The use of Explain Everything to create video lectures in the context of flipped learning

Faculty of Science | Department of Physics

Module: Physics 154: Introductory Physics for Biological Sciences
Lecturers: Prof Brandon van der Ventel bventel@sun.ac.za & Prof Richard Newman rtnewman@sun.ac.za
Blended Learning Coordinator: Dr Ilse Rootman-le Grange ilser@sun.ac.za

Context

Background overview

Physics 154 is offered by the Department of Physics in the Faculty of Science. It is referred to as a service course since the majority of students who do this module are registered for BSc Human Life Sciences and will thus not continue with Physics after their first year. The number of registered students annually varies between 700 and 800. Figure 1 below gives a typical breakdown of the programmes that these students are registered for.

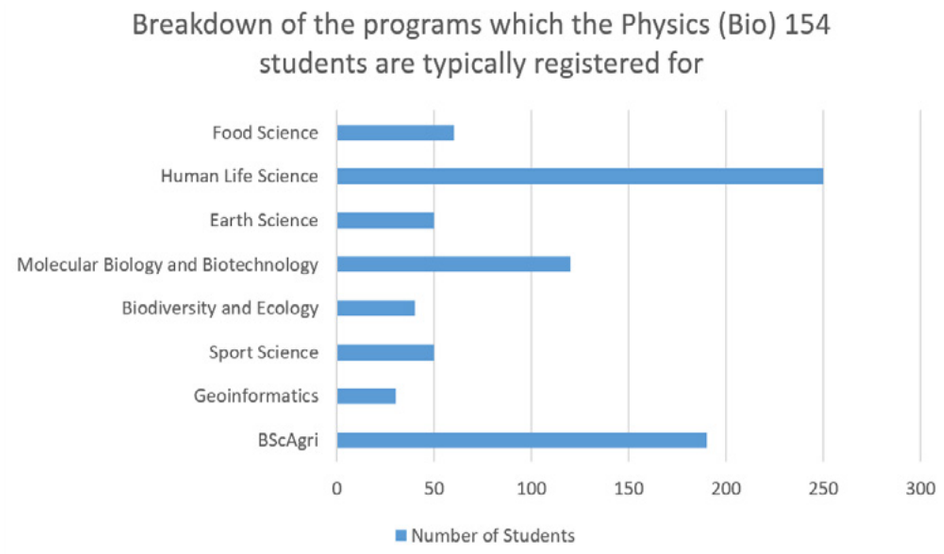

Figure 1: Breakdown of the programmes that students in the Physics (Bio) 154 module are registered for (according to 2016 data). The BScAgric programmes are all shown as one in the above graph.

Topic and intended learning outcomes

Physics 154 is a non-calculus-based Introductory Physics module mainly for students in the Biological Sciences programmes in the Faculty of Science. These programmes include BSc Human Life Science, BSc Biodiversity and Ecology, BSc Molecular Biology and Biotechnology and BSc Sport Science. The curriculum covers topics such as heat, sound, electricity and magnetism.

Established practice

In the current setup, each language group (Afrikaans and English) has three lectures per week. In addition, four tutorial and four practical sessions are spread over the semester.

During the tutorial sessions, students complete a set of problems. Tutors are available throughout the afternoon to assist the students with this. The theory covered in the problem sets is discussed during the preceding lectures. At the end of every tutorial, students write a 45-minute test that contributes towards their final grade.

During the practical sessions, students complete a specific prescribed experiment. These sessions take place in the laboratories and not in the lecture venues. Students usually work in groups. Again, students write a 45-minute test after the completion of each practical.

The challenge

The use of the app Explain Everything in this course forms part of a larger research project that was started in 2012, two years after the iPad was introduced (Apple launches iPad, 2010). By then, the adoption of the iPad in school classrooms was in full swing and a natural question arose: "What impact can the iPad have in the Higher Education environment?" To aid in answering this question, the lecturers of this module, Prof Brandon van der Ventel and Prof Richard Newman, proposed a four-component model for iPad implementation (Van der Ventel & Newman, 2014). In this model, the use of Explain Everything (https://explaineverything.com) was identified as the most suitable app for the flipped learning component.

As a starting point, the lecturers decided not to flip the complete course, however, but rather to start small to investigate the pedagogic value of this app.

Advantages associated with the integration of technology

Explain Everything is an app originally designed for the iOS operating system on Apple devices but is now available on Chrome, Android and Windows devices as well. It has a wide range of features. It can be used to import photos, videos and files, which can then be annotated and moved around. All these actions are recorded onto a timeline that can be converted into a video. Voice-overs to the actions can also be added. Alternatively, a blank canvas can be used to create drawings from scratch or to do step-by-step

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calculations and record the explanations as the calculations are done.

Explain Everything thus provides numerous possibilities for the development of supplementary resources that students can access 24/7 and that allow them to study at their own pace. It can also be used as part of a flipped learning approach.

Learning and assessment activities

Educational approach

The lecturers' motivation for using Explain Everything was to test a flipped learning model. The concept of flipped learning is based on the idea that traditional classroom activities need not be confined to the physical room where the students and the lecturer meet for a fixed time (Lage, Platt & Treglia, 2000). Instead, the flipped learning model relies heavily on the World Wide Web, recorded lectures and narrated PowerPoint slides. The advantage is that students then have access to the learning material 24/7 and can study at their own pace. In addition, contact sessions, i.e. lectures, can focus on the application of concepts rather than simply on the transfer of information.

As mentioned, the lecturers decided that to follow a complete flipped approach for a module with such a large number of students at first-year level would be a high risk. They therefore started by creating supplementary resources to complement the existing lecture notes and prescribed textbook. They then moved on to 'flip' specific sections of the Physics 154 module.

Learning activities

The lecturers' strategy was to use the app to record an entire lecture using the text, multimedia and voice-over functions of the app. In other words, the same lesson that was delivered in class became available as an .mp4 file on SUNLearn. Here one of the great features of this app should be mentioned, namely that one can record hand-written notes together with a voice-over. In the context of Physics, this is very advantageous, as long algebraic derivations can be presented in a lesson so that students can see the actual equations being written and simultaneously hear the lecturer's voice. Since it is a recording, students can pause and rewind it, thus getting a much better understanding of algebraic derivations as compared to just looking at the static text (of class notes) and trying to remember what the lecturer said in class at a specific algebraic step. The lecturers recorded an entire set of lessons covering the Electricity component of the curriculum.

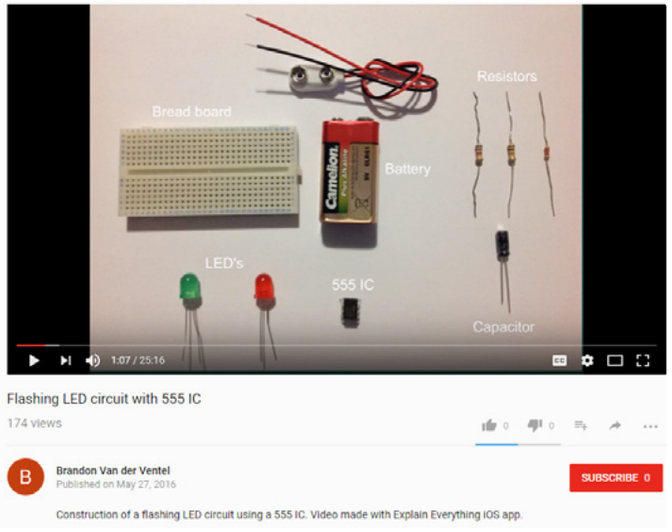

Figure 2: Screenshot of a video made available to students

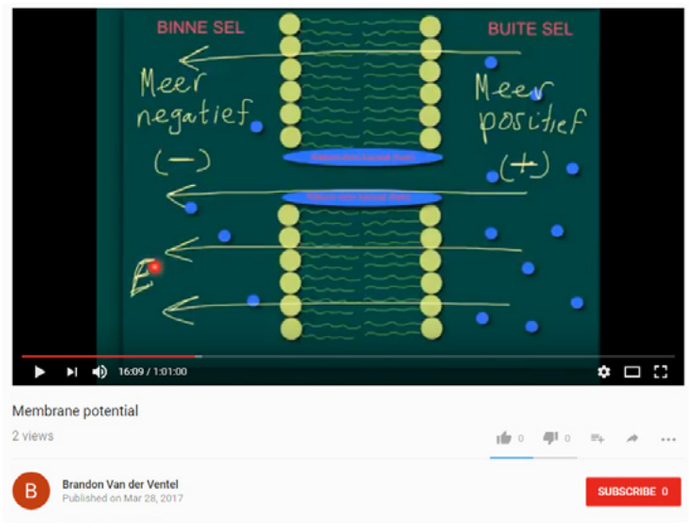

Figure 3: Screenshot of a video made available to students

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Despite students having access to the recorded lectures, there was no drop in class attendance. Furthermore, in the lecturers' experience, the true advantage of these video lectures recorded with Explain Everything lies in (i) reinforcement and (ii) offering a safety net. Since the recordings are an exact duplicate of what was said in class, students could review a particular section or concept at will as if the lecturer were present. In addition, it offered a safety net to those students who missed a lecture.

Practicals form a very important part of the course. Two of the four practicals specifically lent themselves very well to the use of this app, as the lecturers could include pictures and videos of the apparatus and the screen recordings of the data analysis when creating supplementary material. Students could thus run through the entire practical before coming to the laboratories. The lecturers refer to these videos as "virtual practicals". In addition, one of these practicals (the RC-circuit practical) was traditionally seen as the most difficult, as students had no prior knowledge of the concept. Providing students with resources before they came to the laboratory greatly assisted in their preparation for this practical.

The lecturers eventually decided to implement a flipped learning component. They were very cautious as to which topic should be flipped. Their choice of the RC-circuit was largely motivated by the constant mantra of students in this course of "Why must I do Physics?!" It is important to bear in mind that the majority of students in this course are enrolled for programmes in Biological Sciences (Figure 1). The lecturers realised that they could flip the theory of the RC-circuit and focus in class on the biological application of the RC-circuit, namely the membrane potential. To ensure that students seriously studied the video lectures on the RC-circuit theory, they were told beforehand that they would be tested on this topic in their examination.

Here the lecturers could see the advantage of flipped learning, as it created space in the curriculum for more application of the theory and thus increased the standard of the academic offering. Furthermore, students could better see the rationale of doing Physics even though they were studying Biological Sciences. It was a great joy to the lecturers when they noticed students consulting their Biology textbooks during the Physics tutorial on this topic.

Learning environment

Learning setting and content resources

The formal lectures were given in the two big lecture theatres and the practicals and tutorials in three laboratories. All the content for this course was made available via SUNLearn, including the PowerPoint lectures of both lecturers and the video lectures created with Explain Everything.

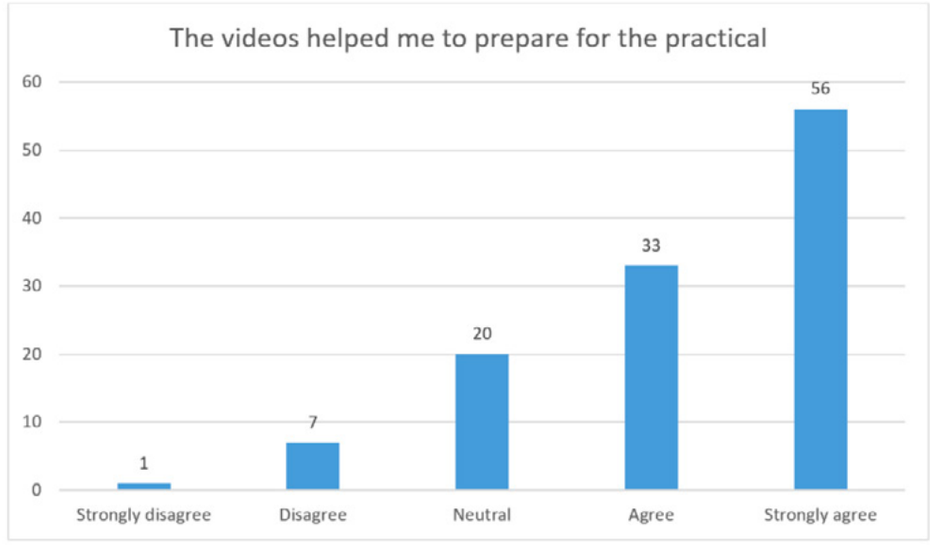
Technology resources

The Explain Everything videos were created on the lecturers' iPads. Students needed access only to the SUNLearn module to make use of these materials.

Student experience

Student feedback on the learning experience

The lecturers launched a survey on SUNLearn to get feedback from the students regarding the Explain Everything videos. Figure 4 below summarises the Likert scale questions while Figure 5 represents some open-ended student feedback.



BLENDED LEARNING CASE STUDIES 2016

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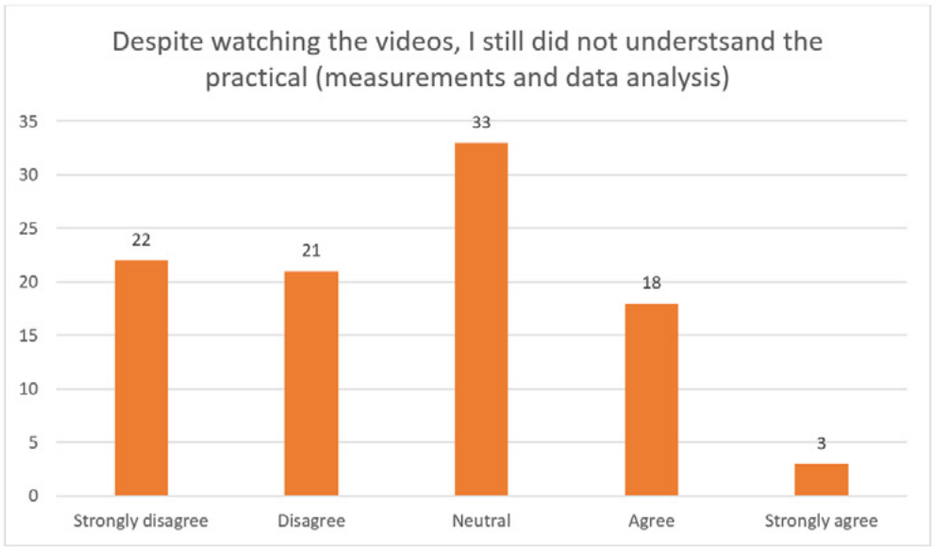

Figure 4: Summary of student responses to the Likert scale survey questions

General

Other concluding thoughts

The iPad and the Explain Everything app worked seamlessly and there were no problems in producing the video lectures. It is important to upload videos to SUNLearn in .mp4 format so that they are accessible to all students regardless of the device on which they view them.

When the lecturers started producing the supplementary lecture videos, they copied content from the existing lecture notes (the PowerPoint slides). They could then easily add voice-overs. This ensured that the videos were very similar to the actual lectures, which was aligned with their aim of creating the supplementary resources to reinforce concepts and to serve as a safety net for students who might have missed a lecture.
As Apple product users, the lecturers used a Bamboo Stylus to write on the screen. For the future production of videos, they will use the iPad Pro and the Apple Pencil. The Apple Pencil allows one to write equations at normal speed and the iPad Pro has palm recognition, which is a very valuable feature when using this app.

References

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