The use of a virtual journal club to promote cross-cultural learning in the reproductive sciences

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Abstract

Purpose Scientific literacy and communication are critical skills in the biological sciences. Journal clubs, in which peer-reviewed academic literature is discussed, are traditionally used to teach students to evaluate the literature, review scientific findings, and learn about historical, controversial, or current topics.

Methods We used a virtual journal club to facilitate the international interaction between two universities with master's degree programs in the reproductive sciences: the University of Murcia (Spain) and Northwestern University (USA). The virtual journal club occurred over a 2-hour period and was held using Blue Jeans Conferencing Service software and involved a total of 29 students. During this event, the students who were separated physically by thousands of miles discussed and exchanged ideas about a high-impact publication in real time. A survey assessment was administered to students at the University of Murcia following the event.

Results Positive perceptions included the establishment of cross-institutional interactions and the ability to practice scientific communication in another language. Areas noted for improvement included preparation time and engagement opportunities.

Conclusion Overall, the virtual journal club is an innovative technology that can easily be broadened and has the potential to foster collaboration, ameliorate multilingual communication, improve cultural competencies, and expand professional global networks.

Keywords Technology · Reproduction · Journal club

Abbreviations

CIES Council for International Exchange of Scholars
MS Master of Science

MS-RSM Master of Science in Reproductive Science and Medicine
UNESCO United Nations Educational, Scientific, and Cultural Organization

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Introduction

Journal clubs, which are thought to have originated in Western Europe, have been in existence since the late nineteenth century [1]. The Canadian physician, William Osler, is credited with developing the first modern journal club while at McGill University in Montreal in 1875 [2]. His prime motivation for establishing a mechanism for collective reading of subscription journals was to avoid the exorbitant cost of print periodicals which were prohibitive for individuals [2]. Today, as they did in the past, journal clubs serve as a venue in which clinicians, researchers, and students convene to evaluate research papers usually on a recurring basis. The common goals of journal clubs

are to keep abreast of current breakthroughs, review the literature systematically and critically, use acquired information to impact research and clinical practice, and teach the next generation of trainees to do the same [3]. When executed effectively, journal clubs can increase awareness of best practices that researchers and scientists can apply to their own work. In the clinical setting, journal clubs can help medical professionals make appropriate health care decisions based on high quality evidence-based data.

As a testament to the value of journal clubs, many graduate training programs require participation in journal clubs as part of their accreditation [4, 5]. For example, in medical education, journal clubs provide trainees instruction in critical assessment of medical literature, epidemiology, and statistics [4]. Despite the perceived importance of journal clubs, it is often difficult to sustain attendance over time due to various reasons such as difficulty in convening diverse stakeholders, lack of time, inadequate preparation, and lack of goals or interest [4, 6].

Traditional journal clubs are face-to-face meetings that take place within an institution. However, virtual learning environments—whether through internet platforms, videoconferencing, and/or social media—are becoming increasingly prevalent in education, including within the journal club setting [5–11]. These virtual learning environments have the potential to invigorate journal clubs through novelty and increased convenience. A major advantage of these approaches is that it allows connectivity of geographically separated sites, enabling groups to work together that otherwise would not have interacted. In addition, the events can be recorded, archived, and used in the future.

The goal of this study was to use state-of-the-art videoconferencing technology to host a global virtual journal club among graduate students enrolled in two different masters programs in reproductive science at large academic institutions in Spain (University of Murcia, Murcia) and the USA (Northwestern University, Chicago, IL). Videoconferencing is a multimedia service that allows groups that are physically separated to meet in a single virtual location and exchange bidirectional information in real time, including discussions and/or presentations. Here we describe the profile of the participating sites, the methodology and technology used to host the virtual journal club, and student perspectives as evaluated by a survey. Overall, the activity was well-received with regard to professional development, and major positive outcomes included establishing and interacting with contacts at other universities and improving multilingual scientific communication.

Methods

Profile of participating sites

The virtual journal club was a single time event involving a partnership between two masters programs in the reproductive

sciences. The Master of Science (MS) Program in Biology and Technology of Reproduction in Mammals at the University of Murcia is run administratively through the Veterinary School and was started in the 2004–2005 academic year with collective input from the School of Medicine (Cell Biology Department), Veterinary School (Physiology Department), and a fertility clinic (IVI Murcia) (<http://www.um.es/en/web/veterinaria/idioma/estudios/masteres/bio-tecno-mamiferos>). The program is currently in its 15th consecutive year. The mission of this program is to support the training needs of those interested in careers in reproductive biology and technology, including animal reproduction, human-assisted reproduction, and basic research. Students in this program come from diverse backgrounds, including animal biology, medicine, veterinary medicine, biochemistry, biotechnology, pharmacy, and animal science. Currently there are 19 enrolled students (2017–2018 academic year), and 232 have graduated from the program. Classes are taught by faculty members in five different departments at the University of Murcia in the medical, nursing, and veterinary schools. In addition, the program has an international component, having invited more than 40 individuals from universities, research centers, clinics, institutions, and companies around the globe to serve as faculty. The program includes instruction by English-speaking professors, and in the 2012–2013 academic years, it was promoted by the Campus of International Excellence Mare Nostrum, and the degree is now recognized as bilingual.

The Master of Science in Reproductive Science and Medicine (MS-RSM) program at Northwestern University is a graduate program within the Feinberg School of Medicine and was established in 2016 (<http://www.crs.northwestern.edu/education/reproductive-science-training/ms-rsm/>). The program is in its second year, with 12 students currently enrolled and 7 who have already graduated. The tripartite mission of this program is to train students in the fields of reproductive science and medicine, thereby enabling the next generation of fundamental and applied research, to build competence in general and reproductive science research and teaching skills, and to create an advanced new curriculum suitable for masters-level training in the reproductive science discipline. The MS-RSM students complete either thesis or non-thesis tracks, and their degree is based on fulfillment of coursework, research, and science communication requirements. The MS-RSM operates within the framework of the Center for Reproductive Science, which consists of more than 200 faculty across multiple interdisciplinary departments who share in teaching and mentoring efforts.

Recently, the University of Murcia and the Council for International Exchange of Scholars (CIES) collaborated with the US Fulbright program to bring professors from the USA onto the teaching staff for a 3-month period. During the 2017–2018 academic year, F.E.D. (Northwestern University) was selected as a Fulbright Senior Scholar, and it was under these

auspices that the virtual journal club was organized and executed between students in the University of Murcia MS program and the Northwestern MS-RSM program.

Videoconferencing service

The virtual journal club between Spain and the USA was coordinated through videoconferencing technology. Specifically, we used the BlueJeans videoconferencing software (Mountain View, CA, USA), which is designed to organize real-time communication between people that are physically separated. The BlueJeans Network (BJN), which was provided by and operated through Information Technology at Northwestern University, is a cloud-based audio/video/content sharing conferencing service that is vendor-agnostic and supports high-resolution videoconferencing and content sharing as well as real-time video sharing. A live chat function is available during the meetings, which can be recorded, and end-to-end encrypted meetings are possible. BlueJeans systems requirements can be found on the BlueJeans.com support website. However, the internet bandwidth requirements include minimum and stable 384 Kbps speed in both directions, and 1 Mbps is recommended for high video resolution. Importantly, multiple sites can login during a session. Standard BlueJeans meetings can have up to 25 concurrent connections in a single meeting. However, there are options for extended capacity and large meetings which enable connections to extend up to 150. Thus, the BJN offers scalability that would allow for wider inclusion or access for students or faculty who cannot be physically at the universities.

Overall, the BJN was ideal for the virtual journal club because it enabled direct audio and visual communication between two rooms as well as sharing of a common PowerPoint presentation that appeared simultaneously in both rooms and whose content could be manipulated in real time as needed. The BJN is available for any individual with a valid Northwestern login. The University of Murcia was able to access this technology by installing the software on a PC via the IRIS network at the University of Murcia, and they then joined the virtual journal club meeting through a designated link.

Although the BJN interface is intuitive and user friendly, we made use of technical support from the Information Technology departments at both institutions for this meeting. At Northwestern University, the virtual journal club took place at the Center for Reproductive Science in a room equipped with a Logitech PTZ Pro 2 camera and a Revolabs FLX UC 500 USB Conference Phone both connected to an Apple Mac mini via a USB. This equipment and site was supported by Northwestern Information Technology. At the University of Murcia, the meeting took place in a conference room at the building for Area of Information Technologies and

Applied Communications of the University of Murcia (ATICA), and the room was equipped with digital cameras, video cameras, computers, microphones, and a multimedia projector. The meeting was broadcast through the University of Murcia corporate network that integrates with the Rediris national research and development network. This network connects all Spanish universities and research centers at 10 Gbps. The camera used was a PTZ Optics 20X-SDI with Black Magic Integration. Informatics support was provided by the ATICA facility.

Journal club format

We held the virtual journal club on a weekday during regular work hours, and we used the technology described above to facilitate live interaction between the two campuses. Of note, to accommodate the time difference between the two sites, the videoconference was scheduled for the late afternoon in Murcia, Spain (Central European Summer Time) which was early morning in Chicago, USA (Central Standard Time). Students in both programs signed waivers to have their photographs taken and used for academic purposes.

For the journal club, the professors from both programs mutually agreed on an impactful and paradigm-shifting publication in the field of reproductive science and medicine for discussion [12]. The manuscript was sent to participating students 10 days in advance of the formal journal club. In the MS program at the University of Murcia, 10% of the students' final grade is based on a mandatory peer discussion of a scientific publication. The students were able to fulfill this requirement by participating in the virtual journal club with the MS-RSM program at Northwestern. Therefore, the students at the University of Murcia were divided into seven groups, and each group was responsible for presenting a figure to the virtual audience and leading the discussion. The students could use two to three PowerPoint slides to complement their presentation, and each student was required to speak in English. The MS-RSM program does not currently have an analogous requirement, so participation for these students was voluntary but highly encouraged. The MS-RSM students were engaged in the manuscript discussion with the intent of interacting with students from another country to learn about a new topic in reproductive science and medicine.

On the day of the actual virtual journal club, the professors who ran the activity gave a brief introduction about the manuscript and the lab in which the work was carried out. Of note, it was made clear that one of the professors was a co-author on the manuscript, so technical and intellectual questions could readily be discussed. The students then presented the figures as described, and the professors concluded the session by providing a brief summary of the manuscript and highlighting the main scientific contributions of the work.

Evaluation

Students at the University of Murcia complete a comprehensive evaluation of academic events that take place during the first semester. These evaluations are performed in January, so that the students have a broader perspective and context of each individual course or activity. During this evaluation period, the students in the 2017–2018 MS program at the University of Murcia were asked to complete a survey designed to evaluate their perceptions of the structure, organization, and value of the virtual journal club. Thus this survey was administered 8 weeks after the virtual journal club. The survey was written in Spanish. Ethical approval is not required for educational survey studies at the University of Murcia. All students who participated in the virtual journal club elected to participate in the survey ($n = 18$). The survey responses were based and evaluated on the Likert scale from 1 to 5 (1 = totally disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = totally agree). In addition to the survey, the students were asked to list three open responses pertaining to either positive or negative aspects of the activity. Common responses were tabulated.

Results

The goal of this virtual journal club was to promote cross-cultural learning, teaching, interaction, and communication in the reproductive sciences using advanced videoconference technologies. A total of 18 students from the University of Murcia and 11 students from Northwestern University participated in the event, which took place over a 2-hour period. During this time, no technical difficulties occurred, which allowed the PowerPoint presentations to be viewed and discussions to take place simultaneously in real time (Fig. 1). Each group of students from the University of Murcia presented a figure from the selected scientific publication, and they explained, analyzed, and constructively critiqued the data presented therein. After presenting the figures, the University of Murcia students asked the Northwestern students questions and engaged the group in a guided debate about the technological and scientific breakthroughs described in the paper and their potential clinical application and relevance. All students at each site had the opportunity to freely speak and participate in the discussion. The University of Murcia students were evaluated and assigned a grade solely by professors at the University of Murcia based on the clarity, effectiveness, and depth of their PowerPoint slides and oral presentation. All students at the University of Murcia met and exceeded the goals of the virtual journal club and were successfully able to communicate in a second language (English) so that the MS-RSM students in the USA could understand and sustain a scientific discussion.

In terms of quantitative metrics, the virtual journal club was well received by the students at the University of Murcia (Table 1). Of the 12 survey questions we used to evaluate student perceptions of the structure, organization, and value of the exercise, 9 (or 75%) received a score of > 4 , indicating that trainees had an overall positive experience with the activity. With regard to professional value, the most highly ranked statements about the virtual journal club's impact were on the ability of students to express themselves scientifically in English (4.38 ± 0.16 points) as well as its utility for academic development and training (4.33 ± 0.21 points). From an organizational standpoint, there was also a high degree of satisfaction. For example, the statement "issues that emerged during the activity were solved appropriately" received a score of 4.39 ± 0.13 points. In addition, students reported that "the coordination and organization between professors of both institutions was appropriate," with a score of 4.33 ± 0.11 points.

In general, the positive quantifiable metrics reported in Table 1 were echoed in the students' free responses, which are summarized in Table 2. Between 40% and 50% of students elaborated on the following benefits of the activity: it established interactions with other universities, increased motivation, improved scientific skills and knowledge of the field, enhanced scientific communication skills especially in English, and decreased public speaking fears.

Areas identified for improvement primarily related to the design and organization of the virtual journal club. The categories that received the lowest scores were "I had enough time to understand and prepare for the activity" (3.11 ± 0.27 points) and "the design of the activity (time, place, classroom...) was appropriate" (3.61 ± 0.24 points). The students' perceptions related to these comments were not further investigated. Although the negative free responses were minimal, approximately 40% of students commented that there was not enough interaction with students at the international site and there was not sufficient time to prepare for the activity. Minor comments, with between 6.7% and 13.3% student responses, included technical issues during the videoconference, high stress levels due to public speaking especially in English, too much time and effort required, and too long and difficult of an activity.

Discussion

In 1997, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) held a colloquium where it was recognized that virtual learning environments represent a new form of educational technology that can provide institutions new challenges and opportunities [13]. More than two decades later, we report the first global virtual journal club that we are aware of in the field of reproductive science and medicine at the masters level. This activity was straightforward to

Fig. 1 Images of the global virtual journal club between Spain and the USA for masters-level students in the reproductive sciences. Representative images of participating students at the two different sites: **a** Northwestern University (Master of Science in Reproductive Science and Medicine) and **b** the University of Murcia (Master of Science in Biology and Technology of Reproduction in Mammals), and **c** their respective institutional logos. The images in **d** and **e** show two

different views of the videoconferencing monitor as seen at Northwestern University. In **d**, the whole group at the University of Murcia is visible as would occur during the discussion, whereas in **e**, the PowerPoint slides are visible with an inset of the group in the upper right hand corner. The image in **f** shows a University of Murcia student presenting a figure for the virtual journal club

organize and conduct because both graduate programs share similar teaching philosophies and learning objectives in the field of reproductive science, and journal clubs take place regularly at both institutions.

Remarkably, however, the virtual journal club had unanticipated benefits that transcended traditional formats. First, it successfully initiated a global community of shared interest in reproductive biology among two cohorts of students who would otherwise probably not interact given the continental divide and distinct graduate programs. Second, because the two graduate programs originate in different schools with

students from different educational, cultural, and professional backgrounds, diverse opinions and perspectives were brought to the discussion. Finally, perhaps the most productive outcome of the virtual journal club was its impact on communication across cultures. Students from the University of Murcia obtain a bilingual degree, so they are required to have a minimum command of the English language to matriculate. While, 6.7% of the students considered the need to express themselves in English a negative aspect of the exercise, between 40% and 50% found that the exercise improved scientific communication, stimulated discussion in English, and

Table 1 Survey questions used to evaluate student perceptions of the structure, organization, and value of the virtual journal club ($n = 18$)

Statement	Score (mean $\pm$ SD)*
I had enough time to understand and prepare for the activity	3.11 $\pm$ 0.27
The time spent on the activity was appropriate	4.17 $\pm$ 0.16
The design of the activity (time, place, classroom...) was appropriate	3.61 $\pm$ 0.24
The coordination and organization between professors of both institutions was appropriate	4.33 $\pm$ 0.11
I consider that I have the resources, knowledge, skills, and attitude necessary to develop this type of activity appropriately	4.06 $\pm$ 0.11
Issues that emerged during the activity were solved appropriately	4.39 $\pm$ 0.13
I believe I prepared myself appropriately	4.11 $\pm$ 0.13
I believe that this kind of activity with trainees from other universities improves my academic development and training	3.94 $\pm$ 0.18
I believe this kind of activities helps me to improve my abilities on expressing myself scientifically in English	4.38 $\pm$ 0.16
I believe this activity is useful for my academic development and training	4.33 $\pm$ 0.21
I would recommend this kind of activity for other classes	4.16 $\pm$ 0.21
I am in general satisfied by this activity	4.11 $\pm$ 0.15

*Average score using Likert scale: 1 = totally disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = totally agree

Table 2 Open response comments from students about the virtual journal club ($n = 18$)

Positive responses	Results (%)
Established contacts/interaction with other universities	50.0 $\pm$ 12.9
Improved scientific communication skills	50.0 $\pm$ 12.9
Increased motivation	43.7 $\pm$ 12.8
Improved understanding and knowledge of the field	43.7 $\pm$ 12.8
Stimulated communication in English	43.7 $\pm$ 12.8
Helped confront fears of public speaking	43.7 $\pm$ 12.8
Negative responses	
Not enough interaction with students at the international university	40.0 $\pm$ 13.1
Insufficient time to prepare the activity	40.0 $\pm$ 13.1
Too high of a difficulty level for a journal club discussion	13.3 $\pm$ 0.91
High level of stress due to public speaking	13.3 $\pm$ 9.1
Technical issues during the videoconference	6.7 $\pm$ 6.7
Too much time and effort required	6.7 $\pm$ 6.7
Too long of an activity	6.7 $\pm$ 6.7
Difficulty expressing thoughts in English	6.7 $\pm$ 6.7

helped overcome fear of public speaking. Integrating a different language in an academic context requires strategies to enable and empower students. Based on the survey responses, the use of videoconference to communicate with students in different countries through the virtual journal club is an important mechanism by which students can practice their language skills in a scientific setting.

Although we view this virtual journal club as an important and successful proof-of-concept, there are several limitations that should be considered. First, there were uneven participation requirements between the two cohorts of students, with those at the University of Murcia being responsible for presenting the figures and leading the discussion. This stems from differences in program requirements because the students at the University of Murcia received a grade for this activity whereas the Northwestern students did not. It may have been more dynamic and useful, for example, if the professors and students from Northwestern provided feedback to the students at the University of Murcia on how effectively they were able to communicate science in English and ways they could improve. In the future, we will generate a formal protocol for how to run a virtual journal club to ensure a more even distribution of tasks among the participating sites. Such modifications should address the main concerns that there was not enough time to prepare for the activity and that there was not sufficient interaction with the other students. Second, videoconferencing requires that the equipment infrastructure and technical support is readily available to avoid issues with sound or image quality. As virtual learning environments are becoming more prevalent, most major universities are equipped with suitable technology. In the case of this virtual journal club, we had dedicated technical support present at both sites for the initial set up. Due to the way the room was

configured at the University of Murcia, a handheld microphone was required. Although this made the conversation less spontaneous, it did make the activity more organized and ordered. Third, we only solicited feedback from the University of Murcia students, and this was done with a significant time delay (8 weeks after the virtual journal club). In the future, we will integrate a survey immediately following the journal club to enable more accurate recall, and we will seek evaluations from all stakeholders, including students and faculty at all sites. Finally, the data presented here are based on a one-time event. Additional virtual journal clubs with more students will be necessary to determine whether they are sustainable and as effective as traditional journal clubs in the acquisition and retention of knowledge in the reproductive sciences. Moreover, more formal long-term follow up studies need to be performed to quantitatively assess the value of the virtual journal club as an educational and learning tool in our field.

Conclusion

We anticipate that virtual journal clubs will only increase in popularity across disciplines and educational spheres because of the many documented advantages, including ease of connectivity across geographically distant sites, the ability to archive material, the ability to integrate diverse opinions and perspectives, and the opportunity to have an impact on a much larger and broader population. For example, one can imagine that this format of interaction could be highly valuable beyond students to faculty who are early in their careers and seeking new collaborations or to small research groups who may face isolation due to a lack of critical mass in their home institutions. In general, virtual forums have been adopted

successfully in various subspecialties around the globe [4–11]. Within the reproductive sciences, for example, the journal *Fertility and Sterility* hosted “Journal Club Live” on YouTube with panelists and viewers from the USA, India, and Spain. Moreover, the Oncofertility Consortium, a global initiative focused on fertility preservation, has hosted global virtual meetings that have enabled conversations around emerging concepts in a field where there is no available textbook [14, 15]. In such scenarios, the utility of a journal or emerging data club is even more important to the community of learners. While our virtual journal club relied on videoconferencing, we expect that more complex multimodal platforms, including blogs, Google Hangouts, Twitter, and Air Video, will become more commonplace [16, 17]. The casual setting and inherent conversational nature of journal clubs makes them particularly amenable to these online and social media-based methods of communication. The challenge with these emerging formats, however, is that participants must be aware of and comfortable with using technology. Thus, conscious efforts will need to be made to avoid creating generation gaps in journal clubs.

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Authors' contributions All authors were involved in the study design and were involved with writing the manuscript. All authors reviewed and approved the final version of the manuscript for submission. F.E.D and M.J.M organized and directed the virtual journal club, and together with R.R. and J.G, they collected and analyzed the data. D.K. translated the study from Spanish into English.

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Compliance with ethical standards

Availability of data and material The survey was performed at the University of Murcia and that material is available upon request.

Competing interests The authors declare that they have no conflicts of interest.

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