

Using a Technology-Enhanced Active Learning Classroom to Teach English: A Help or Hindrance?

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Abstract—Educators view active learning as a pedagogical enabler for preparing students for the demands of today's workplaces and equipping students with 21st century skills such as critical thinking, problem solving, collaboration, and teamwork. However, there seems to be a noticeable incongruity between the eagerness on the development of 21st century skills and the learning spaces where these skills are intended to be acquired. The significance of learning spaces and their potential for facilitating or impeding students' active engagement should not be overlooked. Considering the indispensability of technology in today's world, its integration becomes crucial not only in today's pedagogy and curriculum but also in the design of learning spaces. This study aims to investigate teachers' perspectives of teaching in a technology-enhanced active learning (TEAL) classroom by exploring their experiences of using the TEAL classrooms, the factors affecting their experiences, and how these factors shape teaching experiences from the viewpoint of teacher participants. This study adopts a mixed methods approach where quantitative and qualitative data collection and analysis are incorporated to address the research questions. Findings of the study suggest that the majority of classroom users had a positive overall impression of the TEAL classrooms with some discussing the challenges they encountered. Analysis of the data shows both classroom-related and non-classroom related factors influencing teachers' teaching experiences. Classroom-related factors encompass aspects such as classroom layout and the technology embedded within the classroom environment. On the other hand, non-classroom related factors are classified into course-related, teacher-related, and student-related factors.

Index Terms—active learning, learning space, TEAL classroom, higher education, Oman

I. INTRODUCTION

Active learning is commonly defined as an instructional approach that engages students in the learning process (Prince, 2004). It is a dynamic approach where students take responsibility for their own learning and assume an active role during this process (Kane, 2004). Studies emphasise that students' active engagement significantly contributes to improved learning outcomes (Hake, 1998; Hung, 2014; Kusumoto, 2018). Educators have long attempted to incorporate active learning in higher education institutions (Meyers & Jones, 1993) as a pedagogical enabler for preparing students for the demands of today's workplaces (Carlos et al., 2023; Hernández-de-Menéndez et al., 2019; Hui et al., 2021; Nealy, 2005). The emphasis on the development of 21st century skills such as critical thinking, problem solving, collaboration, and teamwork in today's higher education is for this purpose. However, there seems to be a noticeable incongruity between the eagerness on the development of 21st century skills and the learning spaces where these skills are intended to be acquired (Welsch, 2007; as cited in Holec & Marynowski, 2020). Research findings indicate that the physical learning environment is instrumental in enhancing students' learning outcomes (Brooks, 2010; Oblinger, 2006). Thomas (2010) describes learning environments as integral to the learning process claiming that they are “capable of influencing students in powerful ways long after the physical learning space has been left behind” (p. 503). Thus, the significance of learning spaces and their potential for facilitating or impeding students' active engagement should not be overlooked.

Considering the indispensability of technology in today's world, its integration becomes crucial not only in today's pedagogy and curriculum but also in the design of learning spaces. A technology-enhanced active learning (TEAL) classroom is a learning space designed to foster engagement and collaboration (MIT iCampus, 2016; Poorvu Center for

Teaching and Learning, 2021). Use of technology as well as strategic furniture arrangement in a TEAL classroom environment aims to facilitate student engagement. Therefore, a TEAL classroom should be an ideal classroom setup to facilitate the incorporation of active learning and technology into education.

While the importance of learning spaces has started to gain momentum, there remains a dearth of research on the learning spaces, especially in higher education (Carlos et al., 2023; Vercellotti, 2018). The present study intends to contribute to this under-researched field by examining the impact of a TEAL classroom on the teaching experiences of teachers and the factors that support or prevent the effective use of the space.

II. LITERATURE REVIEW

There is no consensus on a definition for active learning spaces, and the variety of terms such as ‘Innovative Learning Environment’, ‘Active Learning Lab’, ‘Technology-Enhanced Learning Space’ and ‘Future Learning Space’ suggest a lack of consistent nomenclature in the literature. However, they all indicate a learning space enhanced with technology to support student learning through social interaction and collaboration (Carlos et al., 2023). Technology-enhanced active learning classrooms are designed to facilitate student engagement, collaborative active learning, and interaction between faculty and students within an environment enhanced with technology (Lee et al., 2014). One of the main objectives of a TEAL classroom is to foster active learning by enhancing interaction between instructors and students, as well as among students to encourage hands-on learning experiences (Lee et al., 2018).

A number of design features are commonly found in TEAL classrooms. Powers et al. (2022) describe a TEAL classroom as a learning space featuring flexible arrangements where tables are positioned in circles around a central place for the teacher to project content. Additionally, each student table is equipped with its own screen that can help facilitate content projection. Students can use the provided setup in their tables to use their own devices. They add that this arrangement ensures clear visibility for a large group, allowing everyone to actively participate and view the shared content in real-time. Lee et al. (2018) state that TEAL classrooms commonly feature flexible and mobile furniture, as well as adaptable writing surfaces to facilitate a dynamic learning environment. In the TEAL classroom, technology plays a prominent role, with students encouraged to collaborate in small groups using shared laptops, conduct data-based experiments, and engage with media-rich visuals and simulations as well as personal response systems that foster engagement between students and teachers (MIT iCampus, 2016).

In a study by Ge et al. (2015), it was revealed that both instructors and students acknowledged the benefits of an active learning classroom; however, the extent of technology integration depended on instructors' perceived purpose and significance, influenced by course content and context. Focusing on the effectiveness of an active learning space in the improvement of students' communication skills, Marchiori and McLean's (2022) study findings indicated that an active learning space had a significantly greater influence on group work, collaboration, and student-student interactions compared to the traditional fixed-row classroom. These findings highlight the significance of the physical learning space in nurturing students' communication and collaboration skills. Xu et al. (2019) carried out a study on the effects of technology-enhanced learning spaces on postgraduate students' learning. The findings indicated that student engagement can be facilitated by the three factors of academic motivation, extension of time and space, and externalisation and expression using multimedia elements. They concluded that both student characteristics and the employed pedagogical approaches had a significant influence on student engagement and the effectiveness of these spaces. In another study aimed to explore the effects of a TEAL classroom on students' engagement and their learning experiences, Lee et al. (2018) reported active participation, effective teaching, and technical skills as the benefits of the classroom. Gordy et al.'s (2018) study indicated that their active learning classroom enriched with technology positively impacted teaching and learning experiences of a group of teachers and their students by increasing enjoyment, enhancing engagement, promoting interaction, improving group activity efficiency, and fostering creativity. The outcomes of the study suggested that the synergy of these factors had a positive impact on student learning outcomes. Another similar study conducted by Avidov-Ungar et al. (2018) examined the factors that facilitate or impede teaching in an active learning classroom. The results of the study revealed that teachers' strong pedagogic knowledge was a contributing factor facilitating teaching in the active learning classroom, whereas teachers' limited technological knowledge was a barrier to effective teaching in the classroom.

The review of pertinent literature highlights a research gap regarding teachers' perspectives on the TEAL classroom, particularly when they experience both a traditional classroom and a TEAL classroom in the same semester. This emphasises the importance of the present study, which aims to investigate teachers' perspectives of teaching in both a TEAL classroom and a traditional classroom in one semester.

III. CONTEXT OF THE STUDY

This study was conducted at the Centre for Preparatory Studies (CPS) at Sultan Qaboos University (SQU), Oman, where English is taught as a foreign language. The CPS plays a crucial role in preparing students for university life by providing the Foundation Program (FP) courses. These are prerequisite courses in English language proficiency, mathematics, and information technology along with a study and life skills course. The CPS also offers credit courses in English for Specific Purposes (ESP) in various fields of sciences and humanities to support students in their

undergraduate journey.

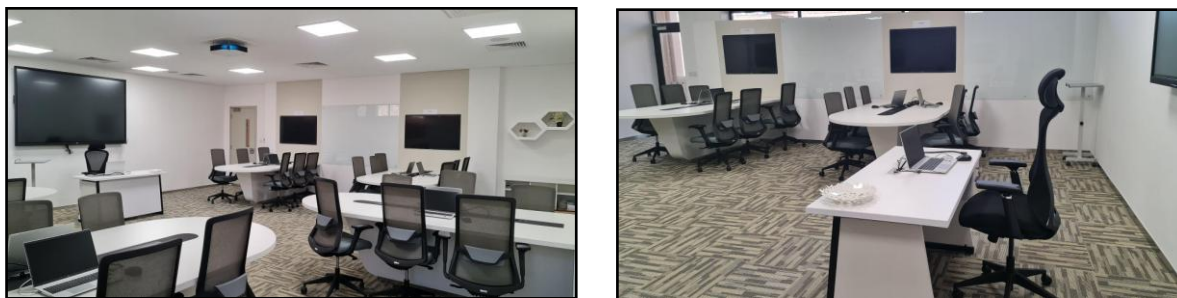


Figure 1. CPS TEAL Classroom

The present study uses two new TEAL classrooms at SQU with similar designs intended to facilitate active learning through their technological and design features. The TEAL classroom in the CPS (Figure 1) includes five D-shaped tables, accommodating six students each, with corresponding screens and glass boards for interactive learning; each table is equipped with two student laptops. The second TEAL classroom, located in a common teaching block, includes the same combination of student tables, screens and boards; however, the room is larger with seven tables and each student desk has only one laptop. Unlike some active learning spaces mentioned in the literature (e.g., Lee et al., 2018; Powers et al., 2022), the student desks are fixed. Both classrooms have a teacher's station consisting of a desk, a laptop and either an interactive screen in the CPS room, or a 3D projector in the common teaching block. The devices in both rooms are linked with *NetSupport School* software, a classroom management program which the teacher can control from their laptop. This software offers various functions such as screen sharing, monitoring and interactive tools, enhancing the integration of technology in teaching practices.

Training was provided for teachers who expressed interest in joining the study and teaching in the room. The training focused on familiarisation with the technological features of the room. Video-recorded training and a reference booklet were also provided to support teachers. Teachers were aware that the room had been designed for active learning; however, no methodology or classroom activities were imposed. Teachers were encouraged to make decisions autonomously regarding the most appropriate use of the rooms for their courses.

IV. RESEARCH METHODOLOGY

To explore teachers' perceptions of the effectiveness of the TEAL classrooms, the following research questions guided this study.

1. How do teacher participants describe their experiences of using the TEAL classrooms?
2. What factors affect experiences of teaching in the TEAL classrooms?
3. How do the identified factors affect these teaching experiences in the TEAL classrooms?

A. Research Design

This study adopts a mixed methods approach where quantitative and qualitative data collection and analysis are incorporated to address the research questions. To obtain data for this study, surveys and interviews were conducted using a sequential method, beginning with the surveys and followed by interviews. A survey comprising structured and unstructured questions was developed for this study. The survey and research design underwent examination by the CPS Research Committee for ethical clearance and quality review, with their feedback incorporated to enhance the quality of the survey. Semi-structured focus-group interviews were conducted to collect qualitative data. The decision to conduct focus group interviews after the surveys was made to delve deeper into the survey responses and to allow teachers to provide new insights into their experiences. Each interview took one hour on average and was audio recorded.

B. Participants

(a). Survey Participants

Voluntary sampling was used for this study. An invitation email was sent to 211 teachers teaching in the CPS to teach in the new TEAL classroom and participate in the study. Out of the 211 teachers, 23 volunteered to teach in the new learning space. As shown in Table 1, 16 teachers completed the survey after teaching between two and six sessions in the TEAL classroom with a data collection window of two weeks. Among the respondents, 14 were English teachers, and 2 were from the Math and IT department.

TABLE 1
PARTICIPANTS AND COURSES

Courses	No. of Teachers completing the survey
FP English	8
ESP of both Humanities and Sciences	6
FP Information Technology	1
FP Mathematics	1

The 16 teachers who completed the survey taught students of both genders, but according to the survey responses, their male students outnumbered the female students on average. Of the sixteen respondents, thirteen reported that they had no prior experience of teaching in a TEAL classroom. Three reported having teaching experiences in classrooms with smart boards and one teacher also mentioned having experience teaching in a classroom with island-style furniture arrangement. The majority of the survey respondents rated their technical skills as either good or excellent (Figure 2).

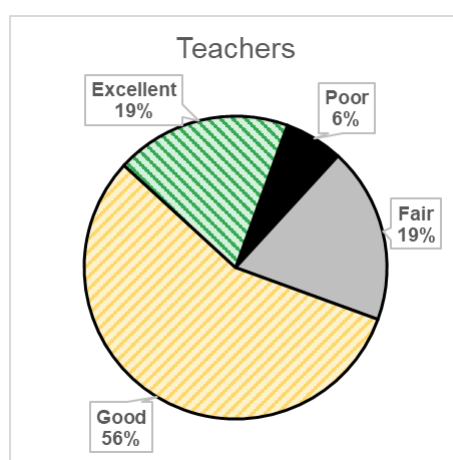


Figure 2. Level of Technical Skills Among Teachers

(b). Interview Participants

All survey respondents were invited to join interviews. The interview participants were exclusively English teachers. Two focus group interviews were conducted, and as Table 2 illustrates, the majority of interviewees were female. By the time of the interview, these teachers had completed up to ten teaching sessions in the new learning space.

TABLE 2
TEACHER INTERVIEWS

	Male Teachers	Female Teachers	Total Participants
Group Interview 1	1	1	2
Group Interview 2	-	5	5

V. FINDINGS

The findings of the study primarily represent the perspectives of English teachers on the TEAL classroom. However, it is noteworthy that the viewpoints of two participants from the Math and IT department have been incorporated in the analysis of the survey results. Any mention of their perspectives explicitly clarifies their identity as teachers from the Math and IT department.

A. Teacher's Descriptions of Teaching and Learning Experiences

(a). Quantitative Data

The data from the teacher survey (TS) suggested that the majority of classroom users had a positive overall impression of the TEAL classrooms. Of the sixteen respondents, thirteen indicated that they would like to have future lessons in the room, two were unsure and one indicated they would not. When asked whether they faced any major

challenges while using a TEAL classroom, a minority of five teachers indicated that they did, mentioning several issues related to layout and technology, with three specifying issues with the NetSupport software.

Two of the survey questions elicited opinions about the layout and technology in the classroom using a three-point scale (see Figure 3). For both questions, at least half of the respondents indicated that they were ‘completely satisfied’. Satisfaction was highest for layout with three quarters selecting the most positive option (completely satisfied). Seven teachers gave consistently positive responses for each of these questions, and one teacher selected consistently negative responses (not satisfied at all). The remaining eight gave a mix of positive and medial responses (somewhat satisfied) with one negative response. None of the teachers who reported experiencing major challenges in the room selected ‘completely satisfied’ for the technology question.

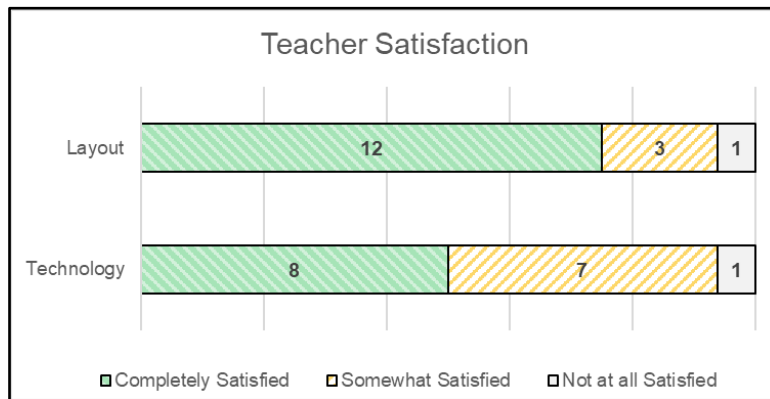


Figure 3. Levels of Teacher Satisfaction for Layout and Technology

One survey question explored perceptions of the effectiveness of the classrooms in enhancing the delivery of teaching content (see Figure 4). Responses tended to be split between medial (somewhat helpful) and positive responses (very helpful). However, there was a notable difference in the responses of the English teacher participants. Two-thirds of English credit-course teachers agreed that the classroom had a very helpful impact on the delivery of teaching content, while for the foundation teacher counterparts, only a quarter chose this positive response. English credit courses, which have higher proficiency students, are more content-based and include a problem-based learning (PBL) component; but the survey data alone is unable to indicate whether these factors influenced the teachers' responses. The two math and IT teachers were divided, with the former answering ‘very helpful’ and the latter selecting ‘somewhat helpful’.

Two other survey questions focused on the teachers’ perceptions of the effectiveness of the room in enhancing engagement and active participation (Figure 4). For each question, at least half of respondents selected the positive option (very effective) while the remainder selected somewhat effective. Teachers were most likely to agree that the room was effective in enhancing student engagement with ten respondents selecting the most positive response. There was a difference between the responses of English teachers compared to the math and IT teachers. The majority of English teachers selected ‘very effective’ for both the engagement and participation questions, while the two math and IT teachers both responded ‘somewhat effective’ to these questions.

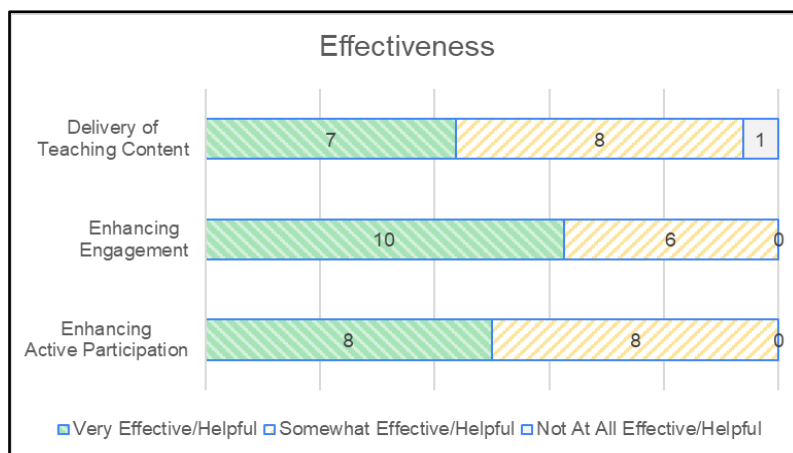


Figure 4. Teachers’ Perceptions of the Effectiveness of the Classroom

(b). Qualitative Data

The general positive overall view of the classroom was reinforced by the teacher interview (TI) data. There was a combination of teachers who had an overall positive view of the room, those who liked particular features of the room, and one interviewee who was generally critical of the room. Interviewees consistently reported that their students had overall positive opinions of the rooms, with no participants stating otherwise; although one teacher suggested that students' positive opinions were merely due to the room being 'fancy'. Thematic analysis of the coded data from the TS unstructured questions and the TI revealed a number of recurrent themes which linked classroom experiences to the TEAL classrooms' features of layout and technology.

1. Layout

Over two-thirds of the data extracts were coded as positive descriptions of classroom layout. Of these coded extracts, the most commonly co-occurring codes were collaboration, engagement and communication. The classroom layout was frequently referred to in descriptions of students engaged in collaborative group tasks including accounts of effective brainstorming, planning and editing. Teacher accounts often associated the seating arrangement, glass boards and student screens with an improved ability for students to see their groups' work clearly, which facilitated enhanced collaboration and engagement.

Some teachers believed that the classroom layout enhanced monitoring of, and interaction with, students. One teacher contrasted their monitoring of students in the TEAL classrooms with monitoring in standard classrooms, stating "you can walk around easily, you can get behind students, you can get next to students, as opposed to in a classroom where often you are getting feedback from directly in front of them" (TI1). In contrast, a few teachers described their monitoring being impeded by the seating arrangement as students often had their backs to the teacher or the smartboard.

2. Technological Features

Around two-thirds of the coded extracts were negative descriptions of the technological features in the classrooms. Negative accounts of technology were most commonly co-tagged as referring to barriers to teaching and learning (38%), and negative accounts of both planning (17%) and delivering teaching content (17%). The positive descriptions of classroom technology were also coded as discussing active learning strategies (13%), opportunities for teaching and learning (10%), descriptions of collaboration (5%) and monitoring students (5%). Several technological features of the TEAL classrooms were described as noticeably affecting the user's experiences of the TEAL classroom, while others were described as having a lesser impact.

Two English teachers described their students effectively collaborating and communicating while using the laptops with groups of students delegating roles effectively so that one member operated each laptop. Three others observed the students not operating the laptop as being left out of group work. Teachers gave mixed descriptions of their experiences with NetSupport. While some participants described using NetSupport as a tool for unobtrusively monitoring students or for enabling engaging activities, others described the software as either not user-friendly or not useful. Regarding the smartboard in the CPS TEAL classroom, teachers described sharing their screens, annotating documents and using the built-in timer; however, some teachers pointed out that the same can be achieved with a whiteboard, projector and pen. Teachers also reported a range of issues related to the smartboard including its position, the sound quality, and the impact of the university screensaver.

B. Factors Affecting Teaching and Learning Experiences

The analysis of the survey and interview data shows two overarching categories of factors affecting teaching and learning experiences: classroom-related factors and non-classroom related factors (Figure 5). Classroom-related factors encompass aspects such as classroom layout and the technology embedded within the classroom environment. On the other hand, non-classroom related factors can be classified into course-related, teacher-related, and student-related factors.

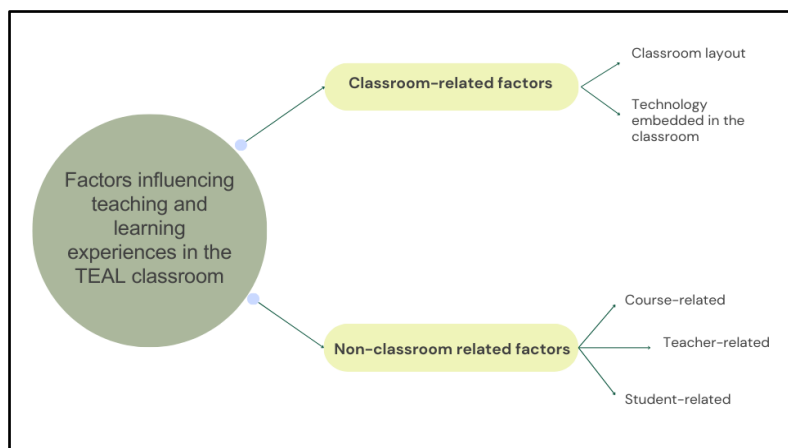


Figure 5. Factors Influencing Teaching and Learning Experiences in the TEAL Classroom

Participants extensively referred to the classroom layout in both the survey and the interviews. They highlighted the following feature of layout as affecting their experiences within the TEAL classroom: furniture arrangement, in particular, the seating arrangement, types of furniture, the immobility of desks, spaciousness, the position of the teacher's desk, as well as the presence of student glass boards. In addition to the features of layout, teachers linked their experiences to technological features of the room including student laptops, the individual screens allocated to each student table, the teacher's smart board, and the NetSupport software. The smartboard and NetSupport software were discussed in relation to their features and user-friendliness. The impacts of these features were mediated by the availability of similar tools on other platforms which were either more familiar or easier to use.

Teachers' experiences were not solely influenced by the features of the classroom, but also by the non-classroom related factors. The teachers' discussion in both interviews revealed that the courses being taught influenced their experiences; there were notable differences between teachers of lower- and higher-level English language courses. Additionally, the nature of the tasks and skills taught in the classroom had an impact on their overall teaching experience. Teachers highlighted the significance of course syllabi and the level of preparation undertaken, recognizing them as factors directly shaping their experiences. Teachers' feelings and assumptions about the classroom also seemed to play a significant role in shaping their experiences. Furthermore, the readiness of teachers to use and integrate the available technology in the TEAL classroom emerged as a critical factor for effectively utilising classroom resources. Another factor was related to students' technical skills, as well as their feelings of being in a new learning environment. Thus, the attitude of students in the class emerged as another factor.

C. Impact of the Identified Factors on Teaching and Learning Experiences

This section provides elaboration on the previously-identified factors and their impacts on shaping teaching and learning experiences.

(a). Classroom-Related Factors

1. Classroom Layout

The furniture in the room had both positive and negative impacts on the participants' teaching experiences. The large student desks were associated with greater comfort, and teachers noted that there was sufficient space for students' resources. The majority of teachers in the interviews and survey emphasised the significant impact of classroom seating arrangement on shaping teaching and learning experiences. Improved collaboration was frequently mentioned in relation to the seating arrangements. As one teacher reported: "*sitting in small groups makes every activity more centred and focussed. I could see how much more collaborative learners were when facing each other and in comfort*" (TS). Teachers also found that the arrangement was conducive to brainstorming and discussion tasks. Moreover, they reported that the seating arrangement facilitated peer feedback and communication. One interviewee suggested that the layout helped ensure that team members were included in the task, noting that "*shy and introverted students were given a safe space to be part of a team and work collaboratively with teammates*" (TS).

The furniture arrangement was also identified as a factor influencing engagement and teachers' ability to monitor and support students, with some adding that the classroom design improved their ability to identify the students who needed support or intervention. It was also noted that the furniture arrangement facilitated teachers' ability to provide quick assistance compared to standard classrooms. However, one teacher provided a contrasting account, suggesting that classroom management of her students was more challenging in the CPS TEAL classroom than in a standard computer lab in which students are seated in rows with individual computers. Interviewees also reported that the TEAL classroom's seating arrangement increased student engagement; however, one teacher stated that although the layout enables the teacher to move around easily and maintain students' engagement, students could become disengaged just as easily as in a standard classroom.

Teachers, however, highlighted the immobility of the furniture in the TEAL classroom. One teacher explained, "*It is great to have island tables around which learners can sit, but I would like to be able to rearrange these islands*" (TS). The teacher emphasised the need for a more modular table situation that can be configured to accommodate the specific needs of the student group. Several teacher participants drew attention to the position of the teacher's desk and questioned whether it was needed in a TEAL classroom. These teachers stated that the placement of the desk could draw both teacher and students back into more traditional, teacher-centred classroom roles. One issue specific to the Gulf-context of the study related to the need for male and female students to sit apart. One teacher described male and female students cramming onto a smaller number of desks to ensure that an empty desk separated them, and suggested that small, movable furniture that could be rearranged would help address this.

Most teachers praised the presence of student glass boards as a teaching and learning tool. The participants, including teachers who were most critical of the room, cited that the student glass boards encouraged collaboration and communication. Teachers described students using the boards for brainstorming, planning and note-taking, associating the boards with improved engagement and collaboration. Some teachers pointed to improvements in peer-support and peer-correction during group work; this was often in relation to the improved visibility offered by the glass boards, screens and seating arrangement. Interviewees also mentioned that students enjoyed working on the glass boards; one teacher even stated that his students had begun to use them autonomously during lessons stating: "*Just during an*

activity, they'd just get out a pen and be explaining something to the people on their desk" (T11). Two participants even suggested that the glass boards could be a relatively inexpensive way to enhance active learning in standard classrooms. The most critical comment regarding the boards was that students could become too active at times.

2. Technology Embedded in the Classroom

Several teachers found the smartboard to be unuseful, with a few teachers admitting to using the board solely as a projector. Teachers who had taught in the larger TEAL classroom, which has a whiteboard and projector instead of a smartboard, believed the whiteboard to be more useful than the smartboard. Another issue was the teacher's confidence in using the smart board in front of the students. They were concerned about making mistakes or appearing incompetent. It seems that understanding the functionalities of a smartboard requires time and training.

Many teachers identified the student screens as having a positive impact on learning with several praising them enthusiastically. In addition to the screens being used for group work and presentations, one teacher described how their class transformed into a walking gallery, with students naturally engaging with the work of other groups. The teacher explained, "without any prompting, but they would move around to see what other groups were doing" (TS). These teachers stated that the student screens greatly enhanced visibility, allowing for increased peer feedback and fostering collaboration among students. Students could get ideas from other groups by looking at the screens, which ultimately enhanced the quality of their own work. However, there were a few teachers who were unenthusiastic about the impact of the screens on teaching and learning. Some stated that they did not need them for the activities they had designed. Others felt technical issues with screen sharing affected group work and teacher monitoring.

Teacher participants expressed differing opinions about the classroom management software, NetSupport. Some found the software useful and believed that it offers a range of engaging activities; however, they emphasised the need for training to fully harness its potential. Teachers critical of the software highlighted the overlap between its features and those of the Google Workspace apps. Several teachers expressed a preference for sharing documents and monitoring student activities using Google Docs or Google Classroom.

(b). Non-Classroom Related Factors

1. Course-Related Factors

Participants in this study taught courses that varied according to subject, target skills and types of tasks, syllabus, and intended learning outcomes.

Teachers described conducting a variety of tasks in the TEAL classrooms, reporting that the TEAL classroom was better suited for some task types, including PBL or research-based projects. One teacher provided insight into the activities they had designed, stating, "they [students] do the research, I had them take notes on the glass boards and make an outline, and then I had them make slides and presentation, and I had them present it at the end for the whole class using the TV [student screens] for the slides" (T11). This teacher's account underscores how the classroom facilitated this project-based task. Similarly, another teacher explained the challenges faced when conducting research-based tasks in standard classrooms due to their seating arrangements and limited access to technology. Notably, a teacher of a PBL component highlighted that the TEAL classroom was an effective environment for applying research-based skills as students could immediately apply their knowledge using the available resources.

Some teachers perceived the course syllabus as a restricting factor dictating the work to be covered and thus preventing free experimentation. One teacher of an ESP course explained that they may have experimented more with the technological features of the classroom had they not been constrained by the content that they needed to cover. This issue could be exacerbated by technological glitches which slowed down the lesson, and could evoke feelings of anxiety in teachers leading them to resort to taking fewer risks. However, not everyone held the same belief. A teacher of a foundation English course had a different perception and used their participation in the study as an opportunity for experimentation with the features of the classroom by devising research-based activities that exploited the technology in the room. The classroom-related factors thus seem to have derived from an interplay between the nature of the course and teacher's personality and belief system.

2. Teacher-Related Factors

Participants in this study varied in technical ability, professional backgrounds and motivations for joining the study. The qualitative data provided some evidence that the unique personalities, beliefs and motivations of these teachers are likely to have contributed to differences in their classroom experiences.

Teachers' responses to the technology in the classroom varied. Teachers of varying levels of technical skills identified the need for ongoing professional development training; however, higher levels of technical skill did not necessarily lead to more positive attitudes to the classroom technology. One teacher stated "I didn't do much. It was the students...I watched the videos and I learned small things, but it didn't bother me that I didn't know much." The teacher identified the limits of their technical knowledge, but their account of teaching the PBL component of a credit course was very positive. In contrast, one of the most technically experienced teachers was most critical of some of the classroom's technological features and their impact on teaching and learning, most notably the smartboard. This demonstrates that the relationship between teachers and uptake of technology is not linear, and can be influenced by their personalities and motivations.

Similarly, teachers' individual motivations and personalities affected other aspects of their experiences in the classroom. The two participants in T11 described experiencing pressure to utilise the features of the TEAL classrooms, but with differing attitudes and actions. One teacher explained, "*whenever I wasn't using the technology there...[I] was always thinking am I wasting this opportunity? But I didn't want to...change my teaching style....*" (T11). This reflects the teacher's justification for joining the study, in which they mentioned the opportunities for collaboration presented by the classroom layout with no explicit reference to technology. The second teacher described a similar pressure stating "*at the beginning, yes, I had the pressure ...[of] what can I do to use the technology available for me to do this activity? How could I change each of those activities that I usually do?*" (T11). This teacher allowed the pressure to contribute to their teaching practice which included numerous tasks exploiting the technology of the classrooms.

Some teachers also mentioned that effective use of the TEAL classroom necessitated careful planning of specific activities, which some teachers found challenging. They explained that they had to plan tasks carefully ensuring that students had clear roles and responsibilities within their teams. Another teacher confirmed that teaching in the TEAL classroom was an additional workload and explained that to fully utilise different features of the TEAL classroom, they would have needed to invest a significant amount of time and effort in preparation. This teacher ultimately decided to adhere to their usual lesson plan in their subsequent lessons, regardless of the classroom environment. They explained that the TEAL classroom setting still produced more satisfactory results compared to the standard classroom setting, even when the lesson was not modified.

3. Student-Related Factors

Teachers explained their perceptions of teaching and learning in the TEAL classroom with reference to their students. A number of descriptions of students were relatively consistent across the teachers' accounts with some notable exceptions. This included students' excitement about the unique classroom which seemed to enhance their motivation and in turn their engagement. The behaviour of students was rarely cited as a problem; however, for one teacher it was a significant issue. The teacher described the students as a "low-level, low-maturity" group who had presented classroom management challenges throughout the semester. Indeed, they were the lowest level English group in the study. The class size was small, and the teacher described spreading the students out so only two were sitting at any table. This decision was made after the teacher had observed that students distracted one another when sitting in a group around a table. The students struggled to work together effectively, and the teacher described some students as browsing their phones while others worked on the laptops. The teacher expressed a preference for teaching these students in computer labs in which each student had their own computer and classroom management was easier. This shows how student-related factors can interact with features of layout with unexpected consequences.

Another factor influencing the effective use of the classroom was the students' level of technical skills. Some teachers noticed that students' proficiency in using technology affected the flow of their lessons. In classes where students had low technical skills, teachers described the experience as time-consuming, resulting in slow progress of the lessons.

VI. DISCUSSION AND CONCLUSION

The findings of the study suggest that the TEAL classroom environment had an overall positive impact on teachers' teaching experiences; however, the impact of the classroom appeared to be mediated by a number of factors related to the course, teacher and students. The significance of the learning space in enhancing teaching and learning experiences is an under-researched area. However, several studies have supported its impact and importance (e.g., Brooks, 2010; Byers et al., 2014; Granito & Santana, 2016; Mulcahy et al., 2015).

The findings of this study demonstrate that the TEAL classroom provides a range of opportunities from the perspectives of teachers, including enhanced engagement and active participation among students and the effective delivery of teaching content. These are in line with the findings of the study conducted by Lee et al. (2018) in which the student participants expressed higher levels of satisfaction regarding active participation and effective teaching in a TEAL classroom. Furthermore, the present study's findings on increased student engagement in the TEAL classroom environment are consistent with previous experimental research on student engagement in active learning classrooms, involving teachers or students of various age groups (Imms & Byers, 2016; Sawers et al., 2016; Xu et al., 2019). It is worth stating that numerous studies support the impact of increased engagement on the overall quality of learning (e.g., Bryson & Hand, 2007; Gonyea, 2006; Imms & Byers, 2016; Sawers et al., 2016). Thus, it can be inferred that a TEAL classroom environment has the potential to facilitate high quality learning experiences.

The TEAL classroom environment was also reported by teachers to encourage collaboration and communication and to enhance effective monitoring and peer feedback. This observation is congruent with the findings of Marchiori and McLean's (2022) study, which also highlighted the positive influence of the TEAL classroom in facilitating collaboration and student-student interaction. This finding also aligns with the underlying goal of a TEAL environment, which aims to promote learning through increased collaboration (Lee et al., 2018; Sawers et al., 2016). The participants in this study associated improved collaboration with the enhanced visibility provided by the classroom environment that helped ensure students' active participation in group work. This finding mirrors the findings of Powers et al. (2022) indicating that the improved visibility also seems to have led to easier and more effective monitoring.

The effectiveness of the TEAL classroom in the implementation of active learning strategies has been supported by a wide range of research studies (e.g., Marchiori & McLean, 2022; Sawers et al., 2016). Teachers in the present study also perceive the TEAL classroom design to be well-suited for a range of active learning strategies including project-based teaching and problem-based learning; and most described enhanced group interaction and collaboration among students. This mirrors the findings of Gordy et al. (2018) who identified improved group activity efficiency among students along with enhanced engagement and interaction. The majority of teachers observed improved group work among students, and reported their positive responses to the room, which is in line with Powers et al. (2022) who stated that TEAL classrooms are well-received by students, particularly for group collaboration and project-based learning.

Regarding teachers' behaviours in a TEAL classroom environment, Beery et al. (2013) demonstrated that teachers do not necessarily show a different teaching behaviour in this learning space. The present study substantiates this finding, as participants did not claim to increase the number of active learning strategies employed in their practices; however, their descriptions of classroom activities suggest that the TEAL classroom helped enhance the incorporation of active learning strategies that they already used. They described enhanced PBL and group activities in which there was increased student interaction and collaboration that drew upon the rooms' technological resources. This parallels the findings of Powers et al. (2022) which described a technology-enhanced active learning space as having a positive impact on the development of 21st century skills among students. These observations suggest that the TEAL classroom setup provides ample opportunities to cultivate skills which are essential for academic and professional success in the 21st century.

The findings of the present study indicate several key areas that pose potential difficulties for the successful use of the TEAL classroom. Technology has been described as a mediator in the learning process (Abraham, 2008; Bower, 2019; Kern, 2014); furthermore, according to Bligh and Crook (2017), technology-enabled learning spaces play a vital role in transforming learning. In the present study, teachers were provided with a number of technological features; however, various challenges emerged regarding the use of technological devices and software. The role of technology cannot be overlooked, given how strongly technology is prioritised in contemporary life and, subsequently, in higher education. One of the objectives of establishing the TEAL classroom was to integrate technology into teaching and learning to equip students with the skills required for modern workplaces. Similar to Ge et al. (2015) who reported that the extent of instructors' utilisation of technology varied, with some demonstrating minimal integration and others exploiting technology extensively, the teachers in the present study varied in the extent to which they incorporated technology into their lessons, and they had differing views regarding the integrating technological features into classroom practice.

As this study suggests, the choice not to use a technological feature could either be a judicious choice based on teachers' analysis of the learning situation, or a teacher's lack of confidence about the technology. Lee et al. (2018) argue for the importance of providing technological support and training to ensure the successful implementation of effective teaching in an active learning classroom. Avidov-Ungar et al. (2018) state that teachers' limited technological knowledge pose a barrier to effective teaching in the classroom. This highlights the need for structured and ongoing training on the use of devices and software as well as their pedagogical applications. Effective training will enable teachers to choose the technology best suited to support their teaching practices and facilitate student learning.

In addition to the challenges associated with technology, participants identified immobility of furniture as a barrier to collaboration in the TEAL classrooms. Moreover, the presence of the teacher desk within the TEAL classroom was reported as another challenge, as it hindered the intended objective for a student-centred classroom. This finding supports the growing trend in higher education to create active learning classrooms with adaptable layouts that encourage student engagement and collaboration, in contrast to the conventional fixed lecture-style setup (Kliever, 2022). However, the comments of teachers in this study regarding the sensibilities of students in the Arabian Gulf regarding gender and appropriate seating arrangements suggest that effective classroom layout can be culturally-specific. Future studies into learning spaces should explore such culturally-bound perceptions.

The collaborative and technological aspects of the TEAL classroom may necessitate thoughtful planning for lessons, which was difficult for some teachers. This is in alignment with Granito and Santa's (2016) finding that the learning space can influence the instructional approaches and teaching modalities that teachers employ. Powers et al. (2022) support this view stating that a non-traditional classroom layout may require teachers to adapt their lessons. It appears that considering learning space as an essential element of lesson planning is worthwhile.

Student-related factors can also be a barrier to collaboration in the TEAL classrooms. Xu et al. (2019) identified academic motivation as a key factor influencing the effective use of TEAL classrooms. Our data supports this view as a group with low academic motivation led to ineffective collaboration in group tasks and therefore reduced the effectiveness of the use of the TEAL classroom.

Overall, it seems that despite the opportunities that the TEAL classroom provides for effective collaboration, barriers can be imposed by the features and users of the classroom which should be accommodated in the design of the classroom and delivery of the lesson. Recognizing both the potential advantages and challenges presented by the new learning environment can enable educators to adopt a novel perspective on the learning space, perceiving it as an agent in the teaching and learning processes.

VII. LIMITATIONS

The limited number of teacher volunteers for the focus group interviews restricted the range of perspectives that this study could have captured. Furthermore, the small sample size of participants poses a challenge in generalising the findings of the study to a broader population.

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