Chapter XV
Facilitating Learner-Generated Animations with Slowmation

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ABSTRACT

Digital animations are complex to create and are usually made by experts for novices to download from Web sites or copy from DVDs and CDs to use as learning objects. A new teaching approach, "Slowmation" (abbreviated from "Slow Motion Animation"), simplifies the complex process of making animations so that learners can create their own comprehensive animations of science concepts. This chapter presents the learning design that underpins this new teaching approach to facilitate the responsibility for creating animations to be shifted from experts to learners. The learning design has four phases which guides instructors and learners in creating animations of science concepts: (i) planning; (ii) storyboarding; (iii) construction; and (iv) reconstruction. This learning design will be illustrated with two examples created by preservice primary teachers in science education as well as providing a discussion about possible future directions for further research.

INTRODUCTION

Over the last 100 years, developments in the techniques of animation have been related to advancements in technology. As computers and software have become more sophisticated, the use of animation to tell stories has become more comprehensive as evident in the recent commercial success of films such as *Harvey Crumpet, Wallace and Gromit,* and *Chicken Run,* which use clay animation, and *Happy Feet, Shrek,* and *Finding Nemo,* which use computer-generated animation. Both of these forms of animation are very complex and labour intensive to create, and so educational resources that use animation for teaching concepts in schools and universities are mostly made by experts. Rarely do learners design and make animations of educational concepts.

There are three main forms of animation with various subtypes that are categorised according to how the images are created, the materials involved, and technology used (Taylor, 1997). The first form is called traditional or hand-drawn animation. This includes the many cartoons and feature length films that were made in the past 70 years which is sometimes called "cel animation." This term refers to the transparent acetate sheets that the diagrams are drawn or traced on and photographed onto film so they can be shown quickly to create an illusion of movement. A second form, stop-motion animation, involves taking digital still photographs of objects or pictures after they have been moved manually to simulate movement. This form includes clay animation which was first introduced in the early 1900s and was made famous by "Gumby" and Will Vinton's use of the term "claymation" in 1978 (Wells, 1998). A third form and the most popular, computer-based animation, has images that are created digitally on a computer using a wide variety of new techniques and software programs. Table 1 summarises these three forms of animation.

But no matter which of the three types of animation is used, they all have two features in common. First, the purpose of animation is to create an illusion of movement with the speed of the frames being played at 24 frames/second (video is 30 frames/second) in an attempt to create a seamless "persistence of vision." Second, the process of making of an animation is complex and tedious so that it is usually left to professional animators and information and commmunication technology (ICT) experts to create. Because of this complexity, nearly all educational animations are made by experts and classified as *learning objects.* These have been defined as:

Digital, re-usable pieces of content that can be used to accomplish a learning objective. That means that a learning object could be a text document, a movie, an mp3, a picture or maybe even a website.

Table 1. Forms of animation

Form of animation	Feature	Types	Examples
1. Hand-drawn animation (cel animation)	Images are hand-drawn and copied or scanned onto a computer	Cartoon animation Character animation Limited animation Rotoscoping	Flintstones Jetsons The Lion King Disney Cartoons
2. Stop-motion animation	Objects, models, or images are created and small movements are made by hand and the models individually photographed	Clay animation Cut out animation Model animation Object animation Puppet animation Silhouette animation	Wallace and Gromit Gumby Chicken Run The Muppets Harvey Crumpet Monty Python (dada animation)
3. Computer-generated animation	Images are created digitally and manipulated on a computer	2-D and 3-D animation Skeletal animation Motion capture animation Morph target animation Flash animation PowerPoint animation	Shrek Cars Happy Feet Finding Nemo