Models in Movies: Teaching Abstract Concepts in Concrete Models

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INTRODUCTION

The tool created here is an instructional video that demonstrates how to create models of the heavy and light chains of an antibody using pipe cleaners, and how the process of V, D, and J gene recombination functions, using the model as a visual aide. The video was created by undergraduate students, with the intended audience being other undergraduates. This type of direct peer teaching aids in education because the “teachers” in this situation greatly enhance their own knowledge through instruction, and their imparting of knowledge is often more helpful to that of another student because they are more aware of comprehension gaps within their peer groups. As such, the supplementary goal of the model is to have students follow along with the video by creating and using their own models, thereby gaining a deeper knowledge of the process with a more thorough interaction.

Using a video in combination with a hands-on model that a student can create on his or her own time allows kinesthetic and visual learners to succeed in a classroom setting where lectures are often tailored to suit auditory learners. Although this study tool was tested in an undergraduate Immunology class, instructional videos and models can be used in many different settings in order to enhance lectures on a variety of topics. The material presented in the video was adapted from Janeway’s Immunobiology (1).

When the video was posted on YouTube.com, it became clear that peer teaching is filling a void in comprehension for students. In five months, the video has been sought out by more than 2500 people. This shows that video sharing websites are an excellent way to make information accessible, and such sites aid in education. Allowing students to make videos and models for their peers with the support of professors can exponentially increase the number of ways learning can be absorbed worldwide.

PROCEDURE

Inexpensive, malleable materials are the easiest to work with in order to create a model; however, the specific material selected for use can be the student’s decision. A video camera, editing software, and a computer are the only other necessary components for the video. In the example shown below (Fig. 1), pipe cleaners were utilized.

A model was created by students for their peers, which demonstrated the concept of interest. The video was filmed, showing how to make the model, as well as how the process works; in this case VDJ gene recombination. The video was then presented to students in lecture, and shared on a class management site. It was also made available on YouTube at http://youtu.be/-zEMfAXPLUA, in order to reach a wider audience.

DISCUSSION

The video was introduced to students in an Immunology class, and materials for making a model were provided approximately two weeks prior to their exam. The materials were taken home, with encouragement to create a model. After their first exam, which included questions about genetic recombination, the students were surveyed using iClickers.

The data in Figure 2 indicate that a teaching tool of this nature, which employs a visual and auditory video component coupled with a hands-on, kinesthetic model component, should be useful to a wide variety of students, particularly the 53% of students who identified themselves as possessing a combination of learning styles. As shown in Figure 3, the primary use of the tool was watching the video, but 8% of students both watched the video and made the model. Further polling would be necessary to determine the reason for the lack of participation by 61% of students; however, it seems reasonable to suggest using the model in class to increase involvement. After additional surveying, we found that 91% of those who watched the video and/or made the model found it to be either ‘extremely helpful’ or ‘somewhat helpful.’ This feedback indicates a need in the classroom for a deeper understanding, as opposed to simple memorization techniques.

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Student Comments:

- “I often use YouTube videos like this to learn difficult topics and it always helps.”
- “Sitting in class is just the beginning of learning a topic, and outside of class is where the time is put in to really learn the presented material.”

After five months of availability on YouTube, the video has been viewed by more than 2500, all of whom were searching for material to supplement their understanding. This suggests that there is a need for peer teaching, as well as methods that are applicable to people of all learning styles.

Comments:

- “Thank you! Helped me a lot to visualize the concept. Very creative!”
- “I’ve been stuck on this all weekend... But after your video...I finally get it!!! Thank you so much!”
- “This is a GREAT video. So helpful.”

CONCLUSION

After testing the idea of using a video in conjunction with a model as a study tool for undergraduate students in an Immunology class, it has become clear that some
students will utilize this additional method for studying, but others will choose not to spend the extra time. Just as learning styles are varied, motivation to truly understand a complicated concept also varies in a classroom. It is important to address as many learning styles as possible with the teaching methods available, and a video that incorporates a method for making a model allows for engagement with the material for students with all learning approaches. Peer teaching is an excellent way to bridge knowledge gaps and create a higher level of understanding. Overall, this method of imparting knowledge has been successful in helping motivated students to visualize complicated, abstract concepts, and deepen their sense of understanding.

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REFERENCES