Increasing the impact of teacher presence in online lectures *

David Iclanzan and Zoltn Ktai

Sapientia Hungarian University of Transylvania
Faculty of Technical and Human Sciences, Târgu-Mureş, Romania
{iclanzan,zoltan_katai}@ms.sapientia.ro

Abstract. We present a freely available, easy to use system for promoting teacher presence during slide-supported online lectures, meant to aid effective learning and reduce students' sense of isolation. The core idea is to overlay the teacher's body directly onto the slide and move it and scale it dynamically according to the currently presented content. Our implementation runs entirely locally in the browser and uses machine learning and chroma keying techniques to segment and project only the instructor's body onto the presentation. Students not only see the face of the teacher but they also perceive as the teacher, with his/her gaze and hand gestures, directs their attention to the areas of the slides being analyzed.
We include an evaluation of the system by using it for online teaching programming courses for 134 students from 10 different study programs. The gathered feedback in terms of attention benefit, student satisfaction, and perceived learning, strongly endorse the usefulness and potential of enhanced teacher presence in general, and our web application in particular.

Keywords: Teacher presence · Teaching aid tools · Online teaching.

1 Introduction

In recent decades, there have been a number of predictions about an increase in demand for online courses. For example, the 2009 Chronicle of Higher Education research report, "The College of 2020", predicted that students would be increasingly interested in online courses [27]. However, it is quite certain that even the boldest predictions did not imply the actual need generated by the COVID-19 pandemic, which in addition, required an almost instant shift.

In most countries, video conferencing tools (Zoom, Microsoft Teams, Google Meet, etc.) provided a quick solution, enabling webinar-like courses. The teaching environments often include PowerPoint slides [4] which are preferred and used by many CS instructors too [22]. The video conferencing tools have a screen sharing feature which allows the teacher to use the same PowerPoint presentation as for

* This study was partially supported by the Sapientia Foundation Institute for Scientific Research.

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

face-to-face lectures. Common learning settings are: i) students listen to the teachers explanation while their eyes are fixed on the slides; ii) the teacher turns on its camera and its video appears next to the slides in a separate smaller window; iii) instruction is presented as full-screen lecture slides with a small embedded video overlay of the instructor speaking (usually, the teachers face on the slide has a fixed size and position).

A major concern with online courses is a sense of isolation that can hinder students ability to learn [8]. When social cues disappear, communication becomes more "task-oriented, cold, and less personal than face-to-face communication" [29, p. 461]. Accordingly, research in the field of online education highlights the key role the "strong teacher presence" plays in engaging learners in meaningful learning experiences [5,28]. This phenomenon was investigated mostly within the framework of asynchronous video lectures. It was suggested that including the instructors face in the online lecture (via a small embedded video) will result in more effective learning because it has the potential to amplify the social cues coming from the teacher [7]. On the other hand, empirical evidence does not support (consequently and consistently) the validity of this social argument. According to Kizilcec, Papadopoulos, and Sritanyaratana [16] a possible reason could be that the resulting social cue is too weak to induce such positive social responses in learners, that could surpass the generated attention division between the two video inputs (teacher and slides).

In line with this suggestion we tried to increase the impact of teacher presence in synchronous video lectures by adding a new, platform-independent feature to video conferencing tools, in the form of a simple web application accessible from any modern internet browser. The application segments in real time the teacher's web camera feed and projects the teacher's body onto the slides. The component allows the instructor to change the position of the video image in the slide area and to zoom in or out, respectively. We expect that this new feature will promote a stronger teacher presence by supporting a "more alive" teacher-student and teacher-slide interactivity. The teacher's gaze and hand gestures engages and focuses students' attention onto the region in the slides that are currently discussed. The teacher may also choose to move his/her image to the region currently analyzed in the slide, or to use his/her scaled down image as a pointer. When it is deemed important for students to pay undivided attention to the teachers explanation, the instructor may scale his/her image to obscure the slide. Since the communication occurs live, the increased "visual flexibility" of the teacher allows them to consider student feedback on how they relate to the content displayed on the slides. In this study, we investigated the effectiveness of this tool with respect to student satisfaction, increased attention and perceived learning.

2 Background

A number of research investigated the effectiveness of instructional videos in engaging students in meaningful online learning experiences. To facilitate a stronger

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

teacher presence, many of these videos feature a picture-in-picture view of the instructor. However, in a recent study, Wang and Antonenko [30] emphasize that it is not clear how teacher presence influences learners' visual attention and what it contributes to learning and affect.

2.1 Split attention versus social cue

Several studies in multimedia learning research have examined the phenomenon of split attention resulting from multiple channel presentation [19,25]. According to Baddeleys Theory of Working Memory [3], separate processing units are employed for different input modalities: the so-called "visual-spatial sketchpad area" of working memory stores visual input and the "phonological loop area" stores auditory information. According to this model, the two visual inputs (the video of the instructors face and the slide content) would compete with each other for visual-spatial cognitive resources while the instructors narration is processed separately (although potentially supported by nonverbal information encoded in the instructors presence; e.g., gestures and facial expressions).

Since all lecture-relevant information is encoded on the slides and in the narration, someone might consider the instructors face as a source of unnecessary extra load as it could obstruct cognitive processing of relevant information and, consequently, hinder learning. On the other hand, according to Clark and Mayer [7], social cues from the instructor may enhance the learning process by triggering social responses in the learner [21] and promoting deeper engagement with the lecture content.

In line with these contradictory viewpoints, prior research on the effect of including the instructors face in lecture videos provided mixed results. A considerable amount of experimental evidence supports Mayers [18] image principle that adding a picture or video of the instructor to a multimedia instruction does not necessarily support learning [14]. On the other hand, there is also competing empirical evidence on learners affective response to the instructors face in video lectures. In a review of the social presence theory and its instructional design implications, Cui, Lockee, and Meng [8] refer to several studies which conclude that social presence is one of the most significant factors in improving learners satisfaction and perceived learning.

A possible reason for these apparently contradictory findings is suggested by Homer, Plass, and Blake [14]. These authors report that learners who saw the speakers face did not report a greater sense of social presence than those who did not see the speaker. In addition, as mentioned above [16] argues that this may happen when the generated social cue is too weak to induce positive social responses in learners. Three immediate indicators of a stronger teacher presence could be attention benefit, increased perceived learning and student satisfaction.

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

2.2 Visual attention, student satisfaction, and perceived learning in online learning environments

Several studies revealed that human eyes elicit strong attentional shifts in the direction of their gaze [1]. Since attention is a prerequisite of learning [26], displaying the instructor in an online learning environment could enhance the learning process because of the generated attentional cueing effect. For example, van Wermeskerken and van Gog [31] investigated learning settings that embodied video examples in which an instructor demonstrates how to perform a task. These authors conclude that the teachers gaze may be a powerful cue for students because it may help them to switch their attention timely from the instructor to the task.

Another important component of the learning process is student satisfaction [2]. According to the Online Learning Consortium, student satisfaction is one of the defining elements of high-quality online learning. A widely used conceptual framework for evaluating learning environments is Kirkpatricks four-level model [15]: reactions, learning, behavior, and results. A cornerstone of Kirkpatricks model is that reaction affect, such as satisfaction, results in effective learning.

Perceived learning is also considered as an indicator of learning and a key element for course evaluation [32]. It is defined as a student's self-report of knowledge gain [24]. According to Alqurashi [2] it is important for teachers to evaluate how students perceive their learning to improve the quality of their online courses.

In a recent study, Wang and Antonenko [30] analyzed the impact of teacher presence on visual attention, perceived learning and student satisfaction in the context of online mathematics education. Participants were invited to watch two instructional videos, with the instructor either present or absent. These authors report that the teacher attracted considerable visual attention and teacher presence positively influenced participants' perceived learning and satisfaction.

We have proposed to test the effectiveness of the tool we designed from a similar perspective but within the framework of Computer Science education. A common particularity of mathematics and Computer Science topics is that the teacher often analyzes the slide content together with students.

3 Client-side web application

With the proliferation of online meetings in general, and online classes in particular, video conferencing tools are frequently adding new features to better suit client needs and maximize market share. Most of these features expand the collaboration and coordination capabilities within these tools, but some of them are meant to offer avenues for more engaging presentations.

Recently, the Zoom platform started offering a new feature, still in beta (as of January 2021), in which users "can share presentations as Virtual Backgrounds for an immersive sharing experience". As the Google Meet platform used by our university does not yet have similar capabilities, we set out to develop a custom solution, to offer a better online learning experience for our students.

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

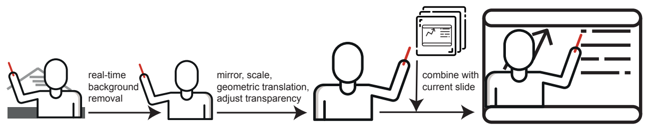

Fig. 1. Stages for obtaining an image-frame that contains the current slide overlaid with the image of the presenter.

The main requirements we established were i) ease of use, minimal learning curve; ii) flexibility - the presenter's projected image can be freely moved / scaled, customizable opacity, etc.; iii) privacy - no registration or data sharing; iv) out-of-the-box functionality - many teachers do not have administrator rights on the school-issued devices, therefore no installation should be required; v) platform independence - the solution should work on all major desktop operating systems and with all video conferencing tools that support screen sharing.

A client-side web application that runs locally in the browser can satisfy all above requirements. Therefore, we developed the application using JavaScript, relying primarily on p5.js - "a client-side library for creating graphic and interactive experiences".

For combining a live web camera video feed of the presenter with a presentation (series of images), one must perform the steps presented in Fig. 1 many times per second. If this process takes too long and cannot be performed fast enough, the combined animation becomes choppy and unenjoyable.

In this time critical sequence, separating the presenter out from the web camera feed (segmentation) is the most computationally expensive one. Trying to maximize the out-of-the-box functionality, first we used a Machine Learning approach, namely, the BodyPix "person segmentation in the browser" neural network to extract the isolated image of the presenter. While the model works well, we found that the segmentation is not pixel-perfect. Usually, there are visually noticeable differences between two consecutive segmentations of a still standing person, which can lead to flickering edges, a known and so far unresolved issue[1].

High-quality video stream layering can be achieved relatively easily with chroma keying (a technique also refereed to as green-screen or colour-separation overlay), therefore we also implemented support for this approach. The green screen removal and combination of the segmented image and slides has been implemented using Seriously.js, a highly efficient real-time video compositor for the web.

The disadvantage of this technique is that it requires the purchase and installation of a uniformly colored backdrop, hindering the ease-of-use and zero deployment cost aspect of the system. Alternatively, software packages using hardware acceleration that can efficiently place a virtual green screen behind

[1] `https://github.com/tensorflow/tfjs/issues/3902`

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

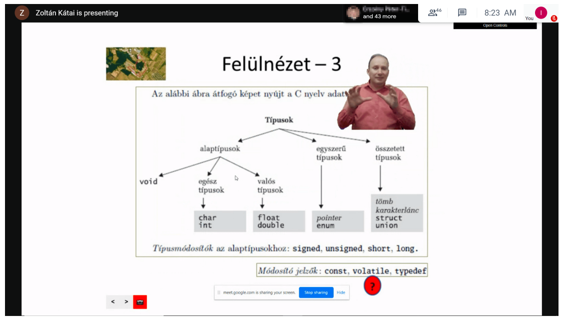

Fig. 2. Snapshot from a lecture delivered through the Google Meet platform.

the user. However, their installation requires administrator rights and some configuration, again raising the entry point for the usage of the application.

A screenshot from a lecture presented with our web application can be seen in Fig. 2. The web application is available freely at the first author's university homepage [2]. We encourage the community to try it and use it for enhanced teacher presence.

4 Method

We designed an evaluation method to compare the following synchronous online learning settings: i) students are focused on the slide contents accompanied by teacher narration ("only narration"); ii) in addition, the video of the presenting teacher is displayed next to the slides ("teacher in a separate window"); iii) the teacher is projected onto the slides and moves dynamically using our tool ("teacher overlaid"). We developed a survey focusing on two main aspects: 1) students general opinion in relation to the importance of nonverbal communication elements in online lectures; 2) students feedback regarding the learning experience facilitated by the new tool.

Based on the above brief literature review, we addressed the following research questions: (RQ1.1) To what extent do students miss visual nonverbal communication elements in online lectures? (RQ1.2) To what extent do these elements contribute to students perceived attention and learning? (RQ2.1) Are the learning settings that visualize the teacher more effective than "only narration", due to the generated social cues? (RQ2.2) Is the "teacher overlaid" condition more effective than the "teacher in a separate window", because of the stronger teacher presence effect? (RQ3.1) What is the level of satisfaction and general feedback regarding an actual lecture delivered in the new format? (RQ3.2) To what extent is the lecture in the new format more effective, compared to the "teacher in a separate window" setting, for perceived attention and learning?

[2] `https://ms.sapientia.ro/~iclanzan/prezcam/`

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

4.1 Pilot study

We scheduled a pilot study for the last teaching week of the first semester (school year 2020-2021), to test the usability of the system, evaluate the extent, if any, of added value for students, and to potentially unravel early, overlooked pitfalls and disadvantages. As we did not have access to a physical green screen, we used a virtual one via the XSplit VCam software.

During this week, all programming courses for the first and second year students attending the Sapientia Hungarian University of Transylvania were delivered with the help of the proposed system. After a brief introduction at the start of the class, the teacher navigated to the tool's website, dragged and dropped the lecture slides, started the camera feed, and then shared his full-screen browser window with the online audience. Because these presentations were not designed (or modified) to specifically suit the overlaid image of the presenter, the teacher resized and repositioned his image on the slides, whenever deemed it necessary. To collect feedback, the students were asked to respond to an online questionnaire right after the lecture.

Roughly 80% of students attending the lectures answered the questionnaire, resulting in 134 answers from 10 different study programs (Informatics, Computer Science, and various other engineering programs). Out of these, 93 (69.4%) responders studied in the first year and 18 (13.43%) answers came from female students.

4.2 Online survey

The survey language was Hungarian and the responses were collected online through Google Forms. We tried to make the questionnaire as brief as possible, as students often report feeling overwhelmed during the pandemic and therefore tend to ignore complex surveys that require more than a few minutes to answer.

After (optionally) indicating their study program, year of study, and sex (questions $0.1 - 0.3$), the students were asked to answer four general questions, pertinent to their experience of following online lectures during the pandemic (when on-premises teaching was not permitted).

Question 1.1 inquired on the extent of students that students had missed nonverbal communication elements, such as the teachers' *body language, gestures, facial expressions, eye contact*, during online lectures. The question explicitly indicated that students should consider all their attended subjects and report on the general impression. Questions 1.2 and 1.3 asked students to gauge the importance of the above-mentioned visual nonverbal communication elements *during online lectures*, in engaging and retaining their *attention* and facilitating their *understanding* of the presented concepts. Answers for questions 1.1-1.3 were indicated on a unipolar 5-point Likert scale. As unipolar scales allow responders to focus on the presence of a single characteristic, it can hopefully generate more clear and inclined responses.

Question 1.4 asked students to consider and rank (from most preferred to least preferred) the following three online lecture delivery methods: i) "only narration" ii) "teacher in a separate window"; iii) "teacher overlaid".

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

In the second part of the survey, students were asked to reflect on the experience of the new lecture format and compare it with the experience of the previous 13 lectures that were delivered with the "teacher in a separate window" method.

By answering questions 2.1 - 2.3, students provided feedback on i) how frequently the overlaid video of the teacher was distracting or disturbing (unipolar 5-point Likert scale) and optionally specify details why or when the projection was intrusive; ii) whether they would like to attend further lectures in this format ("Yes", "No", "Other" (free-text)); iii) and on the overall usefulness of having the video of the teacher overlaid onto the slides ("Distracting", "Neutral", "Useful").

Questions 2.4 and 2.5 inquired on the positive effect (if any) of the new lecture format, in comparison with the previous ones: *"The projection of the teacher on the presentation helped you"* i) "to FOCUS better? Were you able to pay more attention?"; ii) "to BETTER UNDERSTAND the material?". For both questions, the answers could be indicated using a unipolar 5-point Likert scale.

Lastly, students were asked to provide general feedback and suggestions for improvement through a free-text field.

5 Results and Discussion

5.1 Evaluation of the general opinion (RQ1.1 and RQ1.2)

Student feedback with respect to question 1.1 (see Fig. 3) shows that more than 60% of the students miss a more prominent teacher presence in online lectures considerably or to a great extent (the most chosen option). Only 4 male students reported that they did not miss additional nonverbal communication cues coming from the lecturer. This result provides further support that the benefits of nonverbal communication (appearance, posture, limb movement, sight and facial expressions) improve the learning experience of students. As for the possible reasons, Cavanagh et al. [6] underline that visual cues such as body language can play a dominant role in transmitting emotional content [13] and contributes

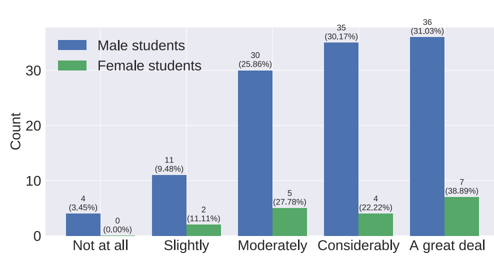

Fig. 3. Student feedback on how much they miss visual nonverbal communication elements, from the teacher.

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

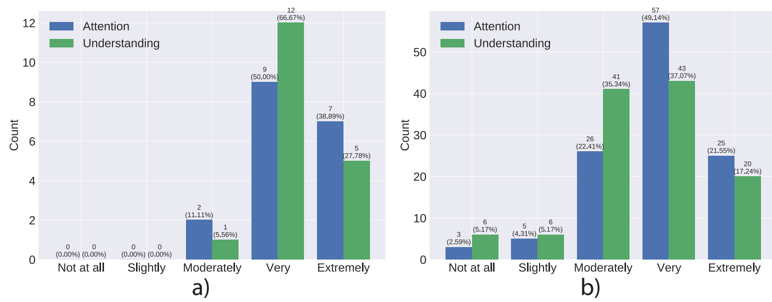

Fig. 4. Importance of visual nonverbal communication elements coming from the teacher, for engaging attention and facilitating a better understanding, as perceived by a) female; b) male students.

to the credibility of the teacher [12]. In addition, nonverbal communication elements support teachers in manifesting more expressively their willingness to communicate and transmit valuable information which could have a great impact on student engagement and learning [20].

In line with the above, the vast majority of both female (fig. 4a)), respectively, male students (fig. 4b)) indicated that a stronger visual presence of the teacher would support them in being more focused during the online lectures and would be helpful in fostering a better understanding. Around 10% of male students saw very little value or no benefit at all in these factors.

With respect to possible gender differences, the [11] study concludes that (in accordance with studies of gender in virtual teams [17]) female students have higher dialogue in distance learning environments than males. Our findings also confirm that the subjective importance of the teachers body language (gestures, facial expressions, eye contact) is assessed as more important by female students for engaging and retaining students attention and fostering a better understanding (questions 1.2 and 1.3). For both questions they choose “considerably” or “to a great extent” in a greater proportion compared to their male counterparts: 79% vs. 73% for question 1.2 regarding the assessed attention benefit, and 94% vs. 54% for question 1.3 - understanding benefit. However, the sample size of female responders is small and therefore prone to a larger statistical error, hence further investigations are required to determine if the observed difference is significant.

Preferred delivery method (RQ2.1 and RQ2.2) Student rankings of the preferred lecture delivery methods reveal two main “camps” (Fig. 5). The biggest one, with 43.28% of the first choices is the “teacher overlaid” presentation approach. However, almost as many students indicated the “only narration” option as their first choice. The vast majority of responders indicated the “teacher in a separate window” approach as their second choice, therefore this option seems to offer a good compromise between the two camps.

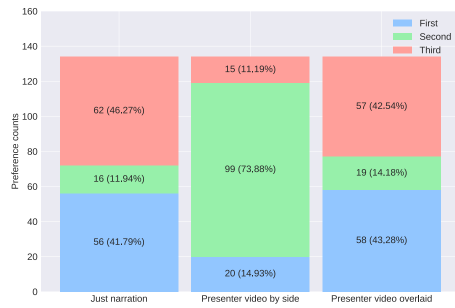

Fig. 5. Students rankings regarding the preferred explanation delivery mechanism during online lectures.

Firstly, we ranked the delivery mechanisms by applying the Ranked Choice Voting[3] method (also known as Instant Runoff Voting - IRV). The "teacher overlaid" method came out as the winner with 69 votes after redistribution. The "only narration" method totaled 65 votes.

Secondly, we applied a rank ordering weighting method [23] to obtain numerical scores. Associating rank positions I., II., and III. with the weights 0.64, 0.29, and 0.07 (rank exponent weights for $p = 2$), respectively, we obtained the following average numerical scores: 0.34 ("only narration"), 0.32 ("teacher in a separate window"), 0.35 ("teacher overlaid"). By applying the Wilcoxon signed-rank test we found that the "teacher overlaid" method was scored significantly higher ($p = 0.01$) and the "only narration" method marginally significantly higher ($p = 0.05$) than the "teacher in a separate window" one. This result, on the one hand, supports our expectation that our tool has the potential to significantly increase the impact of teacher presence. On the other hand, it also suggests that simply displaying the teacher' face next to the slides does not induce a social cue large enough to outweigh the extraneous processing needed to concomitantly follow the two visual inputs [3,18,16].

5.2 Lecture evaluation and feedback (RQ3.1 and RQ3.2)

Fig. 6 depicts the students' feedback on three general aspects. The first one, a), evaluates how often students were distraught by the overlaid teacher video feed. As nobody responded "Always", the pie chart contains only four regions. Half the responders did not notice any disturbance, while one third was rarely distraught, 17% sometimes, while the remaining 3%, unfortunately, often. In the text feedback on why and when the overlay was distracting or disturbing, the consensus (27 times out of the 29 text responses) was that the overlaid teacher sometimes obstructed parts of the text or relevant source code. Two responses indicated that when the teacher repositions itself on a new slide, the flow is interrupted as it takes too much time.

[3] https://www.fairvote.org/rcv#how_rcv_works

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

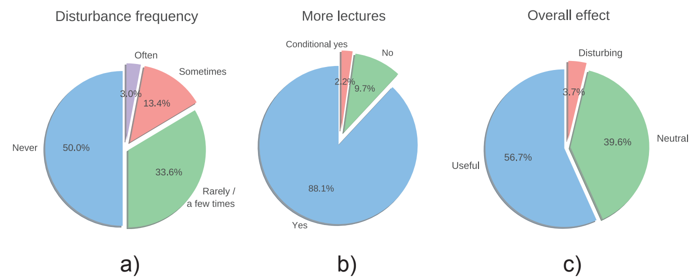

Fig. 6. Students' general feedback on three aspects: a) how often was the presenter's overlay distracting or disturbing; b) whether they would enjoy following other online lectures in this format; c) overall net effect of the technology (if any).

In spite of these occasional inconveniences, more than 88% of the students (see Fig. 6b)) enjoyed and would like to attend further lectures delivered in this format. Three students chose "Other" and in their text response specified a conditional yes: they would like to follow this format only if the obstruction of the content is completely eliminated. Almost 10% of the students would rather not attend online lectures in this format. Considering that 42% of the students indicated that they prefer the narration only delivery, and around 10% saw no value in enhanced teacher presence in general, this percentage is not surprising.

Almost 57% of the students found the overlay of the presenter overall positive and useful, almost 40% neutral, having its advantages but also disadvantages. 5 responders (3.7%) judged it distracting, having a mostly negative impact.

Through the optional free-text feedback and suggestion field, we received 38 entries. Many of these reiterated the observation that the teacher's projection should never cover content on the slides, the placement should be already taken into account when preparing the slides. Others suggested the use of wide aspect ratio slides that would fill more of the screens where students watch the lectures; 4:3 aspect ratio slides leave too many unused regions on the sides of the screen. A few responses mentioned dropped frames and a slight delay between the audio and video feed. Two students observed the occasional artefacts produced by the digital green screen and recommended that we invest in a physical one.

Some responses pointed out that as the presenter is already on the slides, a greater interaction with the content would be welcome. The teacher could point to and touch things, underline and emphasize content during the explanation, similarly to how it is done when the delivery happens on a blackboard in class.

5.3 Effect on attention and understanding

The results of the self-assessment, regarding the benefits of the "teacher overlaid" method with respect to attention and understanding are reported in Fig. 7.

The vast majority of students report that the enhanced teacher presence had helped them "considerably" or to a "great extent", in both aspects. Again, from

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

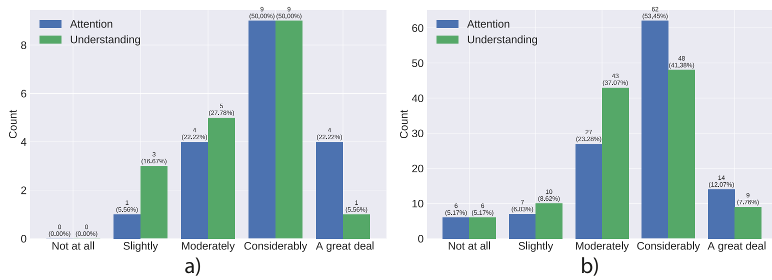

Fig. 7. Perceived benefits of the new online lecture format, as reported by a) female students; b) male students.

the limited data it seems that the self-reported effect is greater in the case of female students. 6 male students reported no improvement at all. As the scales were unipolar, it is possible that these students had a worse learning experience compared to the previous lectures, where the teacher's video was on the side.

As a last step, we compared the corresponding answers regarding attention and understanding benefits from the general opinion and lecture evaluation sections (question 1.2 vs. question 2.4 and question 1.3 vs. question 2.5). We coded the response categories of the 5-point Likert item with numerical scores from 1 to 5 [9]. Since we had to compare relatively highly correlated paired data derived from a medium-sized sample, following the guidelines from [9], we used the modification proposed by Pratt for the Wilcoxon signed-rank test. The test revealed significant differences in favour of general expectation ($p < 0.001$ in both cases). This result emphasizes that students anticipate more potential in nonverbal communication elements than what we have been able to exploit so far with the proposed system for the enhancement of teacher presence. Since generating strong teacher presence is a complex task, this finding emphasizes that it is important for teachers to approach this challenge with professional humility. Dockter [10] argues that online teachers unfounded belief that they create and control their teaching presence can result in increased distance between teacher and students.

6 Conclusions

Prior research suggests that simply including the speaking instructor's face in online lectures does not necessarily result in more effective learning and reduce students' sense of isolation. In this paper we proposed a new, easy to use system meant to promote teacher presence in the form of a client-slide web application. The tool segments in real-time user's web camera feed, and by removing the background projects only the presenter onto the slides. The overlay is not static, the user has the flexibility to move and scale their body size or set transparency as needed. With his/her gaze and hand gestures, the teacher can focus students' attention, easily indicating the areas of the slides currently discussed.

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

We evaluated the system during a one-week pilot study. The feedback gathered from 134 students clearly corroborated the usefulness and potential of enhanced teacher presence. The vast majority of students reported that, compared to previous lectures (teacher' face appeared next to slides), the new delivery format helped them "considerably" or to a "great extent" to focus on the presentation and assimilate the delivered content.

The assessment also revealed several areas for improvement and highlighted that some students prefer to avoid attention division and focus only on the contents of the slides. Therefore, we conclude that teacher presence enhancement techniques must i) ensure that their benefits compensate and offsets the additional mental effort needed to follow multiple visual channels of information; ii) keep a balance and ensure that they are not intrusive for students who prefer to solely focus on the delivered content. Further work and improvements to the system will be made according to these guidelines.

References

1. Admoni, H., Bank, C., Tan, J., Toneva, M., Scassellati, B.: Robot gaze does not reflexively cue human attention. In: Proceedings of the Annual Meeting of the Cognitive Science Society. vol. 33 (2011)
2. Alqurashi, E.: Predicting student satisfaction and perceived learning within online learning environments. Distance Education **40**(1), 133–148 (2019)
3. Baddeley, A.: Working memory. Science **255**(5044), 556–559 (1992)
4. Baker, J.P., Goodboy, A.K., Bowman, N.D., Wright, A.A.: Does teaching with powerpoint increase students' learning? a meta-analysis. Computers & Education **126**, 376–387 (2018)
5. Boton, E.C., Gregory, S.: Minimizing attrition in online degree courses. Journal of Educators Online **12**(1), 62–90 (2015)
6. Cavanagh, M., Bower, M., Moloney, R., Sweller, N.: The effect over time of a video-based reflection system on preservice teachers oral presentations. Australian Journal of Teacher Education **39**(6), 1 (2014)
7. Clark, R.C., Mayer, R.E.: E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning. John Wiley & Sons (2016)
8. Cui, G., Lockee, B., Meng, C.: Building modern online social presence: A review of social presence theory and its instructional design implications for future trends. Education and information technologies **18**(4), 661–685 (2013)
9. Derrick, B., White, P.: Comparing two samples from an individual likert question. International Journal of Mathematics and Statistics **18**(3) (2017)
10. Dockter, J.: The problem of teaching presence in transactional theories of distance education. Computers and Composition **40**, 73–86 (2016)
11. Ekwunife-Orakwue, K.C., Teng, T.L.: The impact of transactional distance dialogic interactions on student learning outcomes in online and blended environments. Computers & Education **78**, 414–427 (2014)
12. Goodboy, A.K., Martin, M.M., Bolkan, S.: The development and validation of the student communication satisfaction scale. Communication Education **58**(3), 372–396 (2009)
13. Goodboy, A.K., Myers, S.A.: The effect of teacher confirmation on student communication and learning outcomes. Communication Education **57**(2), 153–179 (2008)

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47

14. Homer, B.D., Plass, J.L., Blake, L.: The effects of video on cognitive load and social presence in multimedia-learning. Computers in Human Behavior **24**(3), 786–797 (2008)
15. Kirkpatrick, J.D., Kirkpatrick, W.K.: Kirkpatrick's four levels of training evaluation. Association for Talent Development (2016)
16. Kizilcec, R.F., Papadopoulos, K., Sritanyaratana, L.: Showing face in video instruction: effects on information retention, visual attention, and affect. In: Proceedings of the SIGCHI conference on human factors in computing systems. pp. 2095–2102 (2014)
17. Martins, L.L., Gilson, L.L., Maynard, M.T.: Virtual teams: What do we know and where do we go from here? Journal of management **30**(6), 805–835 (2004)
18. Mayer, R.E.: Principles of multimedia learning based on social cues: Personalization, voice, and image principles. The Cambridge handbook of multimedia learning pp. 201–212 (2005)
19. Mayer, R.E., Moreno, R.: A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. Journal of educational psychology **90**(2), 312 (1998)
20. McCroskey, L., Richmond, V., McCroskey, J.: The scholarship of teaching and learning: Contributions from the discipline of communication. Communication Education **51**(4), 383–391 (2002)
21. Reeves, B., Nass, C.: How people treat computers, television, and new media like real people and places (1996)
22. Reuss, E.I., Signer, B., Norrie, M.C.: Powerpoint multimedia presentations in computer science education: What do users need? In: Symposium of the Austrian HCI and Usability Engineering Group. pp. 281–298. Springer (2008)
23. Roszkowska, E.: Rank ordering criteria weighting methods–a comparative overview. Optimum. Studia Ekonomiczne (5 (65)), 14–33 (2013)
24. Rovai, A.P.: Sense of community, perceived cognitive learning, and persistence in asynchronous learning networks. The Internet and Higher Education **5**(4), 319–332 (2002)
25. Schmidt-Weigand, F., Kohnert, A., Glowalla, U.: A closer look at split visual attention in system-and self-paced instruction in multimedia learning. Learning and instruction **20**(2), 100–110 (2010)
26. Schunk, D.H.: Learning theories an educational perspective sixth edition. Pearson (2012)
27. Van Der Werf, M., Sabatier, G.: The college of 2020: Students. Tech. rep., Chronicle Research Services (2009)
28. Vincenzes, K.A., Drew, M.: Facilitating interactive relationships with students online: Recommendations from counselor educators. Distance Learning **14**(4), 13–22 (2017)
29. Walther, J.B., Anderson, J.F., Park, D.W.: Interpersonal effects in computer-mediated interaction: A meta-analysis of social and antisocial communication. Communication research **21**(4), 460–487 (1994)
30. Wang, J., Antonenko, P.D.: Instructor presence in instructional video: Effects on visual attention, recall, and perceived learning. Computers in human behavior **71**, 79–89 (2017)
31. van Wermeskerken, M., van Gog, T.: Seeing the instructor's face and gaze in demonstration video examples affects attention allocation but not learning. Computers & Education **113**, 98–107 (2017)
32. Wright, V.H., Sunal, C.S., Wilson, E.K.: Research on enhancing the interactivity of online learning. Information Age Publishing Inc (2006)

ICCS Camera Ready Version 2021
To cite this paper please use the final published version:
DOI: 10.1007/978-3-030-77980-1_47