Using a social media project as a way to get students to communicate conservation messages to the general public

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Abstract

For conservation biologists to be effective, they need to be able to communicate to the general public. In today's world, communicating means tapping into social media platforms. To get our final-year undergraduate students to engage with using social media as a communication tool, we had each of them create a video, blog, or podcast about a conservation issue they were passionate about. We provided guidance throughout the process but used self-regulated learning as our framework to get the students to engage with the learning process. We further expanded on this by having the students peer-mark 20 of their classmates' projects. This achieved three outcomes, 1) they critically assessed content, 2) it exposed them to topics not covered in class, and 3) they could compare their achievements with those of their peers. To measure our success, we conducted an anonymous survey at the end of the course. Student feedback was very positive with creative freedom, peer-marking, and exposure to science communication being frequent responses. Ultimately, the project achieved our educational goals of fostering self-regulated learning and exposing the students to 21st century skills (e.g. critical thinking, creativity, communication, ICT skills) that they would likely use in their future careers.

Keywords: blog; peer assessment; podcast; self-regulated learning; science communication; YouTube

Introduction

By its very nature, conservation biology stands at the intersection of science and society (Soulé 1985). Thus, effective conservation biologists need to be able to get their messages out to the general public (Sunderland et al. 2009; Bickford et al. 2012; Brownell et al. 2013). If people are aware of specific conservation issues, like threatened species (e.g. rhinos) and landscapes (e.g. forests), or harmful practices such as pollution, they are more likely to display pro-environmental behaviours (Rickinson 2001). This, in turn, may shape government policy in a way that minimises the impact of these issues (Jordan et al. 2009).

As recent as only ten years ago, connecting with the general public meant writing popular articles, giving talks to citizen groups, and if possible, appearing on TV and radio. Today, however, people tend to obtain a large portion of their information via the internet (e.g. Dimmick, Chen, and Li 2004; Escoffery et al. 2005; Rennis et al. 2015). This is obvious when we consider that phrases like 'Just Google it', 'Alexa, can you find…' or 'Siri, what is…' are so common. Knowing that people use the internet is the first step to being able to connect with them. However, what is important is understanding the type of content they rely on, and where they find it. For many people, information is obtained from social media such as videos on sites like YouTube, podcasts on iTunes and Spotify, and short articles and blogs on a range of sites. Thus, for the modern-day conservation biologist, tapping into these social media platforms could be an important way to disseminate information to the general public (Ashlin and Ladle 2006; Clements, Brickford, and Lohman 2007; Lenda et al. 2020).

To get our undergraduate students to engage with using social media as a communication tool for conservation issues, we had them create a video, podcast, or blog about a conservation issue that was important to them (e.g. use of solar energy).

We provided guidance throughout the initial stages of the project and answered any question students had throughout the whole process, but the emphasis was on them to learn via self-regulated learning (Pintrich 1995; Zimmerman, 2000; Rivers 2001). By using self-regulated learning as our framework, our goal was to get students to become active participants (metacognitively, motivationally, and behaviourally) in the learning process (Zimmerman 2008). We therefore designed task-specific goals to guide students through the project with scaffolding events along the way.

The three-phased model (Zimmerman 2000) that we followed, suggests that in the forethought phase the lecturer should assist students to design a good learning plan. To do this, tasks should be broken up into manageable sub-tasks (e.g. choosing a topic, writing the abstract, creating the project; see detail below), to enable students to stay within the timeframe. During the performance phase, students need to deploy different strategies in order to achieve their unique goals. However, they also have to observe how effective their strategies are and revise them if needed (i.e. problem solving). During this second phase, the lecturer provides organised instructional activities to promote cognitive and meta-cognitive processes (Ley and Young 2001). Yet, students are encouraged to self-reflect frequently. Finally, in the self-reflection phase, students reflect on the outcomes and their experience. This phase is critical to shape their future learning approaches towards success (e.g. time management, assessing work from peers to obtain a wider perspective).

To further enhance the self-regulated learning aspect of the project, we had each student peer-mark 20 of their classmates' projects. This accomplished three learning objectives. First, it got them to critically assess content, which is important in science, technology, engineering, and mathematics (STEM) careers (Catherine 2002; Tsunekage 2019). Second, it exposed them to 20 topics we most likely would not have discussed in class. Third, it gave them a way in which they could compare their achievement with that of other students (Bloxham and Boyd 2007). One of the benefits of peer assessment is that the reciprocal process of providing feedback, increases students' own understanding (Roberts 2006) and offers an opportunity to self-reflect on their own work. Chin, Willmot, and Crawford (2006) described some of the benefits of peer assessment including developing self-reflection, and transferable skills such as time management, and critical thinking. Moreover, the fairness and reliability of peer assessment can be valid if the process is designed well (Falchikov and Goldfinch 2000).

Here, we provide the structure and layout of a social-media project, which we run in a final-year undergraduate ecology course. We designed the project so that it addressed two key education goals. First, we aimed at fostering self-regulated learning, where students would embrace self-reflection, take responsibility for their learning, execute choices, be self-motivated, and solve problems in a critical manner. Second, we wanted them to obtain 21st century skills they may need in their future STEM careers such as critical thinking, problem solving, creativity, innovation, communication, ICT skills, productivity, and accountability (Fadel, 2008). To determine how successful the project was in enabling the students to achieve these educational goals, we report the results of an anonymous student survey.

Methods

We developed the social media project for a final-year undergraduate conservation ecology course (ZEN 364) that runs over eight weeks (Fig. 1). Yet, the timeline for the project can easily be modified to fit a semester-long course. Results of this study come from three consecutive years (i.e. 2018-2020) where class sizes ranged between 44 and 54 students (mean= 50 students). Students taking the course majored primarily in

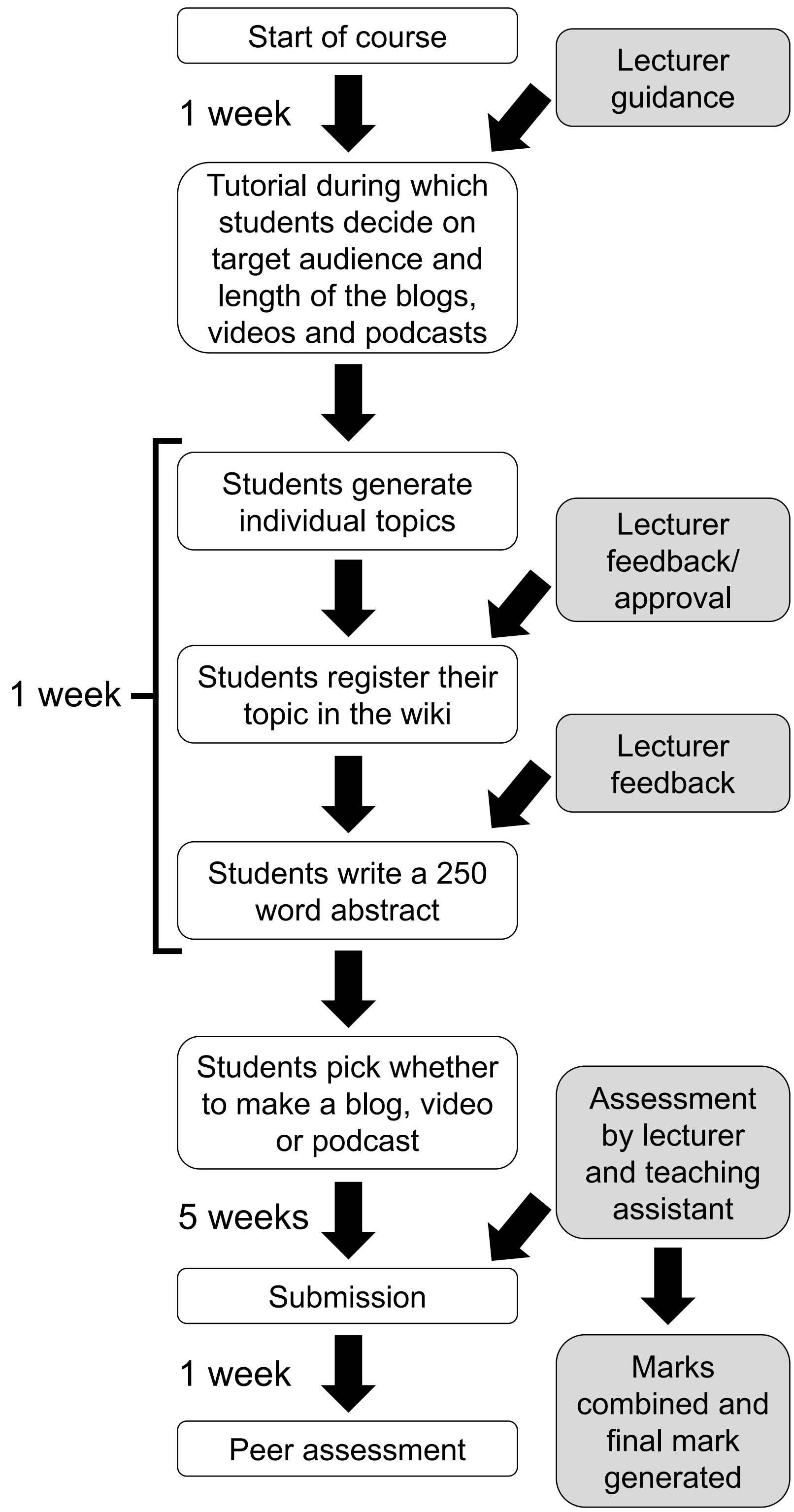

Figure 1. Flow chart of student progress and lecturer input during the project.

zoology, ecology, and environmental sciences, but there were also botany and genetics students registered. In total, the project comprised 20% of the final mark for the course. In all three years, the course instructor (an Associate Professor) and the teaching assistant (MSc Student) were the same. Moreover, the project guidelines did not change over the three years.

The project

In the first week of the course, we held a tutorial session where we introduced the project and explained what was expected from the students. To make the students part of the process, we let the class decided on, 1) the target audience for the projects (e.g. parents, peers, non-scientists, government officials), and 2) the length of the videos (minutes), podcasts (minutes), and blogs (words). During the discussion when the class was deciding about these things, we provided some guidance, highlighting that if the projects were too short, it would be difficult for the students to get all the information across, and if they were too long, they would likely find that the target audience would not watch/listen/read the whole thing (Wu, Rizoiu and Xie 2018; Holland, Verma and Sargsyan 2020; Hyland and Zou 2020). Over the past three years, the students have decided on the videos being between five to seven minutes in length, the podcasts 10-15 mins, and the blogs between 1000 to 2000 words.

Having had the project explained to them, the first step for the students was for each of them to come up with a conservation topic that they wanted to work on. It could be anything, but we encouraged them to pick something that they were passionate about. As only one student could work on a particular topic, we generated a wiki within the learning management system Blackboard Learn (Blackboard Inc., Washington D.C., USA) where the students could provide their ideas and be able to see what topics the other students had already taken. Once the students had provided a topic, we read through the wiki and either approved the topic or provided feedback on how to improve it. For example, some topics were too broad and need to be narrowed down.

Once we had approved a student's topic, they then needed to generate a 250-word abstract outlining their topic and the message that they were looking to convey. This had two goals. First, it forced the students to start engaging with the literature, and thus determine whether there was enough information available for them to complete their project. Second, it gave us a second opportunity to provide written feedback prior to the students starting their projects. In total, we gave the students one week after the tutorial to come up with topics and write their abstracts (Fig. 1).

Having completed their abstracts, the students then needed to decide whether they wanted to create a video, podcast, or blog. To help the students with this, we provided some links to YouTube videos about how to do each of these things, but also encouraged them to explore the internet and find additional resources. This further enhanced the self-regulated learning aspect of the project. From the point where they submitted their abstract, the students had five weeks to generate their social media project (Fig. 1).

An important aspect of the project was that the information provided had to be factual. Thus, prior to the students starting their projects, we discussed with them that, similar to scientific publications, they needed to use reputable sources (i.e. journal articles, books). However, as many conservation issues are covered in the grey literature (e.g. internal reports, government documents), we allowed the students to also use these sources. In addition, we allowed them to obtain information from websites, but stressed that these sites needed to be from trusted conservation organisations (e.g. World Wide Fund for Nature, National Geographic) where the information is reliable compared to

Table 1. Analytic rubric provided to the students at the start of the course and then used by the lecturer, teaching assistant, and the students to mark the project.

Criteria	**0-1**	**2-3**	**4-5**
Content (This is not just about how many references, but how reliable they are, if the information used is relevant, and if the information is put in the correct context. Remember cite the results and conclusion, not the introduction.)	The work relies heavily on very few sources (e.g. 1-3 articles) and thus has limited coverage of the topic. The majority of the websites cited are unreliable (e.g. blogs). It is an extensive collection and rehash of other people's ideas, products, images and inventions. There is no evidence of new thought or inventiveness.	The product incorporates information from a few sources (4-8) and contains evidence of originality and inventiveness. Some of the websites cited are unreliable (e.g. blogs). The information from the sources is used correctly and is relevant to the topic.	The product incorporates information from 8-15 reliable sources (i.e. no blogs) yet shows significant evidence of originality and inventiveness. The information from the sources is used correctly and is relevant to the topic. While based on extensive collection of other people's ideas, products, images and inventions, the work extends beyond that collection to offer new insights.
Presentation	The product is sloppy, boring and looks unfinished. Many technical problems.	The product is neat but not fully polished. The information is accurate and looks real. Some technical issues can be improved.	The product is creative and polished. It captivates attention and is technically appealing.
Audience	The audience will not be captivated, and the message misses the target audience. The style and difficulty level at which the information is pitched is inappropriate.	The product hits and misses the audience. The difficulty level is not appropriate, and the style is not perfect.	The product is perfectly aimed at the target audience. The difficulty level as well as style of presentation is perfectly suited.
Message	The message was not visible, not correct, and not attractive to the audience.	The message is partly clear, but not explicit enough or not 100% correct.	Extra attention was given to making the message crisp, scientifically correct, and attractive to the audience.
Total			

personal blogs which tend to be less trustworthy. To further highlight the importance of using reputable resources, we assigned marks for the references not just based on the number of references the students used, but also how they were used, and how relevant and reliable the references were (Table 1).

Once the students had finished, we had them submit their projects using the plagiarism detection software Turnitin (Turnitin, California, USA), which was part of Blackboard Learn. The students could easily submit blogs as they comprised text. However, for students that generated videos, we had them first upload their video in the unlisted section of YouTube, while students that created podcasts uploaded them onto Google Drive. We then had these students copy the link to their videos and podcasts and insert that link into the abstract they wrote at the beginning of the project. They then upload the modified abstract into Turnitin. Once all the projects were uploaded, we used the PeerMark assignment in Turnitin to randomly assign 20 projects to each student (excluding their own). The students then used an analytic rubric (see details below; Table 1), to mark their peers' projects. We then used the mean value of the peer marks for each project as the final peer mark. As the students tended to be overly generous when it came to marking each other's projects, we weighted the peer mark as 10% of the final mark. The remaining 90% of the mark was divided between the teaching assistant (10%) and the lecturer (80%).

Analytic rubric

At the beginning of the course, we provided the students with an analytic rubric (Sadler 2009, Dawson 2017; Table 1) that they, the lecturer, and teaching assistant would use to mark the project. We did this to 1) be transparent, 2) provide the students with guidelines as to what we expected, 3) highlight how the marks would be distributed between the different aspects of the project, and 4) try and insure both intra- and inter-scorer reliability (Table 1).

For marking purposes, we separated the project into four equally weighted criteria. These included the content, presentation, audience, and message of the project (Table 1). For content, we focussed on the quality and quantity of the references used, and the student's ability to offer new insights based on what they had read. The presentation portion of the rubric focussed on the overall look of the project and whether technically it could be improved. In the audience section, we determined whether the information presented was pitched at the appropriate level for the target audience. Finally, we evaluated whether the message that the students were trying to get across was obvious, and scientifically correct. Where we believe that the rubric worked well for our course, it can easily be modified to better fit a similar project conducted in different course.

Student Feedback

At the end of the course, we conducted an anonymous survey using Qualtrics XM (Qualtrics Inc., Utah, USA) to get feedback from the students about the project. In this survey, we explored whether the students felt that they achieved the learning outcomes of the project such as being able to combine and synthesise information, communicate scientific information to the general public, and see the power of social media as a communication tool. In addition, we asked what they thought we should do differently in future, plus what they liked most and least about the project.

Results

Across all three years, students preferred to write blogs (Mean= 67% of all projects, range 54-82%), compared to making videos (Mean= 26% of all projects, range 14-41%), or podcasts (Mean= 7% of all projects, range 5-11%). Despite living in Africa, students tended to focus their projects on more international conservation issues (69%, range 64-76%) as opposed to African ones (31%, range 24-36%). Topics varied each year, but when focusing on specific species, the students preferred to do projects on animals (vertebrates and invertebrates; Mean= 54% of all projects, range 39-57%) compared to plants (Mean= 2% of all projects, range 0-4%). In addition, threats to species and the environment (e.g. pollution, habitat destruction, climate change) comprised a large portion of the projects each year (Mean= 38% of all projects, range 21-55%), with other topics including alternative energy (wind and solar power), role of hunting in conservation, ecotourism, and water conservation.

Student feedback

Overall, the response to the project was extremely positive. When asked what their favourite part of the project was, 29% of the students that responded over the three years, indicated that it was the freedom of the project, 21% said it was the peer marking, 16% responded that it was the opportunity to communicate with the general public, 15% said it was because it was a different type of project, 9.5% said it was learning new things, and the remaining 9.5% indicated that it was being able to apply social media.

A broad theme that came out in each of the three years was the overall creative freedom that the project allowed the students. Students liked that they could decide on their topic, as it gave them an opportunity to pick something that they were interested in. Our assumption was that the students would be more productive if they worked on something that they liked and thus would be more likely to take ownership of their successes and failures (i.e. the 21st century skill of accountability). As one student put it, ‘What I liked most, was having the opportunity to integrate our knowledge and individuality into a university assignment’, while another said, ‘I liked how we got to choose our own topic and I also liked how we could write colloquially and not scientifically for a change.’ Moreover, they liked being able to choose the format (blog, video, podcast), and not being restricted as to how to present things. For example, they could be humorous, serious, provide narration in the videos, or just overlay text on the video images.

Peer-marking was the students’ second favourite aspect of the project, mainly as it exposed them to additional topics. For example, one student said, ‘I enjoyed marking and seeing what others had done.’, while another indicated that ‘The thing that I liked most about the project was being able to read about all the different topics. I learnt something from every project we had to read.’ However, 12 of the 47 students (26%) that responded indicated that peer-marking was the least enjoyable aspect of the project. Specifically, they indicated that it was because they felt that marking 20 projects was a bit excessive and took too long.

Many of the students indicated that the project got them thinking about the importance of communicating science to the general public. For example, students said that ‘The thing I liked most was that I learned how to make science accessible to the general public.’, ‘It made me realise that I can get my word across to different people in different ways.’, ‘The idea of being able to make a difference just by writing a simple blog or making a short video. It motivated me to really want to put effort into my project’, and ‘As aspiring scientists, we need to realise that we do science for the people and not just ourselves. What this project does is to help us make information easy to understand for the greater community. This helps with how people view science. If this is the approach we use to educate them on why certain things must be done (i.e. in a way that is easy [for them] to understand), we stand a greater chance of influencing and changing behaviour.' These responses highlight that the students practiced and understood the importance of communication as key 21st century skill.

The students also indicated that they preferred doing the social media project as opposed to a normal laboratory assignment (2018: N= 36 students, 82% preferred the project, 5% would prefer a laboratory assignment, 13% undecided; 2019: N= 37 students, 92% preferred the project, 3% would prefer a laboratory assignment, 5% undecided; 2020: N= 22 students, 92% preferred the project, 0% would prefer a laboratory assignment, 8% undecided). In addition, they were appreciative of the fact that they could be a bit passionate about the project, and a little 'less scientific'. For example, one student wrote, 'I loved being able to write a bit more passionately about something in science. We often have to be very unemotional and scientific, and I enjoyed taking a break from that'. All of the feedback about science communication was key for us, as this was one of the main aims of the project.

By asking the students, 'If you had to do a similar project again, would you approach it differently?', we gained insight into the extent to which students self-reflected on the choices that they had made while doing the project. For each of the three years (2018-2020), around half of the students indicated that they would do some things differently (i.e. 62%, 51%, and 53% respectively). To obtain a greater understanding, we followed up by asking them to be specific about what it was that they would do differently. Of the 42 students that replied to this question, 20 (48%) listed time management as the key aspect they would approach differently. For example, they indicated that they would 'begin the research behind my project a lot earlier than I did', ‘spend a lot more time on the assignment’, and that they ‘would manage time for the project more appropriately’.

Another common theme was about their approach to the project. Specifically, many students indicated that they should have been more focussed. This included that they should have planned better, or ‘do a bit more research before I decided on a topic’, or ‘make it a bit longer and more interesting, add more dramatic effects to keep the audience entertained, while informing them about the conservation topic’.

The last common theme was with regards to the format (i.e. blog, podcast, video) that they had selected. Some students indicated that if given another chance, they would do a video rather than a blog or podcast. This may have been in response to having seen other student’s videos when peer-marking, but one student indicated that they would have modified their video by ‘talking on my video and providing more detail’.

Discussion

A key skill required for conservation biologists, and most scientists in STEM for that matter, is being able to communicate scientific information in an accessible way to the general public (Sunderland et al. 2009, Bickford et al. 2012, Brownell et al. 2013). Yet, despite the importance of this skill, it is something that is not generally taught in undergraduate or graduate level courses (Brownell et al. 2013). To try and address this, we designed a social media project for undergraduate conservation biology students to communicate conservation issues.

Bialik and Fadel (2015) claim that creativity, critical thinking, communication, and collaboration are the key 21st century skills that we should expose students to. This project allowed the students creativity in that they could choose a topic and a mode of delivery. Critical thinking was needed to judge the authenticity of information and sifting through content to select what was important to share with their audience. This project has communication at the very heart of it and they had to communicate an important issue to an uninformed audience. The collaboration skill was not as prominent since this was not a group project, but the initial class decisions about the target audience and project length, and peer assessment brought some collaborative actions to the fore. In addition, we believe that this project encouraged ethics and social responsibility, due to the nature of the content.

Based on the quality of the projects produced and the student feedback we received, we are confident that the project was able to achieve our two key learning goals. First, the project forced the students to fully participate in self-regulated learning (Pintrich 1995; Zimmerman, 2000; Rivers 2001). As a group, they decided on the target audience and lengths of the different formats. However, individually they took responsibility for their learning in that they decided on their topic, the information they used and how to structure it, the type of project (blog, video, podcast) they made, and displayed the self-motivation and time management required to ensure that they finished the project in time. As one student put it, ‘the project created time for independent learning and study.’, while a second said, ‘It really helped me to work in an autonomous way, also, the fact that we were allowed to choose our own topic really helped for personal investment’. Based on their responses to the question ‘What would you do differently’, we could see that the students had self-reflected on their approach to the project and could identify what they would do differently next time if given the chance. A hopeful sign for their future careers is that they identified time management as a key skill they needed to work on.

One aspect that should not be underestimated, is the novel nature of the project. Students reacted positively to the fact that it was something different and not the same old practical assignment that they were used to. In fact, one student even said, ‘It reminded me how boring and less stimulating normal projects are.’ Responses like this suggest that university education would benefit from the incorporation of more novel types of assignments like this project.

The choice-element of the project was one aspect that the students greatly appreciated. It is understandable that in many instances, assignments need to be structured with regards to what is expected so as to achieve the desired educational outcomes. Nevertheless, we were able to offer a large degree of freedom within the framework of the project and still achieve our educational goals. However, the students also realised that with choice comes responsibility. One student expressed this concern when they said, ‘I was not too sure I was on the right track all of the time (e.g. was I targeting the right audience? Was I convincing?...) because there is not ONE CORRECT ANSWER to this project’., while another did not like the ‘ambiguity of the project’. Nevertheless, we believe that the frequent and enthusiastic student response about the freedom afforded to them by the project is one of the key reasons that it continues to be a success.

Throughout the social media project, students were exposed to and utilised a number of 21st Century skills that they will likely need in their future careers as scientists. These included, critical thinking, problem solving, creativity, innovation, ICT skills, communication, and accountability. For example, biology students tend not to be exposed to other forms of communication other than writing and public speaking. Yet, by giving them the opportunity to generate videos and podcasts, they greatly expanded their science communication skill set to include these important mediums. This is something the students expressed. ‘It was great to be able to learn new skills, like video editing, for this project that I otherwise would have probably never explored.’ ‘One of the best things was learning how to make videos. It looked pretty cool afterwards’. Moreover, the need to use new computer packages and programs enhanced their ICT skill base. However, the students’ general preference for writing blogs compared to making videos or podcasts likely reflects them staying within their educational comfort zone. Nevertheless, irrespective of the type of project they chose (blog, podcast, video) the freedom available within the project allowed each student to be innovative and creative when presenting their conservation topic. Finally, as the project ran over a number of weeks, the students needed to utilise their problem solving, critical thinking, and time management skills.

Educationally, we were happy with the peer assessment process as it achieved all three outcomes. First, peer-reviewing projects forced students to critically scrutinise content (Catherine 2002, Tsunekage 2019). This was evident in that some students commented on the amount of effort some of their fellow students put into the projects. For example, one student wrote, ‘Some people did not make a big effort with the project. For example, they didn't even read through their final product. Some sentences were just a bundle of words that did not make sense. A lot didn't include any pictures. Pictures is the only way to draw the attention of the public.’ Second, by peer-reviewing other students’ projects, each student was exposed to many topics that they would not otherwise have seen or have covered in such detail. Finally, the peer assessment process allowed students to benchmark themselves against peers in a safe way where they were able to learn from and with each other (Bloxham & Boyd 2007). Thus, by incorporating the peer-mark aspect of the projects, we were able to extend the learning benefits for each student beyond the single project that they generated. Where some students did not like peer-marking, we believe that the arguments of it being ‘too much work’, fall short of the overall benefits gained by the peer assessment process. Moreover, as the projects were relatively short in duration (videos 5-7 min, podcasts 10-15 min) and length (blogs 1000-2000 words), we, and most of the students (based on low number of complaints) felt that it was not an excessive amount of work for the week that they were given for peer marking the 20 projects.

One aspect of the project that we were not fully satisfied with was the use of the rubric by some of the students. Very few students over the three years indicated that they found it difficult to use. Nevertheless, the students that did express concern indicated that they felt that the rubric criteria were too vague and could lead to “a wide array of different marks” (i.e. high inter-scorer variability). In some cases this was true. Yet, as each project was marked by between 17-20 students, and we used the mean value of these marks as the peer mark in the calculation of the final project mark, we are confident that the potential impact of inter-scorer variability was greatly reduced. Moreover, we further controlled for this variability by limiting the overall contribution of the peer mark (i.e. 10%) towards the final project mark.

Looking over the different students marks for individual projects, what stands out is that much a variability in the marking was around the content portion of the assignment. Comparing the lecturer’s marks to those of the students, it is obvious that some of the students were just counting the number of references used in a project and not critically evaluating the quality of the references. This highlights an area where we need to provide greater guidance. We tried to address this, by specifically stating in the rubric that students needed to consider the quality of the information, and not just count references (see Table 1). Yet, being able to competently compare the quality of articles and the journals where they are from tends to come with greater exposure to the literature and publishing one's own research. As such, we believe that we need to spend more time addressing this knowledge gap in the students. Nevertheless, teaching this skill is a bit beyond the scope of this one course, and it might be better to incorporate this skill into a number of courses within the overall degree programme.

Conclusion

If we look back at our own university years, neither of us were ever taught how to communicate our research to the general public. It may have been mentioned as something that was important, but it was nothing that we were ever trained how to do. It was our hope in setting up this project, that we would be able to get our students to engage with this key aspect of conservation biology. What we found, is that due to the novel nature of the project and freedom that the students had in doing it, that they readily engaged with the project. Moreover, some have even gone on to post their projects online. However, as science communication is important beyond just conservation biology (Brownell et al. 2013), we believe that incorporating this sort of project into any undergraduate science course would be beneficial.

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References

Ashlin, A., and R. J. Ladle. 2006. "Environmental Science Adrift in the Blogosphere." *Science* 312: 201–201.

Bialik, M., and C. Fadel. 2015. "Skills for the 21st Century: What Should Students Learn?" Center for Curriculum Redesign. Accessed July 6 2020. http://www.curriculumredesign.org

Bickford, D., M. R. C. Posa, L. Qie, A. Campos-Arceiz, and E. P. Kudavidanage. 2012. "Science Communication for Biodiversity Conservation." *Biological Conservation* 151: 74–76.

Bloxham, S. and P. Boyd. 2007. *Developing Effective Assessment in Higher Education: A practical Guide.* Berkshire: Open University Press.

Brownell, S. E., J. V. Price, and L. Steinman. 2013. "Science Communication to the General Public: Why We Need to Teach Undergraduate and Graduate Students this Skill as Part of Their Formal Scientific Training." *Journal of Undergraduate Neuroscience Education* 12: 6–10.

Catherine, S. C. 2002. Self-regulated Learning Strategies and Achievement in an Introduction to Information System Course. *Information Technology, Learning, and Performance,* 20 (1): 11–25.

Chin, P., P. Willmot and A. Crawford. 2006. "Electronic Peer Assessment Tools for Multidisciplinary Use." Paper presented at the International Society for the Scholarship of Teaching and Learning 3rd Annual Conference (ISSOTL), Washington DC USA, November 9-12.

Clements, R., D. Bickford, and D. Lohman, 2007. "Can YouTube Save the Planet?" *The Scientist* 21: 26.

Dawson, P. 2017. "Assessment Rubrics: Towards Clearer and More Replicable Design, Research and Practice." *Assessment and Evaluation in Higher Education* 42: 347–360.

Dimmick, J., Y. Chen, and Z. Li. 2004. Competition between the Internet and Traditional News Media: The Gratification-Opportunities Niche Dimension. *Journal of Media Economics* 17 (1): 19–33.

Escoffery, C., K. R. Miner, D. D. Adame, S. Butler, L. McCormick, and E. Mendell. 2005. "Internet Use for Health Information among College Students." *Journal of American College Health* 53: 183–188.

Fadel, C. 2008. 21st century skills: How can you prepare students for the new global economy? Paris: OECD.

Falchikov, N. and J. Goldfinch. 2000. "Student Peer Assessment in Higher Education: A Meta-analysis Comparing Peer and Teacher Marks." *Review of Educational Research* 70 (3): 287–322.

Holland, K. D. Verma, and Z. Sargsyan. 2020. What traditional lectures can learn from podcasts. *Journal of Graduate Medical Education* 12(3): 250-253.

Hyland, K., and H. Zou. 2020. In the frame: Signalling structure in academic articles and blogs. *Journal of Pragmatics* 165: 31-44.

Jordan, R., F. Singer, J. Vaughan, and A. Berkowitz. 2009. “What Should Every Citizen Know About Ecology?” *Frontiers in Ecology and Environment* 7: 495–500.

Lenda, M., Skórka, P., Mazur, B., Sutherland, W., Tryjanowski, P., Moroń, D., Meijaard, E., Possingham, H. P. and Wilson, K. A. 2020. Effects of amusing memes on concern for unappealing species. *Conservation Biology, 34*(5), 1200-1209.

Ley, K., and D. B. Young. 2001. “Instructional Principle for Self-regulation.” *Educational Technology Research and Development* 49: 93–103.

Pintrich, P. R. 1995. “Understanding Self-regulated learning.” In *Understanding Self-regulated Learning,* edited by P. R. Pintrich, 3–12. San Francisco, C.A.: Jossey and Bass.

Rennis, L., G. McNamara, E. Seidel, and Y. Shneyderman. 2015. “Google It!: Urban Community College Students' Use of the Internet to Obtain Self-care and Personal Health Information.” *College Student Journal* 49: 414–426.

Rickinson, M., 2001. “Learners and Learning in Environmental Education: A Critical Review of the Evidence.” *Environmental Education Research* 7: 207–320.

Rivers, W. P. 2001. “Autonomy at All Cost: An Ethnography of Meta-cognitive Self-assessment and Self-management among Experienced Language Learners.” *Modern Language Journal* 85 (2): 279–290.

Roberts, T. S. 2006. *Self, Peer, and Group Assessment in E-learning.* Hershey, PA: Information Science Pub.

Sadler, D. R. 2009. “Indeterminacy in the Use of Preset Criteria for Assessment and Grading.” *Assessment & Evaluation in Higher Education* 34: 159–179.

Soulé, M. E. 1985. “What is Conservation Biology?” *BioScience,* 35: 727–734.

Sunderland, T., J. Sunderland-Groves, P. Shanley, B. Campbell. 2009. "Bridging the Gap: How Can Information Access and Exchange between Conservation Biologists and Field Practitioners be Improved for Better Conservation Outcomes?" *Biotropica* 41: 549–554.

Tsunekage T., C R. Bishop, C M. Long and I. I. Levin. 2019. "Integrating Information Literacy Training Into an Inquiry-based Introductory Biology Laboratory". *Journal of Biological Education* DOI: 10.1080/00219266.2019.1600569.

Wu, S., M.-A. Rizoiu, and L. Xie. 2018. Beyond Views: Measuring and Predicting Engagement in Online Videos. *Proceedings of the International AAAI Conference on Web and Social Media*, *12*(1): https://ojs.aaai.org/index.php/ICWSM/article/view/15031.

Zimmerman, B.J. 2000. "Attaining Self-regulation: A Socialcognitive Perspective". In *Handbook of self-regulation,* edited by M. Boekaerts, P.R. Pintrich, and M. Zeidner, 13–39. San Diego, CA: Academic. doi:10.1016/B978-012109890-2/50031-7

Zimmerman, B.J. (2008). Investigating Self-regulation and Motivation: Historical Background, Methodological Developments, and Future Prospects. *American Educational Journal* 45 (1): 166–183. doi:10.3102/0002831207312909.