Article

Evaluating the Effectiveness of Enhancing Webcasts With Digital Tagging

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ABSTRACT

Background: Webcast platforms have paved the way for flipped classroom formats and distance learning, possibly replacing traditional forms of curriculum delivery. However, studies have shown that webcasts still have room for improvement for functionality and usability. In this paper, we introduce the SAM (Stand Alone Media) network platform, which provides features such as embedded digital tags as well as chapter-based and keyword-based navigation that improves the overall usefulness of webcasts.

Methods: A webcast video provided by the Department of Anatomy was uploaded to two webcast platforms: the MedSpace platform, which is currently in use in universities such as the National University of Singapore, and the novel webcast platform, the SAM Network. Students were recruited to appraise the usefulness and efficacy of both platforms.

Results: Most students had issues with the audiovisual quality in current webcasts. The SAM platform was able to address issues students encountered on MedSpace, such as the ability to navigate through the video via keywords. Students also found the digital tags useful. Both platforms proved to be effective in helping students gain more knowledge of the curriculum content.

Conclusion: Webcasts are useful and effective tools in delivering curriculum content. However, issues with webcast quality and platforms can hinder students' learning. The SAM network can address many of these issues, proving the SAM Network's efficacy as a webcast platform. Ultimately, for webcasts to achieve maximum perceived usefulness among students, much would need to be improved upon not only in the webcast platforms we use, but also in changing institutional norms towards learning.

INTRODUCTION

There has been greater adoption of technology within educational institutions worldwide, and the Internet has paved the way for virtual classrooms and distance learning through platforms such as Coursera. Adoption of flipped classroom formats have been on the rise within institutions as well, pushing the shift towards student-directed learning from a lecturer-directed one (Brown, 2006; Ruiz, Mintzer, & Leipzig, 2006). These changes in curriculum delivery methods as well as teaching paradigms have been catalysed by technologies such as webcasts, in which lectures can be pre-recorded or recorded during normal lecture periods and then streamed and viewed remotely through the internet. Currently, we have a webcast platform in the National University of Singapore (NUS) called MedSpace, which is a basic webcasting platform that allows students to stream and review past lectures. The platform allows students to annotate and supplement their notes at specific time points of the webcasted lecture.

However, studies have shown that much work is still needed to make webcasts a more ideal medium for curriculum delivery. Webcasts still pale in comparison to traditional forms of curriculum delivery, such as live lectures, in terms of interactivity. In a study by Wang, Mattick, and Dunne (2010), one of the major complaints by the participants was the inability to clarify concepts in real time just like in a formal lecture setting. Another problem faced in making use of webcasts in curriculum delivery is that students make use of webcasts as a form of passive learning rather than making use of webcasts as active learners. Students may have been accustomed to passively receiving information as they would in live lectures, and hence these learning habits may have carried over when they switch to webcasts.

We thus hypothesised that the introduction of digital tags—which are annotations attached to specific time frames containing hyperlinks as well as enrichment content—would encourage a more active and exploratory approach in learning among students while making use of webcasts. It would thus allow for a navigationism learning approach (Brown, 2006), in which students are allowed to seek out and evaluate information and knowledge from a wealth of different sources of information online, while still being anchored to curriculum content. Through this, students would hopefully be better equipped to integrate the knowledge they have obtained from their core curriculum content and the online information which they may have gleaned beyond the curriculum through the hyperlinks, and apply this consolidated knowledge into

real-world as well as novel situations. In actual fact, annotations were already in use in webcast platforms such as REPLAY, in which such features received favourable reviews by the students involved in the study (Schulte, Wunden, & Brunner, 2008). The drawback of using REPLAY is that it is only accessible to faculty and students of partnering and collaborating universities. Moreover, the videos would be uploaded through Opencast which can only be accessed by collaborating universities. This also means that it would require a dedicated server infrastructure to store the videos.

We also sought to make a webcast platform that provides greater flexibility for students to learn curriculum content from webcasts at their own pace. Most platforms already have a "fast-forward" function and a rudimentary chaptering function in which the video stream can be divided into chapters based on the PowerPoint slide the lecturer is on. However, certain functions on these existing platforms are currently unavailable to students; for instance, students are not able to use terms mentioned during the lecture as keyword search phrases to seek out information within the webcast videos.

Thus, in this paper, we introduce a novel webcast platform, the Stand Alone Media or the SAM Network, which allows for segmentation of a webcast into segments or chapters and also for the webcast to be supported with annotations, insertions of PDFs and hyperlinks. This webcast platform combines a more enhanced annotation functionality, as seen on the REPLAY webcast platform, but has a more flexible navigation interface through the use of digital tags. The annotations can be displayed graphically to show the regions that have been enriched with annotations that will direct learners to additional reading materials. The video can be uploaded via Youtube by the provision of a hyperlink and the server infrastructure has been provided by the creators of the SAM Network. We also compare its effectiveness with our current webcast platform, MedSpace, used in the Yong Loo Lin School of Medicine (YLLSoM). The characteristics and differences between the three webcast platforms are illustrated in Table 1.

Table 1
A comparison of the three different webcast platforms

MedSpace	REPLAY	SAM Network
Webcast platform currently in use in YLLSoM at NUS Basic webcasting platform that allows students to stream lectures and webcasts Allows students to make notes while making use of the platform	Allows annotation Videos to be uploaded on OpenCast Requires collaboration for its usage. This also implies there is a need for dedicated server space for the videos uploading. *Addition of citation for REPLAY	A novel webcast platform Allows for segmentation of webcast into "chapters". Similar to REPLAY, allows for addition of annotations However, unlike REPLAY, it's open access (REPLAY only allows access to partner universities) Better user interface Richer annotations, can display graphically which regions of the webcast has the greatest number of annotations (which could also indirectly indicate which parts of the webcast mentions important or challenging content that may require further reading

METHODS

Preparation of the webcast

A webcasted lecture on embryology development was obtained with permission from the lecturer, Professor Rajendran, from the Department of Anatomy at YLLSoM. The webcast was edited using the software VideoPad Professional 4.11, editing out periods of inactivity and adding in subtitles. The final version of the webcast lecture video was approximately [38] minutes in length. In addition to editing the webcasted lecture video, a verbatim transcript of the lecture was also created.

The webcasted lecture was subsequently uploaded to two different webcast platforms: MedSpace and the SAM Network. Specific points of the webcast were bookmarked on these two platforms to allow for chapter-based navigation.

On the SAM platform, red pointers were incorporated into the video. Digital tags containing hyperlinks to external resources were also embedded in the webcast via the platform's native digital tagging function. Keyword tags were also added as a means of building up a dictionary of medical terms in the video

and enhancing overall video navigation. This will allow users to navigate to the specific point of time when the keyword is mentioned in the webcast. As anatomy lectures tend to have a lot of medical jargon, the keywords and terminology were carefully picked based on their frequency of appearance and whether they were important enough, as determined by content expert, to be digitally tagged. In addition to tagging medical terminology, this process was also intended to facilitate any digital search a user might conduct within the video.

Designing of the questionnaires

In order to evaluate the effectiveness of the two platforms in curriculum delivery, a quiz related to the lecture content was constructed, with guidance from the lecturer Professor Rajendran. This quiz consisted of 7 multiple choice questions (MCQ) with five options per question. This quiz would be taken twice, first prior to watching the webcasted lecture to gauge students' baseline knowledge of the lecture topic (pre-video quiz), and finally after watching the webcasted lecture to evaluate if the webcast platforms were effective in transmitting curriculum content (post-video quiz). The questions and options are arranged in a different order in the post-video quiz to avoid the possibility of bias.

To evaluate student perceptions of the webcast platforms, a survey questionnaire was also designed and administered. This survey contained open-ended questions to record qualitative responses from students. In order to capture quantitative responses, participants were also asked to answer questions on an ordinal 5-point Likert scale, with 1 indicating "Strongly Disagree" and 5 indicating "Strongly Agree".

To further evaluate the platforms' usability, the 10-item System Usability Scale (SUS) instrument was also used (Brooke, 2013). The SUS was designed with 5 positively-phrased items and [5] negatively-phrased items, with the responses ranked on a 5-point Likert scale where a response of 1 corresponds to "Strongly Disagree" and 5 corresponding to "Strongly Agree". For the positively-phrased items, the score of each item was calculated by the scale position of minus 1 (e.g., if the participant selected 5 as "Strongly Agree" with one positively-phrased item, the score of this item would be 4). For the negatively-phrased items, the score is calculated by 5 minus the scale position (e.g., if the participant selected 5 as "Strongly Agree" with one negatively-phrased item, the score of this item would be 0). Thus, the score of each item would range from 0 to 4 and the SUS score can be derived from summing up all the item scores and multiplying them by 2.5 to convert the possible range of the score to a range of 0-100. A SUS score above [68] is considered an acceptable range, which can be further assessed by converting the score into a percentile rank (Brooke, 2013),

a grading scale, and an adjective scale (Bangor, Kortum, & Miller, 2009) for a subjective comparison of the usability between the two platforms. The SUS scale and score can be visualised in Figure 4 (on page 17).

Study design

With approval from the NUS Institutional Review Board (IRB-15-168) to carry out this study, students were recruited and then randomly split into two groups. The first group (MedSpace group) were assigned to watch the webcast on the MedSpace platform. The second group (the SAM Network group) were assigned to watch the webcast on the SAM platform. The students were given a timeslot to view the webcasts on the platforms they were assigned to, and each participant was separated to ensure there were minimal distractions.

Prior to watching the webcast, each participant was given 8 minutes to complete the pre-video quiz. Upon completion, the students were then given a functionality list of features which would give them an idea of the various features on the platform they were assigned to, encouraging them to thoroughly explore the platform's features. They were then given 50 minutes to watch the webcast and to explore the platform. Once the 50 minutes was up, they were given 8 minutes to complete the post-video quiz. This time, the students were allowed to make use of the webcast platform to aid them in answering the quiz. Once they have completed the post-video quiz, they were then given the survey questionnaire to evaluate their experiences with webcasts and the platform they had just used. Participants were then reimbursed for taking their time for participating in this study. Figure 1 provides an illustration of the entire process of the study.

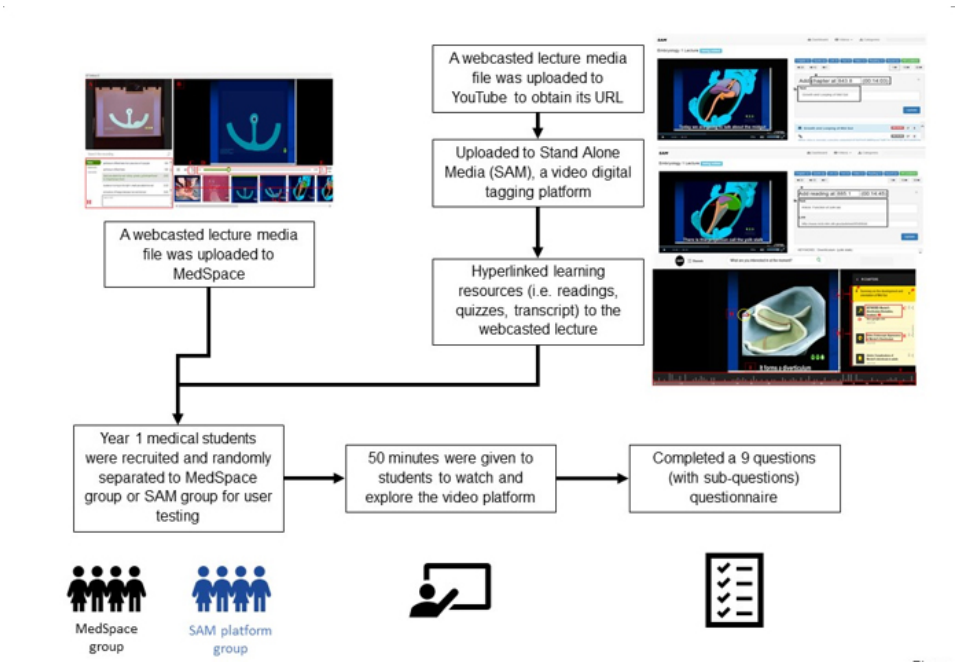

Figure 1. A flowchart of the study process—from the processing of the webcast to the student user testing.

Study participants

All first-year undergraduate medical students enrolled in YLLSoM were eligible to volunteer and participate in this study. This would ensure that the students included in this study would be able to comprehend the content of the webcast videos. Students could also voluntarily opt in and be present during testing. Students who were non-matriculated, unofficial YLLSoM students and students who were absent or had opted out of the user testing phase were excluded from this study.

Due to resource constraints, we aimed to recruit 10 ± 2 test users for each group. This was based on Hwang and Salvendy's study that states that a small number of 10 ± 2 users were enough to detect 80% of usability problems (Hwang & Salvendy, 2010).

Data analysis

The quizzes as well as the survey responses were analysed using IBM Statistical Package for the Social Sciences (SPSS) Version 23. Non-parametric Mann-Whitney U-test and Wilcoxon paired tests were used to analyse responses between and within the two groups. Pearson chi-square test was also used to detect if there were any significant differences between the two groups. The authors subsequently plotted the data using GraphPad Prism 7.

RESULTS

Participant data

The sample size was initially determined to give sufficient statistical power. 25 students were recruited, of which 12 were male (48%), and 13 were female (52%). After dividing these students into groups, the MedSpace group (n=12) had 6 males and 6 females, whereas the SAM Network group (n=13) had 6 males and 7 females. Students from both groups were generally comfortable with watching the videos, with the mean for MedSpace group being 4.58 (S.E.M. ± 0.149) and the mean for the SAM Network group being 4.15 (S.E.M ± 0.191). Based on a Mann-Whitney U-test, there was no significant difference in comfort level between the two groups, and hence the results for these groups would be comparable.

Using the pre-video quiz, the students' base level of knowledge of the lecture content can also be gauged. Out of a total of seven, students from the MedSpace group scored a quiz mean of 3.25 (S.E.M ± 0.372) while students from the SAM Network group scored a quiz mean of 3.77 (S.E.M. ± 0.395). Based on the Mann Whitney U test, there was no significant differences between both groups' quiz scores. Hence, both groups were comparable with the same level of prior knowledge, which was around the passing mean score of 3.5.

Students' perceptions, expectations and experiences towards current webcasted content on the SAM Network and MedSpace platforms

Majority of the participants had high expectations of the webcasts' ease of access and streaming quality. Most students agreed that webcasts should have fast and smooth streaming (mean=4.76, S.E.M. ± 0.087), and that it should be easily accessible (mean=4.72, S.E.M ± 0.092). Many students thought that the engagement level of the webcasts was not as important, having the lowest mean rating of 3.84 (S.E.M ± 0.149). Figure 2 summarises the student perceptions of the current university webcast and platform. A word cloud (in Figure 2B) summarises the qualitative feedback from the students.

When asked about their experiences on webcasted lectures and the problems they faced while using the current webcast platforms, majority of the students cited problems with regards to the webcasts' audiovisual quality. "Unable to see" and "(lecturer) cannot be heard" were among the most frequently cited problems students encountered with current webcasts.

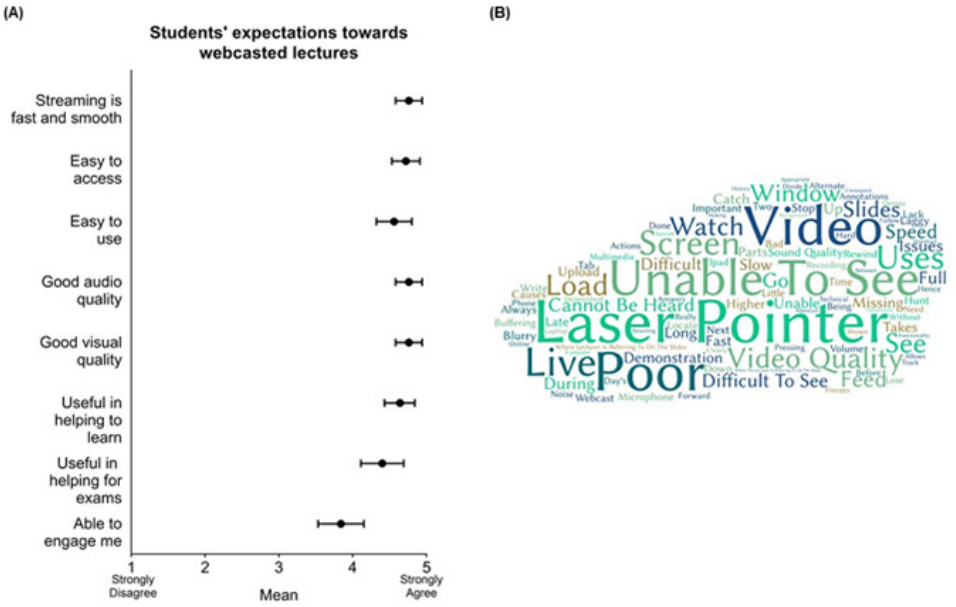

Figure 2. Students generally had high expectations for streaming and audiovisual attributes for webcasts as well as webcast usefulness, but comparatively did not have as high expectations for the level of engagement. These attributes in which students had high expectations for were also where most students found problems in the current webcast platform.

(A) Scatter plot diagram of students' perceived expectations for webcasted lectures in terms of its platform attributes (i.e. ease to access, streaming conditions, ease to use), video attributes (i.e. video and audio quality) and functionality usefulness (i.e. useful in helping to learn, prepare for exams, engage them) on a 5-point Likert scale (n=25); Mean [95%CI].

(B) A word cloud for the responses students gave when asked about commonly encountered problems on the current webcast platform.

Overall, participants rated the usefulness and level of engagement of both platforms quite highly, with these criteria being ranked on the 4-5 range of the Likert scale. However, despite the favourable response towards the features on the SAM platform, there was no overall improvement in perceived usefulness between MedSpace and the SAM Network, implying that the enhancement effects of the SAM Network was fairly conservative, albeit still perceived to be useful by students (Figure 3A).

With regards to visual quality, students had a higher rating for the SAM Network, primarily due to the visibility of the red pointers which had been incorporated into videos on the SAM platform. The audio quality was rated similarly for both platforms since the audio quality was unchanged on either platform. Students also appreciated the chapter-based and time-based navigation features on both platforms, with both features being rated similarly by both groups, with an average rating of between 4-5 on the Likert scale (Figure 3B).

The SAM platform included features which were able to address elements which students found to be lacking on MedSpace. For example, one of the improvements students wanted on MedSpace was the ability to navigate the webcast through keyword tags and to be able to digitally search through the video content, a feature which the SAM Network provides. This function, with definitions of medical jargon and terminology incorporated, would enable students to navigate through the lecture with ease. Hyperlinks to external resources were another feature that was rated highly when students were asked to rate features that would make MedSpace more useful; these were included in the SAM platform and was rated favourably as well (Figure 3C).

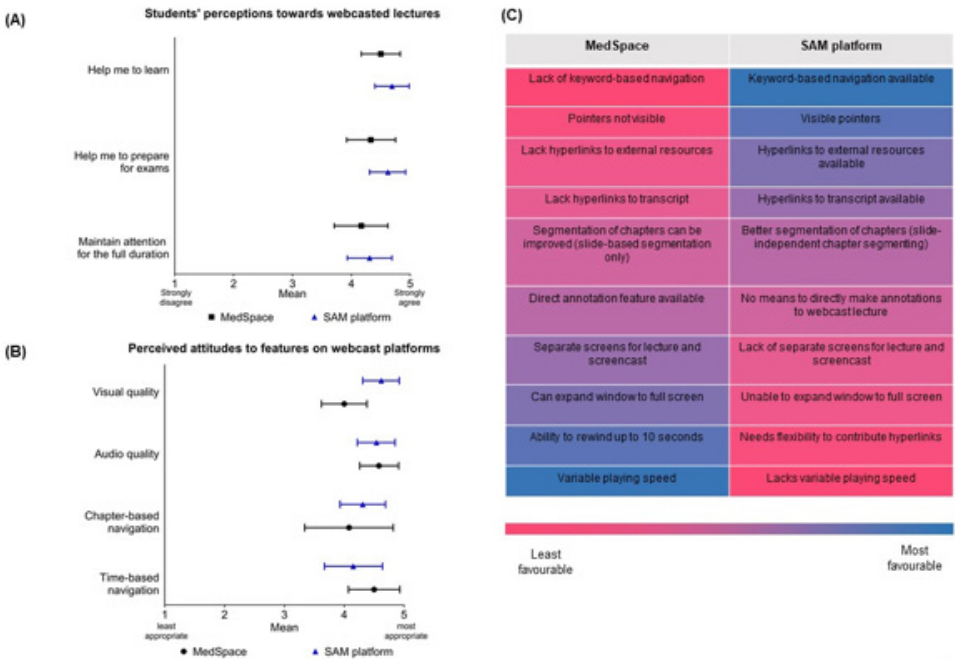

Figure 3. Students found the SAM platform to be slightly more useful than Medspace, and perceived an improvement in some features from MedSpace to SAM platform.

(A) Scatter plot diagram showing students' perceived usefulness of webcasted lectures in helping students to learn, prepare for exams and to maintain their attention on the Medspace and SAM platforms, both on a 5-point Likert scale (n=25); Mean [95%CI].

(B) Scatter plot diagram showing students' perceived usefulness of analogous features on both MedSpace and SAM platform, both ranked on a 5-point Likert scale; Mean [95%CI].

(C) Table of key features which were unique to each platform which students found useful.

In terms of usability, the SAM Network scored an SUS score of 79 while MedSpace scored an SUS score of 84 (Figure 4A). Though both platforms were within the acceptable range of more than 68, the SAM Network's platform usability obtained a grade of C with an adjective rating of "Good", while MedSpace's platform usability had obtained a grade of B and an adjective rating of "Excellent". Moreover, as the scores were converted to percentile rank, the MedSpace platform was in the 90th percentile rank (in the top 10%) while the SAM Network was in the 80th percentile rank (in the top 20%). Hence, the SAM network's platform usability appeared to be poorer than MedSpace. This may be due to the SAM Network's slightly lower flexibility in terms of providing students the opportunity to learn at their own pace, with mean of 4.15 (S.E.M ± 0.222) compared to MedSpace's 4.75 (S.E.M ± 0.131) and a slightly poorer score for the interface, with a mean of 3.92 (S.E.M. ± 0.178)

compared to MedSpace's 4.50 (S.E.M. ± 0.195). Though the SUS scoring of SAM platform was slightly lower than MedSpace, it could be a new navigation platform the students were not familiar with. There had been some drawbacks on the SAM platform, which included 1) there was. no speed control (x2, x4) for the videos, and 2) there was no annotation for parts of the lecture, which was something that students could do in MedSpace (Figure 4B). This indicated that such desirable aspects should be incorporated into the SAM platform to improve its userability. In fact, the students who were in the SAM Network group and had participated in the survey, emailed us after the study to ask if there was a possibility of sending them the link to the digitally tagged webcast, indicating to us that the students did indeed want to use such videos to learn beyond the core curriculum content.

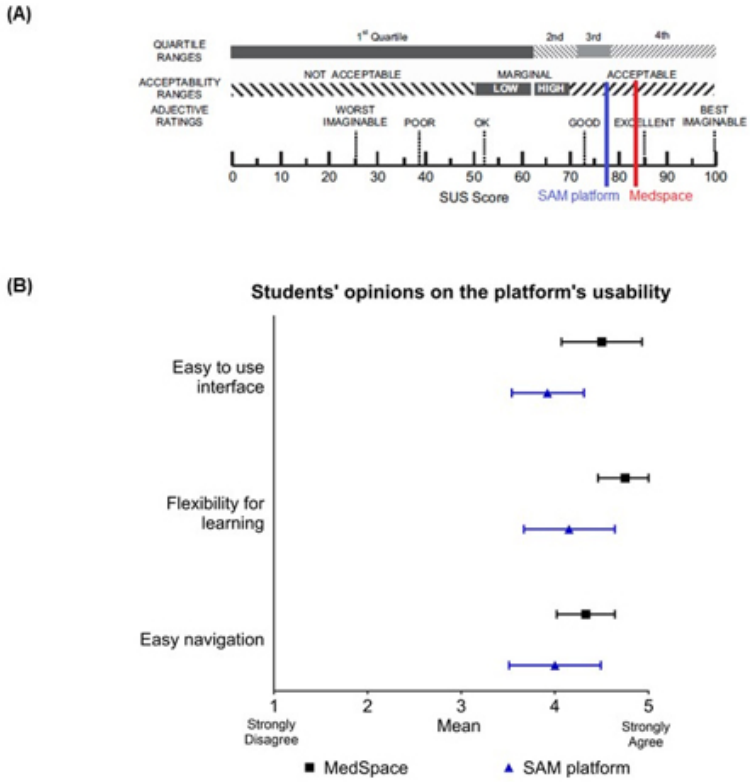

Figure 4. The SAM platform's usability was shown to be generally lower than Medspace's, with Medspace providing a better interface and greater flexibility.

(A) Usability ranking for MedSpace and SAM platform, both placed on a SUS score scale.

(B) Scatter plot diagram of students' perceptions on MedSpace and SAM platform's usability in terms of their interface, flexibility, navigation and learnability on a 5-point Likert scale (n=25); Mean [95%CI]

Efficacy of the SAM network and MedSpace platforms on curriculum delivery

Students from both the MedSpace and SAM Network groups both showed a significant increase in quiz scores after watching their respective webcasted lectures (Figure 5A). However, based on the Mann-Whitney U-test, there was no significant difference between the magnitude of change in quiz scores between the two groups (Figure 5B). This could be due to the small sample size of the study, which would affect the evaluation of the userability of the platform. Moving forward, we intend to expand this study to a larger student population.

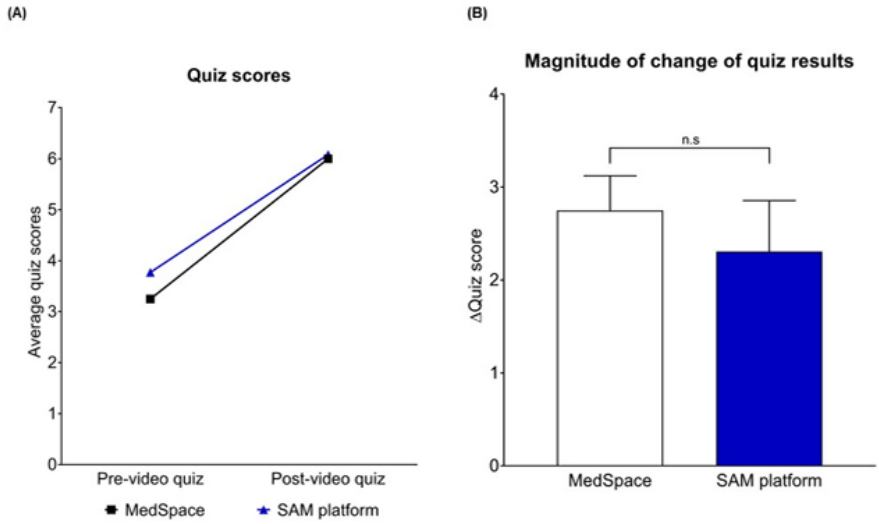

Figure 5. There was an improvement on quiz scores, both for the MedSpace and SAM platforms.

(A) Line graph of mean quiz scores for the pre-video and the post-video quizzes for students in the MedSpace & SAM platform groups.

(B) Bar graph for the magnitude of change in scores for the pre- and post- screening of the webcast videos on the MedSpace and SAM platforms. The magnitude of change in scores were checked for significant statistical change between the two test groups using the t-test.

DISCUSSION

Several studies have noted the supplemental role of webcasts in student learning, functioning as a secondary source of curriculum content which students use to catch up on content they may have missed during lectures (Billings-Gagliardi & Mazor, 2007; Cardall, Krupat, & Ulrich, 2008; Gupta & Saks, 2013; O'Bryne, Patry, & Carnegie, 2008; Schreiber, Fukuta, & Gordon, 2010; Wang *et al.*, 2010). In particular, students have been shown to make use of webcasts as aids in annotating their lecture notes and handouts. It is therefore essential for webcasts to be of good audiovisual quality. Our results show that among its many features, students have high expectations of a webcast's audiovisual quality. However, the sad reality is that current webcasts do not meet these expectations. Based on our results, many students felt that the audiovisual elements of current webcasts are of poor quality, and have indicated a need for improvements of the visual and audio quality in the webcasts that are made available to them. This issue of webcasts having poor audiovisual quality can be a hindrance to students' learning (Enfield, 2013), as students may have difficulty trying to understand the lecture content through the webcast, which can lead to an increase in cognitive load (Mayer, 2005; Sweller, 1994). Also, considering how students have been shown to have a greater tendency to make use of resources if they perceive that these resources add value to their learning (Von Konsky, Ivins, & Gribble, 2009), students may therefore find webcasts not as useful. They may also utilise webcasts less often, even when given a choice between attending lectures or watching webcasts only.

In order to increase the usefulness of webcasts, it is therefore important to enhance and repurpose webcast content. Based on the results from our survey, this would involve (but would not be limited to) the addition of subtitles, improving the audio quality and equalising the sound levels, as well as cutting out periods of inactivity in the webcast video. This would require basic video and audio editing skills, as well as having access to the software needed to make these audiovisual improvements. A standardised format in webcast videos could also prove beneficial. In a study of study guides by Holsgrove, Lanphear, and Ledingham (1998), they posit that having a consistent format proved to be beneficial in ensuring that the overall quality of the materials were consistently of high standards, and we believe this can be applied to webcasts as well. Coupling all these factors together, this would mean that institutions would need to be willing to put in a high investment in ensuring the usefulness of webcasts to their students. Masters and Ellaway (2008) have outlined guidelines of aspects of e-learning that need to be addressed as well as the possible costs that institutions need to take note of when investing in the development of e-learning materials, which encompasses webcasts as well.

From our results, we can see that the enhancements found in the SAM Network were well-received by students, and even addressed issues they encountered in MedSpace. However, the SAM network shares features with other video hosting platforms, particularly YouTube, a massive and popular video hosting site. Similar to the SAM Network, YouTube has the ability to add annotations and hyperlinks to external content. YouTube even offers features such as the addition of subtitles via YouTube's own closed-captioning system, as well as the ability to speed up or slow down videos. However, the SAM Network would still be more ideal for webcasts in comparison to YouTube. For one thing, YouTube's annotations can be intrusive and may block sections of the video, whereas on the SAM platform, digital tags can be found in a separate area from the video, in which they can still be seen by the viewers but would not obstruct the video itself. The SAM platform also has histograms which can denote the regions of videos that have been enriched with annotations. Furthermore, YouTube lacks the ability to be able to navigate the video via keyword search, which the SAM network is able to do. The SAM Network would therefore be more appropriate as a platform for hosting webcasts, although it can be improved with features found in other webcast and video hosting sites such as MedSpace and YouTube.

Even with these improvements, from our study we can see that there is still much room for improvement for webcast platforms. In Wang, Mattick, and Dunne's (2010) study on students' perception of webcast lectures, some students remarked on the lack of teacher-student interaction as well as interactions with their peers when using webcast platforms. While this interactivity is shown to be still missing in both of the webcast platforms we tested for this study, we believe that the annotation feature in the SAM platform can pave the way for teacher-student interactions away from the lecture halls. Firstly, enabling lecturers to add annotations to webcast content provides students with guidance when it comes to exploring curriculum content. Secondly, enabling students to make their own annotations on the webcast platform can be a means for students to clarify content they may come across in their own exploratory learning. This feature also paves the way for collaboration among students; by adding their own annotations to the webcast lectures, other students may also be able to learn from what their peers may have come across outside of the lecture content. Lecturers may choose to curate these annotations, making sure that the annotations added by students remain relevant to the curriculum.

While these improvements seem promising in improving students' learning experiences while using webcast platforms, their full potential cannot be truly realised if students remain accustomed to the passive way of learning, that is, relying on the lecturers to deliver the curriculum content. Such is the case among Singaporean students, which comprise the majority of the students involved in this study. These students are used to a teacher-centred learning approach rather than a learner-centric one (Amin, Tani, Khoo, Samarasekara, & Chan, 2009).

This could be an indication that in order to maximise the usefulness of webcasts, a paradigm shift must be made from a teacher-centric to a learner-centric learning approach, with students being more self-directed and active learners rather than passive receivers of information. The inclusion of hyperlinks could be one of the ways to encourage students to be more active learners and have a guided way of exploring lecture content beyond from what is taught during the lecture. Even though these additional features are well-intended, there could be a possibility that students who access an URL may not return to the webcast to complete the webcast lecture. Another way is to look into changing how institutions assess their students, hopefully changing students' mindsets from studying only to pass to doing actual learning. Thus, the assessment materials for post-video lectures must test both the materials in video as well as the hyperlinks; this would subtly nudge students to explore materials outside of the core lecture content. Another possibility and opportunity would be to incorporate webcast videos within a flipped classroom activity in a "reversal of roles", whereby the annotations are tagged by the students themselves and they can enrich the video segments with materials they deem important Through these changes, students would be able to make full use of webcast content, and increase its perceived usefulness.

CONCLUSION

The SAM Network platform shows potential in improving the quality and usefulness of webcasts. From our survey results, the SAM Network was able to address the many issues students faced in webcast platforms that they were currently using in their institutions. The digital tags proved to be useful and enhanced students' user experience, from equipping them with the ability to navigate through the webcast using keywords, to being able to access enrichment content through the annotations provided.

However, our results also show that the usefulness of a webcast platform depends on the user as well. Despite the enhancements in the SAM Network, students who utilised this platform only fared equally to students who utilised webcast platforms currently offered by their institution. Students in the SAM platform had a lukewarm response towards the addition of hyperlinks to external resources. Considering learning norms among Singaporean students, which formed the majority of the students that participated in the study, this response was to be expected. Students in Singapore still prefer a learner-centric approach, and hence, they may not have fully utilised the features made available to them on the SAM platform. It would thus be interesting to observe how the SAM Network would fare if it were tested on students from different countries with different learning norms.

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