

FAMIS Animations as Teaching Tools and Laboratory Exercises: Their Value and How to Make Them

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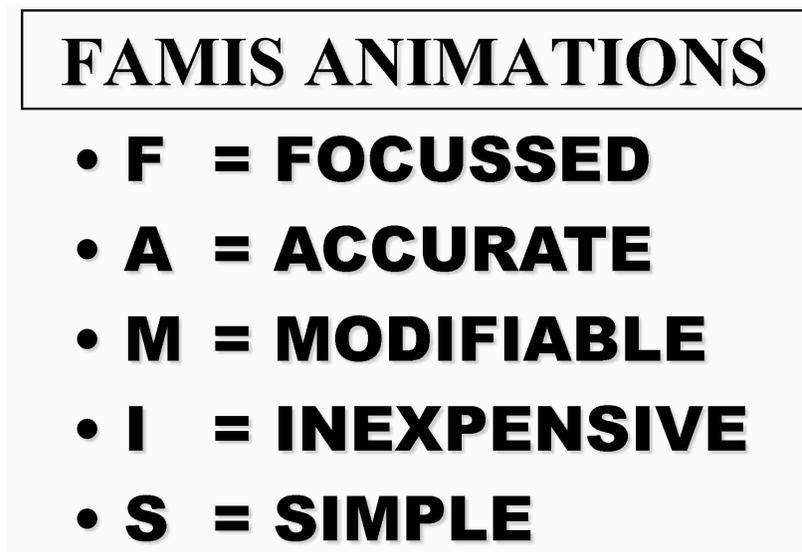
Introduction

Multiple technical resources commonly referred to as multimedia are currently in use by many instructors to communicate difficult topics and concepts to their students in meaningful ways. Today's students embrace these new technologies and to be effective teachers we should also learn how to use them as instructional complements. The most effective teachers use a diversity of methods and approaches to assist their students in the learning process. The issue that arises then is not only how to use these various multimedia but how to use them effectively. One area of rapid development is in the area of instructional animations. While many animations exist they may not always fit an instructor's specific needs. For this reason, I have spent the last several years developing a simple animation method called FAMIS animations. Along the way, I have also learned the essential elements of effective teaching animations.

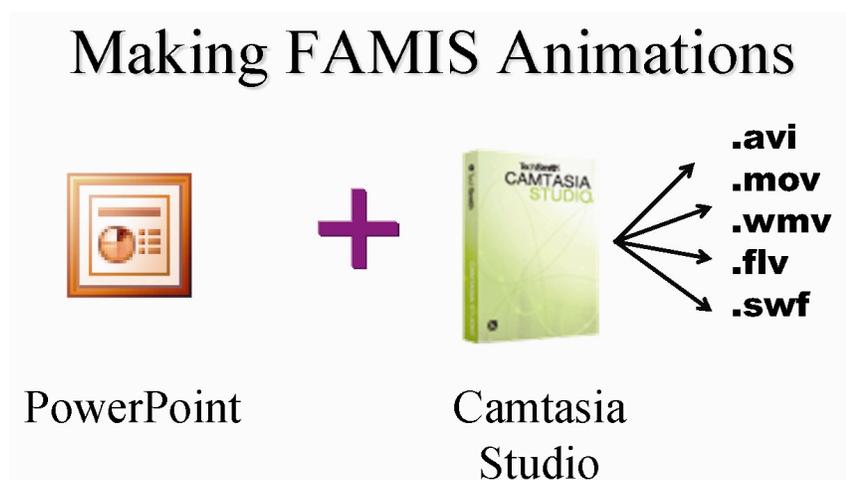
FAMIS Animations

FAMIS animations are so named because they are: Focussed, Accurate, Modifiable, Inexpensive and Simple (Figure 1).

Figure 1. The definition of a “FAMIS” animation.



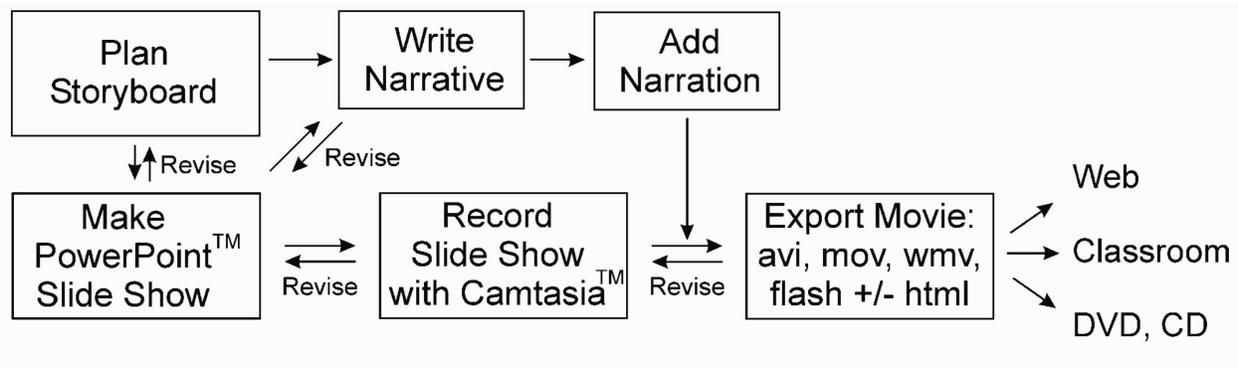
It is possible to produce an excellent animation using Microsoft’s PowerPoint™ program, a program most instructors are already comfortable with using. Then the animation can be converted to any current movie format using Camtasia™ Studio for viewing in class or on-line (Figure 2).

Figure 2. Making FAMIS Animations

“FAMIS” animations are made by making an animation (slide show) in PowerPoint and then capturing it in Camtasia Studio after which the animation is exported in any desired movie format for viewing either as a stand-alone animation, part of a website or as a podcast. The original PowerPoint show and the Camtasia Studio project remain unchanged during these steps allowing the user to revise their animation at any time.

A major use of this method is to help instructors develop their own high quality animations to demonstrate biological events, techniques and methods either for lecture, labs or tutorials. The following flow chart demonstrates the simplicity of the method revealing how it, unlike traditional animating methods and program, is open to revision at any point. This ability to revise the animation is a very powerful attribute allowing one to easily modify their animation and/or share it with others who in turn can make the modifications to suit their own instructional needs.

Figure 3. “FAMIS” animations are made in a similar way to traditional animations except they can be revised at any point and exported in any format.



Adding a narration is optional. If it is to be included, the narration can be done directly into the PowerPoint show or added later in Camtasia Studio. In addition sounds or background music can also be added to the animation in Camtasia Studio. However, if you intend on presenting your animation during class, a narration may not be necessary. Instead, the instructor can provide the appropriate commentary.

Drawing in PowerPoint

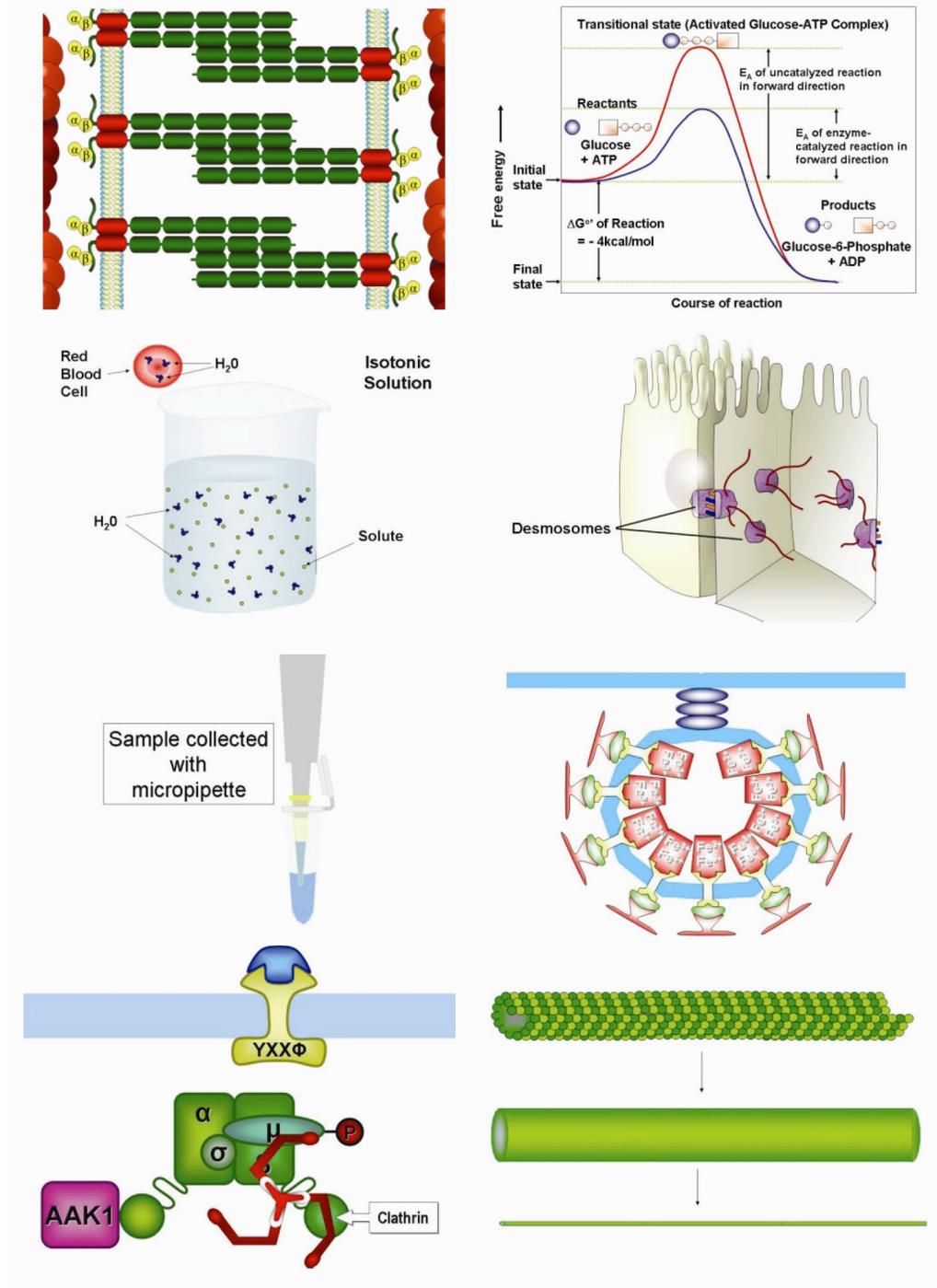
Making animations in PowerPoint is facilitated by the ability to make high quality drawings (the basis of the animation) as shown in the following figure 4.

Clearly it is possible to make complex and detailed drawings in PowerPoint but usually simpler is better.

Animating in PowerPoint

An animation is a complete story that in teaching demonstrates a concept, process or event. The key to making animations in PowerPoint is to use the “Custom Animation” attribute. In PowerPoint 2007 a simple click on the heading “Animations” in the Quick Access Toolbar at the top of the page, opens up all of the animation options. For earlier versions of animating in PowerPoint please check out my article in CBE: Life Sciences Education where some step by step animating procedures are detailed and an animation is provided (O’Day, 2006). Also searching online for “animating with PowerPoint” either through a web-based search engine or at the Microsoft Office website will lead to a diversity of tutorials on how to animate.

Figure 4. Some graphics drawn in PowerPoint.



Capturing and Exporting with Camtasia Studio

Camtasia Studio is a powerful capture program with a diversity of educational functions. It can be purchased online (www.Techsmith.com) for under US\$200. At the Techsmith website you can learn the diverse uses for the program. There is also a link to download a full-featured, trial version—I'd try this out before you buy. For the beginning FAMIS animator, all you really need to know about Camtasia Studio is that it puts a record button on the main tool bar in PowerPoint 2003. In the 2007 version, the button is put in "Add-ins" in the main tool bar. Either way, clicking on the button starts the PowerPoint show (animation) and begins recording it. Once the presentation is over, you can view the "animation" and make changes to the PowerPoint animation if you're not satisfied.

When you have a finished animation in Camtasia Studio, you can further edit it, add a narration and/or sound track, and then export the animation in any current movie format ranging from avi to swf. If you accept the program's pre-set parameters that have been established for each format type, then your movie will be exported quickly and be ready for viewing in the format you select. Again, if you're not satisfied you can revise the animation at any time (Figure 3). With more experience you can begin to modify aspects of how your animation is exported and work with many of the other useful attributes of this program.

The Value of Animations for Teaching

It is important to note that animations are not the solution to teaching; they are just one more tool in the teaching toolbox. Animations are another means of communicating information to facilitate understanding especially of dynamic events. By bringing dynamic events to life, they can provide insight that static graphics and words alone cannot. Since the animations can be put online, they are useful for distance learning and can serve as a valuable study tool for students. Importantly they can provide accessibility to students with learning disabilities because, when provided online, students can work at their own rate to comprehend the material.

Making Educational Animations: Key Points to Consider

To make your animation valuable for teaching, there are a number of aspects that need to be considered. Many of these are common sense but I'll also give some formal terms and references where research has verified the value of these attributes. I go into much more detail about each of these in my articles (O'Day, 2006, 2007, 2008). Understanding the critical components that comprise an effective teaching animation will not only assist instructors in developing their own and their students' animations, it will also assist instructors in selecting appropriate animations from other sources.

The literature is full of contradictory evidence on the value of animations in teaching but most of the negative data and conclusions are due to studies using animations that were inappropriate to those viewing them (e.g., material is too complex or too advanced). So it is important to understand who you are making the animation for and, just as importantly, what makes a useful teaching animation.

Figure 5. Aspects that need to be considered when making any teaching animation.

Pedagogical Parameters

- **Stage-appropriate material** (Tversky & Morrison, 2002)
- **Images & text adjacent** (Mayer, 2003)
- **Term (Text) spoken as it appears** (Mayer, 2003)
- **Oral narration in conversational tone** (Sweller, 1994; Lowe, 2003)
- **Give student some control** (Tversky & Morrison, 2002)
- **Use visual cues to reflect change** (e.g., Colour/Shape; Wilson-Pauwels, 1997)

It is important not to overlook the abilities and interests of our students. The first step in being a effective teacher is getting your students' attention; the second step is holding that attention. There are unlimited ways to get your students' attention. There just as many ways to lose that attention. One of these is clear: discussing or lecturing on material that is beyond student comprehension will generate frustration in one's students. This is also true for animations. It is well documented that the animated material must be appropriate to the topic at hand and to the educational status of the viewers. In order for a learner to gain a proper understanding of the material the content must be easily and accurately perceived and understood. This is referred to as the "apprehension principle".

Animations that move too quickly or that contain excessive extraneous detail or realism can overwhelm the learner leading to little comprehension (Tversky and Morrison 2002; Figure 5, Table 1). Animations are not very effective if they contain more information than is appropriate (Tversky and Morrison 2002). This is the "coherence effect" (Mayer, 2003; Figure 5, Table 1). Thus, it is

essential to define one's goals and keep focused on those goals. For complex processes, it is wiser to break up the content into smaller packages than attempt to cover it all in a single animation.

Table 1. Pedagogical parameters used in making educational animations

Component	Comment	References
Stage-appropriate material	"Apprehension principle"; Content must be aimed at the comprehension/educational level of your audience;	Tversky & Morrison, 2002
Absence of extraneous content focused	" <i>Coherence effect</i> "; keep	Mayer, 2003 material/information
Images & text adjacent	" <i>Spatial contiguity effect</i> "; reinforces association of term with structure/event	Mayer, 2003
Term (Text) spoken as it appears next to image	" <i>Multimedia effect</i> "; reinforces association of term with structure/event and how terms are spoken	Mayer, 2003
Oral narration	Concurrent with visual information; reinforces learning;	Sweller, 1994; Lowe, 2003
Oral narration in conversational tone	" <i>Personalization effect</i> "; reinforces learning	Mayer, 2003
Give student some control	Interaction reinforces learning	Tversky & Morrison, 2002
Use visual cues to change	Colour/Shape reinforce that an event has occurred	Wilson-Pauwels, 1997 reflect

In any field, terminology is critical. Similarly specific components, structures or events have specific names. Animations can be effective ways of linking specific words to these components, structures or events. In keeping with this, Mayer (2003) presents evidence that students learn more effectively when printed words or terms are placed adjacent to corresponding pictures ("spatial contiguity effect"; Figure 5). Furthermore when words or terms are spoken at the same time in an animation the

learning value is further enhanced (“multimedia effect”; Figure 5, Table 1) compared to words or pictures alone.

Oral narration in general has been shown by others to be an effective complement that reinforces learning (Kalyuga et. al. 1999; Lowe, 2003; Mayer and Anderson 1992; Sweller, 1994). Mayer (2003) espouses an additional “personalization effect” that results when such narration is conversational as opposed to being pedantic (Figure 5, Table 1). These results all are consistent with the cognitive load theory which is based upon the concept that there is a limited amount of working memory and by using both visual and auditory channels working memory is increased (Mayer et al. 2001; Sweller 1994; Mayer and Anderson 1992).

FAMIS Animations are Pedagogically Sound

I have been interested in understanding the true value of animations in teaching and learning. To this end, I’ve carried out some controlled research studies in which textbook package animations, hi-resolution 3D animations and FAMIS animations have been compared (e.g., O’Day, 2007). In terms of learning and retention, FAMIS animations rival and, at times, surpass the educational value of traditionally made teaching animations.

Animations Can Lead to Better Short-Term and Long Term Memory Retention

There are a limited number of studies revealing the value of animations in biology teaching. As part of my long-term goals, I have been examining the value of animations in memory retention. With proper time allocated for viewing, students score better grades on short tests after viewing a narrated animation as compared to viewing the same information as a static graphic with an identical figure legend to the narrative (O’Day, 2006). Furthermore, animations also lead to better long-term memory retention compared to equivalent figures with a legend even if the animation is not narrated (O’Day, 2007). This is not to argue that animations are the best way to learn but to emphasize that, along with other pedagogical approaches, animations can assist students in learning and retaining information. I have recently reviewed this research in detail (O’Day, 2008). In that article I suggest new studies that need to be done so that we can learn when the use of animations can be most effective in the teaching process.

Making Animations for Labs and Lab Exercises

In the lab context, animations can be used to demonstrate the sequence of steps in the lab, the concepts to be tested and/or the techniques involved. The animations can be presented online so the students can prepare ahead of time or they can be shown in class to start the laboratory, if that is preferred. This method could also be used as ongoing tutorial or laboratory exercises wherein

students develop animations to explain basic biological concepts or events. This hands-on method is very effective at helping students develop their skills at communicating events visually. Once the animations are complete the students can show their work in class so that all of the students can learn new material. The students can also critique each other's work so they can learn how to improve their animations, learn new animating techniques and to increase their understanding of the material that has been animated.

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