, research, and presenting in order to be more professional. This suggests that they recognise the benefits of STEPS II being co-taught with an English instructor and the role an English instructor can play in their skill development.

Student 5, for example, said that "It's good because it makes us focus on the quality of our writing and be more professional." This is something that many students also identified as important. Indeed, Student 6 said, "It gives us a chance to develop our report to make it look professional enough to present in our jobs in the future." As Student 7 noted, it can only help "to know more about presenting and to be more professional in writing." STEPS II highlights the skills professional engineers need to be successful, so it makes sense that students would connect the importance of improved writing and presenting to their careers. According to Student 8, "Because we need to write reports and create presentations, our English instructor has been very helpful as he gave us a lot of tips to improve our reports, etc." This sentiment was echoed by Student 9 who said, "An English instructor can improve the quality of the report and presentation as well as help the students to improve working together." Teaming is an important component of the course and engineering studies generally and students recognised the need and benefit of having an instructor pay close attention to how the teaming process unfolded throughout the semester. Student 10 explained that "We had issues as a team a few times, but things improved after the English instructor helped us overcome our disagreements. I think we became more productive."

Language and communication support

The majority of students reported that their language and communication skills improved because the course was co-taught by an English instructor. The benefits of having an English instructor in an engineering classroom are many and immediate and suggest that students recognise the importance of developing these soft skills in order to be successful academically and professionally.

For example, several students indicated that having an English instructor co-teach STEPS II supports their language and communication development. As Student 5 stated, "With an English instructor, our writing and communication skills can be improved." This sentiment is echoed by Student 9 who said, "There is someone who can check our communication and spelling mistakes and that can help us to write better and improve our written reports." Student 8 also said that "communication skills are important for writing reports and presenting to each other and team work." This notion that teamwork is important is echoed by Student 3 who asserted that "because this course requires group work, we have to have an English instructor help us learn how to communicate with

group members." Student 4 also felt that she "learned more things and improved her communication skills" because an English instructor co-taught the course.

Distribution of responsibility

Students noted that co-teaching allows instructors to focus on their particular areas of strength, something that helps make co-teaching more effective than having just one instructor in the classroom.

Equal distribution of work
Students recognise the contributions of each instructor as relatively unique based on their area of specialisation and that the distribution of teaching responsibilities is perceived as beneficial. It is likely that establishing equal status early on within a co-teaching model is one way of enhancing these benefits.

According to Student 1, "I think it is a good idea to have more than one instructor because having an English instructor" working closely with engineering faculty "helps me pay more attention to writing, which isn't easy." As Student 2 notes, "The engineering instructors help us to understand the technical process and the English instructor helps us with our writing and presentations." Distributing the teaching responsibility in this way is beneficial "because it's good to have an instructor focus on the technical part while the other instructor focuses on the writing part" (Student 6). This notion is supported by Student 7 who said an "equal distribution of work" also helps students because instructors are more readily available during class to offer support and answer questions that might otherwise need to wait until after class or office hours which are not always convenient for students with often very busy schedules.

Covering all the bases
Students seemed to recognise that it is important to develop a range of skills in a course in order to ensure that they are fully prepared to succeed academically and professionally. However, they understand that an instructor teaching alone is not necessarily able to provide the kind of support that all students need for success.

An important benefit of an English instructor co-teaching STEPS II is noted by Student 10, who said that if "an engineering instructor is the only one teaching, he will focus on the content and won't focus on our writing." Student 10's recognition of the importance of writing as an engineering student is echoed by other students: "It is important for academic life" (Student 6); "It generates engineering skills" (Student 8); "It helps with reports and being less nervous about how to present or demonstrate an idea" (Student 5); and "It helps us in our writing and communication skills" (Student 4). In addition, the "English instructor pays attention to the performance of the team" and is able to help teams develop their presentation skills as a result (Student 9).

Only two co-teachers needed

The way students perceive co-teaching a course like STEPS II is not uniform. While co-teaching is seen by most students as an effective teaching strategy that offers many benefits, some students qualify their support for co-teaching STEPS II.

Student 10 captures these sentiments best when she says, "It is a good idea, but not 3 professors. We only need the English instructor and one engineering professor" because "we are used to having one instructor in the classroom, and I think it's hard when we have more than two." Student 3 echoes these thoughts when he says, "Some students found it difficult to manage their time with more than one instructor." Although only a relatively small number of students (19%) felt this way, such feelings are noteworthy and have been identified as concerns in earlier research (Zapf, Jerome & Williams, 2011; Hudson, Nykvist & Mukherjee, 2016).

Discussion

This article reports on how students perceive a co-taught engineering course and, in particular, if having an English instructor co-teach the course with discipline content specialists enhanced their learning and development of key academic literacy skills. Findings suggest that most students feel that such a co-teaching arrangement offers more benefits than detriments. This is particularly noteworthy, given that the arrangement of the course is atypical in engineering education. These results echo earlier research that also found that many students perceive co-teaching beneficial (Harter & Jacobi, 2018; Jones & Harris, 2012; Seymour & Seymour, 2013).

While no study exists that explicitly examined how students perceive an engineering course that is co-taught with an English instructor, some studies suggest that students perceive co-teaching as more beneficial than detrimental (Dugan & Letterman, 2008; Ricci & Fingon, 2018). In addition, the benefits noted earlier of having an English instructor co-teach a subject that is traditionally taught only by engineering faculty suggest that students improved their writing, research, and presenting skills in meaningful ways.

One particular benefit of having an English instructor co-teach this course is tied to how students perceive the availability for help. As other studies have shown, many students prefer to have questions answered or receive additional support during class rather than during an instructor's designated office hours. Indeed, students often do not take advantage of such opportunities outside of class mainly because it is not convenient to do so (Bacharach, Heck & Dahlberg, 2010; Cox, McIntosh, Terenzini, Reason & Quaye, 2010; Griffin, Cohen, Berndtson, Burson, Camper, Chen & Smith, 2014; Smith, Chen, Berndtson, Burson & Griffin, 2017). Consequently, providing feedback in real-time is something that resonates with many students and is considered an important benefit of co-teaching. The impact of such immediate feedback that stems from having an English instructor present for most class meetings is something that deserves to be explored further. This is especially true given that, according to Plank (2011), co-teaching involves 'messiness' (p.2) that 'moves beyond the familiar and predictable to create an environment of uncertainty, dialogue, and discovery' (p. 3). Although Plank's description is intended to

capture the way teachers may perceive co-teaching, this same description is applicable to the way some students in this study report their perceptions of co-teaching.

In addition, as Yin (2011) suggested, this study can serve as a "unique case" (p. 18) in that it is atypical of engineering courses. Yet, it can also serve as a reminder that bringing together seemingly disparate subjects taught by instructors who normally do not share the same classroom space is one way to enhance the learning experience of students and more effectively help them develop the kinds of skills they need to succeed. While the second language learners in this study report that this co-taught engineering course offers specific benefits tied to writing, research, and presenting, it may be that other courses that bring together instructors with different specialisations can also positively impact the learning of students in ways that an instructor teaching alone cannot.

Finally, although the merger prevented this course from running again, it nonetheless serves as an example of how instructors from different specialisations can come together and effectively co-teach in a way that addresses the identified needs of students. Findings from this study, for example, have helped inform conversations between faculty as they consider new co-teaching possibilities within the new university structure. It is also worth noting that transitioning to co-ed has not overtly impacted teaching and learning, all of which leaves open the possibility to build upon the success of STEPS II as a framework for other co-taught courses.

Implications for practice

There are a number of implications for practice, especially for those interested in bringing together what are often perceived as disparate subjects like English and engineering into the same classroom. One key lesson is that the potential for rich collaboration between English and engineering faculty is possible if an appropriate structure is put into place early on in the course development process. This was the case with STEPS II. For example, partnering from the outset an English instructor with discipline content specialists helped elevate the importance of developing student writing, research, and presentation skills. In addition, conducting research that examined the linguistic needs of students at the same university (see Wyatt et al., 2021) served to reinforce the essential role an English instructor can play in developing such skills.

Establishing the notion of equal status (in this case, where I, as the English instructor was perceived as equal to—rather than ancillary to—the engineering faculty) was also essential. Given that establishing equal status among instructors in a co-taught course is situational and depends on a number of factors that are often specific to a particular course or cohort of students, one key to its successful implementation is to identify ways instructors can meaningfully contribute to a course's delivery. Thus, identifying the needs of students, in this case English language learners, and incorporating those needs into the structure of the course can help co-teachers target their support so that students can benefit the most from their expertise. When designing a co-taught course involving different disciplines, therefore, it may be helpful to establish a framework that takes into consideration the needs of students and the particular abilities of instructors.

Conclusion

The results of this study contribute to the literature on co-teaching in several important ways. While previous studies have focused on how instructors view co-teaching (Anderson & Speck, 1998; Evans et al., 2009; Higgins & Litzenberg, 2015; Livy et al., 2019; Lester & Evans, 2009; White, Henley & Brabston, 1998), the voices of students are mostly absent in the literature that I reviewed. For example, no studies examined how students perceive an engineering course that is co-taught between an English instructor and engineering faculty. In particular, the way English language learners perceive such a course is missing from the literature. As was noted earlier, most students found that the benefits of having an English instructor co-teach with engineering faculty far outweigh the challenges such a new structure might create. This is important to note, because supporting English language learners in challenging subjects like engineering that require students to successfully engage with the English language has implications for course design and student outcomes. This suggests that bringing together an English instructor and engineering faculty to co-teach may be an effective teaching model to follow for many courses in engineering that include English language learners or those offered at an EMI institution.

While this study makes noteworthy contributions, it also has limitations. The sample size, for example, was relatively small and more than twice as many female students than male students participated. Although no key differences emerged in the data between female and male students, increasing the number of participants, both female and male, might offer insight into any potential differences in student perceptions. Including the voices of the instructors who taught the course would also offer a sense of how those directly involved in delivering instruction perceive such a teaching model. It would be helpful to compare the perspective of instructors and students as well.

In addition, other research designs could be used to compare traditionally taught courses to co-taught courses in which two or more instructors with different specialisations come together. Although a few studies have compared traditionally taught courses with co-taught courses, none of the co-taught courses were comprised of instructors from different fields (Carpenter, Crawford & Walden, 2007; Dugan & Letterman 2008; Higgins & Litzenberg, 2015). Conducting longitudinal studies that follow students throughout their time in university in order to examine the effectiveness of co-teaching involving instructors from different fields is another valuable research track that should be considered. Extending this research to include the suggestions above will support a research agenda that will offer a more comprehensive examination of co-teaching between instructors with different specialties, especially as it relates to English language learners (Dafouz & Smit, 2016; Lasagabaster 2018).

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Appendix A: Questionnaire on your STEPS II experience

This questionnaire is designed to better understand your experiences with STEPS II. Please respond candidly and know that your identity and responses will remain anonymous and will be kept confidential. Thank you.

Section A: Demographics

1. Age:
2. Gender: Female Male
3. Nationality: _____

Section B: Please indicate your choice by circling the corresponding number

Item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I like the idea of having more than one instructor for my STEPS II course.	1	2	3	4	5
I wish all of my courses could be co-taught.	1	2	3	4	5
Having an instructor that focuses on writing and presentation skills in STEPS II is very beneficial.	1	2	3	4	5
I would rather just have one instructor teach STEPS II.	1	2	3	4	5
I feel that I am able to learn more because STEPS II is co-taught with an English instructor.	1	2	3	4	5
There are advantages to having more than one instructor teach STEPS II.	1	2	3	4	5
I can see the value of having an English instructor co-teach STEPS II.	1	2	3	4	5
I feel that I am a better writer because this course was co-taught with an English instructor.	1	2	3	4	5
I feel that I am getting two courses in one because STEPS II is co-taught with an English instructor.	1	2	3	4	5
My writing has improved because I pay more attention to it because there is an English instructor co-teaching.	1	2	3	4	5
I think STEPS II is harder because it is co-taught with an English instructor.	1	2	3	4	5
I feel that my writing and language development are supported more in STEPS II because it is co-taught with an English instructor.	1	2	3	4	5

Do you think it is a good idea to have STEPS II co-taught with an English instructor? Please explain.

_____
_____
_____
_____
_____
_____

Are there any benefits to having an English instructor co-teach with engineering faculty? Please explain.

_____
_____
_____
_____
_____
_____

Thank you for taking the time to share your thoughts on your STEPS II experiences.

Appendix B: Interview guide for STEPS II students

Thank you for agreeing to be interviewed for my study. I will treat what you say in complete confidence and will report results without using your name. Please do not respond to a question that makes you feel uncomfortable. If you wish to stop the interview at any time, please just say so.

Q1. Please describe your experience in this course.

Q2. What was it like having an English instructor co-teach STEPS II with engineering faculty? Please explain.

Q3. Do you feel that you benefited by having an English instructor co-teach this course? Please explain.

Q4. Did you find this course difficult because an English instructor co-taught it with two engineering instructors? Please explain.

Q5. Have your writing, research, or presentation skills improved this semester? Please explain.

Q6. If STEPS II had only been taught by an engineering instructor, do you think your experiences this semester would have been appreciably different? Please explain.

Q7. Do you think it is a good idea to have STEPS II co-taught with an English instructor? Please explain.

Q8. If given a choice, would you prefer to have STEPS II taught by two engineering instructors (the way it is currently structured), by only one engineering instructor or by an English and engineering instructor? Please explain.

Q9. Would you like to share anything else about your experience taking STEPS II?

Thank you again for taking the time to share your thoughts about your experiences in STEPS II.

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