Creating An Interactive Video Vignette on the Topic of Torque

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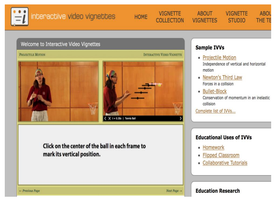
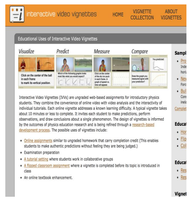
The role of IVV in Physics Education

IVV: The Interactive Video Vignette (IVVs) are part of the LivePhoto Physics Projects which aim to create a collection of videos and class-room tested curriculum materials. IVVs are compact online video lessons that offer students the ability to learn outside the classroom while maintaining the interactivity of an individual tutorial [2,5].

Significance: In the past 25 years, introductory physics instructors have been trying new approaches in teaching based on the outcomes of Physics Education Research (PER) [4]. A common theme of PER-based instruction has been to employ active-learning strategies to overcome challenging physics concepts. Accordingly, the Vignette employs a specific active-learning strategy known as the ECR technique, elicit-confront-resolve: elicit prediction from user, confronts user with experimental result, helps user resolve the differences between them [4].





Approach to the Lesson: The Torque in the Knickerbocker, a Swing Dance Move

$$\vec{T} = \vec{r}\, x\, \vec{F} = |r||F| \sin\theta$$

- *Why swing dance?* Dance is an exciting medium to teach physics and drive interest.
- *The physics:* The Knickerbocker aerial step is simply a controlled flip, where a person rotates around a pivot point.
- *The game-plan*: Introduce the idea of torque through simple examples (e.g., how a door works). We define the ideas behind torque, e.g.,: pivot point, moment arm, and the force. After understanding the basic principles behind torque, we analyze how these ideas apply in the swing dance move.

Research Motivation

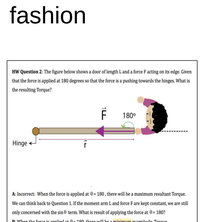
- There is evidence showing that “increasing the interactivity of an online lecture may make it more effective compared to either a non-interactive online lecture or face-to-face lecture” [4].
- We would like to demonstrate how physics can be applied in diverse situations, like dance. Dance is a form of self expression and being able to connect it to physics would highlight how embedded physics is in everything we do.

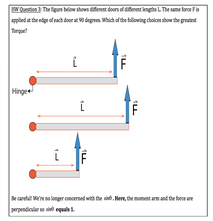
Timeline

Month	January	February	March	April	May	June	July	August	Sept.	October
Activities	Script Writing						Set Up Vignette Layout			Creating Vignette
							Creating Storyboard		Editing Video	
	Review Literature on the IVV, Testing IVV Software		Drafting Concept Questions		Lindy Hop Training (Long Island Swing Dance Syndicate) Learning the Knickerbocker flip		Knicker-bocker practice	Casting		
	Team Building		Torque Research				Script Practice	Video Recording		

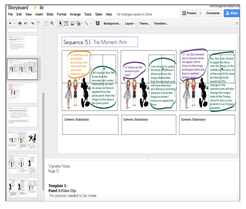
Method

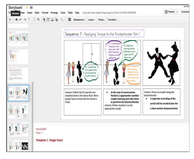
- Drafted Script & Concept Questions: We presented all the components of Torque in a step by step fashion

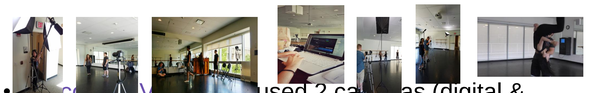




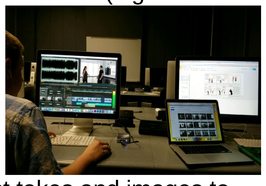
- Created Storyboard & Outlined Vignette Template: We used Adobe Illustrator & Google PPT, allow for smooth transitions between scenes and concept questions



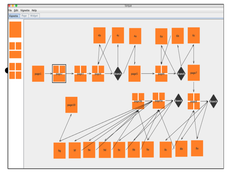




- Record Video: We used 2 cameras (digital & recording camera)



- Edit Video: We used the best takes and images to form a coherent film with Adobe Premier



Lessons Learned

Technical limitations: When working within these limitations, it is important to be patient and creative.

- The IVV application made available to the public and is still in its beta version. It is available at www.compadre.org/ivv
- The application is intuitive however, there is limited documentation.
- The IVV are platform specific (we weren't able to get them to work with safari).

Script writing blocks: The process of breaking complex information down into easier smaller steps to comprehend is challenging. We found the following ways to get around this:

- Explain the concept to another person without any background in the topic (younger sibling, friend or family member etc..) to see if they can understand.
- Watch science education videos, such as Bill Nye, that has been played in the classroom for reference.
- Use a less demanding demonstration that can be shown without much experience required.

Film production: Casting can greatly affect how the well lesson is delivered and shorten the time needed to record.

- Choose a cast that is accustomed to the physics topic being taught.
- Cast should be comfortable speaking and performing in front of a camera.
- Cast should be able to perform the demonstration with ease.

Physics problems: Finding the right difficulty level for the intended audience

- Keep in mind to be consistently thorough with details.
- Understand which concepts are too advanced for an introductory lesson.

Contribution & Acknowledgement

James St. John (Film & Crew), Long Island Swing Syndicate (Training), Dr.Sean Bentley & Prof. Patricia Panatier (Script Review), CJ Russo (Film & Editing), Colleen Wright (Dance & Script Review), The Adelphi University Performing Arts Center (Recording Sight)

References:

[1] Resnick, R., & D. (2013). *Fundamentals of Physics Extended (10th Edition)* (10th ed.). Danvers, MA: Wiley.
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