Biochemians Got Talent: Student Assessment Through YouTube Video Presentations

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Abstract

The University of the West Indies, St. Augustine campus, Trinidad and Tobago, offers a wide range of biochemistry courses for both our Biochemistry and Biology majors. However, our introductory biochemistry courses have been beleaguered by pass rates as low as 45%. In 2011 we introduced a new biochemistry course, BIOL 2365, which had a strong blended learning approach. In its introductory year this course obtained a pass rate of 77%, the highest pass rate of any introductory biochemistry course in the Department of Life Sciences over the past 5 years. In 2012 we encouraged our 155 students to innovate, imagine and create. They were given a semester long (10 week) video project, "Biochemian's Got Talent", where they were required to work in groups of 5 and make 15 minute videos on any topic from the syllabus. 31 videos were produced and uploaded on the course instructor's BiochemJM YouTube channel for worldwide viewing. Feedback questionnaires were provided to the students in the 12th week. Most students (94%) indicated that this was an enjoyable learning experience. Students reported increased knowledge about copyright laws as well as improved communication, social and leadership skills and they had a greater appreciation of the topic through the expression of their creativity as well as that of their peers. The majority of students (>80%) found the size of their group and the time given for the project adequate. Students (>90%) also found the video project an appropriate form of assessment and recommended this form of assessment for other courses. The pass rate for BIOL 2365 increased to 91% in 2012.

1. Introduction.

Trinidad and Tobago is a twin island democratic republic consisting of the two most southerly islands in the Caribbean archipelago. Trinidad, the larger (4,828 sq. km, 1,864 sq. miles) of the two islands, is located approximately 10km (7 miles) northeast of the coast of Venezuela [1]. There are four major tertiary institutions [2] in Trinidad with The University of the West Indies (UWI), St. Augustine campus being the first established (1960) [3]. Education is free for all Trinidad and Tobago citizens from the primary to the undergraduate tertiary levels [2].

The Faculty of Science and Technology (FST), UWI, offers a wide range of biochemistry courses for both our Biochemistry and Biology majors. However, our introductory biochemistry courses have been beleaguered by pass rates as low as 45%. This may be due in part, to a significant increase in class sizes and that many students entering the tertiary system are not equipped emotionally or academically to handle the rigors of tertiary life. Educators must also share some of the responsibility. We needed to critique and in some cases change our methods of delivery as well as assessment for todays' students [4].

BIOL 2365 Comparative Biochemistry is a Level 2 semester 1 Biochemistry course that was first introduced in the 2011 – 2012 academic year. Most of the lectures were available as YouTube videos via the course instructor's BiochemJM YouTube channel [5]. Coursework was continuously assessed using group projects, case studies and online quizzes instead of the traditional one hour written incourse exams given twice during the semester. The pass rate for the final exam was relatively high at 77%.

In the 2012 – 2013 academic year, the objective was to improve student learning. Once again students were given access to all lectures via the BiochemJM YouTube channel [5]. They were given case studies and online quizzes. Additionally, students were encouraged to imagine, create and innovate. We anticipated that this would inspire them to go beyond pen and paper, chalk and board and use their higher order thinking skills to explore the course material. As such the students were given a semester long (10 weeks) project, Biochemians Got Talent (BGT), where they worked in groups to create videos covering any topic on the BIOL 2365 syllabus. After completing this project students were expected to acquire the following skills:

i. Apply critical thinking and creativity to explain selected biochemical concepts.
ii. Demonstrate effective communication skills in the areas of interviewing and presenting.
iii. Demonstrate project management skills and actively use videos as a medium for positive student expression.
iv. Brainstorm and design themes and content for their videos.
v. Complete pre-production and production of their video and create a high-quality video.

We used the term 'Biochemian' in this course to describe an individual who learns biochemistry in a fun way.

This paper will serve as a guide to develop and assess video assignments at any educational institution.

2. Methods.

This BGT video project was implemented from September 2012 to November 2012 (Semester I 2012 – 2013). The following UWI institutions approved this project: Instructional Development Unit (IDU), Department of Life Sciences (DLS) and Marketing and Communications.

Groups of five students made 15-minute videos covering topic(s) or concept(s) taught in the BIOL 2365 course. These videos incorporated songs, skits, cartoons, puppets, interviews, tutorials and debates [Appendix 1]. Students selected the members of their

group. Each group elected a project leader who met with the course instructor to discuss the progress of their project. The project leader also dealt with any administrative matters on behalf of the group.

An instructional manual detailing (i) the objectives and goals of the assignment, (ii) software to use, (iii) important dates of submission, (iv) rubrics and (v) copyright guidelines were posted up on the UWI's BIOL 2365 Moodle site at the beginning of the semester. BIOL 2365 students had full access to this document. The details of the assignment were discussed with the students during their first class of the course and they were asked to consider these important questions before starting their video project:

i. What is the purpose of the video?
ii. Who is your desired audience?
iii. What topics/themes should be covered during the recording?
iv. Who will work on each portion of the video?

In week 1 of the semester project leaders submitted names and student ID numbers of members of the group as well as a working title for their project (refined throughout the semester). In week 2, at least 2 members of each group met with the course instructor to discuss their project. This was a 15 min meeting discussing the general plans of the project and what resources the group would require and use. This was to ensure that the students were on the right track.

By week 3 project leaders submitted a group project outline containing the following: objectives, biochemical themes / topics to be covered in their video, a brief procedure, a list of resources being used and the contribution of each member in the project. This exercise was assessed. A detailed rubric outlining how marks would be awarded and what would constitute an excellent, good, and weak outline was provided in the instructional manual. Project leaders updated the course instructor on progress of their project on a biweekly basis. This was done via email or Facebook or Skype.

The students used the following programs for this project: Microsoft MovieMaker, Powerpoint, Keynote, Camtasia, iMovie and YouTube GoAnimate. Groups submitted their videos in the tenth week. Videos were marked using a detailed rubric and uploaded to the course instructor's BiochemJM YouTube channel [6].

Questionnaires designed to obtain student feedback about the project were provided to BIOL 2365 students in week 12. The questions were mostly open-ended. Students were informed that their participation was voluntarily. All information was kept strictly confidential. Data was analyzed using IBM SPSS Statistics v 18.0

3. Results and Discussion

One hundred and fifty five students were registered for the BIOL 2365 course in Semester 1, 2012 – 2013. Thirty one videos were produced [6]. Ninety three percent of students doing BIOL 2365 answered the questionnaire. There were more female than male students in the class (71.3% Females vs. 28.7% Males), which is representative of the general UWI student body. The average age of this cohort was 21 yrs.

The majority (84%) of students reported that they learnt new skills or improved on existing skills while doing this project. New skills obtained included the (i) use of video editing software and (ii) filming, directing and acting. These are skills that are not typically gained from a biochemistry course but could be an asset in their careers.

Students thought that this project improved their (i) social skills (they learnt how to work in a group), (ii) leadership skills (sorting out conflicts in groups) (iii) Powerpoint skills (iv) self-confidence (v) time management and teaching skills (vi) writing, accessing and analysing data. Students also reported that this group project taught them patience working in groups and they were able to forge new friendships.

The majority of students (71.3%) said that there were unforeseen benefits from this project. Students reported that they learned more about copyright laws, improved communication skills, developed leadership skills, became more social, understood that complex biochemical process can be made simple, discovered skills using a camera, overcame stage fright and increased their enjoyment of biochemistry.

This project required that students work in groups of five. However 17.5% of the students reported that they would have preferred to work alone. Their reasons were as follows: there were too many conflicting ideas, personal schedules between group members clashed and as a result were unable to come together, additionally group members refused to complete their assigned tasks.

One of the major challenges with group work is delinquency. While this cannot be totally prevented it was emphasised during the orientation session on the first day of class that all members of the group were required to participate equally in this project. Students were encouraged to report any form of delinquency to their course instructor with the assurance that all information would be kept strictly confidential. The course instructor interviewed delinquent students and if found guilty, a deduction to the student's mark was made. Two groups experienced problems with delinquency. Their matters were resolved using the above protocol. There were some groups that did not bring delinquent members to the instructor's attention and this led to dissatisfaction amongst group members.

The majority of students (82.5%) acknowledged merit in group work. They preferred to work as a group because the workload could be divided amongst group members. They also recognized that other group members could provide skills such as video editing and musical talents that they did not possess and a wide range of ideas would contribute to a high quality video. Some students indicated that other members of the group were able to explain biochemical concepts that they did not understand.

Most students (85%) found that 5 group members were adequate. They found that the workload was evenly balanced and that fewer members would have made the project too demanding while more members would have lead to a conflict of ideas and too many individuals to agree on decisions. 15% of students suggested that the group size should increase. They indicated that more people were needed to successfully complete their video projects. In future the policy of 5 members per group will be maintained. Groups are allowed to include extra individuals from outside the classroom, if necessary, to assist with the videotaping and to play 'extras' in the video.

This was the first time a project of this nature was undertaken at The UWI. 92.1% of students agreed that the video project was an appropriate form of assessment and would recommend this form of assessment for their other courses. Student feedback is listed below:

(i) 'It is a very different and exciting approach towards learning material'

(ii) 'Because it expresses creativity but at the same time allows you to venture into different learning methods instead of just learning or having to always follow from power point'
(iii) 'It was really fun and it was a new and interesting way to learn the work'
(iv) 'Gives a hands on approach to course material. It's fun & new & interesting'
(v) 'Enables better understanding of the topic as it promotes interest in the topic due to the creative aspect.'
(vi) 'Because it gives a chance for science students to express creativity when we are accustomed to doing labs with strict procedures.'
(vii) 'It was fun- Allows us to learn a skill other than inforamtion regurgitation. It allows us to interact with the information ie get involved; translate it fron a textbook to everyday life.'

7.9% of students said that this project was not an appropriate form of assessment. They believed that it was worth too much of the final exam mark (the project was worth 10% of the final exam mark). After assessing student feedback the weighting of the BGT project will be raised to 15% of the final exam grade.

Students were asked if they would be comfortable collaborating with other students on their videos. The objective being, to develop a peer review learning system where students from other universities can view and comment on our students' videos and subsequently encourage students from other universities to make videos of their own. The majority of students (94.2%) were interested in the idea. They were interested in providing a different approach from the textbook to explain biochemistry to other students and get their feedback. They liked the idea of representing their university and country and show off their skills. Students who were not in support of the idea (5.8%) said they were too shy and felt embarrassed to be recorded.

When asked, 'What did you like **LEAST** about this BGT project?', most students left that section on the questionnaire blank. Those who commented said that they did not like group work and that using editing software was difficult as well as the project was too time consuming. It should be noted that these responses represent a minority of students e.g. 7.6% of students thought they did not have enough time to do the project.

Students responded favorably when asked, 'What did you like **MOST** about this BGT project?' They liked that they were able to choose their own group members and topic. They appreciated that the project allowed them to learn and understand in their own way. It was an escape from the monotony of assessment that other courses used. The students liked acting and filming. They appreciated that this project allowed them to use their creativity to fully understand the topic.

Finally, the students were asked, 'How can this project be improved?' Some students had suggestions while many did not answer. The suggestions were as follows: to increase the weighting of the project to 15%, provide more video cameras, show students how to make a video and how to edit, make the length of the video shorter and allocate topics. From these suggestions the following is being organised for next academic year (i) a private photo studio has volunteered their time and resources to assist students with their projects, (ii) detailed instructional videos on how to create and edit short videos will be provided and (iii) a smartroom is under development at the University that will be equipped with video and audio equipment that students will have access to.

Giving students a certain level of flexibility to choose their own group members and select a topic was essential to increase their level of comfort and successfully complete the video project. It was important for the project's success that the students enjoyed the process. Ninety four percent of students said that they enjoyed the experience and were happy that they completed the project. The majority of students (80.3%) reported that the BGT video project increased their self confidence in doing the course.

All videos were uploaded to the instructor's BiochemJM YouTube channel [6] and made public. The students shared the view that knowledge should be made available to all freely. Anyone with an internet connection can view and learn from these videos; 25 thousand views from over 40 countries have been recorded so far.

These videos will be used as teaching tools for future BIOL 2365 classes. 64.1% of the students agreed to mentor next years' BIOL 2365 students with their BGT video project. Many of our graduates go into secondary level teaching. This course can equip them with additional tools for teaching that can revolutionize the education system from the ground up.

Although not initially planned, the student's efforts were so impressive that they were awarded with prizes. [Appendix 1]
1st Prize: Sweet Assassins [7]
2nd Prize: Say Beta Say Keto [8]
3rd Prize: Ah Bit Ah Oxidation [9]
4th Prize: Told stories of the RE [10]
Best Song: The Beta Oxidation Rap [11]
Best Fight Scene: The Enzyme League [12]
Most Popular Videos: The Enzyme League [12] and The Biochemables [13]

4. Conclusion.

We asked our students to innovate, imagine and create. Their responses exceeded our expectations. They used puppets [14], fight scenes [12], horror [15], music [11] and cartoons [16]; [Appendix 1]. The students effectively applied critical thinking skills and creativity to explain complex biochemical concepts. They were able to effectively produce a high quality video and we can safely say that this project was indeed a success. We believe that the video project played a critical role in increasing the pass rate from 77% in 2011 to 91% in 2012. We strongly recommend that educators implement a similar project in their courses.

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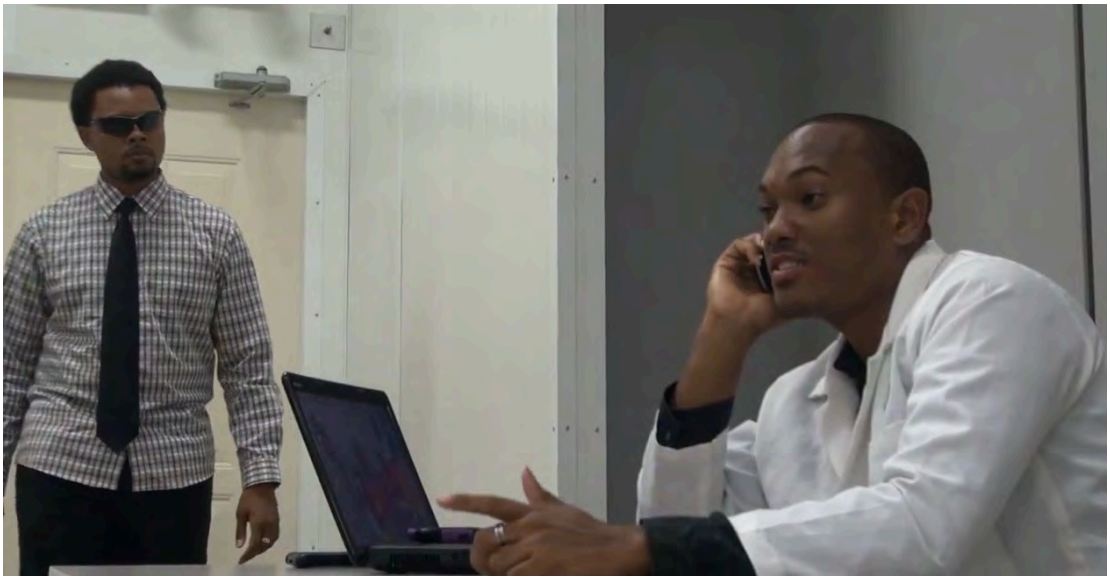
Appendix 1
Illustrative screenshots from selected BGT videos.

Sweet Assassins [7]
When the dangerous metabolic disease diabetes, initiated by the evil Dr. Sweetness, affects Little Fatty it is up to the legendary Inspector Nurse and his team to help Little Fatty through the ordeal and bring Dr. Sweetness' plan to a crushing end.



Best Song: The Beta Oxidation Rap [11]

A rap song outlining the enzymatic reactions involved in fatty acid beta oxidation. Normally students have difficulty remembering these reactions; that is till now.

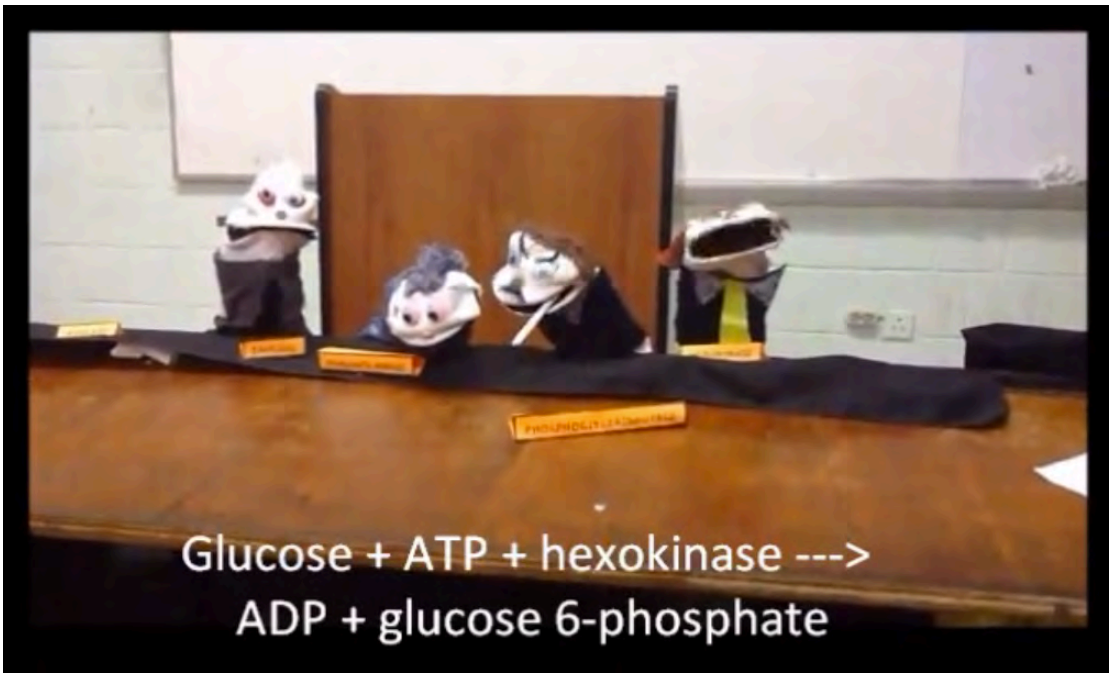
The Enzyme League [12]

After being embarrassingly rejected by the elite Enzyme League, the formidable Sam the Inhibitor intends to exact his revenge by destroying their power source, the Pyruvate Dehydrogenase Complex (PDH). Not only is this complex responsible for the League's power but for all the PDH complexes of the world. Since the PDH complex catalyses the step that links glycolysis to the citric acid cycle for cellular respiration to occur, the destruction of the complex would wreak havoc on the world. Upon hearing this, the Enzyme League seeks to understand the mechanisms involved in the complex's reactions and stop Sam the Inhibitor, ultimately saving the world!

The Biochemables [13]

A team of highly trained and qualified biochemistry students embark on a mission to help a UWI biology/ environmental major student make the most important decision of her life. In order to do this the team uses all their biochemistry skills to tutor her on a topic called "The Urea Cycle".

Parliament Melee [14]
When the "Republic of JM" goes into a state of fasting, the enzymes of the Glycolysis Party (GLY), which usually governs the country, present their budget plan for maintaining blood glucose levels and providing energy, in parliament. The opposition Gluconeogenesis Party (GLU), however, has a few issues with the GLY Party's plan.



Monday 12th [15]

This is a parody to the horror movie 'Friday the 13th' where the sock puppet, Jason M, visits a group of biochemistry students who decided to spend their weekend at a beach house instead of doing their biochemistry project due Monday 12th. They are each asked a question by Jason M, the answer to which decides whether they live or die.

You too sweet for me the diabetes dilemma [16].
This is an animation aimed to educate the public on diabetes. The video begins with Max, an obese man whose wife is unhappy due to Max's impotence. She signs them up for a talk show called "Name your disease" and there, other characters are introduced. Sheila is a middle-aged woman who is always tired and Charlie is a young man who is losing his vision. Dr. Hernandez, Dr. Persad, and Dr. Chen provide insight into the biochemistry of their disease.

BGT Prize Giving Function
Some of the students involved in creating the BGT videos