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Abstract

In this study, Apple TV's display sharing function was used to test collaborative technologies in different language and content-based classrooms. Students were encouraged to use smartphones for real-time screen sharing during learning assignments using a technology-assisted teaching approach. Observations and student feedback showed that the share display capability made learning more student-centred, allowed for quick content sharing, and encouraged better engagement, and a stronger inclusive environment. The simplicity of switching users made activities less dependent on teacher interference, which supported active and collaborative learning. However, there were some limitations with technical concerns including, device connectivity and smartphone compatibility issues, which occasionally slowed interactions between students. Despite these obstacles, students' overwhelmingly positive feedback showed that such technology can improve collaborative and active learning in any classroom.

概要

本研究では、Apple TVのディスプレイ共有機能を用いて、言語とコンテンツに基づくさまざまな教室における共同作業技術を検証した。生徒たちは、テクノロジー支援教育アプローチを用いた学習課題中に、スマートフォンを使ってリアルタイムで画面を共有するよう促された。観察および生徒からのフィードバックによると、ディスプレイ共有機能によって、学習がより生徒中心となりコンテンツ共有が迅速化し、より良い学習参加とより強力な包括的環境が促進された。ユーザーの切り替えが簡単なため、教師の干渉に頼ることなく活動ができ、能動的で協力的な学習が支援された。しかし、デバイスの接続性やスマートフォンの互換性の問題など、技術的な懸念による制限もあり、相互作用が遅くなることもあった。このような障害にもかかわらず、生徒の圧倒的に肯定的なフィードバックは、このような技術がどのような教室でも共同学習や能動的な学習を改善できることを示している。

Keywords

student-centred learning, collaborative learning, educational technology, screensharing

キーワード

生徒中心の学習、共同学習、教育工学、スクリーン共有

Background

In interactive classrooms, students often exchange information orally; however, it is often useful to exchange knowledge in written form. This allows for the content to be studied and analysed more closely, for students to ask other students questions, and for information to be given directly to the teacher. Any of this can be achieved by and/or directed to individual students or groups. To facilitate this exchange of written materials in a more open and clear way to better encourage peer collaboration through technology is the subject of this research.

The traditional way of displaying written materials is on a chalkboard or whiteboard. The 19th century invention of the blackboard, also referred to as a chalkboard, is one of the most profound technological advances in education history (Resilient Educator, 2012). For the first time, an individual could quickly and easily write information on a medium that could then be accessed by a large number of other people, and because the board could be erased, a large amount of content could be displayed successively; pictures or diagrams can also be composed. In addition, using blackboards is economical and requires no initial training. Having students write on a chalkboard or whiteboard has certain drawbacks such as it is very time consuming, and the characters produced may not be legible. Another issue is the materials cannot be prepared ahead of time, especially if a large group is present. Smaller whiteboards have those same problems along with additional difficulties such as the handling of them and the displaying of them to others can be awkward. Furthermore, their smaller size means the characters written on them will unavoidably be smaller than those written on a larger board and therefore the items printed on them will only be accessible to a smaller number of people. Overhead projectors allow students to display prepared materials easily and quickly and even write information on paper more quickly and easily than on a board. However, similar problems with illegible writing may arise and nowadays relatively few classrooms are equipped with overhead projectors. What many classrooms do have are television monitors or projectors and screens. Showing a presentation or video is a helpful way to convey knowledge, but the question is, how can we connect students to these devices to open up new ways of creating student-centred and interactive classrooms? It is possible for students to create presentation or share information by bringing their own USB drives using a classroom computer, should one be present, or by connecting their own laptops to a monitor via a cable. Even though these are beneficial, issues occur usually with physical setup needs and subsequent temporal issues in addition to the assumption that students possess the necessary data drives or laptops needed to share materials. In recent years, it is rare to see a student without a smartphone or tablet. Therefore, is it possible to introduce something that can connect the students' ubiquitous cell phones to these display devices in a more efficient way?

Literature Review

Even before committing to this project's interpretivist research path, as language teachers there are three items constantly under consideration as ways to improve teaching and learning environments for students in our higher educational setting: student-centred teaching approaches, collaborative learning, and technology integration in teaching.

Student-centred learning has been an important part of education for decades and has become more and more prevalent in recent years with institutions encouraging instructors to move away from traditional styles and to transfer the focus toward the student. There are many definitions in the wider literature of what constitutes as student-centred learning, but the core idea underpinning it is the reallocation of focus to embolden students to take control of their own learning and become more active with their teachers and peers rather than just being receptive (Weimer, 2002, p45). Within their description of what it is, Elen et al. (2007) presented an example about the topic of water pollution noting that in a traditional teacher-centred classroom the teacher would conduct a lecture about it, whereas in a student-centred class, students would make a project about their own region's water quality and the teacher would guide them (Elen et al., 2007, p106). Within this approach to teaching, the teacher would become more of a facilitator and guide to help develop a student's own learning through exploration rather than just lecturing and information giving. This was just one example of many, but it demonstrates the shift of attention from the teacher onto the student. Moving into a student-centred teaching environment is especially important within Japanese higher education and in language classrooms as it has been noted that teacher-centred approaches are common practice in Japan (Hashimoto & Fukuda, 2011; Wastila, 2019) and therefore many students expect this situation due to it being a normal aspect of their educational lives (Maftoon & Ziafar, 2013). It has been noted in several studies that Japanese students often face performance anxiety when it comes to communication in foreign language classrooms (Cutrone, 2009), especially in front of their peers. There have been multiple causes for this such as personal worries about grammar or language accuracy, shyness around others or the tense classroom atmosphere (Harumi, 2011), but the reasons which seem to be most often mentioned are a slight negativity towards the tense teaching atmosphere and possible long-term exposure to teacher-centred approaches (Harumi, 2011; King, 2013; Maftoon & Ziafar, 2013; Wastila, 2019). Therefore, finding ways to reduce anxiety and become more student-centred without pressuring students is a must.

Around the world, but especially in Japan, the phrase 'active learning' seems to have become a buzzword with some teachers claiming their lessons are active just by including a group or pair work activity at some instance within the lesson. Kondo's (2010) research showed a positive reaction to group work activities by students more so than individual work; however, she concluded that teachers need to take into consideration all facets of the activity from task

type to group compositions, as just including a group work task may not always be successful. A similar theme has been noted over the years, just because a class is labelled as being 'active', does not mean that learning will naturally happen; it requires the teacher to carefully construct an environment for active learning to successfully occur (Michael, 2006, p164). The teacher needs to consider how learners learn, and if suitable active elements are not methodically incorporated, then decent outcomes may not be achieved (ibid). This is because the importance lies with what students can do while in class in addition to the type of class environment they are in (Baepler et al., 2014, p235). Another style of active learning is collaborative learning, which focuses on how students interact and work with each other in class to promote better peer cooperation, understanding and learning. It is a well-researched field and studies have shown its success in many different subjects from humanities to the sciences (Michael, 2006), and has been shown to be a positive and constructive element of classroom learning if properly implemented (Attle & Baker, 2007; Roseth et al., 2008; Laal & Ghodsi, 2012). The key benefits of collaborative learning include improvements in self-confidence and social interactions with peers, creation of stronger supportive and inclusive learning environments, and the overall increase in productivity (Johnson & Johnson, 2009; Laal & Ghodsi, 2012). As with all approaches to teaching there are disadvantages; however, collaborative learning seems to generally introduce more positive elements into a classroom than negatives ones; responsibility for tasks are shared, students learn from and teach their peers, a more communicative atmosphere is established and there is less pressure resulting from the teacher's presence (Johnson & Johnson, 2009; Kondo, 2010; Laal & Ghodsi, 2012; Wastila, 2019).

New technologies present new opportunities to enhance the benefits of student-centred teaching and collaborative learning. Integrating technology to support or expand learning is not a new aspect of education. Nowadays there are a vast array of options available for teachers to implement in class from touchscreen monitors to smartphone applications. It was highlighted in the background to the study that big boards were, and still are, an iconic learning technology, and overhead projectors were also mentioned, but for the purpose of this study the focus will be on modern smart technologies. The use of mobile and smart devices in classrooms has been increasing over the years (Stockwell & Hubbard, 2013) and has gained traction of the last decade with the global pandemic fortifying their use within learning. During this period, the use of online learning became a necessity with teachers and students across the world being forced to rely on online applications and services, and computers or tablets as a medium for communication and teaching. There have been many books published and studies conducted on the benefits and limitations of the use of educational technology, particularly with the use of mobile learning (on mobile devices) and the learning process (Wilden, 2017). There are also many studies into the efficacy of using tablets [namely Apple iPads] and other smart devices in higher education (Liu & Gong, 2014; Kankaew & Sompong, 2016), but there seems to very little research conducted into the use of Apple TVs in classrooms. Kankaew & Sompong (2016) mentioned their use of the 'Airplay' feature

within Apple TVs to show things to students as a benefit for teaching and learning; however, the students that cover its use or benefit were difficult to find. This small gap in the literature was the inspiration behind this paper, and if the above-mentioned technology specifically can assist with student learning in a beneficial way.

Statement of Problem

As introduced in the background and expanded on upon the literature review, two research questions were developed for this study:

1. What can be done to connect students to devices that open new ways of creating a student-centred experience, and how does the technology create a collaborative environment?
2. How was the feedback from learners about the collaborative experience?

The reason behind the first research question was to tie together the three areas explored within the literature review. The goal was to test a technology for educational purposes in a student-centred teaching atmosphere that encouraged a collaborative learning environment. The reason for the second research question was to understand how students perceived the educational technology that supported the collaborative learning experience.

Methodology and Data Collection Procedures

The research involved using two Apple TVs in two different classrooms, one with Japanese-only students and another with international students. The set up for both classrooms were almost identical as the TV was at the front of the room with the Apple TV device connected to the monitor. As previously noted, Japanese students often expect a teacher-centred approach to teaching (Maftoon & Ziafar, 2013) and suffer performance anxiety in communication classes (Cutrone, 2009), so this design was established to check for any comparison between the two groups. The only difference was the inclusion of a smart speaker for the one class (as seen in figure 1); due to poorer sound quality from the monitor in that room. The other classroom's monitor (as seen in figure 2) had more powerful speakers so a supplement one was not required. The majority of students within the university have iPhones or use products from Apple; therefore, Apple TVs were selected because of their functionality that enables swift and easy connectivity between different devices, and the main ability of being able to wirelessly 'screenshare' their device's screen so documents, images or videos can be shared onto the monitor



Figure 1: Setup of Apple TV with a Smart Speaker.

or television set without the need to physically connect cables. Students can also quickly disconnect their smart device and another person's device can be instantly connected. Although different tasks were implemented throughout the four sessions, the procedure was to have students prepare something as a homework task, bring it into class, briefly review it in small groups, and then have people randomly show their work via screensharing to create a platform for class discussion.

Taking inspiration from the advice of Michael (2006) about the teacher carefully constructing a collaborate and student-centred environment, there was a short initial training period that consisted of the sessions' aims, the task goals, procedure for the session and how to engage with the technology. Harumi's (2011) findings were considered by having students form their own groups to increase the chances of comfortable cooperation between peers and an overall successful atmosphere. The goal was to have students take control of the class by sharing their screen, which comprised of either a document, notes, or image of their homework, and then have other students around the class voice their thoughts or opinions.

Results and Discussion

The pictures below were taken from two different sessions where various students screenshared their work for collaborate tasks to initiate conversations about the topics from the lesson materials.

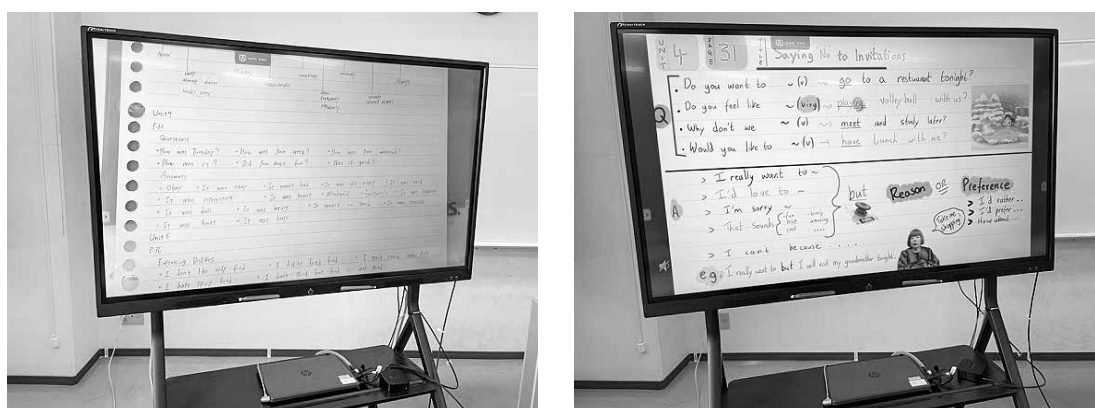


Figure 2: Pictures of students' work using the screenshare feature for collaborate communication tasks [Japanese-only class]

The picture below was taken of students preparing for one of the sessions, with one student sharing their discussion question and others contributing their responses.



Figure 3: Pictures of students' using the screenshare feature for collaborate discussion tasks [International students' class - consent obtained, and features blurred]

- **Research question 1**

The device was connected to the TV at the front of the class for viewing ease, and students were placed into groups at first for an initial check of their prepared tasks (various topic with simple and/or discussion-based questions). Then, a person was nominated to screenshare their work for the entire class to see. People then took turns, student-led, to screenshare their work for different tasks to be practiced. The photos in Figure 2 were taken from the Japanese-only students' classroom, and the task for these sessions were for them to share their conversational phrases with questions, such as having one person invite others do an activity, like going shopping, and then people declining the offer with a personal reason why. This led to group practice, peer-teaching and short discussions about the communicative tasks and formulaic conversational phrases presented by each student. The international students' classwork topics were different with more discussion-based opportunities, often on their opinions about aspects of Japanese culture, but the setup, homework development path and collaborative style were the same for both classes; one person directs while others contribute.

In the Japanese-only class, the students were slightly hesitant at first as their work was being shared and seen by all. Despite the initial hesitancy, once the activity began to progress, they seemed to cooperate well both within their own group and then with the class as a whole. Teacher input was kept to a minimum with the role being reduced to a facilitator. They engaged extremely well with the technology and seemed to enjoy the ease of the sharing of documents and contributing without having the eyes of their peers on them. In addition, the smaller teacher presence seemed to enrich their productivity, which mirrored the ideas presented by Johnson & Johnson (2009) and Laal & Ghodsi (2012).

The tasks in the international-student classes were rather simpler; students prepared possible discussion questions concerning the assigned piece of literature then shared them with the class. Students were then asked to contribute their ideas concerning the questions raised. When

screensharing began, at first one student was chosen at random and their questions were posed and discussed, before they decided, without teacher involvement, who take the next turn. It was then realised while in practice that the technology allowed for a more democratic sharing method, so subsequently the next student showed their questions, the first of which was then discussed, then the third student showed their questions, of which one was discussed, and such a rotation was continued until there were no more original questions remaining. This was what the Figure 3 photo shows from the discussion classes with the international students.

From the teachers' observations, it seemed that students felt more relaxed in this new atmosphere as the need to physically move themselves to the front of the classroom was removed. It was also noticed that some of the more reserved students began to contribute more than they usually did. In addition, the timings needed for people to stand up and move towards the front of the room, then begin to prepare themselves, through the set-up of a slideshow or writing on the board was severely reduced. It is dependent on the type of class; however, many teachers may agree from their own experiences that the changeover time from one student to another can be anything from 30 seconds or even as long as a few minutes, which wastes valuable class time. In all sessions, this was reduced to only several seconds, even when the occasional connectivity issue arose, it still was overall faster than the normal steps mentioned above.

- **Research question 2**

The feedback from both classes was overall positive and the ability to easily screenshare was generally well-received. Specifics from each class will be revealed below.

In the Japanese-only classes, every student had an Apple-made device and was able to easily share their work. Many students noted that they specifically enjoyed the ability to quickly switch between users at the tap of a button and magnify sections of their work and make changes, in the form of corrections or additions, instantly after receiving suggestions from their peers. They were also appreciative of being able to share their work with their peers without physically being at the front of the class, something many generally disliked about giving presentations. Four students mentioned that they felt empowered due to their own work specifically 'guiding' the class's direction and felt more confident to share their ideas in future sessions. Although nothing negative happened during any of the sessions, as the entire screen of a student's device was shown, some expressed concern about what would happen if a private notification or file was accidentally revealed, and what would the teacher do. Therefore, this highlighted that there is a need for proper training and a clear set of rules to be established to limit such problems. Although a training period was implemented, including guiding people to have their notifications muted and files in a specific folder to reduce potential sensitive items from being shared, this need for safety needs to be highlighted on multiple occasions throughout the use of techniques.

In the classes with international students, feedback was also positive among all members. It was noted that many praised the opportunity to lead class discussions from the front of the classroom without having to leave their seat, which they dubbed as ‘armchair leaders’. Similar to what was expressed by the Japanese students, several pointed out they were able to actively contribute to or lead the class without the pressure of having to stand at the front of everyone; the screen-sharing feature acted as their substituted presence. They also noted that some of the questions proposed by people in other groups were ones they did not think of and may have missed if they had only stayed within a single group. Having the opportunity to work on ideas from classmates outside of their own group without having to chase other people down was a well-received feature of these cross-group collaborative tasks. One issue that arose was that two students did not have a compatible device that could link with the Apple TV to enable sharing. Fortunately, this was overcome as the class worked together to work out an approach to incorporate those with non-compatible devices by sharing their work via a proxy. One student emailed their work from their smart device to a fellow student’s compatible smartphone, which was then shared. Another student shared their document with their classmate’s smartphone via Google’s Documents which was then screen-shared, and revisions to the document could be seen in real-time. Although it was fortunate that students were able to collectively uncover a solution to circumvent the issue, the limitation present is that those without compatible devices are immediately at a disadvantage. In this situation there were only two people without such devices; however, if the number of people with non-compatible devices outnumbered the number of those with compatible devices or if no one possessed an Apple-made device, implementing this particular technology system could be difficult or even outright impossible.

Conclusions

Overall, this was a very successful approach for our institution to explore new ways for student-centred and collaborative learning and was well-received by all involved. The most advantageous point of the study seemed to be the capability to share content in a student-centred fashion without the pressure and potential embarrassment of being physically in front of the other students. The ability to quickly display content, switch between presenters, and edit the material in real time resulted in sessions running much smoother and faster than what typically occurs in normal classes. The time taken for students to stand up, set up themselves and any devices they have up to share with the class, and start presenting their material was removed entirely in place of just wirelessly connecting to the screen within seconds of the previous student. This flow dramatically saved time, increased productivity and seemed to reduce student performance anxiety based on teacher observations. Although there were a few minor issues with connectivity or some students not having compatible devices, sufficient countermeasures were uncovered, and the overall feedback was positive leading to the construction of more student-centred and collaborative learning environments than usual. However, this was a small-scale study, so the long-

term implementations of this technological need to be studied in further research. A possible future approach could be the technique of students sending the teacher their materials anonymously first, then the teacher relaying them to the class; this could help to further reduce feelings of anxiety associated with work being shared with peers. This study also sets the foundations for further research into examining the expense and efficacy of the use of other devices such as a Chromecast, Miracast dongle or an Amazon Firestick. Similarly, many newer smart TVs have screen sharing as a built-in function. These devices could be tested to check for the possibility of furthering the possibility of addressing the limitation found within this study of people for people who do not possess Apple devices.

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