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The Effect of More and Less Relevant Details and Teacher Voice on Student Retention and Problem-Solving Transfer in Teacher-Created Multimedia

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THE EFFECT OF MORE AND LESS RELEVANT DETAILS AND TEACHER VOICE ON STUDENT RETENTION AND PROBLEM-SOLVING TRANSFER IN TEACHER-CREATED MULTIMEDIA

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Dissertation Abstract

The Effect of More and Less Relevant Details and Teacher Voice on Student Retention and Problem-Solving Transfer in Teacher-Created Multimedia

Many teachers create multimedia resources for their students, but most are uncertain as to what factors to consider regarding the design of multimedia instructional materials. Prior research identified instructional design principles for multimedia including the coherence principle and voice principle.

The purpose of this study was to test the coherence principle in a realistic setting using a heterogeneous group of ninth grade students in a humanities course to determine the effect of seductive details on retention and problem-solving transfer. To extend understanding of the voice principle, this study examined the effect of the teacher's voice on student learning as measured by retention and problem-solving transfer. Additionally, the study explored the relationship between prior knowledge, retention, and problem-solving transfer.

Accordingly, the study, a 2 x 2 factorial design used a convenience sample of 134 ninth grade students enrolled in a Christian Sexuality course in an urban, co-ed high school in the San Francisco Bay Area. Students were randomly assigned to one of four groups for the four multimedia packages delivered over a month: No Seductive Details/Teacher Voice, No Seductive Details/Different Teacher Voice, Seductive Details/ Teacher Voice, or Seductive Details/ Different Teacher Voice. Students completed a

prior knowledge inventory first and a retention inventory and problem-solving transfer inventory after each multimedia package.

Eight two-way ANOVAs were conducted to determine differences in performance between the groups. One statistically significant main effect for the seductive details condition, $F(1, 121) = 4.32$, $p < .05$, $d = 0.36$, was observed for problem-solving transfer in Video 1. In contrast to prior research conducted in laboratory settings, there was no seductive details effect observed. No statistically significant differences for voice were observed, but the descriptive statistics revealed a trend of improving scores for both retention and transfer for different teacher voice suggesting that social agency theory does not explain previous voice principle research. Prior knowledge was positively associated with transfer for teacher's voice and with retention with different teacher's voice.

This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the Faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

Colette Roche	April 7, 2016
Candidate	Date

Dissertation Committee

Mathew Mitchell, Ph.D.	April 7, 2016
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CHAPTER I

INTRODUCTION

Statement of the Problem

Multimedia is a widely used instructional tool in secondary classrooms. While teachers generally can evaluate content for clarity and accuracy, most are uncertain as to what other factors to consider regarding the selection and design of multimedia instructional materials (Rey, 2012; Thalheimer, 2004; Towler, 2009).

Multimedia designers and users often operate under the belief that adding information for interest (seductive details) is helpful in motivating students to learn (Rey, 2012). As a result, multimedia often includes narrative detail as well as sound and visual effects that are irrelevant to the defined learning goals (Thalheimer, 2004). In contrast, others design multimedia to include only essential elements (coherence principle) of the material to be learned (Mayer & Moreno, 2002). Ascertaining the relative efficacy of these two conflicting approaches to multimedia design—seductive details versus the coherence principle—has practical importance for secondary teachers as they gain greater access to inexpensive and easy tools for creating their own multimedia as well as to commercially prepared multimedia materials (Mayer, 2014b; Thalheimer, 2004).

Research regarding multimedia initially focused on comparing learning with and without multimedia components (Samaras, Giouvanakis, Bousiou, & Tarabanis, 2006); however, inconclusive findings led to a greater emphasis on identifying instructional design principles that maximize multimedia benefits (Mayer, 1997; Mayer & Moreno, 2002). One line of inquiry has focused on designs that reduce cognitive load, the mental effort used in the working memory (Moreno & Park, 2010). Cognitive load is theorized to be created by the limitations of the working memory, which processes information received via the senses in order to connect the new information with existing information in long-term memory (Sweller, 2010). One design principle theorized to reduce cognitive load and thereby improve student learning is the coherence principle whereby extraneous materials are reduced or omitted in multimedia instructional material (Mayer& Fiorella, 2014; Rey, 2012; Thalheimer, 2006).

The coherence principle evolved from previous investigations of the effect of varying types of details in written materials (Muller, Lee, & Sharma, 2008). A number of earlier studies investigated paragraphs of text where seductive details (extraneous material not essential to the learning goals) were added to increase the interest level of the material for students (Garner, Gillingham, & White, 1989; Hidi, Baird, & Hildyard, 1982; Mayer & Moreno, 2003, 2010). Although seductive details were found to help students with high prior knowledge (Park, Moreno, Seufert, & Brünken, 2011), other research suggested that some students were distracted from learning by seductive details content (Rey, 2012). In research on multimedia, Mayer and Moreno (2003, 2010) suggested eliminating extraneous material improves learning with multimedia. Park et al. (2011) found that seductive details in multimedia designed to reduce cognitive load by

using dual channels (visual and verbal without redundant material) led to better transfer and retention results for students with higher prior knowledge.

Teacher-created multimedia lends itself to being shared among teachers beyond the creator of the materials. Related research into effective multimedia found a personalization principle where using informal instruction language in multimedia led to better problem-solving transfer results (Kartal, 2010; Moreno & Mayer, 2000b, 2004). Seven additional experiments explored the role of the human voice by comparing it with a computerized voice or comparing standard accents with strong, nonstandard accents. In six cases that Mayer (2009) identified as supporting an emerging voice principle, the human voice in a standard accent resulted in better problem-solving transfer results (Atkinson, Mayer, & Merrill, 2005; Mayer, Sobko, & Mautone, 2003). In contrast, Ahn (2010) found no difference between standard accents and nonstandard accents.

The coherence principle and the personalization principle, as well as other instructional design principles for multimedia, are grounded in systematic research that reports sufficient statistical information for comparison including measures of practical significance (Mayer, 2014c; Mayer & Fiorella, 2014; Rey, 2012; Thalheimer, 2004). However, the generalizability of these instructional design principles is limited by the nature of the research design and sample compositions in prior studies. Generally, experiments were short, one-shot treatments in a laboratory environment followed by measurement. The test subjects were university students who were part of the psychology general test pool, generally in their early 20's and self-identified novices in the natural sciences subject areas (Clark & Mayer, 2011; Mayer, 2009; Rey, 2012).

Purpose of the Study

Prior research has identified instructional design principles for multimedia including the easily implemented coherence principle and voice principle. Both yield problem-solving transfer increases of medium to high practical significance (Mayer & Fiorella, 2014). However, these findings are limited in generalizability because they were conducted in laboratory environments testing homogeneous samples with low prior knowledge generally in natural sciences (Clark & Mayer, 2011; Mayer, 2009; Rey, 2012; Thalheimer, 2004). Therefore, the purpose of this study was to test the coherence principle in a realistic setting using a heterogeneous group of ninth grade students in a humanities course to determine the effect of seductive details on retention and problem-solving transfer. Additionally, this study extended the emerging voice principle by examining the effect of the teacher's voice on student learning as measured by retention and problem-solving transfer. Finally, this study explored the relationship between prior knowledge, retention, and problem-solving transfer.

Accordingly, the study used a series of 2 x 2 between subjects factorial designs and randomly assigned students across six classes to one of four groups: seductive details and teacher's voice, no seductive details and teacher's voice, seductive details and different teacher's voice, or no seductive details and different teacher's voice. The study also collected a measure of prior-knowledge.

Significance of the Study

This study is important for four reasons. First, this study provided application of laboratory-based research to a realistic school setting. Mayer's review of 14 studies about the coherence principle revealed that 13 showed a large effect size for multimedia

designed using the coherence principle (Mayer 2009). But Clark and Mayer (2011) acknowledged the need for such research in "authentic learning environments" (p. 172). Research outside of the laboratory setting does not always find support for a coherence principle (Muller et al., 2008; Rey, 2012).

Second, the large effect sizes, median Cohen's $d = 0.97$ in a review of 14 laboratory-based, coherence principle studies, suggest an easily implemented multimedia design approach for significantly improving student problem-solving transfer and retention results (Mayer, 2009). Confirmation of this principle's effect in a realistic setting would provide teachers with essential guidance in their choice or design of multimedia. Because the coherence principle is easy for teachers to recognize and implement, evidence regarding its generalizability in a realistic classroom setting is of particular importance.

Third, this study adds to the research on the relationship between prior knowledge and seductive details. Rey (2012) notes inconsistency in past research on seductive details with regard to prior knowledge. While the coherence principle is a design principle that reduces cognitive load by eliminating unnecessary details, seductive details are included to enhance student interest and thus motivate students to attend to the content. Most previous studies used self-assessment scores to identify subject area novices (Rey, 2012), and a few studies used prior knowledge as a covariate to control for a lack of random assignment (Muller et al., 2008; Park et al., 2011; Park, Kim, Lee, Son, & Lee, 2005). By using a heterogeneous sample and a measure of prior knowledge, this study sought to explore the relationship between prior knowledge, retention, and problem-solving transfer by conditions.

Finally, teachers commonly share instructional materials that they create. This study extended the emerging voice principle by explicit assessment of the effect of knowing the teacher's voice on student learning.

Theoretical Framework

While many theories can be applied to the study of multimedia learning, this study is grounded in the cognitive theory of multimedia learning (CTML). CTML extends cognitive load theory (CLT) and adapts it specifically to multimedia learning (Mayer, 2005). Both are concerned with efficiency and effectiveness in instruction (Mayer, 2014a; Sweller, 2010). Additionally, a portion of this study is built on social agency theory, a theory used to explain how some design choices in multimedia learning objects increase learning (Atkinson et al., 2005; Mayer, 2014c; Mayer et al., 2003; Moreno, Mayer, Spires, & Lester, 2001).

Cognitive load theory

CLT is an instructional design theory based on the assumption that learning is a process of moving information into long-term memory in such a way that it can be recalled and transferred in different contexts (Sweller, 2010). CLT assumes that the working memory is the key to the long-term memory and that working memory is constrained at any given moment by the processing loads placed on it. CLT identifies three types of load: extraneous, intrinsic, and germane (Moreno & Park, 2010; Sweller, 2010).

How materials are presented and organized can increase or reduce the demands placed on the working memory. Extraneous load refers to the cognitive resources required by the instructional design or by any other factor that distracts from learning

(e.g., a chaotic learning environment) (Kalyuga, 2011). For example, when lesson materials do not address a learner's lack of prior knowledge, extraneous load increases as learners struggle to organize the new material (Kalyuga, 2010; Moreno & Park, 2010; Sweller, 2010).

Extraneous load is also created by adding interesting information that is not directly related to learning goals. Some instructional materials have "seductive details" deliberately included to motivate learners to continue through the learning materials. CLT suggests that learning is harmed by extraneous load and thus seductive details should be eliminated (Garner et al., 1989; Mayer & Moreno, 2003, 2010; Rey, 2012).

Intrinsic load, the second of the three loads, is a function of how complex the learning materials are—a factor over which the instructional designer has limited control (Kalyuga, 2010). Frequently, intrinsic load is measured by element interactivity, i.e., counting how many elements interact with each other and thus must be processed in the working memory at same time in order to complete a task (Sweller, 2010). Intrinsic load has also been measured as "task difficulty" by using the mean probability of reaching the correct solution (Brünken, Seufert & Paas, 2010). Another key factor for intrinsic load is the prior knowledge of the learner. Students who can draw on existing schemas because they have greater prior knowledge have fewer elements to process simultaneously within their working memories than learners with lower prior knowledge (Kalyuga, 2010).

Germane load refers to the cognitive resources that are used for building schema for the new learning material (Moreno & Park, 2010). In essence, germane load is the active processing that the learner engages in to make sense of and to integrate the learning into his or her existing framework of knowledge. Instructional design, according

to CLT, should include elements that encourage active processing, like self-explanation where students are prompted to explain concepts to themselves as they proceed through lesson material (Kalyuga, 2010). Another technique for generating germane load is using the personalization principle in designing instructional materials. Moreno and Mayer (2010) report on several studies demonstrating that students performed better when the language used in the instructional materials, written or oral, is informal and included the learner. They concluded that the personalization principle is one simple design element for increasing germane load (generative processing). However, they also acknowledged that it was possible that the learning advantages of the personalization principle could be a result of reducing extraneous load. Informal language choices may be easier and clearer to students (Moreno & Mayer, 2010). Six additional studies have investigated the role of voice (Atkinson et al., 2005; Mayer & DaPra, 2012; Mayer et al., 2003). They found advantages for learning for human voices (vs. computer generated) with a standard accent (American English vs. English with a Russian accent). Mayer (2014c) sees preliminary evidence for a voice principle that may increase learning by encouraging active processing.

The three loads, extraneous, intrinsic, and germane, are considered to be additive, so reducing extraneous load, in theory, allows more cognitive resources for processing higher intrinsic loads and for engaging in germane (active) processing. Thus, instructional design based on CLT seeks to identify and reduce extraneous demands on the working memory that are a result of instructional design choices (Kalyuga, 2010, 2011; Moreno & Park, 2010; Sweller, 2010). CLT suggests that eliminating seductive details in learning materials reduces extraneous load and increases working memory

resources available for intrinsic and germane loads. Additionally, using informal language and human, standard accented voices may increase germane load which is theorized to be beneficial for learning.

The cognitive theory of multimedia learning

CTML, an instructional design theory specific to multimedia learning, extends CLT and is predicated on three assumptions, each of which is grounded in theory (Mayer, 2005):

1. Learning is limited by working memory constraints (CLT).

2. Learning is more efficient when dual channels are used (dual coding theory).

3. Active processing is necessary for learning (generative theory).

CTML, like CLT, sees the constraints of working memory as key to instructional design. Essentially, all information must be processed through the working memory in order to be incorporated into the long-term memory. Miller (1956) found that the general limitation for processing information was seven items plus or minus two. Baddeley and Hitch (1974) extended Miller's work by theorizing models of how information is processed. CLT and CTML focus on the limited processing ability in the working memory. Learning materials designed using the CLT or CTML frameworks are thus intended to limit unnecessary use of working memory resources (Mayer, 2009; Sweller, 2010).

CTML recognizes dual coding, using both auditory and visual sensory channels for conveying information as suggested by Paivio's Dual Coding theory (Moreno & Mayer, 2000a), as a key reason for using multimedia for instruction (Mayer, 2014a). Dual coding theory posits that information enters the brain through both visual (nonverbal) and

verbal channels and that use of both channels simultaneously increases the number of ways that information is coded in memory (Mayer, 1997; Mayer & Moreno, 2002).

Finally, CTML emphasizes active processing called generative processing in CTML or germane load in CLT. Both CLT and CTML recognize the need for the learner to actively engage with the learning materials in order to move information into long-term memory and to build schemas (Mayer & Moreno, 2003, 2010).

CTML is a model to explain how meaningful learning occurs (Mayer, 2014a; Mayer & Wittrock, 1996). Meaningful learning is the name Mayer gave to his initial model, which has evolved into CTML (Mayer 2005). Figure 1 shows Mayer's model.

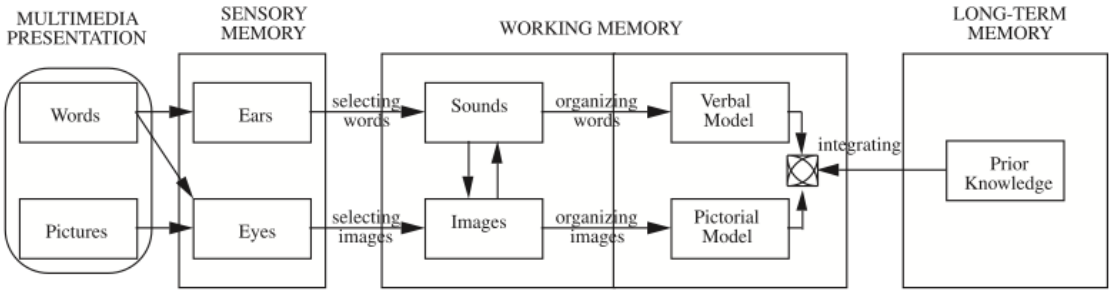

Figure 1. Mayer's CTML model (Mayer, 2001, p. 37).

Meaningful learning occurs through an active process. Learners select relevant words and pictures, organize them into verbal and visual models, and then integrate them with each other and their prior knowledge (Mayer, 2005). Mayer and Wittrock (1996) assess meaningful learning indirectly by use of problem-solving transfer questions. Harp and Mayer (1997) identified the addition of the first measure of problem-solving transfer as one of their unique contributions to seductive details research. Problem-solving transfer is the ability to use what has been learned in one situation in a novel situation (Mayer & Wittrock, 1996). Problem-solving transfer items ask students to figure out something not directly presented in the lesson using the underlying conceptual

understanding from the lesson (Mayer & Wittrock, 1996). Within multimedia research, problem-solving transfer is generally measured immediately after the learning period by a series of problem-solving questions (Mariano, 2014). Muller et al. (2008) shifted from Mayer's free response problem-solving transfer questions to multiple choice questions. Muller et al. (2008) justified the shift because multiple-choice questions are better suited for realistic settings.

As an instructional design theory, CTML seeks to reduce extraneous cognitive load, to increase efficient use of both the auditory and visual channels, and to engage learners in actively processing learning materials (Mayer, 1997; Mayer & Moreno, 2002).

Social agency theory

In some multimedia studies an additional theoretical framework is included with CTML. Social agency theory has been proposed as a means of exploring the effectiveness of pedagogical agents (Atkinson et al., 2004; Mayer et al., 2003; Moreno et al., 2001). If personalization and the voice principle augment germane load (Mayer, 2010), social agency theory may explain how. Social agency theory in multimedia learning posits that the relationship between the computer and the learner can take on similar characteristics to purely human relationships. Within multimedia, the assumption is that a relationship can be fostered by including human voices in the accent of the region of the learner and that social cueing can be prompted by informal choices of language. Social cueing, according to the framework, may improve learning by causing the student to try to learn more deeply because his/her social interaction schema has been primed (Mayer, 2014c; Mayer et al., 2003). While one explanation for the effects of the personalization and voice principles is social agency theory, an alternative is cognitive load. The use of

computerized voices, too formal or too casual of language, or voices that students do not readily recognize may add extraneous load causing students to lose efficiency in processing learning material (Atkinson et al., 2004).

This study explored the effect of seductive details in dual channel instructional materials (multimedia) on retention and problem-solving transfer and included a prior knowledge measure. According to CTML, seductive details should have interfered with student retention and problem-solving transfer when students had lower prior knowledge because prior knowledge reduces the amount of working memory needed to process the learning material and may prevent the wrong schemas from being primed (Rey, 2011, 2012). This study also explored the effect of the teacher's voice in retention and problem-solving transfer. Although some research has led to the identification of an emerging voice principle, no studies have been conducted to examine whether the student knowing the teacher's voice increases student learning. Both CLT and social agency theory would predict that students should perform better in retention and problem-solving transfer tests when the voice in the multimedia is that of their teacher because students are not using additional cognitive resources in figuring out whose voice they are listening to (CLT) or because they are able to draw on the existing classroom relationship when they hear their teacher's voice in the multimedia.

Background and Need

As schools and individuals have acquired increased access to technology and the internet, more teachers use video podcasts, animations, and multimedia packages as part of instruction (Eskicioglu & Kopec, 2003). One relatively new multimedia tool popularized by Sal Khan's *Khan Academy* is screencasting (Khan, 2011). *Khan Academy*

is a collection of screencasts (initially created by Sal Khan to tutor his cousin in another state) and other instructional videos designed to help students learn independently. Content is chunked into discrete segments, generally ranging from two to 15 minutes in length. One result of the *Khan Academy* and new multimedia technology is the recognition of the digitally "flipped" classroom (Bormann, 2014; LaFee, 2013). The digitally flipped classroom model uses teacher-created screencasts or other multimedia materials to provide direct instruction outside of the classroom so that class time can be used for problem solving, discussion, labs, and other activities that students cannot engage in productively outside of class (Bergmann & Sams, 2013; Bormann, 2014; LaFee, 2013). Proponents of the digitally flipped classroom model focus on the opportunity for students to absorb direct instruction at their own pace while class time is used for deeper learning through problem solving and group activities (Bergmann & Sams, 2013; LaFee, 2013; Lancaster, 2013). However, multimedia selection and creation in this context tends to reflect more of a teacher's anecdotal sense of what engages student interest than research-backed design principles about what effectively augments student learning (Smith & Smith, 2012; Towler, 2009). As reflected in the *Khan Academy* collection, a long tradition in teaching is the sharing of teacher-created instructional materials. In the past, shared materials were generally limited to written materials (worksheets) where authorship is rarely clear; however, shared teacher-created multimedia products make authorship obvious when students cannot help but note that the voice belongs to a different teacher. There is no research on the effect of the learner knowing the teacher's voice on student learning.

The modality effect and multimedia advantage

Multimedia allows the use of both the auditory and visual sensory channels, theorized by both CLT (Sweller, 2010) and CTML (Mayer, 2014a) to improve cognitive processing. Improved problem-solving transfer resulting from using auditory and visual sensory channels to deliver information is called the modality effect (Mayer & Moreno, 2003). The modality effect is one solution to an increased cognitive load due to split attention—the additional cognitive processing required when the learner must divide attention between visuals like text and a graphic on the screen (Sweller, 2010). Multimedia allows written text to be replaced by an auditory track allowing the user to hear information while viewing an accompanying graphic. Multimedia materials designed to use the visual and auditory channels simultaneously provide a means to avoid overloading a single channel (Mayer, 1997). Multimedia, because it relies on the use of both audio and visual material, shifts some of the learner's processing from one channel to another by moving some information to the auditory channel to prevent overloading the visual channel.

The CTML suggests that designing multimedia so that the auditory and visual channels are used to prevent overloading either channel can lead to improved student learning (Mayer, 2014a). Several studies (e.g., Ginns, 2005; Mayer & Anderson, 1991, 1992; Mayer & Moreno, 2002) found that replacing written text with spoken narration led to greater transfer, the ability to apply a recently learned concept to a different context or circumstance. For example, after studying a multimedia program on botany, the problem-solving transfer test provided students with characteristics of a natural environment and required students to design a plant that would thrive in that environment. Using a

computer program, students selected plant parts (type of leaf, type of root system, type of stem, etc.) that were appropriate for the given natural environment (Moreno & Mayer, 2000b).

In a meta-analysis of 39 studies of the modality effect, Ginns (2005) found that students performed better when graphics were presented with spoken narration than with text, but those effects were moderated by the degree of element interactivity—the number of items the learner must be able to hold simultaneously in the working memory (Ginns, 2005)—and by whether the presentation was user-paced or system-paced. Spoken narration with graphics was more effective with high element interactivity and more effective with system-paced presentations. Because element interactivity was used as a proxy measure for intrinsic load (Moreno & Park, 2010), Ginns (2005) suggested that combining spoken narration with visual graphics has greater impact for high intrinsic load (inherently complex) materials than for lower intrinsic load (inherently less complex) tasks. Although proponents of flipped classrooms cite the ability of students to review materials as much as they need (Bormann, 2014), Ginns (2005) suggested that system-paced materials more accurately reflect the reality that students have limited time to learn concepts. As long as formal education is set to a strict timeline, user-pacing is limited by the finite amount of time students have to learn content (Ginns, 2005).

While screencasting and video creation provide teachers with the ability to take advantage of the benefits of multimedia (i.e., reducing cognitive load by using both the audio and visual channels to process information), they also raise questions about design. If most teacher-created multimedia is intended to be used outside of class, what is most

effective design for student learning? Can teachers continue to share their materials with their colleagues or does the voice on the audio track influence student learning?

Seductive details and the coherence principle

Text and multimedia research have explored the effects of adding details that are interesting but not directly relevant to the instructional goal as a means of maintaining student interest. The research consistently uses two measures of learning called retention and problem-solving transfer (Harp & Maslich, 2005; Harp & Mayer, 1997, 1998; Rey, 2011; Thalheimer, 2004). Retention, in these studies, refers to the ability to recall main ideas and details from the content (Harp & Mayer, 1997) and was a standard measure from the reading research. Transfer, sometimes called problem-solving transfer in these studies, generally refers to the ability to use the content information in a new and different context (Harp & Mayer, 1997; Mayer & Wittrock, 1996). Harp and Mayer (1997) included problem-solving transfer for the first time in studies of seductive details because they were interested in meaningful learning: selecting words and images, organizing the words and images into models, and integrating the verbal and visual models with prior knowledge. Mayer and Wittrock (1996) posited that problem-solving transfer was a way to measure meaningful learning. Seductive details research began with text-based materials and was later extended to multimedia materials.

A body of research in the 1980s and 1990s studied the impact of various means of enhancing text interest for students. Hidi et al. (1982) found that students generally identified narrative text as interesting and that students were able to identify key ideas within narrative (story-telling) text. In contrast, students found expository (explanatory) text uninteresting, yet they were still able to identify key ideas. However, when students

read blended text (narrative and expository) they were less successful in identifying key ideas. Hidi et al. (1982) found that subjects' responses seemed to indicate that mixing interesting and important material with uninteresting and important material distracted readers from identifying the main ideas.

Garner et al. (1989) explored the relationship between what they labeled seductive details in expository text on macro-processing, the ability to recall key ideas, and micro-processing, the ability to recall and use information in a new context, extending the work of Hidi et al. (1982). Garner et al. (1989) conducted two experiments. In the first, 20 adult graduate students selected for strong academics were placed in one of two groups. Both groups read three paragraphs of expository text. The text for one group added one seductive detail to each paragraph while the other did not. Seductive details were details included to add interestingness to the reading for the purpose of keeping readers engaged. While related to the material to be learned, they were not necessary for achieving the learning goal. After reading, each participant was asked to identify the main ideas, rate interest, write down the most interesting thing read, and then perform a picture exercise where the investigator held up a picture of an animal and asked the participant to choose a second picture that was different from the first based on characteristics described in the reading. The second experiment (n = 36) was made up of seventh graders identified by tests and teachers as average readers. Participants were placed in one of three conditions: no seductive details, no seductive details and redundant signaling, and seductive details. The text was the same from the first experiment except for the redundant signaling text, which included additional signal words intended to cue students to the important information.

Garner et al. (1989) found in experiment one that adults in the seductive details group performed less well on the identification of the main ideas task and that there was no difference on the second task that required participants to identify an insect that was different from the insects in the reading and to justify the choice with a reason based on the reading. Both groups rated their text as of average interest. In experiment two they found that the group of seventh graders who had materials that included seductive details and minimal signaling performed significantly less well than the groups that did not have seductive details. Garner et al. (1989) called this decrease in performance the "seductive details effect."

Mayer and Moreno (2003, 2010) extended the research with texts and suggested that eliminating extraneous material improves learning with multimedia. Extraneous material, sometimes called seductive details, are words, sounds, images, and video that, while interesting, are not essential to the material or learning goals and instead add to the cognitive processing load for students (Mayer & Moreno, 2010). Reduction of extraneous material in instructional material is referred to in the literature as the coherence principle, the design principle (Clark & Mayer, 2011; Mayer, 2009; Mayer & Moreno, 2003, 2010) recommended to counteract the seductive details effect.

In a review and meta-analysis of literature (n = 39) on the seductive details effect, Rey (2012) reported that a review of the literature provided mixed results regarding a seductive details effect. Studies finding support for the seductive details effect reported large effect sizes, and a meta-analysis revealed a statistically and practically significant effect for the seductive details effect (Rey, 2012; Thalheimer, 2004). For retention, the weighted mean effect size was Cohen's $d = 0.30$, a small to medium effect. For problem-

solving transfer, the weighted mean effect size was Cohen's $d = 0.48$, a medium effect size (Rey, 2012). In other words, seductive details interfered with retention and, more importantly, with problem-solving transfer. A number of moderating effects were examined including the use of time limits for the learning phase and/or testing phase, the effect of different kinds of seductive details, the impact of cognitive load (low load with seductive details outperformed those without the seductive details), and learner characteristics (extraversion, self-regulation skills) (Rey, 2012).

Rey (2012) noted several key limitations of the research he reviewed. First, the research generally used a self-report of prior knowledge to ensure only novices participated. Using a measure of prior knowledge as a covariate could improve the interpretability of the role of prior knowledge. Second, power analyses are necessary to ensure the sample is large enough to find an effect. Third, the type of seductive details should be distinguished (irrelevant vs. somewhat unimportant). Studies rarely provide a clear definition of seductive details, and Rey (2012) suggests that differentiating between whether the material is totally irrelevant to the learning objectives as opposed to somewhat unimportant to the learning objectives may sort out some of the inconsistent findings in the literature. Fourth, longer learning times are necessary. Fifth, different types of learners should be included in order to connect the expertise reversal effect (when students with high prior knowledge perform more poorly in a reduced cognitive load environment) and the seductive details effect. Sixth, research should be connected to adaptive learning environments (Rey, 2012).

Rey's (2012) meta-analysis reviewed research about the seductive details effect from all modes of instruction. While most of the research has focused on text and text

with illustration, a growing body of work examines the seductive details effect in instructional multimedia materials.

Mayer, Heiser, and Lonn (2001) report on four experiments, two experiments (one and two) testing the effects of redundancy with text and audio and two experiments (three and four) testing the effects of adding video to multimedia to enhance interest. The treatment group in experiment three received a multimedia program interspersed with six short (approximately 10 seconds each) narrated video clips related to the instructional topic of lightning but not related to the instructional goal of explaining a cause and effect model of lightning formation. In contrast, the control group received only the multimedia program. While no statistical difference in retention scores was found, there was a statistical difference in the transfer scores favoring those who did not receive the videos. Experiment 4 used the same videos, but instead of interspersing the videos throughout the instructional materials, they were all placed either before or at the end of the same multimedia program used in experiment 3. Mayer et al. (2001) found no statistical difference in performance on retention, but did find a statistical difference favoring the group that saw the videos after the multimedia instructional program. Mayer et al. (2001) interpreted the results as supporting the extension of the seductive details effect found in earlier text research to multimedia design.

In contrast, Park et al. (2011) found that seductive details were useful for students with higher prior knowledge with multimedia that had been designed to use dual channels to reduce cognitive load. In their experiment, 100 high school students were randomly assigned in a 2 x 2 factorial design testing the reduction of cognitive load by shifting text to an audio track and examining the impact of seductive details or no seductive details in

each multimedia design. The self-paced multimedia package was made up of 11 screens and was part of the single 75-minute session that included pre-tests, instruction and post-tests. They found that the students who achieved the highest scores were those in the narrative-seductive details group. The narration condition also received higher ratings of cognitive load. They suggested that perhaps adding some additional cognitive load (like seductive details) for knowledgeable learners might enhance learning. Their findings suggest that some learner traits (higher prior knowledge) and design traits (dual channel) may make seductive details useful.

The seductive details effect has been investigated from a perspective of application. Mayer and colleagues applied seductive details research to designing learning materials without seductive details thus testing a coherence principle (Mayer, 1999, 2003, 2008, 2009; Mayer & Moreno, 2003, 2010). In one of the very few studies conducted in a realistic environment, Muller et al. (2008) tested the coherence principle with 104 students from years 10 (n = 22), 11 (n = 18) and the first year of university (n = 64) using an online multimedia treatment on stellar spectra. Students participated voluntarily as part of homework and accessed the computer-based learning material from home on their personal computers. This study compared results of students who received a concise version of the material (7 minutes 30 seconds) to those who received the longer version with interesting but irrelevant details (10 minutes 45 seconds). The post-test was made up of 13 multiple-choice questions and three short answer questions. Each question type included items intended to measure retention and problem-solving transfer. Muller et al. (2008) found no significant difference between the concise and extended treatment groups, nor did they find any significant difference between prior knowledge as

determined by the different grade levels participating in the study. Muller et al. (2008) in their experiment in authentic setting failed to replicate the findings of Mayer and associates in their laboratory-based research. They suggested a number of possible explanations for their results including the “noise” introduced into the experiment by having the students complete the work at home instead of in a classroom. They noted, however, the advantages of deploying materials online with the ability to randomly assign treatment groups as well as creating a transparent and repeatable process. They also recommended that future studies consider improving item discrimination by employing two-tiered, multiple-choice tests, using a measure of cognitive load, using a measure of interest, and awarding grades for “earnest participation” in order to provide better abilities for linking the extra materials to an observable result.

Much of the research conducted regarding the seductive details effect and its countermeasure, the coherence principle, has taken place in laboratory conditions in single shot treatments for very short durations. Learning materials are often less than four minutes in duration and groups receive a single treatment that is measured immediately (Doolittle & Altstaedtler, 2009; Harp & Maslich, 2005; Mayer, DeLeeuw, & Ayres, 2007; Mayer & Moreno, 2002, 2003; Mayer et al., 2001; Moreno & Mayer, 2000a). The participants, generally, have been homogenous groups selected for limited prior knowledge. Longer learning sequences with heterogeneous groupings in an authentic environment are needed to learn more about the generalizability of the seductive details effect and the effectiveness of designing multimedia by following the coherence principle to reduce the seductive details effect (Thalheimer, 2004). However, as Muller et al.

(2008) suggested, reducing the amount of "noise" that enters the study in an authentic environment is also needed.

Personalization principle and the voice principle

One question about teacher-created multimedia is whether it is effective for teachers to share their created content with other teachers of the same course. A body of research supports a multimedia design principle called personalization, an instructional design principle that says that when multimedia instruction is presented in a conversational style that people learn more deeply (Mayer, 2014c), that may be relevant to this inquiry. Studies of personalization initially investigated the effect of multimedia materials that used formal language in contrast with materials that used conversational style. Moreno and Mayer (2000b) reported on five experiments using a computerized voice agent or text with results suggesting that students who received personalized text or voice outperformed those who received the formal style text or voice. Personalized text and speech used second person ("you") and a conversational style. Moreno and Mayer (2000b) suggested that the improved problem-solving transfer and retention for subjects who received the personalized materials may have been a result of the priming of cognitive engagement activating the learner's self-structure. They also suggested that the less formal, conversational language may reduce cognitive load as students work to make sense of the materials.

A subsection of the research on personalization in multimedia has focused on the differences between computer voices and human voices as well as the role of accents, which has led to the identification of an emerging principle, the voice principle (Mayer, 2014c). Atkinson et al. (2005) performed two experiments using convenience samples

where participants were randomly assigned to one of two groups—computer voice or human voice. The first experiment was with college students while the second was with high school students. In both experiments the human voice groups outperformed the computer voice groups on near (structurally identical problems) and far (structurally different) problem-solving transfer as well as in performance on all four practice problems. The practical significance was moderate to large on each measure. The experiments suggest that there is a voice principle that can guide design of multimedia learning packages.

Mayer et al. (2003) examined the role of voice in two experiments. Their experiments were conducted in English using a voice with a standard accent voice for the region and a voice with a heavy, but understandable, Russian accent. They hypothesized that human, standard accented voices may improve the likelihood of students engaging cognitively with material because social cues prime the schema for making meaning of material. They found that students performed significantly better on problem-solving transfer tasks when they were in a regionally standard accented human voice group. In contrast, Ahn (2010) in a doctoral dissertation study was unable to replicate the findings of Mayer et al. (2003). Ahn used a longer learning period, included levels of accent (medium and heavy), and used two different accents (German and Korean). She found no statistical differences among groups in learning measures and suggested that the longer learning period may have allowed students to acclimate to the accents (Ahn, 2010).

Mayer (2014c) cataloged instructional design research on the personalization principle using Cohen's *d* to focus on practical significance. In his review of 17 experiments on personalization, Mayer (2014c) found a large median effect size of 0.79.

In a related line of research, there is preliminary evidence suggesting that human voices with a standard accent lead to better transfer than computerized or accented voices. Mayer (2014c) reviewed six studies on the voice principle and found a large median effect size of 0.74. The large effect sizes suggest that instructors can very easily improve the effectiveness of their multimedia materials. Extending the research of the voice principle to whether the student knowing the voice has a significant effect on learning as social agency theory suggests is of practical value to instructors.

The need for the study

The relative ease with which teachers can now produce multimedia for their students creates a practical need for research-based guidelines for effective design. Research reveals a modality effect suggesting that students have better problem-solving transfer results when dual channels are used (Ginns, 2005; Mayer, 1997; Mayer & Moreno, 2003; Sweller, 2010). Research in text and multimedia suggests that including interesting but instructionally irrelevant details to motivate student interest creates a seductive details effect which is detrimental to student learning as evidenced by problem-solving transfer results, while research on designing multimedia that follows the coherence principle, the design principle that eliminates instructionally irrelevant details, improves problem-solving transfer for students (Clark & Mayer, 2011; Garner et al., 1989; Mayer 2009; Mayer & Moreno, 2003, 2010; Mayer et al., 2001; Rey, 2012).

This study sought to address weaknesses and gaps in the previous research on the seductive details effect and its countermeasure, the coherence principle. The study was conducted within a realistic environment with materials that were longer in duration (between 9 and 18 minutes in length versus 2 to 4 minutes in many prior studies) and

used four instructional sessions with four measurement sessions with the same subjects. This better reflects realistic instructional practices. The sample for this study, unlike in most previous studies, was a heterogeneous group and the prior knowledge measurement provided a means to explore the relationship between prior knowledge, retention, and problem-solving transfer in different conditions (Rey, 2012; Thalheimer, 2004). To account for how students encounter multimedia learning, this study was conducted within the classroom environment as an in-class learning activity and thereby reduced "noise" (Muller et al., 2008) while contributing data from a realistic environment.

Further instructional design research revealed a personalization principle where informal instructional language leads to better problem-solving transfer, and, in a related line of research, there is preliminary evidence suggesting that human voices with a standard accent lead to better transfer than computerized or accented voices. Thus the study sought to extend the limited research on the voice principle to investigate the role of knowing the teacher's voice. These principles are particularly relevant because teachers frequently share instructional materials with other teachers, and the research that has led to the identification of the voice principle suggests that applying simple design principles leads to strong learning gains. Additionally, a finding in support of improved learning when the learner knows the teacher's voice would add support to social agency theory in understanding the voice principles in multimedia learning.

This study also extends the understanding of both the seductive details effect and the voice principle by examining a possible interaction between the two. The large effect sizes found in research on the coherence principle (0.86), the personalization principle (0.79) and the voice principle (0.74) suggest that these are important design principles

(Mayer, 2014c; Mayer & Fiorella, 2014). The study directly addresses acknowledged weaknesses and gaps in the literature and holds practical importance for teachers who design their own course multimedia materials.

Research Questions

The study sought to answer the following questions:

1. What is the effect of seductive details at four testing times in teacher-created multimedia on retention (the ability to recall content) and on problem-solving transfer (the ability to use content knowledge in a new and different context)?

2. What is the effect of the teacher's voice at four testing times in teacher-created multimedia on retention and problem-solving transfer?

3. What is the relationship between prior knowledge, seductive details, and teacher voice?

Definition of Terms

Coherence Principle: An instructional design principle that says that students learn better from materials where extraneous words, images, sounds, and video have been eliminated (Mayer & Moreno, 2003).

Cognitive Load Theory: An instructional design theory based on knowledge of human cognitive architecture which specifically addresses the limitations of working memory (Paas & Sweller, 2014).

Cognitive Theory of Multimedia Learning: An instructional design theory that addresses how people learn from words and pictures. It has three assumptions: limited capacity, dual-channel processing, and active processing. According to the theory, people are able to process limited amounts of material using both verbal and visual channels.

Meaningful learning occurs when people engage in appropriate cognitive processing while learning (Mayer, 2014a).

Dual Coding Theory: A theory that visual information and verbal information are processed in separate cognitive channels of the brain (Paivio, 1986).

Element Interactivity: The number of elements that must be processed at the same time in the working memory. Used as a way of describing intrinsic load in cognitive load theory (Sweller, 2010).

Essential Processing: The cognitive processing necessary to represent the essential presented material in the working memory during learning. This is related to the complexity of the material (Mayer & Pilegard, 2014).

Expository Text: Text that explains, informs, or describes (Gillingham et al., 1989).

Extraneous Cognitive Load: In cognitive load theory, the demands placed on working memory by instructional design choices that create non-essential elements that interact in the working memory (Paas & Sweller, 2014).

Germaine Cognitive Load: In cognitive load theory, the demands placed on working memory by the intrinsic interactivity of elements (Paas & Sweller, 2014).

Intrinsic Cognitive Load: In cognitive load theory, the demands placed on working memory by the essential interacting elements that must be processed at the same time in the working memory (Paas & Sweller, 2014).

Meaningful Learning: Learning that is a result of selecting, organizing, and integrating information so that it can be used in a context different from the one in which

it was initially presented. Meaningful learning is measured by problem-solving transfer tests (Mayer, 2003).

Multimedia Instructional Message: Learning materials consisting of words and pictures intended to foster meaningful learning (Mayer, 2003).

Non-Seductive Details Design: For the purpose of this study, non-seductive details versions included only visuals selected as directly relevant to the learning objectives and an audio track that omitted anecdotes and did not include music.

Narrative Text: Text that tells a story (Hidi & Baird, 1986).

Personalization Principle: An instructional design principle that says that when multimedia instruction is presented in a conversational style that people learn more deeply (Mayer, 2014c).

Problem-Solving Transfer: A form of transfer that occurs when a student is able to solve problems that are different from those studied during the instruction phase (Mayer, 1999).

Retention: How much learners remember from a learning unit. Often measured through unstructured recall activities (write down everything you remember) or structured recall activities (write down everything you remember about . . .) (Garner, Alexander, Gillingham, Kulikowich, & Brown, 1991; Garner & Gillingham, 1991; Garner et al., 1989; Hidi & Baird, 1986). In this study, retention was measured by the number of correct answers on multiple choice quizzes after the learning time.

Schema: Knowledge organized into units or chunks that can reduce demands on the working memory (Kalyuga, 2010).

Screencast: A multimedia recording of voice and material from a computer screen, tablet screen, or SMART board generally created by individual teachers as instructional materials for students (Smith & Smith, 2012).

Seductive Details: Extraneous words, sounds, images, and video that, while interesting, are not essential to the material or learning goals (Mayer & Moreno, 2010). In this study seductive details were visual details that were pleasant and interesting (30% addition) but not directly related to the learning objectives, verbal details in the form of anecdotes (23-33% addition) that were not directly related to the learning objectives, and music without words unrelated to the learning objectives.

Seductive Details Effect: The decrease in learning attributed to the inclusion of seductive details (Garner et al., 1989).

Social Agency Theory: A theory that states that social cues in media allow humans to enter into a relationship with media and multimedia (Mayer et al., 2003).

Teacher Voice: For purpose of this study, teacher voice was the voice of the teacher of the class in which the student is physically enrolled; any other voice was a different teacher's voice.

Voice Principle: An instructional design principle stating that students learn best from unaccented, human voices (Mayer, 2014c).

Working Memory: "A limited-capacity memory store for holding and manipulating sounds and images in active consciousness" (Mayer, 2014a).

Summary

This study tested the coherence principle in a realistic setting using a heterogeneous group to determine the effect of seductive details on retention and

problem-solving transfer with teacher-created multimedia. Additionally, this study extended the emerging voice principle by examining the effect of the teacher's voice on student learning as measured by retention and problem-solving transfer. Finally, this study examined the relationship between prior knowledge, retention, and problem-solving transfer in each condition.

CHAPTER II

REVIEW OF THE LITERATURE

Instructional Design Principles

Early multimedia research compared learning with and without the use of multimedia; however, inconclusive findings led to research which sought to identify instructional design principles that maximize the benefits of multimedia (Mayer, 1997; Mayer & Moreno, 2002). Mayer (2014a) lists 14 instructional design principles for multimedia.

One focus of research in multimedia is design that reduces cognitive load demands. A number of design principles are theorized to improve learning with multimedia by reducing cognitive load and are supported by a body of systematic research that reports consistent statistics including practical significance. Despite the fact that results of these studies are often reported in series to replicate findings and eliminate plausible alternative explanations, generalizability of the extracted principles is limited by the research design and sample composition: exposing university test subjects, generally subject area novices in their early 20’s, to short, one-shot treatments followed by measurement.

The following principles represent the clearest and most practical instructional design guidance available, and they are easy to recognize and follow. These 14 design principles are organized in Table 1 by the type of load they reduce or augment.

Table 1. *Multimedia Design Principles Defined*

Design Principle	Function	Definition
Coherence	Reduces extraneous processing	Eliminates extraneous materials
Signaling	Reduces extraneous processing	Provides cues about how information fits together
Redundancy	Reduces extraneous processing	Eliminates written text that is identical with the audio narration
Spatial Contiguity	Reduces extraneous processing	Places text next to the animation or graphic to which it refers
Temporal Contiguity	Reduces extraneous processing	Synchronizes narration with animation
Segmenting	Manages essential processing	Divides longer materials into smaller segments
Pre-Training	Manages essential processing	Previews key ideas or concepts
Modality	Manages essential processing	Uses both the visual and auditory channels for learning
Personalization	Fosters generative processing	Uses conversational style language and directly addresses the learner.
Voice	Fosters generative processing	Uses unaccented, human voices.
Embodiment	Fosters generative processing	Includes an on-screen agent that gestures and engages in eye contact.
Guided Discovery	Fosters generative processing	Directs inquiry-based learning
Self-Explanation	Fosters generative processing	Prompts students to explain how a process works as they learn it
Drawing	Fosters generative processing	Prompts students to draw representations of the main ideas

Reduce extraneous processing

Each of the following design principles is theorized to reduce extraneous cognitive load demands and thus free up cognitive processing for selecting information (essential processing) and organizing and integrating information (generative processing) (Mayer, 2014a).

Coherence principle

Mayer and Moreno (2003, 2010) suggested elimination of extraneous material (words, sounds, images, and video) improves learning with multimedia. Extraneous material, sometimes called seductive details, may be interesting but is not essential to the material or learning goals and adds to the cognitive processing load for students (Mayer & Moreno, 2010). Reduction of extraneous material in instructional material is referred to in the literature as the coherence principle. Park et al. (2011), in contrast, found that seductive details were useful for students with higher prior knowledge with multimedia that had been designed to use dual channels to reduce cognitive load. Their findings suggest that some learner traits (higher prior knowledge) and design traits (dual channel) may make seductive detail useful.

Signaling principle

When removal of extraneous material is not possible, providing cues as to how information fits together seems to improve student performance on problem-solving transfer tasks (Mayer & Moreno, 2003, 2010). The signaling principle posits that using section titles, highlighting key elements, providing transitions with relational cues, and emphasizing relational cues with vocal tone in narrations help students process extraneous material that cannot be eliminated. Mayer (2009) suggested that verbal

signaling is more effective than visual signaling. Signaling is theorized to provide learners with cues of relationship and importance needed by novice learners for organizing material (Mayer, 2009).

Redundancy principle

Mayer and Moreno (2003) suggested that redundancy has a negative impact on learning with multimedia and that well-designed multimedia eliminates redundancy of written text that is identical with the spoken track. In general, their research suggests that students achieve greater gains with multimedia designed to follow the redundancy principle, which is theorized to reduce extraneous load (Mayer, 2009; Mayer & Moreno, 2010). However, in some cases, legal requirements for accessibility may be a factor in determining whether or not redundancy of written and spoken text might be appropriate (Mayer & Moreno, 2010).

Spatial contiguity principle

With regard to animations or graphics, alignment of items on a screen is important (Mayer & Moreno, 2002). Placement of text contiguous with the portion of the animation or graphic to which it referred improved student performance. Mayer (2009), in reviewing studies examining the spatial contiguity principle, suggested that students with low prior knowledge benefit from the contiguous placement of text on graphics or animation. This simple design consideration seems to reduce extraneous load, freeing up working memory for processing the new material in a way that is especially helpful to novice learners (Mayer, 2009; Mayer & Moreno, 2002).

Temporal contiguity principle

Mayer and Anderson (1991) found that animations are improved by including narration that is synchronized to the animation. In a series of experiments, they tested narration alone, animation alone, and animation with synchronized narration. Students demonstrated greater transfer when presented with animation that included synchronized narration. Mayer and Moreno (2002, 2003, 2010) and Mayer (2009) described this as the temporal contiguity effect and theorized that extraneous load is reduced by placing related verbal and pictorial information in synchronized proximity. The student receives information to code in both channels simultaneously and does not need to hold one set of earlier mental representations while attending to the later companion audio or visual materials.

Manage essential processing

Each of the following principles is theorized to manage intrinsic load by assisting the learner with selecting appropriate information (Mayer & Pilegard, 2014).

Segmenting principle

How multimedia material is divided is also important according to Mayer and Moreno (2003). Instead of presenting multimedia materials in one long unit, learners appear to achieve better results when materials are segmented into smaller units with user-controlled pacing. Mayer and Moreno (2010) explained that segmenting can address the intrinsic load of material by providing time for learners to create their own mental representations for each section before moving onto the next section. By dividing the content into segments such as a series of short videos or animations, the inherent complexity of the material is attenuated. Mayer (2009) cautioned that these findings are

based on three experiments and suggested more exploration. Kay (2012) also found that the literature on video podcasts suggests that research on video segmentation is needed to understand how students use segments when they are provided for viewing outside of class.

Pre-training principle

Pre-training, exposure to the key content ideas or concepts, is an area that can improve student results (Mayer, 2009; Mayer & Moreno, 2003, 2010). Pre-training helps novices in a content area to construct a conceptual framework prior to the multimedia learning experience (Mayer & Pilegard, 2014). Some multimedia includes pre-training segments or materials.

Modality principle

CLT seeks to avoid overloading cognitive processing. One method of reducing cognitive load is to shift some processing from one channel to another such as shifting some information to the auditory sensory channel if the visual sensory channel is overloaded. Several studies (e.g., Ginns, 2005; Mayer & Anderson, 1991, 1992; Mayer & Moreno, 2002) suggested that replacing written text with spoken narration leads to greater problem-solving transfer, the ability to apply a concept to a different circumstance (e.g. after studying a unit of botany, identifying plant characteristics for a given natural environment).

The modality effect is the improved transfer resulting from using auditory and visual channels to integrate information that would otherwise need to be integrated by the learner (Mayer & Moreno, 2003). The modality effect is one solution to increased cognitive load due to split attention—the additional cognitive processing required when

the learner must divide attention between visuals like text and a graphic on the screen (Sweller, 2010). Multimedia materials designed to use the visual and auditory channels simultaneously provide a means of avoiding overloading a single channel (Mayer, 1997).

Ginns (2005), in a meta-analysis of 39 studies of the modality effect, found that students performed better when graphics were presented with spoken narration than with text, but that those effects were moderated by the degree of element interactivity (the number of items the learner must be able to hold simultaneously in the working memory) and by whether the presentation was user-paced or system-paced. Spoken narration with graphics was more effective with high element interactivity and more effective with system-paced presentation. Given that element interactivity is used as a proxy measure for intrinsic load (Moreno & Park, 2010), Ginns (2005) suggested that combining spoken narration with visual graphics has greater impact for high intrinsic load (inherently complex) materials than for lower intrinsic load (inherently less complex) tasks. Ginns (2005) also suggested that system-paced materials provide efficiency for learning where students have limited time to learn concepts.

Foster generative processing

One premise of CTML is that learning requires active processing to construct knowledge (Mayer & Moreno, 2003). Each of the following principles is theorized to promote organization and integration of information (Mayer, 2014a). The first three principles are theorized to motivate students to organize and integrate information by using social cueing. In other words these principles draw from Social Agency Theory, using social cues within multimedia environments motivates learners to respond as they

do with live people and thus encourages generative processing (Mayer et al., 2003). Each of the first three principles is thought to increase social presence (Mayer, 2014c).

Personalization principle

The personalization principle posits that using conversational style language, language that directly addresses the learner and reduces formal language constructions, such as use of the third person, improves student learning by motivating students to organize and integrate information (Mayer, 2014c). Moreno and Mayer (2000b, 2004) found in a series of experiments that students with text or narration in conversational language performed better on problem-solving transfer tasks. Ginns, Martin, and Marsh (2013) in a meta-analysis on the effects of conversational style on learning found moderate to strong effects on retention and problem-solving transfer. Their study included effects from 16 journal articles, 4 conference papers, and 2 dissertations and included studies using personalization, politeness, and author visibility.

Voice principle

The voice principle is a newly emerging principle (Mayer, 2014c) that seems to indicate that students perform better on problem-solving transfer tasks when multimedia narratives are delivered by human voices instead of computer generated voices. Additionally, unaccented human voices resulted in better problem-solving transfer results for learners than did an accented voice (Atkinson et al., 2005; Mayer et al., 2003); however, Ahn (2010), in a dissertation study, was unable to replicate earlier results with accents.

Embodiment principle

Another small body of research on pedagogical agents suggests an embodiment principle, that is, students perform better on transfer tests when the multimedia includes an on-screen agent that gestures and engages in eye contact than when there is an on-screen agent that does not (Mayer & DaPra, 2012; Mayer, 2014c). This research suggests that in learning materials that use a pedagogical agent, the pedagogical agent should use facial expressions, eye-contact, and gestures/movements that resemble those of humans.

Guided discovery principle

Discovery learning is a form of inquiry-based learning that draws on student experiences to generate new understandings (de Jong & Lazonder, 2014). Several studies comparing direct instruction with discovery learning found that direct instruction brought about better results. Guided discovery, however, has been shown to promote better learning than direct instruction. Guided discovery is a more directed form of discovery learning that provides a focus for learning (de Jong & Lazonder, 2014).

Self-explanation principle

Self-explanation is a technique that prompts students to explain how a process works as they move through it. The prompts can involve a question with space for written responses or can be questions followed by a time to respond mentally (Wylie & Chi, 2014). Multimedia that prompts self-explanation generally requires more time than other forms of multimedia but returns better retention and problem-solving transfer results (Crippen & Earl, 2004; Eysink & de Jong, 2012; Eysink et al., 2009; Hilbert, Renkl, Schworm, Kessler, & Reiss, 2008; Moreno, A., Joy, & Sutinen, 2013; Moreno & Mayer, 2010).

Drawing principle

The drawing principle states that people learn better from scientific text when they draw a representation of the main ideas (Leutner & Schmeck, 2014). Drawing while reading seems to improve understanding because it is a generative activity.

Instructional design principles and the study

In the present study the coherence principle and the voice principle were manipulated because they do not require specialized knowledge or tools. The coherence principle and voice principle are the easiest principles for teachers to apply to their own work. The teacher-created multimedia in the study followed the redundancy principle, spatial contiguity principle, temporal contiguity principle, modality principle, and personalization principle. It did not apply the signaling principle as that could confound the seductive details effect. The segmenting principle was not used as the teacher-created multimedia was not lengthy enough to require segmenting. Pre-training was limited to the topic introduction in the materials. The embodiment principle, adding a moving human image or human-like animation, was not be used because it requires skills that many teachers do not have as well as technology that is less widely available. The principles of guided discovery, self-explanation, and drawing were not be used because, as additional methods of fostering generative activity, they were potential confounds for the voice principle.

Seductive Details

First generation seductive details research

The concept of seductive details has its roots in research in reading. Reading research is rich with exploration of how students identify main ideas and how text can

best be designed to maximize student learning (Garner et al., 1989). Within reading research is a smaller field that explores the relationship between interestingness of text and student ability to identify and recall main ideas. Hidi et al. (1982) found that students were better able to identify main ideas in narrative writing (story-telling) and in expository writing (writing used to explain, inform, or describe) than they were able to identify main ideas when the writing mixed narrative and expository styles. Narrative writing was described as being more interesting than expository writing. The finding of greater difficulty with mixed style text led to Hidi and Baird's (1986) review of the literature on discourse processing where they argued that interestingness in text was a variable in need of study. They developed their proposition by identifying that the main focus of reading research had been structural elements and interest sparked by knowledge elements. Hidi and Baird (1986) argued that one major gap in the literature was research into interest generated in other ways—by values or any other method that might create affective interest.

"Seductive details effect" with scientific text

In the study that coined the term "seductive details," Garner et al. (1989) explored the relationship between what they labeled seductive details in expository text and student macro-processing. Macroprocessing described how readers build an understanding of expository text by moving through each of the individual propositions in the text to distill the content and then, by selecting, constructing, and generalizing, come to the general sense of the text. Macroprocessing was measured by tests of recall. Microprocessing described transforming content into a form that could be used in another context. For example, in their study, Garner et al. (1989) provided three paragraphs of

expository text describing differences between various insects organized by insect characteristics. The microprocessing task required participants to match the pictures of insects that had been mentioned in the text based on the differences mentioned in the text.

Garner et al. (1989) conducted two experiments. In the first 20 adult graduate students selected for strong academics were placed in one of two groups. They predicted that adults who were strong readers would not be distracted by seductive details (recall scores would not be different) and would find the seductive details to be interesting (seductive detail text would receive higher interest ratings). Both groups read three paragraphs of expository text. The text for the experimental group added one seductive detail to each paragraph; the control text was the base text. Seductive details were details included to add interestingness to the reading for the purpose of keeping readers engaged. While related to the material to be learned, they were not necessary for achieving the learning goal for students to differentiate insects by characteristics. After reading, each participant was asked to identify the main ideas, rate interest, write down the most interesting thing read, and then perform the microprocessing picture matching task where the investigator held up a picture of an animal and asked the participant to choose a second picture that was different from the first based on characteristics described in the reading. Garner et al. found that adults in the seductive details group performed less well on the identification of the main ideas task and there was no difference on the second task which required participants to identify an insect that was different from the insects in the reading and to justify the choice with a reason based on the reading.

Garner et al. (1989) identified their seductive details using three factors: first, the details had to be unrelated to the learning goal; second, the details had to be interesting;

third, the details were validated as interesting by 20 public school teachers who were asked to select the most interesting detail in each paragraph. The 20 teachers all selected the details added to the first two paragraphs and 80% selected the detail in the third paragraph that was placed as the interesting detail. However, both groups (control and seductive details) in experiment one rated their text as of average interest.

The second experiment (n = 36) was made up of seventh graders identified by tests and teachers as average readers. Participants were placed in one of three conditions: no seductive details, no seductive details and redundant signaling, and seductive details. The text was the same from the first experiment except for the redundant signaling text, which included additional signal words intended to cue students to the important information. Garner et al. (1989) found that the group of seventh graders who had materials that included seductive details and minimal signaling performed significantly less well than the groups that did not have seductive details. They called this decrease in performance the "seductive details effect."

Garner et al. (1989) were the first to suggest that seductive details may have a deleterious effect on student learning. In fact, their surprising finding that adults who are strong readers were also distracted by details included for the purpose of adding interest raised additional questions about the role of interest in reading and understanding text. However, as Goetz and Sadoski (1995b) point out, their work failed to consider whether it was the details or the additional length of text that caused a difference. The seductive details text was approximately 40% longer than the comparison text. In text research, length of text is associated with recall—the longer the text the less recalled (Goetz & Sadoski, 1995b).

Measure of reading ability and biographical text

Seductive details research continued with Wade and Adams (1990) who extended Garner et al. (1989) by adding a measure of reading ability to a study involving the seductive details effect. Wade and Adams' (1990) purpose was to investigate structural importance and text-based interest and how they interact to affect student recall of text. They created and used the same historical biographical text about Admiral Nelson for two experiments. College students were divided into two reading ability groups using the *Nelson-Denny Reading Test.* Students scoring in the 50th percentile and higher were identified as the high ability readers while those who scored below the 50th percentile were identified as the low ability readers. The two groups rated interest and importance of sentences and took a free recall measure after reading the passage. Free recall, sometimes called unstructured recall, involves writing down all of the material one can recall onto a blank sheet of paper, generally with a time limit. The study used two measures of free recall—one immediately following the reading and one a week later.

In the first experiment (n = 52), students rated interest and importance of sentences. The ratings were used to determine four categories of sentences: high importance/high interest sentences (main ideas), high importance/low interest sentences (supporting details), low importance/high interest sentences (seductive details), and low importance/low interest sentences (biographical details that related to common daily life occurrences). Students rated first identified one quarter of the sentences as least important and then repeated the process three times. Wade and Adams (1990) found that interest and importance were highly correlated in the selected biographical text. In the second experiment (n = 48), they found no significant difference between recall of high

importance/high interest material and low importance/high interest materials. In neither experiment did the researchers find a connection between reading ability and the seductive details effect. Wade and Adams (1990) did not report on the spread of reading scores. Possibly using bottom and top quartile may have led to different results.

Wade and Adams (1990) suggested that their findings might be related to the qualities of biographical text and that possibly students have biographical schemas that helped them to organize the unimportant details about everyday life that were included. Because they found that interesting and important details are remembered at the same rate as interesting and unimportant details, they suggested that teachers be cautious about the use of seductive details in class discussion and lectures. They also suggested that using structured recall as part of the recall test might have resulted in different findings. Many recall tests use unstructured recall where a blank sheet of paper is provided for students to write all of the important ideas that they remember. Wade and Adams' (1990) findings added evidence that reading ability does not mediate the seductive details effect as was first suggested by Garner et al. (1989).

Placement of seductive details and prior knowledge

In subsequent work, Garner et al. (1991) reported on two studies investigating placement of seductive details. Their studies were situated in the context of interest research with text. They identified two approaches to interest and interest research. The first was rooted in Dewey and his notion that children engage and learn when they are interested in the content. Reading research consistently finds higher recall when students are interested in the content (Garner et al., 1991). The second approach attempts to create interest for the reader by adding interesting details to the text. Garner et al. (1991) situate

the seductive details effect, when readers miss the main ideas and instead remember irrelevant details, in Dewey's construct of "fictitious inducements to attention" (cited in Garner et al., 1991, p. 644).

The first study (n = 48) randomly assigned undergraduates to one of four conditions (n = 12). The purpose of the study was to explore the placement of interesting details. The researchers prepared the text materials based on a *Newsweek* article on Stephen Hawking. Eight doctoral students rated the interest and importance of each sentence using a scale of high, medium, or low. The following forms were created from the rated sentences. Form A was a generally interesting text with interesting detail placed in a separate paragraph. Form B was a generally uninteresting text with the interesting details placed in a separate paragraph. Form C embedded the interesting details in a generally interesting paragraph while form D embedded interesting details in a generally uninteresting paragraph. Participants read the provided material on Stephen Hawking's grand unification theory and black holes without a time limit. They were informed prior to reading that they would need to recall important details. When they finished reading they exchanged the reading materials for three recall measures also without a time limit. The researchers found that there was no significant difference between the placement of detail groups. They did find a difference between the generally interesting text versus the generally uninteresting text that favored the interesting text. They also found that there was a high recall rate for high interest/low importance details and for moderate interest/moderate importance details. In contrast, low interest/high importance details were not recalled at a high rate.

In the second study, Garner et al. (1991) replicated the first study and added a measure of prior knowledge of physics as they thought there might be a relationship between prior knowledge and how interesting a text is perceived to be. In the second study, 228 undergraduates were randomly and equally assigned to one of four groups. The procedures and materials were identical to the first study except for the addition of a 25 question multiple-choice test on physics content knowledge taken by students in class one week before the treatment. The pre-test results were then used to identify high knowledge and low knowledge students (high knowledge scored 1/2 of a standard deviation or more above the mean and low knowledge scored 1/2 of a standard deviation or more below the mean), which created two groups of 79. Experiment two had a significant main effect finding for group and interestingness. The high domain knowledge group outperformed the low domain knowledge group, and the interesting passage group outperformed the uninteresting passage group. There was no statistically significant result for placement (embedded versus separated seductive details), but in three of the four conditions, the scores were lower when seductive details were embedded in the text. Finally, there was an interaction effect between knowledge and interest. Interesting text reduced the performance gap between low and high knowledge conditions.

Garner et al. (1991) concluded that adding material for interest (seductive details) has a negative impact on student learning and that application of their research suggests that teachers need to find content that is interesting to students instead of trying to make content/materials interesting. While the second study did find significant differences within prior knowledge and interestingness groups, there were no statistically significant results with regard to the placement of seductive details suggesting that seductive details

did not play a particular role in recall for students. Without a control group using a text without seductive details, no conclusions about seductive details themselves are possible. Garner et al. (1991) drew conclusions beyond the scope of the research they report.

Topic knowledge, cognitive interest, and text recall

Garner and Gillingham (1991) used the same materials on Stephen Hawking that were developed by Garner et al. (1991) in an experiment with 36 undergraduates with the purpose of exploring the relationships among topic knowledge, cognitive interest and text recall, three variables other researchers have found associated. Garner and Gillingham (1991) found that students with low topic knowledge and with high topic knowledge rated materials as being of low interest. Students with some knowledge rated material as interesting. They found no seductive details effect. Garner and Gillingham (1991) attribute not finding a difference for seductive details to the participants not finding the seductive details interesting unlike participants in other studies who used these materials. Only half of the participants in this study rated the details as moderately interesting. One other interesting finding in this study was that knowledge and structured recall were not associated, possibly resulting from general high performance, a restriction range measurement problem that can reduce correlation if it exists. Finally, participants demonstrated more knowledge on the structured recall task than they did on the unstructured recall task. The structured recall task seems to indicate that cues helped students to access information that they had. The conclusion of the researchers was that providing background knowledge to low topic knowledge students before they read might improve cognitive interest, which may in turn improve recall.

Time spent on details

Wade, Schraw, Buxton, and Hayes (1993) revised the Admiral Horatio Nelson materials from the Wade and Adams (1990) studies to include more information. The 2,100-word selection was re-written to include sentences of approximately the same length. All participants in the study read the same text one sentence at a time on a computer screen, and 99 of the 143 sentences met the researchers' criteria for analysis (based on ratings in the pre-study). They found that students spent significantly longer reading sentences that were of high importance/low interest and recalled significantly more high interest/low importance sentences. The study suggests that readers remember more interesting details than uninteresting details. In many ways, this study exemplifies some of the difficulties with early seductive details research. The interest and importance ratings were "forced" into rough quartiles by asking students to select one quarter of the sentences as least important or least interesting. Additionally, "interesting" was not defined for raters; they were asked to rate the sentence for interest based on what they found most interesting (Wade & Adams, 1990; Wade et al., 1993).

Challenges in first generation seductive details research

At this point in the research, Goetz and Sadoski (1995b) questioned the evidence of a seductive details effect. In their commentary they examined the existing literature regarding the seductive details effect and identified what they regarded to be significant flaws. They dismissed most of the research on the methodological grounds because it did not include an experimental control condition of no seductive details. The criticism is truthful, but the criticized studies did clearly delineate the purpose of the studies and used methodology appropriate to the stated purposes (Wade, Alexander, Schraw, &

Kulikowich, 1995). Goetz and Sadoski (1995b) also raised the question about how seductive detail is defined citing the definition from Garner (1992) “fictional inducements to attention” (cited in Goetz & Sadoski, 1995b, p. 518). Garner used the definition, but other research in the early 1990s relied on a combination of interest ratings and importance ratings to define seductive details (high interest/low importance = seductive details) (Wade et al., 1995). Goetz and Sadoski (1995b) provided alternative interpretations for the research used to support a seductive details effect. They suggested that the addition of unimportant highly interesting information confused readers instead of “seduc[ing] them away” from main ideas (p. 507). They posited that the added material actually interrupted the process of making sense of the text because it interrupted the coherence of the text. This alternative explanation offered to explain text issues evolved into one of the possible explanations for how seductive details inhibit learning in later literature (Harp & Mayer, 1997). Finally, Goetz and Sadoski (1995b) suggested that dual coding theory, their area of research, might explain the differences that Garner and colleagues attributed to seductive details. They suggested that general, abstract material is recalled less well because it is not “dual coded” because abstract material does not prompt affective responses from the reader. Concrete details, on the other hand, they posited are more likely to be coded in both the verbal and nonverbal systems making them more likely to be recalled. Wade et al. (1995) rejected this possible explanation because Goetz and Sadoski (1995b) had not examined the concreteness or abstractness of each item recalled and the research itself did not specifically do so. Additionally, they cited that information rated as important but uninteresting had several concrete elements

in it. Readers did not personally engage with the information calling the supposition into question (Wade et al., 1995).

The early literature in seductive details reveals several challenges to the research. First, how should seductive details be defined and validated? In the early literature seductive details were rated by either parties unlike those who would complete the study—teachers of grades 1-12 or doctoral students (Garner et al., 1989, 1991)—or by students in pre-studies that forced the ranking (Wade & Adams, 1990; Wade et al., 1993). In some cases the researchers included a general interest rating and discovered that the subjects found the material less interesting than the raters (Garner & Gillingham, 1991; Garner et al., 1989). A second issue for researchers of interest in reading was how to avoid confounding findings when seductive details increase text length and longer text is associated with poorer recall. The third issue was how can researchers create two equivalent texts that compare seductive details with no seductive details. (Goetz & Sadoski, 1995b).

Attempt to address challenges

Schraw (1998) conducted three experiments approaching interest in a slightly different manner. The first examined the relationship between interest and context for both main ideas and seductive details using the text on Admiral Nelson used by Wade and Adams (1990) and Wade et al. (1995). Schraw (1998) used interest and importance ratings from Wade et al. (1993) to select 16 main ideas and 16 seductive details that were arranged randomly. Participants (n = 30) were placed in one of two groups context dependent or context independent. Those in the context dependent group received the full text to read first, then the 32 randomly ordered sentences to rate for interest, then a series

of multiplication problems and finally they took a free-recall test. Those in the context independent group did not read the full text but completed all other tasks. Schraw (1998) found that there was no difference in ratings between main ideas and seductive details for those who read the full text first. For the second group, seductive details were rated significantly higher than main ideas and ratings for both were lower than the ratings made by those who read the full text first. Schraw (1998) conducted further analysis to reduce the 32 statements to 18 made up of 3 categories: context-dependent seductive details, context-independent seductive details, and context-dependent main ideas. Experiment two was designed to examine reading time and recall differences among the three categories determined in experiment one. Participants (n = 35) read the full passage on a computer that allowed them to read one sentence at a time. Participants advanced to the next sentence by hitting space bar and reading time for each sentence was recorded by the computer. After reading the participants spent five minutes working math problems before completing a free-recall test. Schraw (1998) found that both types of seductive details were recalled better than main ideas, but that readers spent more time on the context-dependent seductive details. Additionally, he found that seductive details were significantly and positively correlated with story recall. In experiment 3 (n = 72), Schraw (1998) used four versions of the Nelson text: version 1 included 12 targeted seductive details, versions 2 and 3 contained context-dependent and context-independent seductive details, respectively, and version 4 excluded the 12 targeted seductive details. He found that there was no significant difference in total recall among groups. He did not find support for a seductive details effect.

While Schraw (1998) addressed some of the methodology concerns from Goetz and Sadoski (1995b), the sample size in experiment three was small enough that it may have lacked enough power to find an effect. In addition, manipulating 12 seductive details may not be enough to create a seductive details effect. In Wade et al. (1993) seductive details accounted for 40% of the content. Schraw's accounted for approximately 9% of the text. While Schraw avoided the confound of length of text, he may simply not have manipulated the conditions enough to replicate earlier results. Schraw (1998) also introduced a new problematic theme in seductive details research and the later coherence principle research, the reuse of previous research texts and materials. While Schraw (1998) altered the text on Admiral Horatio Nelson significantly, much of the research reuses texts and other materials limiting generalizability of results. Schraw's (1998) study signals a shift in the research regarding seductive details.

Summary of first generation research on seductive details

The first generation of seductive details research focused on text and was guided by research on reading (Garner & Gillingham, 1991; Garner et al., 1991; Gillingham et al., 1989; Hidi & Baird, 1986; Schraw, 1998; Wade & Adams, 1990; Wade et al., 1993). The first generation researchers were interested in what sorts of details improved recall of main ideas and supporting details. They noted that students recalled emotionally interesting details in the biographical texts about Admiral Horatio Nelson and Stephen Hawking (Garner & Gillingham, 1991; Garner et al., 1991; Wade & Adams, 1990) to the detriment, in some cases, of recalling the main ideas. The bulk of the first generation of research ended with the apt methodological criticisms of Goetz and Sadoski (1995b).

The first generation of research into the seductive details effect used measures of retention where participants were either provided with a blank sheet of paper and asked to write down everything that they recalled from the reading (unstructured recall) or were prompted (structured recall) to write down what they recalled by main ideas in the reading (Garner & Gillingham, 1991; Garner et al., 1989, 1991; Hidi & Baird, 1986).

Second generation seductive details research

The second generation of research is dominated by the work of Mayer and his colleagues who extend the research initially in two specific ways. First, they used two measures of learning—retention to see how much material participants remembered and problem-solving transfer tests to see how well participants selected and integrated the learning materials with their prior knowledge (Harp & Mayer, 1997; Mayer, Griffith, Jurkowitz, & Rothman, 2008). Problem-solving transfer is important because selecting and integrating material with prior knowledge is Mayer's definition of meaningful learning (Mayer, 2003), and problem-solving transfer measures require the learner to use what they know to solve a problem that has no obvious solution (Mayer & Wittrock, 1996). Second, the research reported by Mayer and his colleagues, in contrast with earlier seductive details research, (Garner & Gillingham, 1991; Garner et al., 1989, 1991; Goetz & Sadoski, 1995a; Hidi & Baird, 1986; Wade et al., 1995) compares a seductive details group with a non-seductive details group using an experimental design.

Illustration and problem-solving transfer

The second generation of research began with Harp and Mayer (1997). They examined the role of interest in learning from scientific text and illustration because interest is used to justify adding material, whether verbal or visual, to learning materials.

Harp and Mayer (1997) grounded their work initially in Kintsch's (1980) distinction between two types of interest—emotional and cognitive. Harp and Mayer (1997) posited that emotional interest, although it may arouse emotional engagement in learners, interrupts the causal chain of scientific explanation causing less learning. Cognitive interest, in contrast, is created by the learner understanding the material. Adding materials that emphasize structure and causality therefore increases cognitive interest. Cognitive interest improves student learning (Harp & Mayer, 1997).

Harp and Mayer (1997) conducted two experiments that extended previous seductive details effect research by combining decorative illustrations with explanatory text. Decorative illustrations are illustrations that have very little connection to text or content (Levie & Lentz, 1982). Previous research focused on creating interest with seductive details in narrative or descriptive text (Garner et al., 1989, 1991; Wade, 1992; Wade & Adams, 1990) or with decorative illustrations (Levin & Mayer, 1993; Mayer 1993; Mayer, Sims, & Tajika, 1995). Using self-identified low prior knowledge students from the university research pool, Harp and Mayer (1997) assigned students to one of four groups: base group (n = 19), base with seductive text (n = 17), base with seductive illustrations (n = 18), and base with seductive details and seductive illustrations (n = 20). The base group received a booklet with approximately 550 words and six black and white illustrations with captions showing the causal process of lightning formation. The base with seductive text included an additional 150 words of text intended to make the base text more interesting, a 27% addition. The base with seductive illustrations added six color photographs that were captioned with approximately 60 words from the seductive details text. The base with seductive text and seductive illustrations used both the 150

words of additional seductive text and the six additional color photographs with captions. Harp and Mayer (1997) found that the base group recalled significantly more ideas and that the base with seductive details and seductive illustrations recalled significantly fewer than all the other groups. They also found that the base group generated significantly more solutions in the problem-solving transfer test than the other groups.

Harp and Mayer (1997) added a new measure to seductive details research—problem-solving transfer. While they were interested in retention (how many main ideas students could recall), they were more interested in whether students could take what they had learned and apply it to a novel problem, that is, meaningful learning (Mayer & Wittrock, 1996). Because seductive details are intended to create interest, participants also rated interest; however, Harp and Mayer (1997) found no significant difference among groups in self-reported interest. The second experiment revised the interest instrument to distinguish between cognitive and emotional interest and found that the seductive details text and the seductive illustrations were rated as having higher emotional interest while the base text was rated higher in cognitive interest. They concluded that skilled readers can differentiate between the two types of interest and that cognitive interest is more helpful to student learning with explanatory text.

Harp and Mayer (1997) provided the first response to Goetz and Sadoski's (1995a) apt criticism that research into seductive details had failed to include a comparison group with materials without seductive details. Unfortunately, Sadoski (2001) suggested that Harp and Mayer (1997) compared two unlike texts because the 150 words of seductive details added 12 additional ideas to the original 550 word text with nine ideas. Sadoski (2001) also pointed out that the first paragraph of the lightning

formation materials presented effects as well as causes making it logical to believe that the organizing principle of the text was causes and effects of lighting. Essentially, one group read a text on causes of lightning and the other read a text on causes and effects of lightning (Sadoski, 2001). Sadoski (2001) raised a challenging issue: How can researchers test a seductive details hypothesis with text-based materials since adding seductive details is likely to change the text structure? Thalheimer (2004) pointed out that Harp and Mayer (1997) not only compared text conditions but also found that the inclusion of seductive illustrations, which did not change the text structure, reduced both retention and problem-solving transfer scores.

Exploring how seductive details harm learning

Text research regarding seductive details focused on the impact on learning. Harp and Mayer (1998) reported on four experiments whose purpose was to test three hypotheses about how seductive details harm learning. They used two of the same booklets on lightning formation (base and base with seductive details and seductive illustrations) from Harp and Mayer (1997). A second booklet for each condition was created that highlighted the nine key ideas. In experiment one, which tested the theory that seductive details distract the student from selecting the main ideas, they found that while students with seductive details and seductive illustrations recalled significantly fewer main ideas and produced significantly fewer solutions for problem-solving, that highlighting the main ideas made no difference in performance in either the retention or problem-solving tasks.

Experiment two tested the same idea and instead of using highlighting to focus students on the main ideas, specific learning objectives were used as part of the

instructions for some conditions. They found that while there was a seductive details effect, including learning objectives improved retention and problem-solving for the base text condition and the seductive details text condition. Their results did not support the hypothesis that seductive details distract the reader from selecting the main ideas.

Experiment three tested an alternative hypothesis that seductive details interfere with learning by disrupting the organization of material necessary to create a causal chain in order to form a coherent mental model. To test this hypothesis, organizational signaling, intended to help the participant organize the structure of the text, was added to two sets of the lightning formation booklets. The findings (those in the seductive details treatments performed significantly worse on retention and transfer) suggested that signaling did not help students to attend to the nine main ideas.

Experiment four tested the hypothesis that seductive details prime the wrong schemas thus diverting the learner from the appropriate prior knowledge needed to integrate new material into long-term memory. In addition to the base lightning formation materials, three additional versions were created: seductive details at the beginning, seductive details interspersed, and seductive details at the end. They found that the base group and the group with seductive details placed at the end of the materials performed similarly. They also found that the groups with seductive details placed at the beginning and interspersed throughout the text both performed significantly less well than the other two conditions and that there was no significant difference between them. Harp and Mayer (1998) suggested that seductive details do their damage by priming the wrong context and activating the wrong prior knowledge thus interfering with integration of new material into students' existing schemas.

Using similar materials, Mayer et al. (2001) report on two experiments (3 and 4 in the article) testing the effects of adding video to multimedia to enhance interest. In the third experiment, the treatment group received a 140 second multimedia program interspersed with six short (approximately 10 seconds each) narrated video clips related to the instructional topic of lightning but not related to the instructional goal of explaining a cause and effect model of lightning formation. In contrast, the control group received only the 140 second multimedia program. While no statistical difference in retention scores was found, there was a statistical difference in the problem-solving transfer scores favoring those who did not receive the videos. Experiment four used the same videos, but instead of interspersing the videos throughout the instructional materials, they were placed as the first 60 seconds or the last 60 seconds of the 140 second multimedia program used in experiment three. Mayer et al. (2001) found no statistical difference in performance on retention, but they did find a statistical difference in problem-solving transfer scores favoring the group that saw the videos after the multimedia instructional program. Mayer et al. (2001) interpreted the results as supporting the extension of the seductive details effect found in earlier text research to multimedia design. Their results were consistent with Harp and Mayer's (1998) finding that seductive details prime the wrong prior knowledge and interfere with integration of new knowledge.

Studies finding no differences

Others, however, have not been able to confirm the seductive details effect (Muller et al., 2008; Park & Lim, 2007; Rey, 2011; Schraw, 1998) finding no significant differences between treatment groups. Still others have found that seductive details have

improved retention and problem-solving transfer performance (Park et al., 2011; Towler, 2009; Towler et al., 2008).

Prior knowledge. Muller et al. (2008) designed an online study using the physics of stella spectra as the subject matter. The subjects of the study were in three different grade levels in the Australian school system, the tenth grade participants having had no formal coursework on astronomy, eleventh grade participants having had one unit of coursework on astronomy, and first year university students having had two formal units of coursework on astronomy. Their online materials were designed based on objectives and the version with seductive details included video excerpts from an interview with an astronomer. The base version of instruction was 7.5 minutes and the seductive details version was 10.75 minutes. Muller et al. (2008) found no difference in performance between the seductive details and no seductive details versions. However, the experiment was conducted under realistic circumstances and not a laboratory setting causing the researchers to suspect that the realistic circumstances introduced significant "noise" into the experiment.

Park and Lim (2007) also failed to find significant differences with their test of cognitively interesting versus emotionally interesting illustrations versus text only in a ten hyper media card presentation on the life cycle of a hurricane. These findings were in contrast with the previous study by Park et al. (2005) that found, when controlling for prior knowledge, those with cognitively interesting illustrations outperformed the text only and emotionally interesting illustrations groups. Park et al. (2005) also used the life cycle of a hurricane as the content but designed the material for delivery on a personal assistance device.

Working memory. Doolittle and Altstaedter (2009) sought to add to the research on working memory capacity and multimedia instruction. Individual differences in working memory capacity have been considered as worth investigation for their impact on learning in a multimedia environment. Doolittle and Altstaedter (2009) defined working memory capacity as "a measure of an individual's ability to control attention in order to maintain representations in working memory and to search for and retrieve relevant information from long-term memory" (Doolittle & Altstaedter, 2009, p. 9). They conducted two, 2 x 2 factorial design experiments seeking effects of working memory capacity and instructional design of multimedia. In both experiments participants were placed in one of two groups: high working memory capacity and low working memory capacity based on results from the OSPAN (Operation Span), a working memory test that used sentences made up of two questions about whether a math statement was correct with a word embedded after each math statement. The upper (n = 54) and lower (n = 52) quartile performers were selected from the 201 students who were administered the OSPAN for experiment one.

Experiment one used a 145 second multimedia animation tutorial based on Mayer and Chandler's (2001) how lightning forms tutorial. The transfer questions were the four questions used by Moreno and Mayer (2000a). The high and low working memory students were randomly assigned to either the animation with auditory narration (no seductive details) or to the animation with auditory narration with extraneous sounds and images (seductive details). Doolittle and Altstaedter (2009) found that the high working memory participants significantly outperformed the low working memory participants in both conditions. In contrast with other research findings, they found no significant

difference between the seductive and no seductive details condition. Doolittle and Altstaedter (2009) suggested that there might not have been enough seductive details to either activate inappropriate schemas or to distract learners from main ideas.

Doolittle and Altstaedter (2009) designed their second experiment to use contiguous placement of key words on the animation and a spotlight effect to focus attention on relevant features of an animation in real time. They used Mayer and Anderson's (1992) transfer test and built a multimedia tutorial using Flash animation based on Mayer and Anderson's (1992) "How Does a Car Brake Work?" Doolittle and Altstaedter (2009) found that the high working memory capacity students outperformed the low working memory capacity students. There was no main effect for a signaling effect using visual signaling. There was also no interaction between the working memory groups and the signaling groups.

Doolittle and Altstaedter's findings did not support a seductive details effect. They suggested that a possible explanation for their findings was that they may not have added enough seductive details which is consistent with Rey's (2011) observation that research needs to better catalog the types and quantities of seductive details added. Better cataloging could help determine when seductive details create a seductive details effect. Doolittle and Altstaedter (2009) also suggested that working memory capacity was not a factor that mediates multimedia design since learning was consistent across design conditions.

Large amounts of seductive details. Rey (2011) tested 108 undergraduates at a German university using 20 Microsoft PowerPoint™ slides on the life cycle of a star. The base version used 700 words and the seductive details version added an additional 448

words. Decorative illustrations were also included. Rey (2011) found that the base group performed better on the retention test, but that there was no difference on the problem-solving transfer test. The better performance on the retention test is consistent with Goetz and Sadoski's (1995b) criticism that retention is associated with text length. In Rey's (2011) experiment, the seductive details group had 39% more text than the control group.

Self-paced environment and prior knowledge. Park et al. (2011) created a self-paced multimedia environment made up of 11 screens with static pictures and verbal explanations of the structure and function of the cellular molecule responsible for the synthesis of ATP (biology). The module used an explicit learning objective and students could replay the screens as desired. Park et al. (2011) found that the seductive details narrative group outperformed the other groups. They also found that seductive details were more helpful to students with higher prior knowledge than those with low levels of prior knowledge.

Training environment. Towler (2009) and Towler et al. (2008) found that seductive details improved performance in training situations. Towler et al. (2008) examined the impact of trainer expressiveness and seductive details in a sexual harassment audio recorded training. The two versions differed by 109 words. Towler found that the group with seductive details version combined with the expressive trainer's voice outperformed the other groups. In Towler (2009) two training experiments using screenshots, video, and explanatory narration about Microsoft Excel™ and Using Mail Merge in Microsoft Word™, respectively, both found better problem-solving transfer results with the procedural tasks that followed the training period.

Summary of second generation research

The second generation of seductive details research expanded to include words and pictures, Mayer's (2003) definition of multimedia. It also responded to the criticisms of Goetz and Sadoski (1995a, 1995b) by using true experimental designs; however, it did not respond effectively to the criticism about length. The second generation of research also added a measure of problem-solving transfer in order to measure, by proxy, meaningful learning (Mayer & Wittrock, 1996). The results of the research are mixed with some studies finding a seductive details effect (Harp & Mayer, 1997, 1998; Mayer et al., 2001), some unable to find a seductive details effect (Muller et al., 2008; Park & Lim, 2007; Rey, 2011; Schraw, 1998), and still others finding improved problem-solving transfer with the addition of seductive details (Towler, 2009; Towler et al., 2008; Park et al., 2011). The second generation of research also began exploring the role of individual differences in working memory (Doolittle & Alstaedter, 2009) and prior knowledge (Muller et al., 2008; Park et al., 2011).

The Coherence Principle

While a body research has focused on seductive details and their effects on learning, a related body of research has investigated how instruction can be designed to avoid a seductive details effect and, as a result, increase student learning with multimedia. A purpose of this body of research is to provide instructional design guidelines for multimedia (any instruction that uses words and images) to promote meaningful learning (Mayer, 1999; Mayer, 2014a). Meaningful learning is learning that students can apply in a different situation and is measured by problem-solving transfer (Mayer, 2014a; Mayer & Wittrock, 1996).

Mayer and Fiorella (2014) reported on 23 studies exploring the coherence principle reported in 13 articles. Mayer and colleagues contributed to the research by including a measure of problem-solving transfer, by directly comparing a seductive details version with a version designed following coherence principle, and by providing clear descriptions of treatments including screenshots of materials when relevant. These studies include effect sizes (Cohen's *d*) providing a sense of the practical significance of the coherence principle. Although Mayer and Fiorella present the medium to large effect sizes as persuasive evidence of the coherence principle, a close examination of the studies reveals both improvements on past methods and some critical questions on the present findings.

Mayer, Bove, Bryman, Mars, and Tampango (1996) reported on three experiments using lighting formation materials in a booklet. In experiment one, 54 undergraduates were assigned to one of four groups: passage and summary, passage only, summary only, or no instruction. The summary in this study was an annotated illustration of the steps of lightning formation. The purpose of this experiment was to determine if the summary improved student recall and problem-solving transfer. They found that instruction improved performance and that the summary group significantly outperformed the other three in recall. For problem-solving transfer, the passage and summary group and the summary only groups significantly outperformed the others while not differing from each other. In other words, the annotated illustration was as effective in both measures as the complete instructive passage with the annotated illustration.

Experiment two altered the lightning formation booklets to add a verbal summary only (the text only from the annotated illustration) and a visual summary (the illustration only from the annotated illustration) only in addition to the passage alone and the passage with the annotated illustration. Mayer et al. (1996) found that the summary group recalled more idea units than the other groups and performed better on the problem-solving transfer tasks as the group that received the passage and the annotated illustration. The group that received the illustration without verbal information performed the least well.

Experiment three manipulated the materials once again so that the annotated illustration summary made up one condition, the full passage divided and printed under the appropriate illustration (summary plus 550 words), and the annotated illustration with an additional 50 words of text added. Mayer et al. (1996) found that the summary group outperformed the other groups in recall and performed better than the summary plus 550 words and as well as the summary plus 50 words. Mayer et al. (1996) interpreted these three experiments as strong support for "less is more" or what they call coherence in designing instruction.

Limitations in the Literature

Role of prior knowledge

Of the 45 relevant studies on seductive details or the coherence principle, prior knowledge measures are either nonexistent (Bartsch & Cobern, 2003; Doolittle & Altstaedtler, 2009; Garner et al., 1989, 1991; Lehman, Schraw, McCrudden, & Hartley, 2007; Mayer & Jackson, 2005; Schraw, 1998; Shen, McCaughtry, Martin, & Dillion, 2006; Towler, 2009) or self-reported for the purpose of ensuring that participants have limited prior knowledge (Harp & Maslich, 2005; Harp & Mayer, 1997, 1998; Mayer &

Moreno, 2003; Mayer et al., 1996, 2001, 2007, 2008; Moreno & Mayer, 2000a; Park & Lim, 2007; Park et al., 2005; Towler et al., 2008). Three studies specifically use prior knowledge as a covariate to extend seductive details research (Magner, Schwonke, Aleven, Popescu, & Renkl, 2014; Muller et al. 2008; Park et al., 2011).

In an experiment extending seductive details research with illustrations, Magner et al. (2014) conducted an experiment with 52 eighth graders using a geometry lesson in a computer-based learning environment. In their pre-study they had 87 eighth graders rate illustrations in a geometry lesson in order to select the most interesting decorative illustrations to include in the experiment. Magner et al. (2014) used the five categories of illustration from Levie and Lentz (1982): decorational (has very little connection to text or content), representational (aids in comprehension of the text), organizational (shows a structural framework), interpretational (clarifies difficult content), and transformational (assists with encoding information). Magner et al. (2014) were interested in the affective role of illustration, especially in whether or not it could spark situational interest motivating attention to content. They began the study with a pretest and, after the learning period, participants took an immediate posttest and then a delayed posttest. After the immediate posttest, participants were offered a geometry booklet to take and study over the course of the week in preparation for the delayed posttest. The delayed posttest was identical to the immediate posttest except that it included additional problems that students would have learned from the booklet.

Magner et al. (2014) found that students with low prior knowledge experienced reduced learning outcomes in the seductive details condition. They also found that students with high prior knowledge performed better with seductive details, results that

they think suggest that the decorative illustrations triggered situational interest. However, they also found that interest did not last as demonstrated by the delayed posttest. Magner et al., (2014) suggest that prior knowledge is an important moderator of the seductive details effect because it may increase available working memory.

Similarly, Park et al. (2011) found that seductive details were useful for students with higher prior knowledge with multimedia that had been designed to use dual channels to reduce cognitive load. In their experiment, 100 high school students were randomly assigned in a 2 x2 factorial design testing the reduction of cognitive load by shifting text to an audio track and examining the impact of seductive details or no seductive details in each multimedia design. The self-paced multimedia package was made up of 11 screens and was part of the single 75 minute session that included pre-tests, instruction and post-tests. They found that the students who achieved the highest scores were those in the narrative-seductive details group. The narration condition also received higher ratings of cognitive load. They suggested that perhaps adding some additional cognitive load (like seductive details) for knowledgeable learners might enhance learning. Their findings suggest that some learner traits (higher prior knowledge) and design traits (dual channel) may make seductive details useful.

Muller et al. (2008) accounted for prior knowledge by selecting students at three levels of education where the national curriculum includes specific content knowledge at each level. They found no differences.

Defining seductive details

Researchers have identified seductive details in three different ways. A few studies used “expert ratings” to determine which details were seductive. Garner et al.

(1989) inserted one seductive detail per paragraph and asked 20 teachers to identify the most interesting detail in each paragraph. In the paragraphs one and two, all of the teachers identified the inserted seductive detail as most interesting. The third seductive detail was identified by 80% of the teachers as the most interesting of the paragraph. Garner et al. (1991) had eight doctoral students rate each sentence of the Stephen Hawking reading as interesting or uninteresting and important or unimportant and then defined sentences that were labeled as both highly interesting and unimportant as seductive details. Garner and Gillingham (1991) had 20 graduate students rate the interest and importance of the Stephen Hawking reading as well but provided no information about the method used. Shen et al. (2006) asked PE teachers to rate content of the existing commercial video "Sneaky Fox" for interest and importance and used that information to create a second version of the video without seductive details. Garner et al. (1989, 1991) both forced ratings. Garner et al. (1989) asked for the most interesting item in each paragraph without seeking information about where on the continuum of interest the content was. Garner et al. (1991) had the doctoral students rate the Stephen Hawking passage for interest (high, moderate, low) and importance (high, moderate, low). For both Garner et al. (1989, 1991) studies, the general interest ratings from the participants indicated that, at best, they found the materials somewhat interesting without regard for which materials they had. Shen et al. (2006) did not use a measure of direct interest in the materials but found no difference in situational interest between groups.

Other researchers have relied on student ratings of interest and importance gathered in pre-studies (Grice & Hughes, 2009; Harp & Mayer, 1998; Lehman et al., 2007; Magner et al., 2014; Mayer et al., 2008; Park et al., 2011; Schraw, 1998; Wade &

Adams, 1990). In most cases not enough detail is provided to describe manner in which the ratings were attained. How interest itself is defined is varied. Harp and Mayer (1998) had students rate the interest of each element in their lightning formation materials. Using Kintsch (1980), they had students identify items as cognitively or emotionally interesting. Wade and Adams (1990) had students rate interest and importance of each sentence using a four point scale. They noted that highly interesting unimportant items were related to Nelson's injuries and love life while the interesting and important items were main ideas (Wade & Adams, 1990). In other words, the seductive details were emotionally interesting while the main ideas were cognitively interesting.

The third method is to use definitions to create or identify seductive details. Bartsch and Cobern (2003) selected images unrelated to the text for their materials. Harp and Mayer (1997) used materials selected by researchers from National Geographic. Mayer and Jackson (2005) used quantitative materials as the seductive details in their qualitative explanation of ocean wave dispersion. Mayer et al. (2001) included video about lightning that did not include anything about the causal chain of lightning formation. Mayer et al. (2007) included related material (mechanical brakes on bikes, and air brakes on busses and trains) in their lesson on hydraulic brakes in cars. Muller et al. (2008) included segments of an interview with an astronomer in their stella spectra physics lesson after designing the content of their materials to match closely to the learning objectives of the defined curriculum. Park and Lim (2007) and Park et al. (2005) relied on Kintch's (1980) definitions of cognitive and emotional interest. Rey (2011) and Sung and Mayer (2012) used Levie and Lentz's (1982) definition of decorative illustrations.

Only Muller et al. (2008) explicitly described their design process to explain how the "coherent" material was identified and how their seductive details were selected. Consistently defining, identifying, and validating seductive details is a weakness in the literature.

Amount of seductive details used

Reporting of the amount of seductive details used is also inconsistent. In some cases the descriptions do not include quantifiable differences in the compared versions (Doolittle & Altstaedtler, 2009; Park et al., 2011; Towler, 2008). In others a difference in text length is provided (Garner & Gillingham, 1991; Garner et al., 1989, 1991; Harp & Maslich, 2005; Harp & Mayer, 1998; Lehman et al., 2007; Mayer et al., 1996, 2008; Mayer & Jackson, 2005; Shen et al., 2006). Other studies include text and/or presentation length (Grice & Hughes, 2009; Magner et al., 2014; Mayer & Moreno, 2003; Mayer et al., 2001; Moreno & Mayer, 2000a, 2002; Muller et al., 2008; Park & Lim, 2007; Park et al., 2005; Sanchez & Wiley, 2006; Shen et al., 2006; Sung & Mayer, 2012; Towler, 2009). Studies that report quantifiable amounts of seductive detail range from additions of 13% to 39% (Gillingham & Garner, 1989; Rey, 2011). Rey (2011) choose to add almost 40% seductive details in his experiment to maximize his chance of finding a seductive details effect while Towler (2009) added only 15% seductive details. Rey (2011) found no significant differences while Towler (2009) found significantly increased retention and problem-solving transfer in her sexual harassment training study. Mayer's studies, the ones that most consistently find a seductive details effect or support for the coherence principle, tend to range from adding 23% to 33% of text-based seductive details (Harp & Mayer, 1998; Mayer & Jackson, 2005; Mayer et al., 2008).

It is, however, important to remember Goetz and Sadoski (1995b) criticism of early seductive details research that students recall less from longer texts than they do from shorter texts. Mayer's research mitigates this by its focus on problem-solving transfer. Problem-solving transfer is Mayer's measure for meaningful learning whereby learners construct a mental model from multimedia by selecting and organizing visual and verbal material and, using prior knowledge, integrate the visual and verbal models by "building the connections between them" (Mayer, 1997, p. 5). Having constructed a mental model, learners can then apply the model to novel situations. However, Sadoski (2001) cautions that Harp and Mayer (1997, 1998) may have confounded their results because they changed the structure of the materials with their additions. The literature thus far does not address avoiding this potential confound.

Types of seductive details

Research on seductive details and the coherence principle has focused on number of words, types of illustration, additions of music, inclusion of environmental sounds and video. Findings are mixed in all.

Twenty-two studies examined seductive details added through words. Seven studies compared concise and extended versions delivered by narration (Harp & Maslich, 2005; Mayer & Jackson, 2005; Mayer et al., 2007; Park et al., 2011; Shen et al., 2006; Towler, 2009). Four of the studies found a seductive details effect (or improved performance for a concise version) in problem-solving transfer (Harp & Maslich, 2005; Mayer & Jackson, 2005; Mayer et al., 2007; Shen et al., 2006). Two of the studies found no difference between seductive details and the concise versions (Mayer et al., 2007; Park et al., 2011). It is possible that Mayer et al. (2007) did not find a significant

difference because the length of instruction was only one minute. Park et al. (2011) may not have found a difference because students were allowed to pace themselves and could review screens as desired. One study, Towler (2009), found improved problem-solving transfer for the group that included seductive details. Towler (2009) may have found improved results because she included details from highly publicized sexual harassment cases (i.e., President Bill Clinton) as the seductive details in the sexual harassment training. Those details may have inadvertently primed the appropriate schemas for sexual harassment.

Thirteen studies that varied text length found a seductive details effect for problem-solving transfer (Garner et al., 1989; Harp & Mayer, 1997, 1998; Lehman et al., 2007; Mayer & Jackson, 2005; Mayer et al., 1996, 2007, 2008). Of the 13, Mayer et al. (1996) used versions that obviously compared structurally different materials since some participants received only a captioned illustration and other received a 600 word text with the captioned illustration.

In contrast, three studies did not find a seductive details effect by manipulating the length of text (Garner & Gillingham, 1991; Mayer et al., 2007; Rey, 2011). Garner & Gillingham (1991) may not have found a seductive details effect because they experienced a restriction of range in their measurement and the participants found the text less interesting than the prior group who rated it. Mayer et al. (2007) used a very short learning time—one minute for animation or three minutes for the written version. Rey (2011) did not limit the learning time, which may have masked a seductive details effect.

Six studies focused on illustration alone (Bartsch & Cobern, 2003; Magner et al., 2014; Park & Lim, 2007; Park et al., 2005; Sanchez & Wiley, 2006; Sung & Mayer,

2012). Two of the studies used Kintch's (1980) constructs and compared cognitively interesting illustrations with emotionally interesting illustrations (Park & Lim, 2007; Park et al., 2005). Park and Lim (2007) found no significant differences on the retention and comprehension tasks with the 36 undergraduates. In contrast, Park et al. (2005) found that, after controlling for prior knowledge, the cognitive interest illustration group significantly outperformed the emotional interest group in problem-solving transfer. Magner et al. (2014) found a seductive details effect for problem-solving for all but high prior knowledge students in their study using the cognitive tutor for a geometry lesson. Sung and Mayer (2012) used only a retention measure in their comparison of three types of illustration: instructive (cognitive goal), seductive (interest goal), decorative (affective goal of pleasantness). They found that those who received the instructive illustrations recalled significantly more. Sanchez and Wiley (2006) examined the role of working memory by randomly assigning pre-screened top and bottom quartile working memory students to either conceptually relevant illustrations or seductive illustrations. They found that for retention the low working memory group experienced a seductive details effect and that the high working memory group performed significantly better with seductive details. Their second measure was an inference verification task that revealed the low working memory group performed significantly less well with seductive illustrations, but there was no difference for the high working memory group. Bartsch and Cobern (2003), in a methodologically problematic study, included images unrelated to content in a third of the presentation slides. They found a seductive details effect for retention after changing from an analysis of variance to a t-test. They did not include a problem-solving measure. Harp and Mayer (1998) focused on illustration and text. They found that using

color photographs of tangentially related material instead of an illustration of the causal chain of events in lightning formation created a seductive details effect for both retention and problem-solving measures. The limited body of research on seductive illustration uses varied definitions for identifying seductive illustration as well as varied measures. Future research would benefit from clear definitions of the illustrations included and how they were evaluated.

Three experiments tested music as a seductive detail with mixed results. Grice and Hughes (2009) found that students performed better with the addition of music to animation when comparing no music or animation, animation only, music with slides, music and animation. Their study was made up of 25 slides on study and life skills delivered online to 772 high school students and undergraduates across many schools. Six slides were manipulated with one of the four conditions. The average time spent on the six slides was 210 seconds for the music with animation, 202 seconds for the animation, 67 seconds for the music and narrative, and 55 seconds for the narrative alone. Their study seems to indicate that adding music to animation creates results in better learning as measured by retention. The purpose of Grice and Hughes (2009) study was to explore "flow" in the online environment, which is why they only measured retention. However, Moreno and Mayer (2000a), in contrast, report on two experiments where music reduced learning as measured by both retention and problem-solving transfer. In both studies, one using lightning formation materials and the other using the hydraulic brakes materials, concise versions led to better learning outcomes.

Four experiments explored the effect of adding relevant background environmental sounds (Mayer & Moreno, 2003; Moreno & Mayer, 2000a, 2002). Three

of the experiments used lightning formation materials and used storm sounds as the background environmental sounds. There was no effect. The fourth experiment (Moreno & Mayer, 2000a) found an effect for the addition of mechanical sounds to learning materials on hydraulic brakes.

Two experiments inserted video as seductive detail (Mayer et al., 2001; Muller et al., 2008). Both added 30% more time for the instructional time with the version including video. Both used video that was on the topic but not directly related to instructional goals. Both interspersed clips of the video throughout the instructional materials. Mayer et al. (2001) found a significant difference in transfer while Muller et al. (2008) did not. The difference in finding may be related to three factors: time, setting, and prior knowledge. The learning phase for Mayer et al. (2001) was 120 seconds or 200 seconds depending on the version. The experiment was conducted under laboratory conditions with subjects who self-reported low prior knowledge. The learning phase for Muller et al. (2008) was 7.5 minutes or 10.75 minutes depending on the version. The experiment was delivered online (distance learning) using three distinct prior knowledge groups determined by their year in the Australian school system.

Materials used in multiple studies

In the research on seductive details and the coherence principle, there are many materials that are reused. In the 45 relevant studies, 29 of the studies reuse materials from other studies. Frequently the materials are modified, but they are fundamentally the same materials. The most frequently reused materials are the lightning formation materials, which are used in 16 of the 45 studies (Doolittle & Altstaedtler, 2009; Harp & Maslich, 2005; Harp & Mayer, 1997, 1998; Lehman et al., 2007; Mayer & Moreno, 2003; Mayer

et al., 1996, 2001; Moreno & Mayer, 2000a, 2002). The Stephen Hawking materials are used in three studies (Garner & Gillingham, 1991; Garner et al., 1991). The Admiral Horatio Nelson materials are used in two of the studies included (Schraw, 1998; Wade & Adams, 1990). The hydraulic brakes are used in three studies (Mayer et al., 2007; Moreno & Mayer, 2000a) and the life cycle of hurricanes is used twice by Park and Lim (2007) and Park et al. (2005). Finally, ocean wave material appeared in the three experiments conducted by Mayer and Jackson (2005).

While there are practical reasons to reuse materials, the re-use of materials limits the generalizability of findings, an important consideration since much of the research following the genesis in text research is used as support for instructional design principles. Diversifying materials may increase generalizability, or it may suggest that something inherent in the materials has led to some of the previous findings.

Settings used

The vast majority of research in this area has been conducted in laboratory settings with undergraduate research pools (Bartsch & Cobern, 2003; Doolittle & Altstaedtler, 2009; Garner & Gillingham, 1991; Garner et al., 1991; Harp & Maslich, 2005; Harp & Mayer, 1997, 1998; Lehman et al., 2007; Mayer & Jackson, 2005; Mayer & Moreno, 2003; Mayer et al., 1996, 2001, 2007, 2008; Moreno & Mayer, 2000a, 2002; Park & Lim, 2007; Park et al., 2005; Rey, 2011; Sanchez & Wiley, 2006; Schraw, 1998; Sung & Mayer, 2012; Towler, 2009; Towler et al., 2008; Wade & Adams, 1990). Delivery of instructional materials varied from paper to computer-based. While the laboratory settings help to isolate the factors being studied, they also are radically

different from the realistic settings where findings might someday be applied (Clark & Mayer, 2011; Rey, 2011, 2012).

Three studies were conducted in a classroom. In the most realistic setting, Shen et al. (2006) compared two versions of the "Sneaky Fox" net game instructional video for physical education with junior high students by splitting them into two groups on the two ends of the gym where they watched the video and completed the tests. Shen et al. (2006) found a seductive details effect with their students. In contrast, Magner et al. (2014) and Park et al. (2011) conducted their computer-based studies within the classroom context with eighth grade students and high school students, respectively. Magner et al. (2014) replicated the realistic setting including providing additional learning materials for students to study over a week. Magner et al. (2014) found that there was a seductive details effect except for students who had high prior knowledge. Park et al. (2011) did not find a seductive details effect.

Two studies were conducted online (Grice & Hughes, 2009; Muller et al., 2008). Muller et al. (2008) note several advantages to conducting studies online including the ability to collect precise data and the ability for other researchers to easily attempt to replicate results. They also noted one major drawback of "noise" that potentially might hinder finding differences. While Grice and Hughes (2009) found better retention, it seemed more strongly associated with the animation than the music. Muller et al. found no significant differences between groups.

Time

Time is an ill-reported element of the research. Studies that reported a learning time ranged from 45 seconds (Moreno & Mayer, 2000a) to 35 minutes (Magner et al.,

2014). Eleven studies had a learning time less than five minutes (Doolittle & Altstaedtler, 2009; Harp & Maslich, 2005; Mayer & Moreno, 2003; Mayer et al., 1996, 2001, 2007; Moreno & Mayer, 2000a, 2000b, 2002; Sung & Mayer, 2012). Six of the 11 studies reported found significant difference in problem-solving transfer supporting a seductive details effect (Harp & Maslich, 2005; Mayer et al. 1996, 2001, 2007; Moreno & Mayer, 2000a), and five found no significant difference (Doolittle & Altstaedtler, 2009; Mayer & Moreno, 2003, Experiment 3; Mayer et al., 2007, 2008; Moreno & Mayer, 2002). Of the 14 studies that reported more than 5 minutes and not more than 10 minutes of learning time, 10 found a seductive details effect for problem-solving transfer (Harp & Mayer, 1998; Mayer & Jackson, 2005; Shen et al., 2006), two found no significant difference (Park & Lim, 2007; Muller et al., 2008), one found that seductive details improved problem-solving transfer (Towler, 2009), and one had no measure of problem-solving transfer (Bartsch & Cobern, 2003) Others report a total length of participation and still others merely report that there was no time limit. A small number who provide no time limit report the range or average length of time spent but do not delineate the learning time. Conclusions about learning time are difficult to draw because of the inconsistency in reporting of learning time.

Homogeneous samples

Of the 45 relevant studies 39 were conducted using undergraduates who were part of the university research pool. In addition, most studies attempted to limit their sample to students with low prior knowledge. Six studies vary from this pattern. Magner et al. (2014) used eighth grade students from the highest track while Gardner et al. (1989) used seventh grade students who were average readers. Muller et al. (2008) sought a more

heterogeneous grouping by including three grade levels that had had varying degrees of exposure to the subject matter based on the required national curriculum. Shen et al. (2006) conducted their study with a heterogeneous group of middle school PE students. Sanchez and Wiley (2006) deliberately tested a larger group to create a lower and higher working memory groups defined by falling in the bottom or top quartile of a working memory test. Finally, Park et al. (2011) used prior knowledge as a covariate for their 100 high school participants. The homogeneous nature of the participants in most studies reduces the generalizability of results. This body of research needs more variety in participants.

The Voice Principle

Mayer (2005, 2014c) cautiously identified the voice principle as a principle emerging from the research on personalization that increases generative processing. The voice principle suggests that multimedia designed using human voices that are in the standard accent of the region can improve motivation for the learner to commit to active processing (Mayer, 2014c, p. 346). The six studies reported in three articles and a dissertation provide mixed results and are rooted in an extension of CTML that adds social agency theory. Social agency theory says that social cues in multimedia can activate a social response in learners and thus lead to deeper cognitive processing and better learning outcomes (Mayer, 2014c, p. 348). Social agency theory suggests that the human voice activates human relationships even though the learner is interacting with a computer.

Mayer et al. (2003) examined the role of voice in two experiments. They hypothesized that human, standard accented voices improve the likelihood of students

engaging cognitively with material because social cues prime the schema for making meaning of material. They found that students performed significantly better on retention and problem-solving transfer tasks when they were in the standard accented human voice group. In experiment one (n = 68), participants were randomly assigned to a native accent instruction group or a strong Russian accent instruction group to learn about lightning formation. Participants in the native accent condition performed significantly better on the problem-solving transfer test. In experiment 2 (n = 40) the same materials were used to compare learning from a human voice or a computer generated voice. Participants who were instructed by the human voice performed significantly better on the retention and problem-solving transfer tests leading Mayer et al. (2003) to see support for social agency theory triggering social schema to help students commit to cognitive engagement.

Atkinson et al. (2005) performed two experiments using convenience samples where participants were randomly assigned to one of two groups—computer voice or human voice. The first experiment was with college students while the second was with high school students. In both experiments the human voice groups outperformed the computer voice groups on near and far problem-solving transfer as well as in performance on all four practice problems and on problems 3 and 4. The practical significance was moderate to large on each measure. The experiments suggest that there is a voice principle that can guide design of multimedia learning packages.

Atkinson et al. (2005) conducted two experiments. The first was with 50 undergraduate students from Mississippi State University who were randomly assigned (n = 25) to one of two conditions, human voice or computer voice, in a computer-based learning environment. Participants received a multimedia-training program on solving

proportional reasoning word problems. The measurement tools were a 15-item speaker survey and a posttest with four near transfer questions and four far transfer questions. Near problem-solving transfer problems were structured identically to the sample problems whereas far problem-solving transfer problems required adjusting the solution method to a new problem. The groups were tested under lab conditions.

The second experiment was conducted in a high school setting with 40 high school students. They all had the same instructor (across different class periods) and were randomly assigned to the computer voice or human voice group.

In the first experiment the human voice groups performed statistically significantly better on performance on all four practice problems, posttest near transfer, posttest far transfer, speaker rating, performance on practice problems 1 and 2, and performance on practice problems 3 and 4. Practical significance was also moderately large to large for each. The results for the second experiment were similar. The human voice group outperformed the computer voice group on all comparisons. Only the performance on practice problems 1 and 2 was not statistically significant. The practical significance was moderate to large on each statistically significant measure.

However, Ahn (2010), in her dissertation extending the voice principle work of Mayer et al. (2003), found no significant difference in performance among five groups: native accent, moderate German accent, heavy German accent, moderate Korean accent, and heavy Korean accent. She attributed the failure to find a difference to instruction time noting that Mayer et al. (2003) used a very brief instructional time, 140 seconds, in contrast with the 7 to 10 minutes of instructional time for the five accent groups. Ahn (2010) suggested that learners adapt to accents with longer instructional periods and that

time mitigates the additional effort needed to understand an accent. One other difference that may have had an impact was the difference in how the treatment and testing were enacted. Mayer et al. (2003) conducted their work in the lab and restricted time for responses to the retention (four minutes) and transfer questions (four questions at 2.5 minutes each). Ahn (2010) conducted treatment and testing online and was not able to restrict time.

Mayer and DaPra (2012) conducted three experiments on embodiment (the use of a human figure in multimedia presentations). In their second experiment, a 2 x 2 factorial design they compared human voices with computer voices and high embodiment and low embodiment in a 229 second multimedia learning environment. They found no significant differences between groups for voice. They found a significant interaction between embodiment and voice in that high embodiment with the human voice led to significantly better problem-solving transfer scores.

Clearly the research into a voice principle is in early stages and the six studies have found mixed results. Mayer (2014c) argued that social agency theory can be added to CTML and that social agency theory explains how voice can contribute to generative processing. Voice is meant to trigger social schemas, which help students commit to cognitive engagement (Atkinson et al., 2005; Mayer & DaPra, 2012; Mayer et al., 2003).

While Atkinson et al. (2005) found that the human voice led to better problem-solving transfer than the computerized voice, Mayer and DaPra (2012) found no significant difference. In comparing computer and human voices when combined with varying degrees of embodiment, Mayer and DaPra (2012) found that breaking human social cueing by using a human voice with a low embodiment image reduced the

difference between the human and computer voices. They suggested that this supports social agency theory.

While Mayer et al. (2003) found that a voice in the standard accent of the region led to better transfer performance than a strong Russian accent, Ahn (2010) found no significant difference between the various accented and standard accented voice in her dissertation study. Mayer et al. (2003) suggested that social agency theory might explain the difference in their findings. In contrast, the difference in findings could be attributed to increased extraneous cognitive load caused by accents and the difference in the length of learning moderated the increased load by allowing students in the longer condition time to adjust to the accents (Ahn, 2010).

The six studies supporting an emerging voice principle have focused on human voices compared with computer voices and on accented voices compared with unaccented voices. In both comparisons extraneous cognitive load could explain the differences found (Ahn, 2010; Mayer et al., 2003). A study comparing two human voices, the voice of a teacher who students know and the voice of a different teacher with whom they do not have a student-teacher relationship, might begin to untangle whether social agency or cognitive load is a better explanation for why students are learning.

Summary

Multimedia research has yielded 15 design principles to date. Each principle serves one of three purposes defined by the cognitive theory of multimedia learning: to reduce extraneous processing, to manage essential processing, or to foster generative processing.

The first principle, the coherence principle, is theorized to reduce extraneous processing. The coherence principle emerged from research on seductive details which, in its first generation, was grounded in text research and later, in its second generation, evolved into multimedia research. Text research generally relied on measures of retention while multimedia research added a measure of problem-solving transfer. Findings throughout both generations of research are mixed. The shift from text to multimedia also led to a shift from examining the effect of seductive details to examining the effect of designing instruction coherently.

The literature on seductive details and the coherence principle has several limitations for future research to address: the role of prior knowledge, how seductive details are defined, the quantification of seductive details, how seductive details are cataloged, the reuse of materials in multiple studies, and the almost exclusive use of laboratory settings.

Research on the emerging voice principle is limited to seven studies that compare human and computerized voices or accented and unaccented voices. Six of the studies found that human voices or unaccented human voices lead to better problem-solving transfer than do computerized voices or accented voices. The seventh study found no learning difference between accented and unaccented voices. Early research is limited to comparing human voices, computer voices, and accented with unaccented voices. Comparing results for the voice of a teacher with whom students have a student-teacher relationship with the voice of a teacher with whom they do not have a student-teacher relationship could provide evidence for social agency theory or for cognitive load theory in shedding light on the emerging voice principle.

CHAPTER III

METHODOLOGY

Research Questions

The study seeks to answer the following questions:

1. What is the effect of seductive details at four testing times in teacher-created multimedia on retention (the ability to recall content) and on problem-solving transfer (the ability to use content knowledge in a new and different context)?

2. What is the effect of the teacher's voice at four testing times in teacher-created multimedia on retention and problem-solving transfer?

3. What is the relationship between prior knowledge, details, and voice?

Research Design

The study was a quasi-experimental 2 x 2 between subjects factorial design that included a measure of prior knowledge. The study was implemented with six classes of a required ninth grade Christian Sexuality course, the entire population of first semester course enrollees. The independent variables for this study were seductive details or no seductive details and teacher voice or a different teacher's voice. The two dependent variables for this study were (a) retention and (b) problem-solving transfer. The study

lasted four weeks with teachers deploying videos and measurements approximately once a week on the same days across all classes.

Table 2. *Design of Study*

Prior Knowledge		Voice	
		Teacher's Voice (TV)	Different Teacher's Voice (DTV)
Instructional Design	Seductive Details (SD)	n ≈ 32	n ≈ 32
	No Seductive Details (NSD)	n ≈ 32	n ≈ 32

Sample

The sample for the study was from an urban, private school on the West Coast with an enrollment of approximately 1150 students. The sample included all but nine, grade 9 students (n = 136) enrolled in Christian Sexuality in the fall semester of 2015. The course is neither a high or low interest course for students. A power analysis was conducted using *G*Power 3*.1 for "F tests - ANOVA: Fixed effects, special, main effects and interactions" using the following inputs: alpha .05 power level of .80, a F significance level of .025 equivalent to a medium effect size of 0.5 (Cohen, 1988). The power analysis determined a minimum total sample size of 128, within the sample for the study (Faul, Erdfelder, Lang, & Buchner, 2007).

Students were assigned to the classes by the school's computerized scheduling program which placed approximately half of the ninth grade class in one of six sections of Christian Sexuality while the other half of the ninth grade class was placed in one of approximately six sections of the other semester-length religion course. Students were randomly assigned to one of the four groups of the study without regard to the class period to which they had been assigned. Demographic data including sex, age,

ethnicity/race were solicited from the participants and compared with the general demographic information available in the student information system.

The demographic information on ethnicity/racial identification for all ninth grade students enrolled for the 2015-16 school year is rendered in Table 3.

Table 3. *Ethnicity/Racial Identification Provided Upon Enrollment by Parents of All Ninth Grade Students and Self-Reported Ethnicity/Racial Identification Provided by Students in Sample*

Ethnicity/Racial Identification	Percentage of Grade 9 Class Parent Report (N = 295)	Percentage of Sample Student Report (n = 134)
African-American	23.7%	18.7%
Asian-American	9.8%	10.4%
European-American	43.4%	39.6%
Latin-American	8.5%	9.7%
Native American	0.3%	1.5%
Pacific Islander	1.4%	0.7%
Other	12.9%	19.4%

The students' ethnicity and racial identification was reported by parents at the time of enrollment. The collection system only allows one of the following options to be selected: African-American, Asian-American, European-American, Latin-American, Middle-Eastern, Native American, Pacific Islander, and Other. The entirety of the ninth grade class is made up of 43% European-Americans and 57% all others. For the purposes of this study, the category of Other and Middle-Eastern were combined as only one ninth grade student was identified as Middle-Eastern.

At the beginning of the study, the students in the sample were asked to self-report via survey demographic information including their ethnicity/racial identification. Students selecting "Other" were provided space to write in an identity. These entries

included “Blasian,” “Ethiopian, African-American, White,” “Hapa-Haole,” “Greek, Native American, and African-American” suggesting that differences in Table 3 may be the result of students identifying differently from how their parents identified them.

The demographic information on identification of gender for all students grade 9 students enrolled for the 2015-2016 school year is rendered in Table 4.

Table 4. *Gender as Reported by All Grade 9 Students at Time of Enrollment* (*n = 295*)

Gender	Female	Male
	52%	48%

The ninth grade class as a whole is made up of slightly more female students than male students. Table 5 provides the gender break down of the participants in the study.

Table 5. *Gender of Sample* (*n = 134*)

Gender	Female	Male
	53%	47%

The study included slightly more female participants than male participants as compared to the gender makeup of the ninth grade class.

Protection of Human Subjects

An application was sent to the University of San Francisco Institutional Review Board for the Protection of Human Subjects (USFIRBPHS) and was approved as exempt research according to 45 C.F.R. § 46.101(b) of the Basic Health and Human Services Policy for Protection of Human Research Subjects. On the first day of school, students received a letter of consent explaining the study and providing a place for the student and parent to consent or decline permission for the use of their data in the study (Appendix

A). Teachers collected the consent forms on the second day of class and returned them to the researcher.

This research adhered to the ethical standards of the USFIRBPHS. The study investigated the seductive details effect in teacher-created multimedia on student retention and problem-solving transfer. The rights of participants were protected. No physical, mental or emotional risks were anticipated. Although the videos were a required element of the course, data from the nine students who opted out were excluded from the research study.

The following steps were taken to address ethical considerations.

1. A signed letter of consent was obtained from the parent or guardian of each participant. The form contained the study's purpose and a description of the data collection methods (Appendix A).

2. All participants were provided an opportunity to ask questions about the research during the study.

3. All participants were assured of the anonymity of the data used for the research. Only the researcher had all of the participants' names and all of their data. The researcher used the names only for the purpose of coding the data. Instructors were provided only aggregated data for their students.

4. Each of the instructional multimedia packages was the first introduction to a content area that is part of the curriculum. Subsequent instruction from the teacher and other class learning experiences provided multiple opportunities for all students to master content.

5. The measures of retention and problem-solving transfer were used by teachers as formative assessments of the lesson for the sole purpose of refining the planning of the subsequent lessons.

6. At the end of the semester and prior to final exams, students had access to all versions of the videos should they have desired to review them.

Instrumentation

This study used five instruments created collaboratively by the researcher and teachers, which are delineated in Table 6.

Table 6. *Measures and Timing*

Created by	Measure	Timing
Researcher	10 Item Prior Knowledge Survey	Class Session 2
Teacher/Researcher	7 item Retention Test 1 4 item Problem-Solving Transfer Test1	Multimedia Package 1
Teacher/Researcher	7 item Retention Test 2 4 item Problem-Solving Transfer Test 2	Multimedia Package 2
Teacher/Researcher	7 item Retention Test 3 4 item Problem-Solving Transfer Test 3	Multimedia Package 3
Teacher/Researcher	7 item Retention Test 4 4 item Problem-Solving Transfer Test 4	Multimedia Package 4

Content validity was established using responses to the content validity assessment form which was disseminated using SurveyMonkey (Appendices E, F, G, H, I). A team of teachers was sent the content validity assessment form. The respondents were two men and four women. Two of the women regularly teach the course and were part of the design team. One of the two did not create any content while the other developed the Self-Disclosure content and quiz questions. All of the respondents have

taught high school students in the high school setting. All but one have at least a decade of teaching experience with the age group. Two hold a master's degree in Systematic Theology, one holds a master's degree in Theology and one holds an Ed.D. in Catholic School Leadership. The remaining two hold a Ph.D. in Spanish and a master's degree in Education, respectively. Four of the respondents have taught or currently teach in the religious studies department. Of the remaining two, one is an English teacher and the other now teaches college level Spanish in another state. The content validity assessment included more test questions than were intended for use. Questions that were deemed by reviewers to be ambiguous were dropped.

The researcher created a prior knowledge survey (Appendices C, D), and it was reviewed for content validity (Appendix E) by using a content validity assessment form. The two reviewers were divided in their responses based on their understanding of the first question—"Does the question clearly ask for information about prior knowledge?" Their responses indicated that they interpreted this question as asking if the question asked for "direct information" about prior knowledge. An answer of "no" usually resulted in a response of "indirectly" to the next question which asked if the question was asking for information in a direct or indirect manner. Questions that could be indirect indicators of prior knowledge were more often split. For example, the question about religious identification was seen by one respondent as not providing any information about prior knowledge.

For each multimedia package (Creation, Self-Disclosure and History of Courtship Rituals parts 1 and 2), teachers and researcher collaboratively discussed the concepts of the 7 item multiple-choice retention test and a 4 item two-level multiple-choice problem-

solving transfer test. The questions were derived by the researcher from the content design chart with some input from content developers and varied in difficulty in an effort to avoid ceiling or floor effects. The retention questions required students to demonstrate that they remembered factual information from the multimedia learning object by recognizing and selecting the correct multiple choice answers (Mayer & Wittrock, 1996). The problem-solving transfer questions required students to demonstrate the ability to use what they learned from the multimedia learning object in a new situation by responding to a two-tiered, multiple-choice question where the first part required a response that applied the material in a new situation and the second part required the student to select the conceptual reason for the answer (Muller et al., 2008). Each video used a total of 15 questions, seven retention and four two-tiered, problem-solving transfer questions.

Each of the multimedia learning object instruments was deployed through the learning management system (LMS), Schoology, and accessed by students on their personal laptops during class time. Students took the prior knowledge survey in class as a survey deployed through SurveyMonkey prior to beginning the study. Each of the multimedia packages was designed as a learning unit in the LMS. Four "courses" matching the four conditions were created in the LMS and students were randomly assigned across class periods into one of the four conditions: No Seductive Details/Teacher Voice (NSD/TV), No Seductive Details/Different Teacher Voice (NSD/DTV), Seductive Details/Teacher Voice (SD/TV), and Seductive Details/Different Teacher Voice (SD/DTV). For each of the four multimedia sessions, teachers read an introductory statement (Appendix S) directing students to the LMS where students read

an introductory statement, viewed the multimedia, and in “test” mode completed the retention measure and problem-solving transfer measures.

Treatment Description

Students completed four multimedia sessions on four separate dates on their laptops during class time in this study. Each session began with the teacher of the course reading directions to the class. Students were then directed to open the module on their laptops and read the directions in the module. The directions prompted them to watch the teacher-created multimedia that was between 10 and 17 minutes in length. After students viewed the multimedia, they completed the retention and problem-solving tests in the LMS. The classroom teacher monitored the room.

Development of Learning Objects

The teachers of the course created the multimedia learning objects collaboratively over six months. The design process began with the instructors identifying subject matter for which multimedia would be useful. Then they prioritized and selected the four topics for the learning sessions. Next they identified the learning objectives for the teacher-created multimedia and created scripts for each learning object. Possibilities for seductive details were generated collaboratively in person and via google documents as were some recall questions (Muller et al., 2008).

After creating the learning objectives and the written script, instructors identified key images and other elements that they believed to be directly relevant to the learning objectives. Instructors were asked to suggest images that they believed would be interesting to their students but that were not directly related to the learning objectives. The scripts were reviewed and a second augmented script was developed that included

anecdotes that were interesting but not important to the learning objectives. This process was followed for each of the four multimedia learning objects.

Each of the multimedia learning objects was reviewed by six independent professionals, five of whom have experience working with students in the identified age range, to validate the objects as being the seductive details version or the non-seductive details version. Two of the reviewers had professional instructional design backgrounds. Reviewers were provided with PDF versions of the eight PowerPoint™ scripts (two for each content area) containing the words and images and a link to the validation survey in SurveyMonkey (Appendices J–R). Reviewers had no difficulty differentiating between the two designs; they did, however, disagree about whether or not the designs were substantively the same content.

Prior research does not document any efforts to validate that two versions of multimedia are substantively the same content. Reviewers were asked as the final question for each multimedia package, "Do you consider the content of both PowerPoints™ as rendered in the pdfs to be generally the same?**"** The question required a yes, no, or other response and included room for comments. Table 7 provides the background of the three reviewers who provided comments on Creation (Video 1).

Table 7. *Reviewer Background and Explanation for Content Rating*

Reviewer Background	Reviewer Explanation for Content Generally the Same
Educational Technologist, MA, Digital Media Learning	"Generally, they are similar. Version 2 does a better job of providing more examples for students to relate to and identify with."
Corporate Instructional Design Manager, MA, Instructional Design	"The first is superior to the second. The second distracts with unneeded content (the research bit I reference in 8. (Slide 3). There are a few images in the 2nd version that distract as well and do nothing to reinforce the content."
Occupational Therapist, University Adjunct Faculty, MS Occupational Therapy	"not sure, the second version was a bit more flowery and had more stuff in it-- but I had to compare the first two slides by cutting/pasting to see if they were different... they aren't.

While the reviewers were split in responding yes and no to this question, the comments suggested that responses were related to how the reviewer conceptualized "generally the same" and the reviewer's preference for design. Because the comments seemed to be more design-related than content-based, the contents were not altered.

As part of the school's scheduling process, the course had two instructors assigned for the fall and each instructor was assigned three sections. One instructor had slightly fewer students. Each instructor recorded the audio track for both scripts (no seductive details and seductive details versions) for each of the four sessions. The learning objects were created using Microsoft PowerPoint™ and the audio track was added to each slide show. Each version was saved as a movie, uploaded to a private YouTube Channel, and embedded into the correct learning unit and condition (course) in the LMS. The researcher created the final multimedia products to ensure consistency across all products.

Design of Learning Objects

Mayer (2014a) detailed a series of multimedia design principles. Table 8 delineates the design principles that were used in the multimedia learning objects and explains the omission of some principles.

Table 8. *Multimedia Design Principles*

Design Principle	Function	Used	If Not, Why
Coherence	Reduces extraneous processing	Yes/No	Principle being tested
Signaling	Reduces extraneous processing	No	Potential confound to coherence principle
Redundancy	Reduces extraneous processing	Yes	
Spatial Contiguity	Reduces extraneous processing	Yes	
Temporal Contiguity	Reduces extraneous processing	Yes	
Segmenting	Manages essential processing	No	Not all learning objects were not long enough to be segmented
Pre-Training	Manages essential processing	Yes	
Modality	Manages essential processing	Yes	
Personalization	Fosters generative processing	Yes	
Voice	Fosters generative processing	Yes/No	Principle being tested
Embodiment	Fosters generative processing	No	Uses technology not readily available to teachers
Guided Discovery	Fosters generative processing	No	Potential confound for the Voice Principle
Self-Explanation	Fosters generative processing	No	Potential confound for the Voice Principle
Drawing	Fosters generative processing	No	Potential confound for the Voice Principle

Defining Seductive Details

Prior research on seductive details also has been criticized for poor definitions of seductive details (Rey, 2012). Seductive details in this study were visual details that were pleasant and interesting but not directly related to the learning objectives, verbal details generally in the form of anecdotes that were not directly related to the learning objectives, and music without words unrelated to the learning objectives. The seductive details versions included approximately 30% additional visual (images and non-redundant text) seductive details, between 16-31% percent oral seductive details by way of anecdotes as determined by word count, and music mixed in the audio track for the seductive details versions. A review of the literature revealed that experiments that added between 23% and 33% seductive details generally found a seductive details effect (Harp & Mayer, 1998; Mayer & Jackson, 2005; Mayer et al., 2008), although Rey (2011) did not find a seductive details effect when he added 39% seductive details.

Previous research has not quantified seductive illustrations or music. The non-seductive details versions in this study included only visuals deemed by the design team as directly relevant to the learning objectives and an audio track that omitted anecdotes and did not include music. The seductive details versions included more images and substituted images that made a visual reference to the concept in an interesting way. For example, in *The History of Courtship Part 1*, the image of a man in a white tank style shirt was used for the slide discussing domestic violence because students call that style of shirt a "wife-beater." Another example is in *Self-Disclosure* where the slide on social media is an image of "Social Media Explained with Bacon." The seductive details versions all included an underlying musical track called "Acoustic Breeze." The original

track was two minutes and 33 seconds and was well-suited to looping. It was edited to fit the length of each video. Each multimedia package included a non-seductive details version and a seductive details version. Both versions were recorded by each teacher resulting in four versions of each multimedia package.

Tables 9, 10, 11, and 12 describe the design of the four multimedia packages.

Table 9. *Comparison of NSD and SD Elements in Creation Video* (*Video 1*)

	NSD	SD
Word Count	1810	2146 (16%)
Number of Slides	14	14
Number of Images	15	17
Music	No	Yes, *Acoustic Breeze*

Table 10. *Comparison of NSD and SD Elements in Self-Disclosure Video* (*Video 2*)

Self-Disclosure	NSD	SD
Word Count	1308	1729 (25%)
Number of Slides	16	16
Number of Images	18	19*
Music	No	Yes, *Acoustic Breeze*

* Six images were more “stimulating”

Table 11. *Comparison of NSD and SD Elements in History of Courtship 1* (*Video 3*)

History of Courtship Part 1	NSD	SD
Word Count	1360	1949 (31%)
Number of Slides	19	23
Number of Images	20	27
Music	No	Yes, *Acoustic Breeze*

Table 12. *Comparison of NSD and SD Elements in History of Courtship 2* (*Video 4*)

History of Courtship Part 2	NSD	SD
Word Count	1357	1930 (30%)
Number of Slides	15	19
Number of Images	17	24
Music	No	Yes, *Acoustic Breeze*

Prior research has also been criticized for fundamentally altering the structure of the materials. Sadoski (2001) criticized the work of Harp and Mayer (1997, 1998) in their lightning studies for creating one set of materials that was about causes of lighting while the seductive details version could be construed to be about the causes and effects of lighting because the first paragraph set forth approximately half causes and half effects of lightning. In an effort to avoid creating materials that were fundamentally different, the verbal seductive details for this study were chosen to be augmentations of information included in the presentation and placed in the middle of the presentations. For example, the script for the History of Courtship, Part 2, referenced the women's suffrage movement and mentioned Elizabeth Cady Stanton and Susan B. Anthony. In the seductive details version, additional biographical details were added about Elizabeth Cady Stanton and Susan B. Anthony, but the fundamental message paralleling the changes in courtship practices with the evolution of women's rights remained the same.

There is no prior research that compares teacher's voice with a different teacher's voice. For this study teacher's voice referred to the voice of the teacher of the class to whom the student was assigned. The voice belonging to the other teacher who did not teach the student was considered to be a different teacher's voice. Each multimedia

package was created with two versions for voice: the teacher's voice and the different teacher's voice. Teachers recorded the audio tracks in the same room on the same days using the same equipment. The researcher edited the recordings (each teacher had multiple takes) to create audio tracks for each of the PowerPoint™ slides. The two teachers had different speech patterns and the researcher reduced the lengths of the pauses for one teacher to create recordings that were closer in length. Table 13 shows the lengths of each video by teacher.

Table 13. *Video and Version Lengths by Teacher*

Video and Version	Teacher A (female)	Teacher B (male)
Creation NSD	13:34	12:13
Creation SD	17:39	15:57
Self-Disclosure NSD	11:15	10:46
Self-Disclosure SD	14:23	13:51
History of Courtship, Pt 1 NSD	10:14	8:56
History of Courtship, Pt 1 SD	14:19	12:51
History of Courtship, Pt 2 NSD	10:20	9:35
History of Courtship, Pt 2 SD	15:25	13:49

The pool of teachers for this course included three women and one man. For the semester of the study, one woman and one man were assigned to each teach three of the six sections of the course. Both teachers are native English speakers and neither has a non-regional accent. A total of 16 multimedia packages were created for this study.

Procedures

The 134 participants enrolled in the fall semester of Christian Sexuality, a required ninth grade, semester-long course, were individually and randomly assigned to one of four groups: 1. Seductive Details/Teacher Voice (SD/TV), 2. No Seductive

Details/Teacher Voice (NSD/TV), 3. Seductive Details/Different Teacher Voice (SD/DTV), or 4. No Seductive Details/Different Teacher Voice (NSD/DTV). All students received four teacher-created multimedia packages on four separate content areas for the course over a period of approximately four weeks. The multimedia packages provided the introduction to each of the content areas and were designed collaboratively by the teachers and researcher with and without seductive details. In class sessions between multimedia treatments, teachers used their standard teaching activities including lecture, discussion, video clips, student presentations, and student individual and group work. The study was set in a high school with a one-to-one, bring-your-own laptop program. Every student has his/her own laptop computer which is used for a variety of tasks throughout the school day. Students also regularly use the generally robust school network to connect to the internet for resources outside of the physical classroom.

During the orientation week in August, students were individually and randomly assigned to one of four conditions for the duration of the experiment: 1. SD/TV; 2. NSD/TV; 3. SD/DTV; or 4. NSD/DTV. To prevent teachers from checking group assignments, the researcher created a parallel course shells in the LMS for the research and randomly assigned each student to one of the four groups. Teachers were not informed about which treatment each student received. Teachers agreed to four dates in August and September on which they deployed the multimedia learning objects during class time.

Because of Monday holidays and curricular timing, Video 1 and Video 2 were each deployed on Mondays, while Video 3 and Video 4 were deployed on Tuesday/Thursday or Wednesday/Friday, respectively. All seven class periods of a

student's schedule met on Mondays for 45 minutes. Three periods (1, 2, 3) met on Tuesdays and Thursdays for 80 minutes while the remaining four periods (4, 5, 6, 7) met on Wednesdays and Fridays for 80 minutes. For most videos, teachers began the scheduled periods with the multimedia package. Students were read the same directions by both teachers instructing them to open the class in the LMS, to read the directions, watch the video (ranging from just under 10 minutes to just under 18 minutes), and then to open the quiz and respond to the 15 questions (Appendix S). Students were allowed as much time as they needed to complete the quizzes. The four versions of the videos had slightly different running times (generally less than two minutes difference by voice and less than four minutes by details).

Students watched the multimedia material assigned to them using their laptops and their own headphones. Headphones were provided to students who did not have headphones in class. In each of the learning sessions, after completing the video, students completed the retention and problem-solving tests, which were delivered and scored through the LMS.

Data Analyses

The study used a 2 x2 factorial design that included a measure of prior knowledge for each of the four multimedia packages. Descriptive statistics (means, standard deviations) are reported in Chapter IV. To answer research questions 1 and 2, data analysis was conducted using eight two-way analyses of variances (ANOVAs) to determine if significant differences existed between conditions. The data did not meet the assumptions for an ANCOVA. The seductive details condition was compared with the no seductive details condition, the teacher voice condition was compared with the different

teacher voice condition, and the analysis examined the interaction between the seductive details and the teacher's voice. The significance level for analysis was set at 0.05. Pearson Product Moment Correlation coefficients were calculated for prior knowledge with details (SD and NSD) prior knowledge with voice (TV and DTV). These analyses were used because the data did not meet the assumptions for an ANCOVA. The Statistical Package for the Social Sciences (SPSS) was used for the statistical analysis of the data.

CHAPTER IV

RESULTS

The purpose of this study was to test the coherence principle in a realistic setting using a heterogeneous group of ninth grade students in a humanities course to determine the effect of seductive details on retention and problem-solving transfer. Additionally, this study extended the emerging voice principle by examining the effect of the teacher's voice on student learning as measured by retention and problem-solving transfer. Finally, the study also looked at the association among prior knowledge, retention, and problem-solving transfer.

Accordingly, the study used a series of 2 x 2 between subjects factorial designs and randomly assigned students across six class periods to one of four groups: seductive details and teacher's voice (SD/TV), no seductive details and teacher's voice (NSD/TV), seductive details and different teacher's voice (SD/DTV), or no seductive details and different teacher's voice (NSD/DTV). Students remained in the same groups for each of four videos. The independent variables were details (seductive or no seductive details) and voice (teacher voice or different teacher voice). The dependent variables were retention, as measured by a seven question multiple-choice retention test after each video and problem-solving transfer, as measured by a two-tiered, four question multiple-choice

test after each video. When statistically significant differences exist, *p* values are reported in the table, otherwise no *p* values are reported. For all statistical tests, *p* was set at .05. Cohen's *d* is reported in descriptive tables regardless of a finding of statistical significance. A small effect size is 0.20, a medium effect is 0.50, and a large effect is 0.80 (Cohen, 1988).

This section first provides descriptive statistics for research questions one and two. Next, the further analysis of data for answer questions one and two is described. Then research question three is considered. Finally, the section concludes with a summary.

Research Question 1

What is the effect of seductive details at four testing times in teacher-created multimedia on retention (the ability to recall content) and on problem-solving transfer (the ability to use content knowledge in a new and different context)?

The first research question examined whether or not there was a statistical difference between seductive details and no seductive details as measured by multiple-choice retention and problem-solving transfer measures. Scores in general were low for the measures. The retention measures had a total possible score of 7 and the transfer measures had a total possible score of 12. The retention measure scores averages as a percentage ranged from 32% to 78% while the transfer scores averages ranged from 27% to 51%. Table 14 provides the descriptive statistics for all conditions for videos on the dependent variable of retention. Cohen's *d* was calculated using the totals from the no seductive details (NSD) groups and the totals from the seductive details group (SD).

Table 14. *Descriptive Statistics and Cohen's d for Retention by Details for Videos 1-4*

Video	Details	Voice	M	SD	*d*	N
1	NSD	DTV	2.53	1.32		32
		TV	2.43	1.31		30
		Total	2.48	1.30		62
	SD	DTV	2.40	1.48		30
		TV	2.91	0.84		33
		Total	2.67	1.21	0.15	63
2	NSD	DTV	5.47	1.42		34
		TV	5.18	1.33		33
		Total	5.33	1.38		67
	SD	DTV	5.41	1.41		32
		TV	5.48	1.30		33
		Total	5.45	1.35	0.09	65
3	NSD	DTV	3.32	1.80		34
		TV	3.55	1.52		33
		Total	3.43	1.66		67
	SD	DTV	3.72	1.49		32
		TV	3.14	1.59		35
		Total	3.42	1.56	0.01	67
4	NSD	DTV	3.03	1.58		32
		TV	2.58	1.86		31
		Total	2.81	1.72		63
	SD	DTV	2.80	1.65		30
		TV	2.29	1.58		35
		Total	2.52	1.62	0.17	65

NSD = No Seductive Details; SD = Seductive Details; DTV = Different Teacher Voice; TV = Teacher Voice

On Videos 1, 2, and 4, the students in the seductive details condition scored slightly higher on the retention measure than did the students in the no seductive details condition. The effect sizes were very small (Cohen's d = 0.15, 0.09, 0.17), and for Video 2 the effect size favoring no seductive details was minuscule (Cohen's d = 0.01).

Descriptive statistics for the problem-solving transfer measure by details for all of the videos are reported in Table 15. Cohen's *d* was calculated using the totals from the no seductive details (NSD) groups and the totals from the seductive details group (SD).

Table 15. *Videos 1-4 Descriptive Statistics and Cohen's d for Problem-Solving Transfer Details*

Video	Details	Voice	M	SD	*d*	N
1	NSD	DTV	5.19	2.21		32
		TV	4.90	2.23		30
		Total	5.05	2.21		62
	SD	DTV	5.67	2.59		30
		TV	6.18	2.42		33
		Total	5.94	2.49	0.38*	63
2	NSD	DTV	3.79	1.72		34
		TV	3.94	1.87		33
		Total	3.87	1.78		67
	SD	DTV	3.97	1.60		32
		TV	3.27	1.55		33
		Total	3.62	1.60	0.15	65
3	NSD	DTV	4.62	3.13		34
		TV	4.94	2.41		33
		Total	4.78	2.78		67
	SD	DTV	5.50	2.21		32
		TV	4.37	2.46		35
		Total	4.91	2.40	0.05	67
4	NSD	DTV	4.19	3.17		32
		TV	3.52	2.28		31
		Total	3.86	2.76		63
	SD	DTV	4.73	2.85		30
		TV	4.09	2.66		35
		Total	4.38	2.75	0.19	65

*$p < .05$

On Videos 1, 3, and 4, the students in the seductive details condition scored slightly higher on the problem-solving transfer measure than did the students in the no seductive details condition. The effect sizes were small with Video 1 (Cohen's $d = 0.38$) for the seductive details version and small with Video 2 ($d = 0.15$) for the no seductive details version, Video 3 ($d = 0.05$) for the seductive details version, and Video 4 ($d = 0.19$) for the seductive details version.

Research Question 2

What is the effect of the teacher's voice at four testing times in teacher-created multimedia on retention and problem-solving transfer?

Table 16 reports descriptive statistics and Cohen's *d* for the retention measures for the independent variable voice for each of the four videos. Cohen's *d* was calculated using the means of different teacher voice and teacher voice.

Table 16. *Descriptive Statistics and Cohen's d for Retention by Voice for Videos 1-4*

Video	Voice	M	SD	*d*	N
1	DTV	2.47	1.39		62
	TV	2.68	1.11		63
	Total	2.58	1.25	0.17	125
2	DTV	5.44	1.41		66
	TV	5.33	1.32		66
	Total	5.39	1.36	0.08	132
3	DTV	3.52	1.66		66
	TV	3.34	1.56		68
	Total	3.43	1.61	0.11	134
4	DTV	2.92	1.60		62
	TV	2.42	1.71		66
	Total	2.66	1.67	0.30	128

Inspection of the table reveals that teacher voice was an advantage in Video 1 with a small measure of practical importance (Cohen's $d = 0.17$). In Video 2 the different teacher voice provides a small effect (Cohen's $d = 0.08$). Video 3 shows a slight increase for the small effect size for different teacher voice (Cohen's $d = 0.11$), and Video 4 reveals a small effect size for different teacher voice (Cohen's $d = 0.30$).

Table 17 provides the descriptive statistics and Cohen's *d* for the problem-solving transfer measure for each of the four videos. Cohen's *d* was calculated using the means of different teacher voice and teacher voice.

Table 17. *Problem-Solving Transfer Descriptive Statistics for Voice by Video*

Video	Voice	M	SD	*d*	N
1	DTV	5.42	2.39		62
	TV	5.57	2.40		63
	Total	5.50	2.39	0.06	125
2	DTV	3.88	1.65		66
	TV	3.61	1.74		66
	Total	3.74	1.69	0.16	132
3	DTV	5.05	2.74		66
	TV	4.65	2.44		68
	Total	4.84	2.59	0.15	134
4	DTV	4.45	3.01		62
	TV	3.82	2.49		66
	Total	4.13	2.76	0.23	128

Table 17 shows that for Video 1 students who had their teacher's voice performed slightly better (Cohen's $d = 0.06$) on problem-solving transfer measures than their peers who had a different teacher's voice. For the subsequent videos, students who were in the different teacher's condition outperformed the teacher's voice condition. Video 2 (Cohen's $d = 0.16$), Video 3 (Cohen's $d = 0.15$) and Video 4 (Cohen's $d = 0.23$) show small but increasing effect sizes for the different teacher's voice group.

Data analysis

For each of the four videos, data were collected for the dependent variables of retention and problem-solving transfer. Because of unequal assignment to classes and student absences, the cell sizes were similar but not balanced. Data were inspected for outliers. One outlier was identified as assessed by being greater than three box-lengths from the edge of the box in a box plot for the NSD/DTV condition in Video 1 Retention. The outlier was retained.

Data were also inspected regarding the assumption of normality. The sample size, 134, resulted in cell sizes ranging from 30-34, generally viewed as robust for the

assumption of normality. There was not homogeneity of variances, as assessed by Levene's test for equality of variances, for video 1 retention, $p = .02$. There was homogeneity of variance for all remaining groups and measures. Despite not meeting all six of the assumptions for a two-way ANOVA for each group and each measure, eight two-way ANOVAs were conducted to examine interaction effects.

The plots for the eight interaction effects are in figures 1-8 below and the results of the between-subjects effects tests follow each figure. Significance was set at $p = .05$. The dashed line signifies teacher voice in all plots.

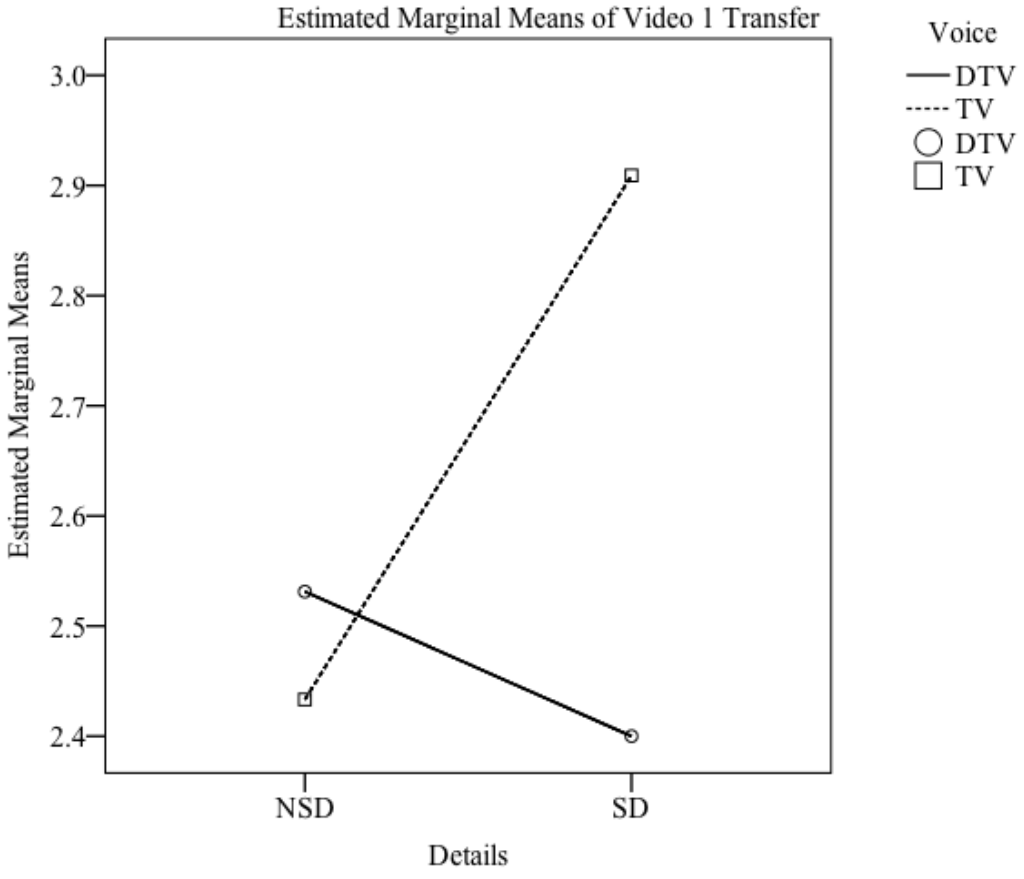

Figure 2. Interaction Plot for Video 1 Retention Details to Voice.

Figure 2 shows a potential interaction effect between levels of details and levels of voice for Video 1. The interaction was not statistically significant, $F(1, 121) = 1.84$,

p = .18. There was no main effect for details $F(1,121) = 0.59$, p = .44 or voice $F(1,121)$ = 0.84, p = .36 for Video 1 retention.

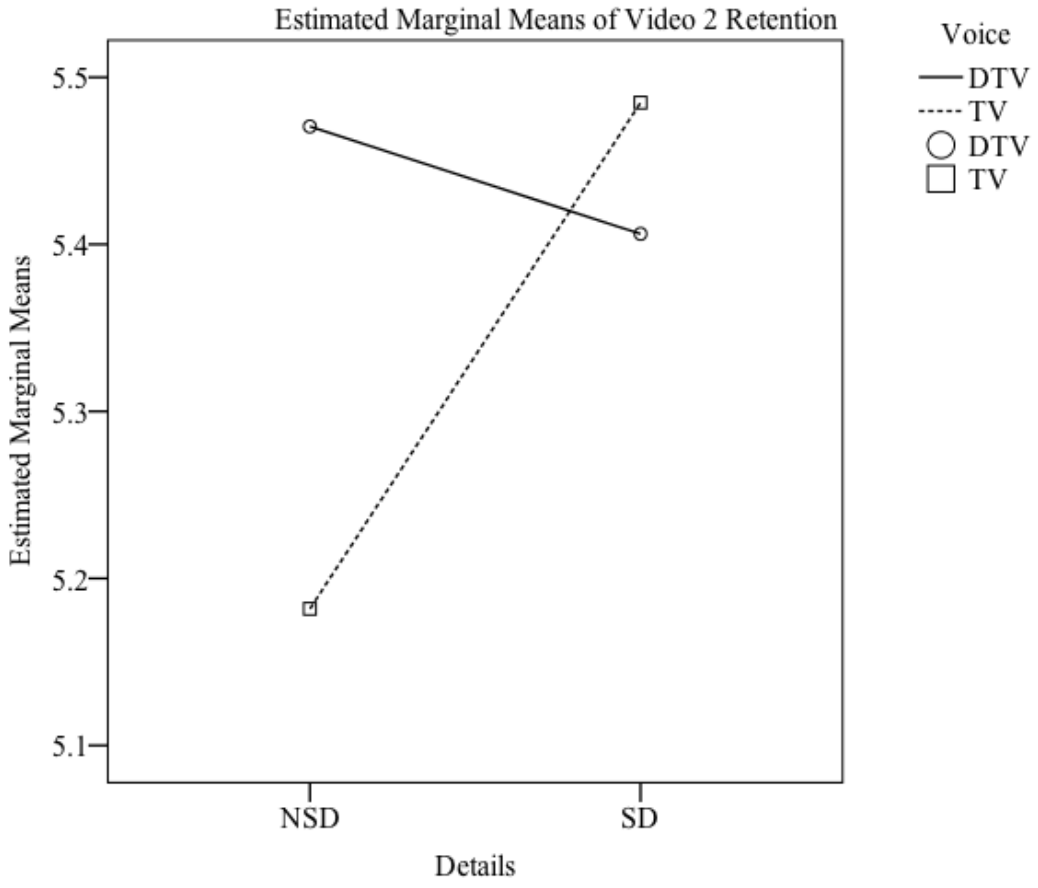

Figure 3. Interaction Plot Video 2 Retention Details to Voice.

Figure 3 reveals a potential interaction effect between details and voice. The interaction between level of detail and level of voice on retention in Video 2 was not statistically significant, $F(1,128) = 0.60$, p = .44. There was no main effect for details $F(1,128) = 0.25$, p = .62 or voice $F(1,128) = 0.20$, p = .66

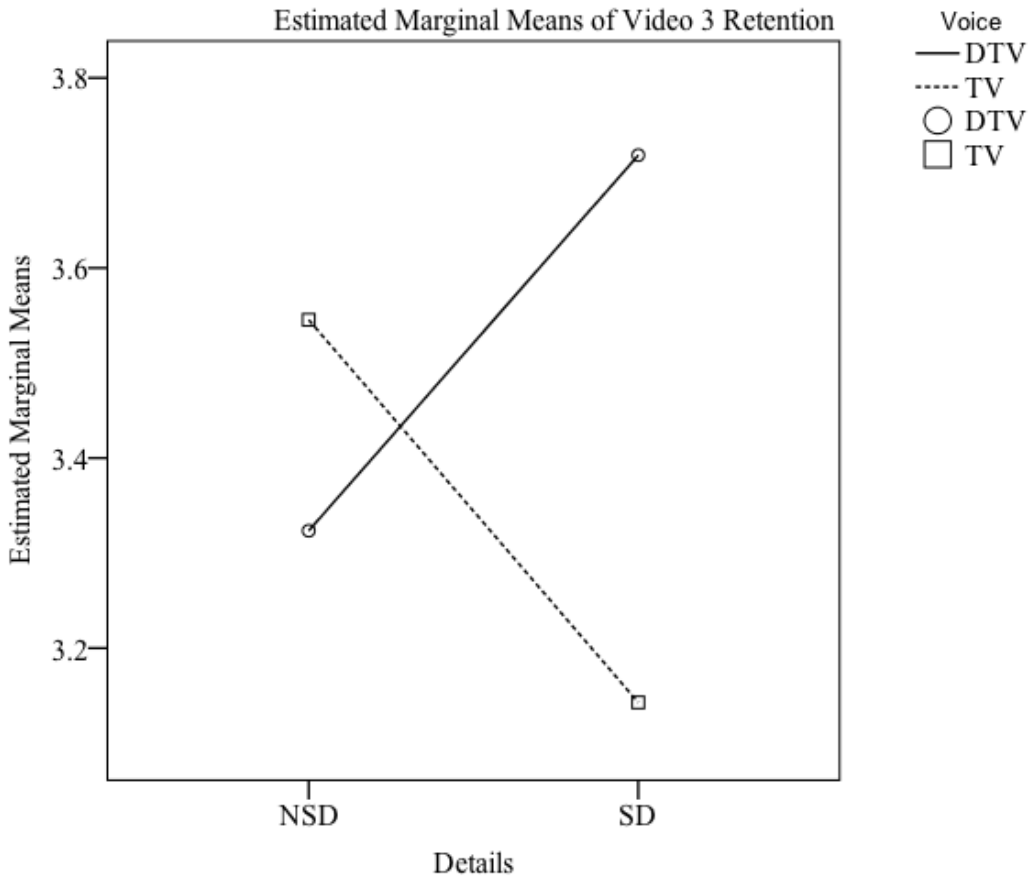

Figure 4. Interaction Plot Video 3 Retention Details to Voice.

Figure 4 reveals a potential interaction effect between details and voice. The interaction between level of detail and level of voice on retention in Video 3 was not statistically significant, $F(1, 130) = 2.06$, $p = .15$. There was no main effect for details $F(1,130) = 0.00$, $p = .99$ or voice $F(1,130) = 0.41$, $p = .53$.

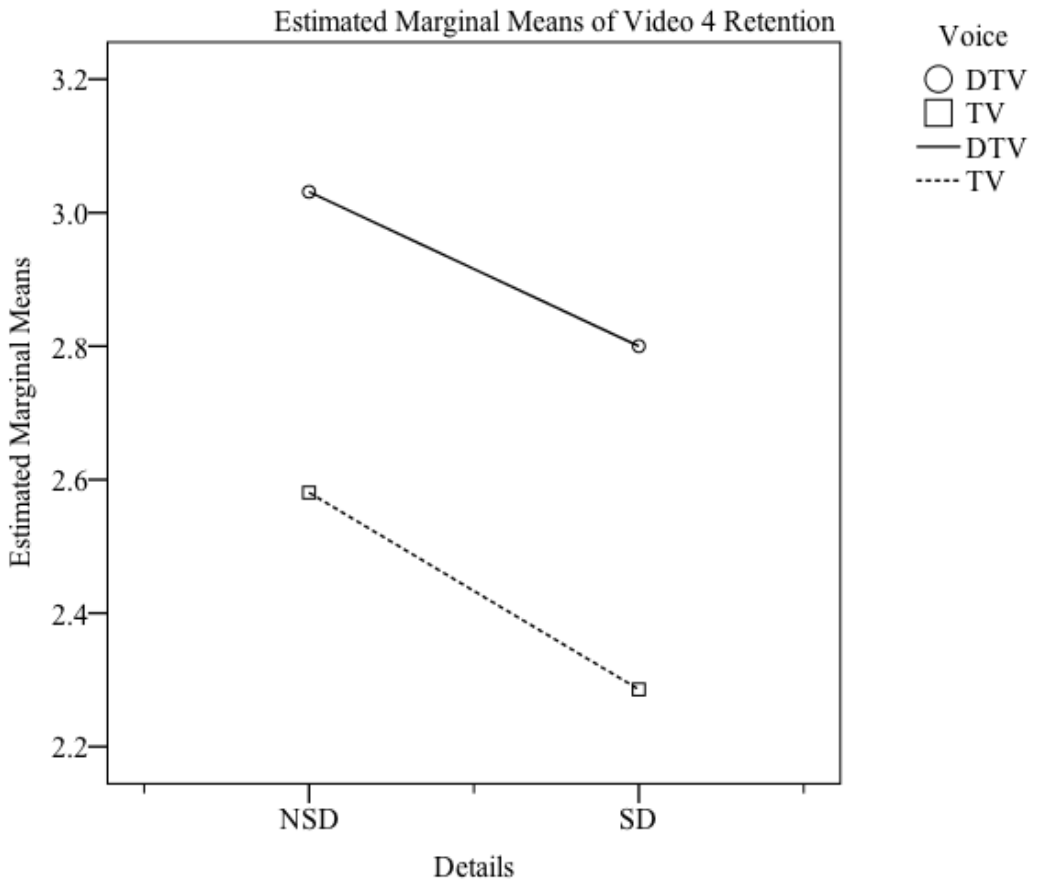

Figure 5. Interaction Plot Video 4 Retention Details to Voice.

Figure 5 reveals no interaction effect between levels of details and levels of voice for retention for Video 4. There was no main effect for details $F(1,124) = 0.80$, $p = .37$ or voice $F(1,124) = 2.67$, $p = .11$.

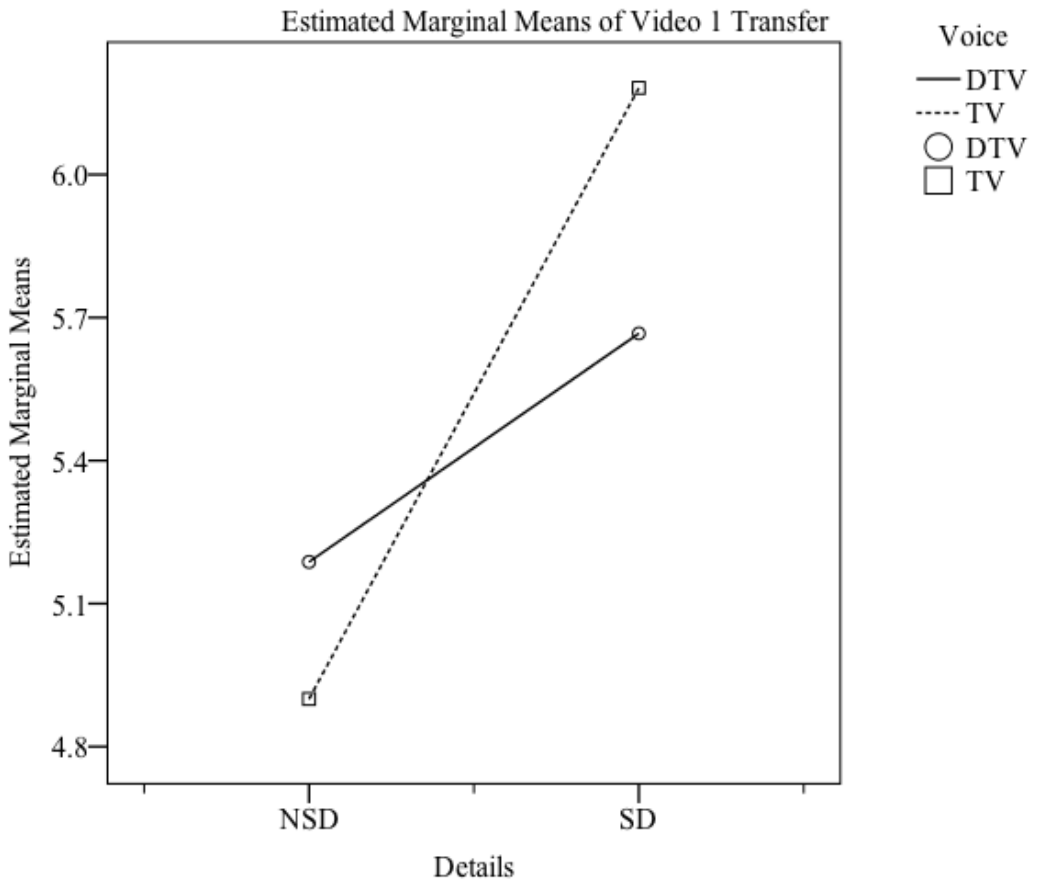

Figure 6. Interaction Plot Video 1 Problem-Solving Transfer Details to Voice.

Figure 6 reveals a potential interaction effect between details and voice. The interaction between level of detail and level of voice on problem-solving transfer in Video 1 was not statistically significant, $F(1, 121) = 0.97$, $p = .33$. There was a statistically significant main effect for details, $F(1, 121) = 4.32$, $p < .05$ on transfer. A pairwise comparison with the Bonferroni adjustment for multiple comparisons identified a 0.88 mean difference advantage for students in the seductive details group on the transfer measure with a small effect size ($d = 0.36$).

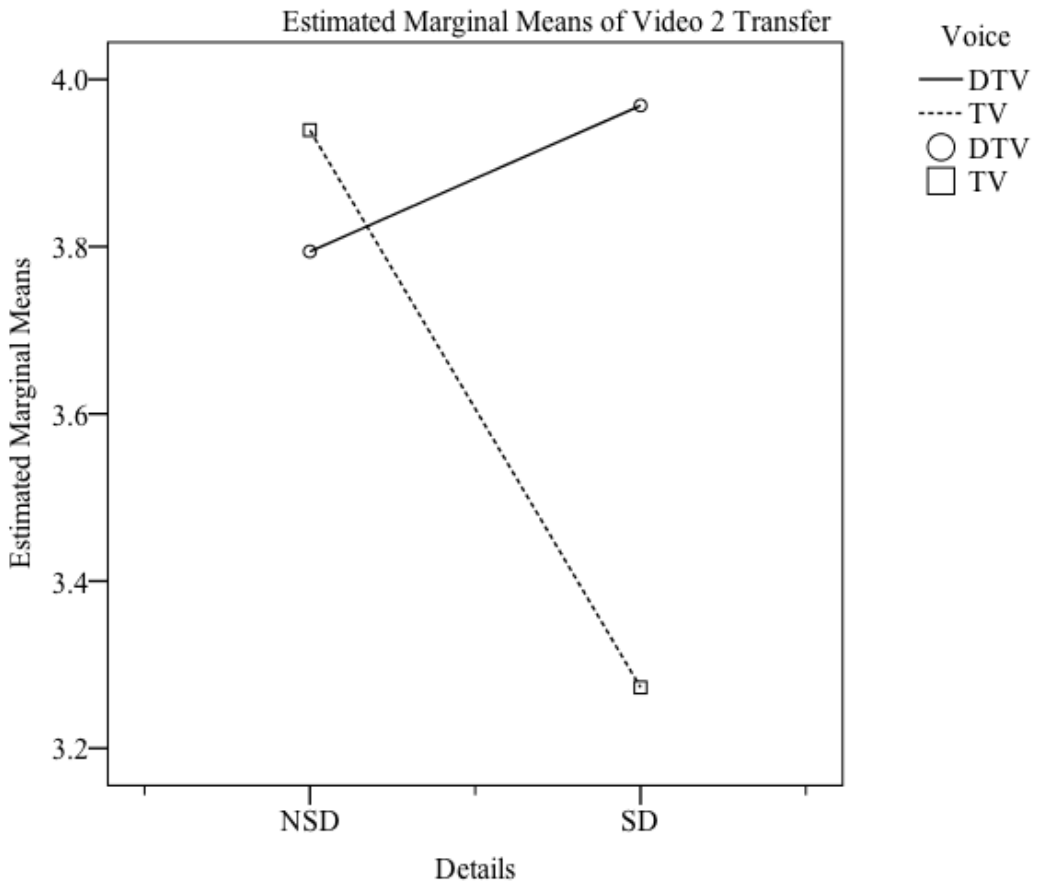

Figure 7. Interaction Plot Video 2 Problem-Solving Transfer Details to Voice.

Figure 7 reveals a potential interaction effect between details and voice. The interaction between level of detail and level of voice on transfer in Video 2 was not statistically significant, $F(1, 128) = 2.22$, $p = .14$. There was no statistically significant main effect for details $F(1,128) = 0.99$, $p = .32$ or voice .$F(1,128) = 0.79$, $p = .38$.

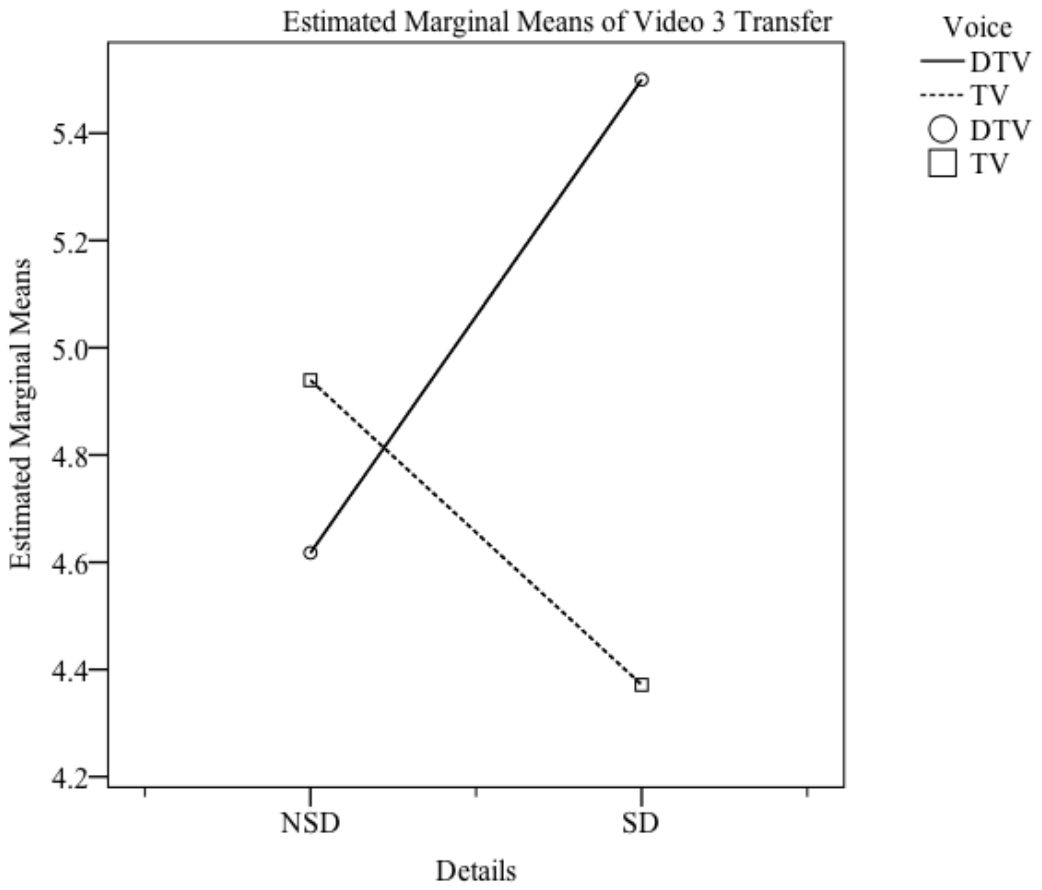

Figure 8. Interaction Plot Video 3 Problem- Solving Transfer Details to Voice.

Figure 8 reveals a potential interaction effect between details and voice. The interaction between level of detail and level of voice on problem-solving transfer in Video 3 was not statistically significant, $F(1, 130) = 2.67$, $p = .11$. There was no statistically significant main effect for details, $F(1, 130) = 0.12$, $p = .73$ or for voice, $F(1, 130) = 0.82$, $p = .37$.

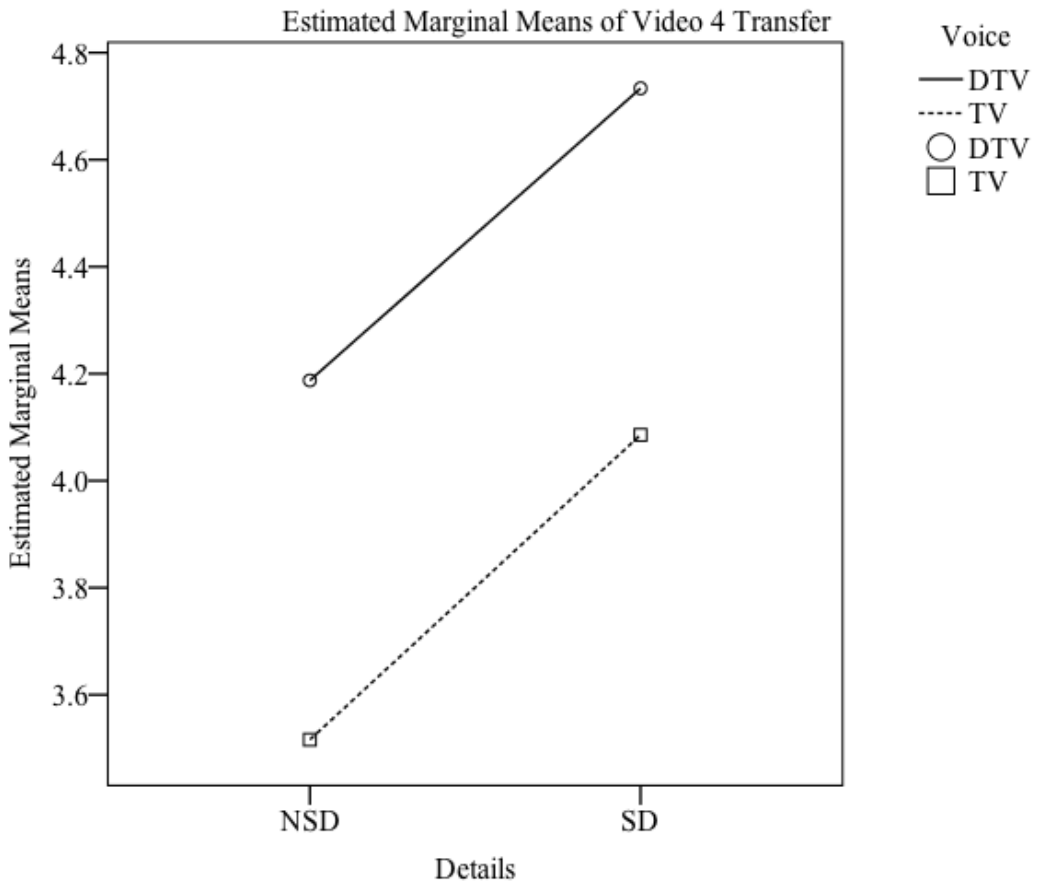

Figure 9. Interaction Plot Video 1 Problem-Solving Transfer Details to Voice.

Figure 9 reveals no interaction effect between levels of details and levels of voice for problem-solving transfer in Video 4. There was no main effect for details, $F(1, 124) = 1.30$, $p = .26$ or for voice, $F(1, 124) = 1.82$, $p = .18$.

Research Question 3

What is the relationship between prior knowledge, details, and voice?

The third research question investigated the association between prior knowledge, seductive details and teacher voice. Prior to the first instructional video, students completed a prior knowledge inventory that sought to differentiate levels of prior knowledge in each of the three knowledge areas addressed in the videos. Results are

reported for prior knowledge for each video with three tables: a table by details, a table by voice, and a table by group. The tables include descriptive statistics and report statistically significant correlations with prior knowledge.

The prior knowledge inventory was designed to assess prior knowledge in each of the three content areas: Creation, Self-Disclosure, and History of Courtship. Table 18 reports sample size, means, standard deviations, range, and minimum and maximum scores.

Table 18. *Descriptive Statistics for Prior Knowledge Measures*

PK Measure	N	M	SD	Min.	Max.
Creation	133	37.32	19.77	5	84
Self-Disclosure	133	8.58	3.42	0	12
Courtship	133	8.72	4.98	0	18

The prior knowledge inventory for Video 1 addressed prior knowledge of scripture and experience with the two creation stories set forth in the first chapters of Genesis (Appendix D). Table 19 reports means, standard deviations and sample sizes for grouping by details for prior knowledge of creation, Video 1 retention and Video 1 transfer. It also reports Pearson Product Moment Correlation Coefficients.

Table 19. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients by Details for Video 1*

Details		M	SD	*r*	N
NSD	Prior Knowledge	38.68	18.99		66
	Retention	2.48	1.30	-.13	62
	Transfer	5.05	2.21	.39**	62
SD	Prior Knowledge	35.97	20.56		67
	Retention	2.67	1.21	-.08	63
	Transfer	5.94	2.49	-.10	63

**Correlation is significant at the 0.01 level (1-tailed).

Prior knowledge of the creation stories resulted in a statistically significant, small, positive correlation between prior knowledge and transfer for the group with no seductive details.

Table 20 provides results for prior knowledge with Video 1 for groupings by voice.

Table 20. *Descriptive Statistics and Prior Knowledge Pearson Product Moment Correlation Coefficients by Voice for Video 1*

Voice	Measure	M	SD	*r*	N
DTV	Prior Knowledge	37.18	19.70		66
	Retention	2.47	1.39	-.10	62
	Transfer	5.42	2.39	-.02	62
TV	Prior Knowledge	37.45	19.98		67
	Retention	2.68	1.11	-.12	63
	Transfer	5.57	2.40	.23*	63

* Correlation is significant at the 0.05 level (1-tailed).

Prior knowledge of the creation stories resulted in a statistically significant, small, positive correlation between prior knowledge and transfer for the group with teacher voice.

Table 21 provides results for Video 1 for prior knowledge by groupings of details and voice.

Table 21. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Groups for Video 1*

Details	Voice	Measure	M	SD	*r*	N
NSD	DTV	Prior Knowledge	38.56	17.43		34
		Retention	2.53	1.32	-.04	32
		Transfer	5.19	2.21	-.10	32
	TV	Prior Knowledge	38.81	20.79		32
		Retention	2.43	1.31	-.23	30
		Transfer	4.90	2.23	.50*	30
SD	DTV	Prior Knowledge	35.72	22.04		32
		Retention	2.40	1.48	-.15	30
		Transfer	5.67	2.59	-.22	30
	TV	Prior Knowledge	36.20	19.43		35
		Retention	2.91	.84	.04	33
		Transfer	6.18	2.42	.03	33

* Correlation is significant at the 0.05 level (1-tailed).

Prior knowledge of the creation stories resulted in a statistically significant moderate positive correlation between prior knowledge and transfer for the group with no seductive details and teacher voice.

Prior knowledge for Video 2 was assessed by asking questions about what is appropriate to disclose to whom at what point in relationships (Appendix D). Three tables follow reporting descriptive statistics and Pearson Product Moment Correlation Coefficients for Video 2. Table 22 provides the descriptive statistics for prior knowledge by details for Video 2.

Table 22. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Details for Video 2*

Details	Measure	M	SD	*r*	N
NSD	Prior Knowledge	8.80	3.16		66
	Retention	5.33	1.38	.06	67
	Transfer	3.87	1.78	.11	67
SD	Prior Knowledge	8.36	3.68		67
	Retention	5.45	1.35	.08	65
	Transfer	3.62	1.60	.02	65

There were no statistically significant correlations for prior knowledge and details for Video 2. Table 23 provides the data for prior knowledge by voice for Video 2.

Table 23. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Voice for Video 2*

Voice	Measure	M	SD	*r*	N
DTV	Prior Knowledge	8.21	3.58		66
	Retention	5.44	1.41	-.03	66
	Transfer	3.88	1.65	.01	66
TV	Prior Knowledge	8.94	3.25		67
	Retention	5.33	1.32	.19	66
	Transfer	3.61	1.74	.15	66

Table 23 reveals that there were no statistically significant correlations for prior knowledge and voice. Table 24 below provides the descriptive statistics and correlations for prior knowledge by groupings of details and voice for Video 2.

Table 24. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Group for Video 2*

Details	Voice	Measure	M	SD	*r*	N
NSD	DTV	Prior Knowledge	8.44	3.36		34
		Retention	5.47	1.42	.06	34
		Transfer	3.79	1.72	.15	34
	TV	Prior Knowledge	9.19	2.93		32
		Retention	5.18	1.33	.10	33
		Transfer	3.94	1.87	.07	33
SD	DTV	Prior Knowledge	7.97	3.84		32
		Retention	5.41	1.41	-.12	32
		Transfer	3.97	1.60	-.12	32
	TV	Prior Knowledge	8.71	3.54		35
		Retention	5.48	1.30	.30*	33
		Transfer	3.27	1.55	.21	33

*. Correlation is significant at the 0.05 level (1-tailed).

Inspection of Table 24 reveals a small, statistically significant, positive correlation between prior knowledge and retention for the seductive details teacher voice group.

Prior knowledge for Video 3, History of Courtship Part 1, and Video 4, History of Courtship Part 2, was assessed by asking students what they knew about dating and marriage (Appendix D). Student responses for prior knowledge for Videos 1 and 2 were not included in this inventory. Six tables follow reporting descriptive statistics and Pearson Product Moment Correlation Coefficients for Video 3 and Video 4. Table 25 provides the descriptive statistics for prior knowledge by details for Video 3.

Table 25. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Details for Video 3*

Details	Measure	M	SD	*r*	N
NSD	Prior Knowledge	9.17	5.24		66
	Retention	3.43	1.66	.24*	67
	Transfer	4.78	2.78	.15	67
SD	Prior Knowledge	8.28	4.71		67
	Retention	3.42	1.56	-.02	67
	Transfer	4.91	2.40	.10	67

* Correlation is significant at the 0.05 level (1-tailed).

Table 25 reveals a statistically significant small positive correlation between prior knowledge and retention for the no seductive details group for Video 3. Table 26 below provides the descriptive statistics and correlations for prior knowledge and voice for Video 3.

Table 26. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Voice for Video 3*

Voice	Measure	M	SD	*r*	N
DTV	Prior Knowledge	8.36	5.06		66
	Retention	3.52	1.66	.28*	66
	Transfer	5.05	2.74	.15	66
TV	Prior Knowledge	9.07	4.92		67
	Retention	3.34	1.56	-.05	68
	Transfer	4.65	2.44	.11	68

* Correlation is significant at the 0.05 level (1-tailed).

Table 26 reveals a statistically significant small positive correlation between prior knowledge and retention for Video 3 for the group with the different teacher's voice. Table 27 provides the descriptive statistics and correlations for groupings by details and voice for Video 3.

Table 27. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Group for Video 3*

Details	Voice	Measure	M	SD	*r*	N
NSD	DTV	Prior Knowledge	8.56	5.36		34
		Retention	3.32	1.80	.52**	34
		Transfer	4.62	3.13	.14	34
	TV	Prior Knowledge	9.81	5.11		32
		Retention	3.55	1.52	-.16	33
		Transfer	4.94	2.41	.14	33
SD	DTV	Prior Knowledge	8.16	4.79		32
		Retention	3.72	1.49	-.05	32
		Transfer	5.50	2.21	.18	32
	TV	Prior Knowledge	8.40	4.70		35
		Retention	3.14	1.59	.01	35
		Transfer	4.37	2.46	.05	35

** Correlation is significant at the 0.01 level (1-tailed).

Table 27 reveals a statistically significant, moderate positive correlation between prior knowledge and retention for the group with no seductive details and different teacher voice.

Table 28 provides the descriptive statistics and correlations for prior knowledge and details for Video 4.

Table 28. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Details for Video 4*

Details	Measures	M	SD	*r*	N
NSD	Prior Knowledge	9.17	5.24		66
	Retention	2.81	1.72	.11	63
	Transfer	3.86	2.76	.15	63
SD	Prior Knowledge	8.28	4.71		67
	Retention	2.52	1.62	.13	65
	Transfer	4.38	2.75	.13	65

No statistically significant correlations are reported in Table 28. Table 29 reports the descriptive statistics and correlations for prior knowledge and voice for Video 4.

Table 29. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Voice for Video 4*

Voice	Measures	M	SD	*r*	N
DTV	Prior Knowledge	8.36	5.06		66
	Retention	2.92	1.60	.22*	62
	Transfer	4.45	3.01	.03	62
TV	Prior Knowledge	9.07	4.92		67
	Retention	2.42	1.71	.07	66
	Transfer	3.82	2.49	.28*	66

*Correlation is significant at the 0.05 level (1-tailed).

Table 29 shows a statistically significant, small, positive correlation between prior knowledge and retention for different teacher voice and a statistically significant, small, positive correlation between prior knowledge and transfer for different teacher voice. Table 30 reports descriptive statistics and Pearson Product Moment Correlation Coefficients by groupings of details and voice for prior knowledge, retention, and transfer.

Table 30. *Descriptive Statistics and Pearson Product Moment Correlation Coefficients for Prior Knowledge by Group for Video 4*

Details	Voice	Measure	M	SD	*r*	N
NSD	DTV	Prior Knowledge	8.56	5.36		34
		Retention	3.03	1.58	.14	32
		Transfer	4.19	3.17	.07	32
	TV	Prior Knowledge	9.81	5.11		32
		Retention	2.58	1.86	.11	31
		Transfer	3.52	2.28	.35*	31
SD	DTV	Prior Knowledge	8.16	4.79		32
		Retention	2.80	1.65	.31*	30
		Transfer	4.73	2.85	-.01	30
	TV	Prior Knowledge	8.40	4.70		35
		Retention	2.29	1.58	-.01	35
		Transfer	4.09	2.66	.28	35

*Correlation is significant at the 0.05 level (1-tailed).

Table 30 reveals a statistically significant, small, positive correlation between prior knowledge and transfer for the no seductive details teacher voice group, and a statistically significant, small, positive correlation between prior knowledge and retention for the seductive details different teacher voice group.

Table 31 reports all statistically significant correlations for prior knowledge for all four videos by measure.

Table 31. *Statistically Significant Pearson Product Moment Correlation Coefficients for Prior Knowledge by Measure and Condition*

Measure	Details	Voice	*r*	N
V1 Transfer	NSD		.39**	62
V1 Transfer		TV	.23*	63
V1 Transfer	NSD	TV	.50*	30
V4 Transfer		TV	.28*	66
V4 Transfer	NSD	TV	.35*	31
V2 Retention	SD	TV	.30*	33
V3 Retention	NSD		.24*	67
V3 Retention		DTV	.28*	66
V3 Retention	NSD	DTV	.52**	34
V4 Retention		DTV	.22*	62
V4 Retention	SD	DTV	.31*	30

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Table 31 reveals that prior knowledge was statistically significantly correlated (positive, small to medium) with no seductive details and/or teacher voice for the measure of transfer in Video 1 and Video 4. Prior knowledge for retention measures has a small, positive correlation with seductive details and teacher voice for Video 2 and with seductive details and different teacher voice for Video 4. For Video 3 retention measures, prior knowledge was associated (small to medium, positive correlations) with no seductive details and/or different teacher voice. Prior knowledge also had a small,

positive correlation with different teacher voice for retention on Video 4. Table 30 shows that prior knowledge was positively associated with transfer for teacher's voice and with retention with different teacher's voice.

Summary of Results

The purpose of this study was to test the coherence principle in a realistic setting using a heterogeneous group of ninth grade students in a humanities course to determine the effect of seductive details on retention and problem-solving transfer. Additionally, this study extended the emerging voice principle by examining the effect of the teacher's voice on student learning as measured by retention and problem-solving transfer. Finally, the study also looked at associations among prior knowledge, retention, and problem-solving transfer.

Figure 10 summarizes all of the statistically significant results from this study.

ANOVA Results Video 1

Measure	df	*F*	*d*	*p*
V1 Transfer	121	4.32	0.36	.04

Pearson Product Moment Correlations

Retention				Problem-Solving Transfer			
Video	Details	Voice	*r*	Video	Details	Voice	*r*
V3	NSD		.24*	V1	NSD		.39**
V3		DTV	.28*	V1		TV	.23*
V4		DTV	.22*	V4		TV	.28*
V2	SD	TV	.30*	V1	NSD	TV	.50*
V3	NSD	DTV	.52**	V4	NSD	TV	.35*
V4	SD	DTV	.31*				

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Figure 10. Summary of Statistically Significant Results

One statistically significant difference was found for Video 1 problem-solving transfer where students who received seductive details outperformed their peers who did

not. Several statistically significant, small to moderate, positive correlations also were found between prior knowledge and retention or transfer by treatments. Prior knowledge was statistically significantly correlated with no seductive details and/or teacher voice for the measure of transfer in Video 1 and Video 4. Prior knowledge for retention measures was correlated with seductive details and teacher voice for Video 2 and with seductive details and different teacher voice for Video 4. For Video 3 retention measures, prior knowledge was associated with no seductive details and different teacher voice. Prior knowledge was also correlated with different teacher voice for Video 4 retention. The correlations with prior knowledge were limited to the no seductive details condition, the teacher voice condition, and the no seductive details with teacher voice condition for measures of transfer. In contrast, with retention measures prior knowledge tended to be associated with the groups that had different teacher voice. Generally, prior knowledge was positively associated with transfer for teacher's voice and with retention for different teacher's voice.

CHAPTER V

DISCUSSION OF RESULTS

The purpose of the study was to test the coherence principle in a realistic setting using a heterogeneous group of ninth grade students in a humanities course to determine the effect of seductive details on retention and problem-solving transfer. Additionally, this study extended the emerging voice principle by examining the effect of the teacher's voice on student learning as measured by retention and problem-solving transfer. Finally, this study collected a measure of prior knowledge to examine the relationship between prior knowledge, retention, and problem-solving transfer. This chapter summarizes the study, examines the limitations, discusses the findings, reaches conclusions and identifies implications for research and practice.

Summary of the Study

Multimedia, both commercial and teacher-created, is a widely used instructional tool in secondary classrooms. The relative ease with which teachers can now produce multimedia for their students creates a practical need for research-based guidelines for effective design. Research in text and multimedia suggests that including interesting but instructionally irrelevant details to motivate student interest creates a seductive details effect which is detrimental to student learning as evidenced by problem-solving transfer

results, while research on designing multimedia that follows the coherence principle, the design principle that eliminates instructionally irrelevant details, improves problem-solving transfer for students (Clark & Mayer, 2011; Garner et al., 1989; Mayer, 2009; Mayer & Moreno, 2003, 2010; Mayer et al., 2001; Rey, 2012).

Teacher-created multimedia lends itself to being shared among teachers beyond the creator of the materials. Related research into effective multimedia design found a personalization principle where using informal instruction language in multimedia led to better problem-solving transfer results (Kartal, 2010; Moreno & Mayer, 2000b, 2004). Although some research has led to the identification of an emerging voice principle related to the personalization principle, no studies have been conducted to examine whether knowing the teacher's voice increases student learning.

This quasi-experimental 2 x2 factorial study, set in an urban private high school, randomly assigned ninth grade students (n = 134) across six sections of a religion course to one of four designs of teacher-created multimedia: 1. No Seductive Details/Teacher Voice (NSD/TV); 2. Seductive Details/Teacher Voice (SD/TV); 3. No Seductive Details/Different Teacher Voice (NSD/DTV); 4. Seductive Details/Different Teacher Voice (SD/DTV). Teachers and the researcher collaboratively developed multimedia packages in four content areas: Creation, Self-Disclosure, History of Courtship, Part 1, and History of Courtship, Part 2.

Over approximately one month, each group viewed its assigned version of the four teacher-created multimedia packages in class, on personal lap-tops using headphones. On four separate dates, students accessed the multimedia packages through the school's learning management system and, after viewing them, completed a seven

question multiple-choice retention quiz and an eight question multiple-choice transfer quiz. The quizzes were distributed and scored by the LMS and the answer randomization feature was turned on for the quizzes. Before viewing any of the videos, students completed a prior knowledge inventory for Creation, Self-Disclosure, and the History of Courtship.

The study sought to answer the following questions:

1. What is the effect of seductive details at four testing times in teacher-created multimedia on retention (the ability to recall content) and on problem-solving transfer (the ability to use content knowledge in a new and different context)?

2. What is the effect of the teacher's voice at four testing times in teacher-created multimedia on retention and problem-solving transfer?

3. What is the relationship between prior knowledge, details, and voice?

Summary of Findings

The first research question examined whether or not a statistically significant difference existed between multimedia with seductive details and no seductive details as measured by multiple-choice retention and problem-solving transfer measures and analyzed by eight two-by-two factorial ANOVAs. One statistically significant result was found for Video 1, which showed students who received the seductive details treatment outperformed those who received the no seductive details treatment on the transfer measure with a small effect size (d = .38).

The second research question investigated the effect of teacher voice on retention and transfer in teacher-created multimedia. No statistically significant differences were found.

The third research question considered the relationship between prior knowledge, details, and voice. Several statistically significant, small to moderate, positive correlations were found between prior knowledge and retention by treatment group. In Video 2, prior knowledge was associated with retention for the seductive details with teacher voice group. In Video 3, prior knowledge was associated with retention for no seductive details, different teacher voice, and for the group with no seductive details and different teacher voice. In Video 4, prior knowledge was positively associated with retention for different teacher voice group as a whole and for the seductive details/different teacher voice group.

Several statistically significant, small to moderate, positive correlations were found between prior knowledge and transfer by treatment group. In Video 1 and Video 4 prior knowledge was positively associated with transfer scores for no seductive details, teacher voice, and the no seductive details/teacher voice group. Figure 11 summarizes the statistically significant findings of this study.

ANOVA Results Video 1

Measure	df	*F*	*d*	*p*
V1 Transfer	121	4.32	0.36	.04

Pearson Product Moment Correlations

Retention				Problem-Solving Transfer			
Video	Details	Voice	*r*	Video	Details	Voice	*r*
V3	NSD		.24*	V1	NSD		.39**
V3		DTV	.28*	V1		TV	.23*
V4		DTV	.22*	V4		TV	.28*
V2	SD	TV	.30*	V1	NSD	TV	.50*
V3	NSD	DTV	.52**	V4	NSD	TV	.35*
V4	SD	DTV	.31*				

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

Figure 11. Summary of Statistically Significant Results

Limitations

This study was unique in several ways: access to a large sample in a realistic setting, use of subject matter from the humanities, an attempt to carefully account for design elements in the multimedia, use of educational technology, and the ability to randomly assign ninth grade students across assigned classrooms and meeting times. Most of the study's limitations reflect these unique characteristics as researchers rarely have access to large samples that can be randomly assigned in an authentic setting. The most obvious limitation is with regard to generalization of the findings may lack generalizability beyond the setting of the study given that the sample was a convenience sample drawn from a single school. Further limitations of the study are discussed thematically.

Student integrity and effort

Study participants viewed multimedia and completed online tests on their own computers in class. The study was designed using materials the teacher intended to use

for class and the tests had no impact on student grades. As a result this study may have several limitations regarding student integrity and effort, but careful planning and response may have mitigated their impact.

It was possible for students to make an insincere attempt on the posttest materials. Teachers did not use scores as a graded assessment, which may have caused students to believe the materials and posttests were not important. Teachers directed students to make their best effort, and teachers were directed to address any student who seemed to be making an insincere attempt. Inspection of the frequency of the score of "zero" on retention and transfer tests was consistently low until Video 4 when the number of students who scored a zero tripled. It seems likely that students made a sincere effort on the first three videos.

Students also had two ways to share information about the multimedia content or the quizzes. Classes met at different times during the day. This created the possibility of students discussing the content between classes or sharing screen shots. Teachers reminded students not to discuss material each time students completed a multimedia package and it is unlikely that students shared information digitally because many students do not know how to take screen shots. In reviewing the data, no trends of upward scoring by period of the day were observed.

Most limitations related to honesty and effort were reduced by conducting the study at the beginning of the school year with students who were new to the school. The lack of existing roles and relationships among students reduced the likelihood of inappropriate communication regarding the study's materials or measures. Additionally, the lack of a high stakes testing environment significantly reduced the motivation to be

dishonest. Most students also begin the school year with a desire to do well in their classes reducing the likelihood of a lack of sincere effort. Finally, directions from teachers and close observation of students while they were working should have mitigated insincere effort on the part of the students.

Technology

This study relied on technology: internet access, laptops, a learning management system, YouTube, and earphones. The access points (allowing computers to connect to the internet) and other network infrastructure were updated over the summer. Unfortunately, significant internet access issues affected the first multimedia package. Many students were unable to access the materials or were delayed such that they were unable to complete the activity during the class period. Teachers told affected students not to access the material at home and that they would be provided time for completion in the next class. Time stamps on the work suggest that students followed these directions. This limitation suggests that the data for the first multimedia package should be viewed cautiously.

Use of computers and a learning management system was predicated on an assumption about how students would approach the materials. One teacher discovered that a few students opened the test and completed it while watching the video for the second multimedia package in spite of the directions telling them to complete one item at a time. This was an unanticipated action. Teachers directed students for the final two multimedia packages to make sure to only work on one item at a time and watched for the split screen. Teachers did not report any further simultaneous use of the video and the

test. The teachers did not believe that this was a widespread problem, but it is an important consideration for future researchers when designing procedures.

Use of YouTube also introduced unanticipated options for students. One teacher noticed that a few students changed the video speed settings and watched the videos in high speed. Students were admonished not to alter the speed on the two subsequent videos. For some students this may have had an impact on their understanding of the content. Students without seductive details may have missed key points while students with seductive details may have found them less distracting. The teachers believed this was limited to a few students so it likely did not impact the overall study. It is, however, an important consideration in future research—especially if the study is completed in an unmonitored environment.

Quantifying and defining seductive details

Two additional limitations for this study are common to multimedia design research in general. The first is quantification of seductive details. This study sought to clearly quantify the seductive details and then validate the designs as either seductive details or no seductive details. Verbal seductive details were quantified by word count, images were quantified by count or type, and music by presence or absence. The multimedia presentations were created in PowerPoint™ so that the versions could be compared slide by slide. While outside reviewers consistently distinguished the seductive details version from non-seductive details version accurately, their feedback indicated they did not necessarily identify individual elements within a version as seductive details. In general, images were the most difficult items to identify and quantify. Even the designers struggled with whether or not an image of the “Life is Good” brand was a

seductive detail when used as the illustration for the *Creation* story refrain "and God saw that it was good." The team also struggled with quantification when substituting a seductive details image for a non-seductive details image. In other words, when augmenting a presentation with seductive details images, should the presentation use substitution or addition of images, or both? Ultimately, the first presentation relied heavily on substitution and subsequent presentations used substitution and addition of images. Past research involving seductive details as images has focused on decorous illustrations, which do not make sense in the context of a multimedia presentation. While the reviewers found some images to be interesting, they did not necessarily find them to be distracting from the main point (e.g., "Life is Good" brand and "God saw that it was good"). Additionally, while reviewers recognized the seductive details in the verbal content, they did not necessarily think that it was interesting content.

Research in this area has long struggled with defining "interesting" and has generally relied on people different from the participants in age and education to identify the content as interesting (Grice & Hughes, 2009; Harp & Mayer, 1998; Lehman et al., 2007; Magner et al., 2014; Mayer et al., 2008; Park et al., 2011; Schraw, 1998; Wade & Adams, 1990) or asking participants to rate the material's level of interestingness (Wade & Adams, 1990). Past research revealed that ratings of interest are not consistent across groups of people (Garner et al., 1989, 1991) and sometimes are not consistent within groups of people (Garner et al., 1989).

Another question about quantifying seductive details is time. Unlike previous research, this study created multiple versions of the multimedia based on teacher voice. Because people speak and read with different cadences and emphasis, in spite of editing

out significant portions of pauses, the same content videos differed by more than a minute in length based on teacher voice. This study did not include recording length as a factor in quantification of seductive details as the differences were unanticipated.

Time may also have been an issue with regard to the added time for seductive details. The time differential created an unanticipated potential confound—because images were quantified based on percentage of total images as well as visual content, some images were displayed for up to a minute as the related content was narrated. In the debriefing following the data collection, some students expressed their annoyance about the length of time that images were present on the screen.

Quantification of seductive details is critical to being able to compare studies and possibly explaining conflicting findings in the body of research on seductive details and the coherence principle. While this study made significant improvements in reporting quantified seductive details, the validation process raised questions about identification of individual elements of seductive details and suggests the need for clearer definitions for quantifying images as seductive.

Measurement

In general, scores on the retention and transfer measures were low for all videos, generally in the 40-50% range. Retention results for Video 2 were an exception with students scoring on average 70%. The range was also restricted for Video 1, Video 2, and Video 4. No students scored the top scores for either measure for Video 1, Video 2 (transfer only) and Video 4. No student scored the bottom scores for Video 2 (retention only). Only Video 3 had students score in the full range of scores, but only two percent scored the top two scores for transfer while 11% scored the top two scores for retention.

Teachers contributed general ideas for retention questions except for Video 2 where the teacher created most of the retention questions and answer choices. As a result, the researcher created the retention questions for Video 1, Video 3, and Video 4 and the transfer questions for all videos with limited feedback from the teachers. The low scores on average and the restriction in range were likely a result of the questions, on the whole, being too difficult for the students.

Additionally, this study did not use a pilot study and thus was unable to assess the reliability and validity of the measures prior to the study. A panel of experts was used for content validity, but a pilot study would have provided a more methodologically sound study.

Like prior research, the measure for prior knowledge was self-reported and scored by two independent readers with a high degree of inter-rater reliability (k = .96, k = .83, k = .93). Unlike much prior research, the participants were not all content novices, nor were they intended to be. One consequence of using the humanities for this study is that the subject matter was rarely objective. A student who has studied the Judeo-Christian *Creation* stories in the context of his or her religious tradition may have a large amount of prior knowledge but from a very different context than the lesson. The prior knowledge inventory attempted to address that possibility by including questions about religious affiliation and frequency of attendance of church/synagogue/mosque/temple services. However, the correlation matrix did not reveal a consistent positive correlation between prior knowledge and retention or between prior knowledge and problem-solving transfer.

Assuming that students responded honestly to all questions, the prior knowledge measure may have measured prior knowledge incompletely, the introductory nature of

the material may have negated the influence of prior knowledge, or the cognitive load was too significant for prior knowledge to have an influence. In addition, since the prior research in this field has largely involved mathematics and science, learning subject matter from the humanities may be influenced differently by prior knowledge (Magner et al., 2014; Muller et al., 2008; Park et al., 2011).

Finally, the measurement instruments for retention and problem-solving transfer were designed following the recommendations of Muller, Sharma, and Lee (2008). A multiple-choice test to measure transfer was used in their study largely because research in realistic settings is difficult to manage when the measure is a free response question requiring inter-rater reliability. They found no significant differences in their research and suggested that their test may not have been sensitive enough. They recommended use of a two-tiered, multiple-choice test for the transfer measure. This study used a two-tiered, multiple-choice measure for transfer. Students were first presented with a novel situation and asked to select an answer. Next students had to select the reason for their answer. The questions were presented one at a time and students could not return to previous questions after completing them. A number of students selected the wrong response to the novel situation but selected the correct underlying reasoning based on the content taught. Conversely, some students selected the correct answer to the novel situation, but selected the wrong reasoning response. Because this is different way of measuring transfer, it is difficult to know if the treatments did not make a difference or if the multiple-choice measurements need to be more nuanced.

The unique opportunity to work with a large sample in a realistic, technology-rich setting is reflected in the limitations. Accordingly, inclusion of suggestions from previous

research, careful construction of learning objects, and application of previous research to humanities-based materials are important contributions to this area of research.

Discussion of the Findings

The topical areas of the research questions organize discussion of the findings for this study. Research question one addressed design of multimedia by use or omission of seductive details. Research question two addressed design of multimedia by use of the regular classroom teacher's voice or a different teacher's voice. Research question three addressed the relationship of prior knowledge to the choice of details and voice.

The role of seductive details

A significant portion of the literature on seductive details suggests that seductive details are damaging to student learning and that multimedia designed according to the coherence principle results in better learning (problem-solving transfer) at a meaningful effect size. Mayer (2014a) reports 0.86 as the median effect size of the studies he reviewed; however, the results of the research are mixed with some studies finding a seductive details effect (Harp & Mayer, 1997, 1998; Mayer et al., 2001), some unable to find a seductive details effect (Muller et al., 2008; Park & Lim, 2007; Rey, 2011; Schraw, 1998), and still others finding improved problem-solving transfer with the addition of seductive details (Park et al., 2011; Towler, 2009; Towler et al., 2008).

This study found one statistically significant difference among groups with Video 1 where the seductive details group outperformed the no seductive details group at a small level of practical importance. This finding is in contrast with much of the prior research (Harp & Mayer, 1997, 1998; Mayer et al., 2001) and consistent with other research (Park et al., 2011; Towler, 2009; Towler et al., 2008). It suggests that seductive

details are not necessarily a damaging design choice in realistic settings. However, in this study the subsequent videos showed no statistically significant differences among groups, although in Video 3 and Video 4 the SD groups did show very small favorable effect size differences and very small numerical advantages in scores which is consistent with other research (Muller et al., 2008; Park & Lim, 2007; Rey, 2011; Schraw, 1998). This study is unique in its access to a large, randomly assigned sample within an authentic setting using materials from the humanities. The results of this study are generally consistent with research completed in realistic settings and generally contrast with research conducted in laboratory settings. This study had more than adequate power to detect effect sizes smaller than those reported by Mayer and Fiorella (2014) It is likely that the significant reduction in effect size found in this study is connected to factors introduced by conducting the study in classrooms, new measures, measurement error, longer learning materials, and humanities-based subject matter.

In contrast to prior research, this study used four learning experiences. Students remained in the same groups for all four multimedia experiences. Interestingly, the pattern of results was not consistent across the content. This could reflect the mixed results of past research or it could suggest that some subject matter is more sensitive to particular designs.

Alternatively, past research may have had mixed results because some designs included seductive details at the beginning of the materials that may have created two versions of learning materials that actually taught different concepts. Sadoski (2001) criticized earlier research for teaching two different concepts—cause of lightning vs. cause and effect of lightning. Previous research may also have activated the wrong

schema. Harp and Mayer (1998) theorized that seductive details "did their damage" by activating the wrong schema. This study used a consistent design with verbal seductive details included in the middle of the presentation so to avoid activating the wrong schema as well as preventing the unintentional teaching of two different concepts.

The role of voice

Early research on the voice principle is limited to comparing human voices, computer voices, and accented with unaccented voices (Ahn, 2010; Mayer, 2014c). This study sought evidence to contribute to a theoretical framework for a voice principle: Comparing results for the voice of a teacher with whom students have a student-teacher relationship with the voice of a teacher with whom they do not have a student-teacher relationship could provide evidence supporting either social agency theory or cognitive load theory.

Prior research on the voice principle has not addressed differences between multimedia using the student's teacher's voice and multimedia using a different teacher's voice. While teachers have long used professionally created materials that use other people's voices, nothing has been examined about whether or not it is effective to use amateur multimedia created by another teacher. Research on the voice principle posits that social agency theory may explain why previous research has found better learning results with human voices and voices without accents supporting the idea that the human voice can generate a sense of relationship that causes the viewer to engage on a human level even though the materials are machine mediated. Alternatively, differences could be explained by cognitive load theory. Ahn's (2010) study extending the accent work of Mayer et al. (2003) used much longer recorded materials and did not find a difference in

learning by voice accent suggesting that the longer materials may have provided subjects with time to adjust to the added extraneous cognitive load initially caused by the accent.

This study used four videos used during the first month of school. The only video where the teacher's voice was found to be an advantage was Video 1, which students watched on their second day at a new school where they met with their seven teachers for the second time. While there were no statistically significant differences for voice, the descriptive statistics revealed a trend of improving scores for both retention and transfer for different teacher voice. The effect sizes were small enough (d = 0.16 - 0.30) that this study did not have the power to detect a statistically significant difference between groups.

The trend of an advantage for retention and transfer scores for the students with the different teacher's voice, though not statistically significant, suggests that cognitive load might be at work in the voice principle since the teacher's voice which would have been associated with a relationship was not an advantage. Additionally, the data were also checked for patterns of low scores by teacher to make sure that neither teacher was disproportionately disliked or liked. The data did not show a pattern by teacher and group, providing no evidence to support social agency theory as an explanation for the voice principle.

Initial indicators suggest that a different teacher's voice does not have a negative impact on student learning. In fact, this study found increasing effect sizes over time for different teacher's voice.

The interactions between details and voice

There were no statistically significant interactions between details (seductive/SD or no seductive/NSD) and voice (teacher/TV or different teacher/DTV); however, for Video 1, Video 2, and Video 3, there were potential interactions between details and voice for both retention and transfer. The potential interactions shifted over time. Initially, NSD was most effective when combined with DTV. In contrast, SD was most effective with paired with TV (Video 1 and Video 2). In Video 3, the combination shifted to SD being most effective when paired with DTV and NSD being most effective when paired with TV. Finally, in Video 4 there was no interaction, and NSD and DTV were the most effective combinations.

Transfer results revealed differences and also shifted over time. With Video 1 both voices benefitted from seductive details (TV was more effective), but DTV was more effective with the NSD version than was TV. In Video 2 and Video 3, NSD was most effective when paired with TV while SD was most effective when paired with DTV. But in Video 2, the NSD/TV pairing was the most effective while in Video 3 SD/DTV was the most effective pairing. Finally, Video 4 had no interaction effect but SD was more effective for both DTV and TV while DTV was more effective than TV.

The interactions suggest that the combination of details and voice influences retention and transfer differently. This study also suggests that changes may occur over time in how details and voice interact when subjects are assigned to the same design of details and voice for four videos deployed over a month. This could have interesting implications for the use of quasi-professional multimedia like the *Khan Academy* screencasts and the *Crash Course* series of videos where the voices are consistent

throughout the series of videos. The *Khan Academy* screencasts do not include seductive details while the *Crash Course* series uses a wide variety of seductive details in its videos.

Prior research indicates that the inclusion of seductive details is harmful to learning and most especially to learning as measured by problem-solving transfer (Harp & Mayer, 1997, 1998; Mayer, 2014a; Mayer et al., 2001). The interaction effects for this study suggest that seductive details interact with other variables that may have a role in how seductive details affect learning.

The role of prior knowledge

Prior knowledge in past research has largely been used as a measure to ensure that subjects were novices (Harp & Maslich, 2005; Harp & Mayer, 1997, 1998; Mayer & Moreno, 2003; Mayer et al., 1996, 2001, 2007, 2008; Moreno & Mayer, 2000a; Park & Lim, 2007; Park et al., 2005; Towler et al., 2008). In a few cases, the prior literature explored relationships between prior knowledge and seductive details finding that the group with higher prior knowledge performed better with seductive details than without (Magner et al., 2014; Park et al., 2011). Muller et al. (2008) used three levels of prior knowledge by including three age groups who had completed different portions of the state curriculum for their study. They found no differences among groups. The present study, in contrast, found small to moderate positive correlations for prior knowledge in some conditions on some measures.

Prior research suggests that this study should have found a positive correlation between transfer and prior knowledge for the seductive details group. Additionally, cognitive load theory suggests that this study should have found a positive correlation for

prior knowledge and the learning measures. Instead of finding a consistent relationship between prior knowledge and retention with stronger associations for conditions that imposed greater cognitive load, this study found small to moderate associations between prior knowledge and retention in Video 2, Video 3, and Video 4 for specific groups. In Video 2, the SD/TV group performed better as they had more prior knowledge. In Video 4, the SD/DTV group performed better as they had more prior knowledge. In both cases, seductive details could have imposed greater cognitive load and the increased cognitive load may have been mitigated by prior knowledge.

For Video 3, small associations between prior knowledge and retention were also statistically significant for NSD and DTV and there was a moderate association for the NSD/DTV group. Video 4 also had a small association for DTV. The limited research proposes two theoretical possibilities to explain a voice principle—social agency theory and cognitive load theory. The prior knowledge and retention measures were statistically significantly associated for DTV, suggesting that perhaps cognitive load is imposed by the different teacher voice and that prior knowledge mitigated the additional load. In Video 3, however, it is interesting that the NSD group had a small positive association between prior knowledge and retention and that the NSD/DTV group had a moderate positive association. According to cognitive load theory and the cognitive theory of multimedia learning, the NSD group should have had the least amount of cognitive load imposed while the SD group should have had a statistically significant positive relationship between prior knowledge and retention as prior knowledge should have reduced cognitive load.

The findings for problem-solving transfer are even more at odds with prior research. According to cognitive load theory and the cognitive theory of multimedia learning, the NSD and TV groups should have been the most advantaged groups for the study. Of the four groups, NSD/TV should have had the least amount of extraneous cognitive load imposed by design of the learning materials. Video 1 and Video 4 were the two videos that had statistically significant positive correlations between prior knowledge and transfer. For Video 1, NSD and TV each had small positive associations between prior knowledge and transfer, and the group that had both had a moderate positive relationship. For Video 4, the TV group and the NSD/TV group had small positive associations between prior knowledge and problem-solving transfer. These findings suggest that prior knowledge was more important for students to be able to demonstrate problem-solving transfer if they were in the groups that theoretically imposed less cognitive load for the learning. Cognitive load theory and the cognitive theory of multimedia learning suggest that the designs imposing higher cognitive load should have resulted in stronger positive correlations between prior knowledge and problem-solving transfer.

A few possibilities may explain these findings. First, the cognitive load imposed by the learning materials or testing materials may have been too high for prior knowledge to mitigate the load for those in the higher load conditions (e.g., seductive details). The differences in findings for prior knowledge and retention and prior knowledge and problem-solving transfer may reflect the differences in difficulty. The problem-solving measures were challenging as reflected by the low scores and the restriction in range. But it is possible and probable that the prior knowledge measures did not fully measure prior

knowledge since there were such low and sometimes negative correlations with retention and problem-solving transfer.

Research regarding if and how prior knowledge influences learning from different instructional designs is quite limited (Magner et al., 2014; Park et al., 2011). While this study did not produce consistent results across the four videos, it suggests that prior knowledge may affect retention and problem-solving transfer differently, particularly in humanities-based subject material.

Conclusions

Multimedia design is an important area for research as teachers create their own multimedia and experiment with flipped classrooms. This study suggests that design choices may have less impact in realistic settings than in laboratory settings. This study carefully developed content following specific learning objectives. Verbal seductive details were deliberately placed in the middle of the content because prior research suggests that seductive details in the introduction trigger the wrong schemas. Seductive detail placement may be a particularly important design consideration.

This study also suggests that over time, a different teacher's voice may be advantageous for teacher-created multimedia. By extension, this study suggests that not only is there no appreciable negative impact of sharing one's multimedia with other teachers, but also that there may be greater learning value for use of multimedia with a different teacher's voice. In this study, students heard the voice of the same different teacher for each multimedia package suggesting that it may be important that the different teacher's voice be consistent when using a series of multimedia packages.

The study also suggests that seductive details may interact with other elements like teacher voice to enhance or impair learning. Initially, seductive details and teacher voice were a better combination than no seductive details and teacher voice. By the third and fourth videos, seductive details and teacher voice was the worst combination for learning. This suggests that use of multimedia with seductive details in the classroom setting may be more effective when using a different teacher's voice.

Finally, this study suggests that the role of prior knowledge requires much more investigation particularly in the humanities.

Implications for Research

This study's limitations and findings suggest several areas for further research.

Quantification and validation of seductive details designs

First, clear and consistent quantification of seductive details is rare in existing research. Reporting of the amount of seductive details used is also inconsistent. In some cases the descriptions do not include quantifiable differences in the compared versions (Doolittle & Altstaedtler, 2009; Park et al., 2011; Towler, 2008). In others a difference in text length is provided (Garner & Gillingham, 1991; Garner et al., 1989, 1991; Harp & Maslich, 2005; Harp & Mayer, 1998; Lehman et al., 2007; Mayer & Jackson, 2005; Mayer et al., 1996, 2008; Shen et al., 2006). Other studies include text and/or presentation length (Grice & Hughes, 2009; Magner et al., 2014; Mayer & Moreno, 2003; Mayer et al., 2001; Moreno & Mayer, 2000a, 2002; Muller et al., 2008; Park & Lim, 2007; Park et al., 2005; Sanchez & Wiley, 2006; Shen et al., 2006; Sung & Mayer, 2012; Towler, 2009). Studies that report quantifiable amounts of seductive detail range from additions of 13% to 39% (Gillingham & Garner, 1989; Rey, 2011). Rey (2011) choose to

add almost 40% seductive details in his experiment to maximize his chance of finding a seductive details effect while Towler (2009) added only 15% seductive details. Rey (2011) found no significant differences while Towler (2009) found significantly increased retention and problem-solving transfer in her sexual harassment training study. Mayer's studies, the ones that most consistently find a seductive details effect or support for the coherence principle, tend to range from adding 23% to 33% of text-based seductive details (Harp & Mayer, 1998; Mayer & Jackson, 2005; Mayer et al., 2008).

The present study provides a first attempt at fully quantifying visual, verbal, and auditory seductive details. The seductive details version was created after the no seductive details version by using the word count and image count to determine additional word and image counts needed for the seductive details version. By using Microsoft PowerPoint™ to create the video products, the present study was able to create slide-by-slide comparisons. An unintended consequence of this process was additional length of the videos with differences in teacher cadence. Additionally, the longer text often led to longer focus on a single image for sometimes as much as a full minute. Future quantification of seductive details needs to account for video time as well as the components of the video. Along this same line, students are generally sophisticated consumers of multimedia. They may have expectations of visual interest created by timing of images and shifting angles of "shots." While teacher-created multimedia will never be able to compete with professionally created multimedia, some attention to this design feature may be merited.

This appears to be the first multimedia study that attempts to provide a means for validating multimedia seductive details. In reviewing the validation data, it was clear that

respondents could identify the whole as being either a seductive details version or a no seductive details version; however, in keeping with the text-based research that first identified a seductive details effect, respondents had difficulty consistently identifying seductive details. Earlier text-based research found that "interest" ratings by the subjects varied from experiment to experiment (Garner et al., 1989). The present study also found that the raters were inconsistent in what they identified as interesting. An improved validation process might provide better data in future research.

Length

Future research would also benefit from comparing the length of multimedia learning materials with results. Much of the existing literature that reports large effect sizes is based on very short multimedia learning materials—one to four minutes (Thalheimer, 2004). The length of the learning material may have a significant impact on how effective any one design is. The materials of this study ranged from 10 minutes to 18 minutes in learning time, and the smaller effect sizes may be connected to the longer learning times.

Actual Students' Use of Multimedia

Some student behaviors that teachers needed to address in the administration of this study suggest there is value in examining how students actually use multimedia instruction. In the present study teachers observed students who viewed the videos at a faster speed than the intended speed. YouTube allows viewers to change their viewing speeds up to two times the intended speed. For the busy student, viewing instructional videos at a higher rate of speed may seem like a logical and efficient choice. How

widespread this practice is would be worth investigating as it may suggest other design features.

Additionally, since most instructional video in this context is intended for students to view independently, it is also worth knowing if students would be likely to complete a quiz or other assignment based on the video simultaneously as opposed to sequentially. If students are inclined to complete the two simultaneously, teachers could design the quizzes or assignments to be generative activities like self-explanation to help students better engage in the learning activity. Thus far, much of the work on flipped classrooms focuses on the advantage of students being able to pause and repeat sections that they did not understand initially (Bergmann & Sams, 2013; LaFee, 2013; Lancaster, 2013). Gathering more qualitative information about how students actually use multimedia resources has implications for learning and may reveal a disconnect between how educators think students will use multimedia learning materials and how they actually do.

Measurement

More complete prior knowledge measures could also provide better information on the relationship between prior knowledge, retention, and transfer under different conditions. More nuanced information about prior knowledge could provide evidence supporting the cognitive theory of multimedia learning.

The present study, like Muller et al. (2008), suggests that while studies in a realistic setting require a measurement tool that is appropriate to the larger numbers of students, creating measures that are sensitive enough to find significant differences is difficult. Muller et al. (2008) suggested that using two-tiered, multiple-choice questions might improve the ability to detect differences in transfer. The present study used two-

tiered, multiple-choice questions in the transfer measures but had consistently low scores on both retention and problem-solving multiple choice sections suggesting that the study might not have been able to detect effects because measures may have been too difficult. Future research would benefit from a multiple choice instrument sensitive enough to detect differences. The two-tiered, multiple-choice questions approach merits further investigation especially since multiple-choice measures are widely used by teachers to measure learning.

Learning Management Systems

This study also provides a model of the powerful research that can be unleashed by taking advantage of the capabilities of Learning Management Systems (LMS). Modern LMS's make it possible to randomly assign students to different groups across classrooms in a digital environment that is exactly the same for each student. Many LMS's also provide access to a wide range of analytics that can help researchers understand when students access materials and how students really use them. The introduction of LMS use in both university and K-12 settings provides researchers with the potential to test laboratory research principles in realistic settings with large samples across time and place.

Application to Authentic Settings

Finally, this study reinforces the importance of testing principles generated in the laboratory in the real classroom. Research in on seductive details generally shows strong effect sizes in the laboratory and inconsistent results in authentic settings. Developing meaningful principles for learning requires both the laboratory to isolate principles and classrooms to see how those principles work in practice.

Implications for Practice

While the present study contributes to the body of knowledge that helps us understand how to design multimedia for student learning, it has other important implications for practice. Unlike most prior studies, this study tested principles with meaningful laboratory results in an authentic classroom setting. Laboratory testing helps identify promising principles. Testing those principles in a realistic setting helps to determine how meaningful they are when all of the other "noise" of educational settings is introduced.

This study suggests that educational practitioners can share multimedia they have created with other teachers to use with their classes and that use of a different teacher's voice may be beneficial. This study also suggests that there is generally no seductive details effect when multimedia packages are designed with 16-33% verbal seductive details, instrumental music is added, and images are added or exchanged for more interesting images in a humanities class.

This study suggests that prior knowledge is related to retention and transfer in different ways. Groups with no seductive details and/or teacher voice showed positive correlations between transfer and prior knowledge for Videos 1 and 4. The associations were less consistent for prior knowledge and retention by group, but the different teacher voice group was consistent for Videos 3 and 4. Potentially, this may suggest that design choices should consider the desired outcome (retention, problem-solving transfer, or both). Problem-solving transfer may increase cognitive load, making prior knowledge more important when transfer is the goal as well as suggesting that design choices reducing cognitive load are more helpful with transfer goals.

This study also suggests that teachers can focus more on content and a little less on design without harming student learning. While teachers creating multimedia should make sure that the beginning of the multimedia activates the correct schemas (e.g., avoid placing seductive details in the introduction), this study did not find any harm to student learning from the addition of seductive details. This study also suggests that teachers can share multimedia they created with other teachers since a different teacher's voice does not impair learning and may even improve it.

This study also raises questions about how learners may be changing. Students in this study are different from the vast majority of students in previous studies. As members of the class of 2019, they were born in 2001, the same year the first iPod was released and that Wikipedia was born. Their world has always had internet and smart phones. They were four when YouTube was created. They were six when the first iPhone was released. To them MySpace is an amusing relic of a barbaric past and Facebook is less appealing than Instagram and Snapchat. More importantly, as a digital generation born into constant exchanges of information, this group is genuinely representative of students who have had to manage and organize rapid exchanges of information often while engaging in many other activities simultaneously.

The college students who have made up a significant portion of the prior research were not necessarily members of this digitally aware and engaged population. Additionally, by participating in a laboratory setting as part the psychology research pool in a university, these participants did not use their own technology and did not control how they interacted with it.

The present study revealed that students use their technology differently based on their levels of experience. By allowing students to use their computers and earphones/buds, this study capitalized on student comfort level with their devices. Although these students are "digital natives," only a few are digital experts. Their interaction with digital technology is characterized by what they are interested in as opposed to earlier generations being afraid of "deleting everything accidentally." By allowing them to use devices that they were comfortable with, this study added another level of authenticity. Not only did the research take place in real classrooms, but it also allowed to students to use their own technology to interact with the content.

Some students used the higher speed settings on YouTube to move through the content more quickly. Not every member of this generation is aware of these settings, but those with higher "technology prior knowledge" are. Some students used the side-by-side windows to watch the video while viewing and answering the questions on the quiz, another characteristic behavior of learners with higher prior knowledge of technology use.

These exciting developments open even more options for learning. The ways in which the students engaged with the multimedia packages suggest that using tools that allow teachers to embed questions in video at key concept points may provide a generative activity for student learning while simultaneously providing important formative feedback for teachers. Such tools could also be used to provide a metacognitive touch point for students in evaluating how successfully they are engaging with learning opportunities. Students may also find the ability to complete a generative activity using the side-by-side windows to be helpful. The possibility of using verbally-based, self-

explanation tools to drawing tools opens a number of opportunities for students to engage in deep learning.

Finally, the collaborative and social nature of many digital technologies used by this new generation of students is waiting to be harnessed for purposeful learning. Student experiences with digital technologies cannot help but shape how they engage with digital information. Practitioners stand at the threshold of an educationally exciting time. Guided by the best laboratory research and modifying methods as they discover what works best in the real classroom, practitioners are poised to take advantage of the new tools and skills of their digitally native students.

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APPENDICES

APPENDIX A

Informed Consent

6

UNIVERSITY OF SAN FRANCISCO
CHANGE THE WORLD FROM HERE

August 21, 2015

Purpose and Background
Ms. Colette Roche, Assistant Principal, is also a doctoral student at the University of San Francisco, and for her doctoral dissertation she is conducting a study on multimedia design. She believes that as teachers design short multimedia materials for their students that it would be beneficial to better understand what design factors are most helpful for student learning.

Your teen is being asked to participate because he/she is a High School student who is enrolled in the Christian Sexuality course this semester.

Procedures
In your child's Christian Sexuality class, students will view four multimedia learning experiences over approximately a month: *Creation (Genesis)*, *Self-Disclosure and CyberSafety*, *History of Courtship Part 1,* and *History of Courtship Part 2*. Each multimedia learning experience is between 10 and 17 minutes in length and is followed by a short quiz (not included in your child's grade). Your child will also take a short prior knowledge inventory. These activities will be completed in class, and your child's teacher will use the quiz results to focus later instruction for that area of study. These activities are part of the course.

If you agree to allow your teen to be in this study, the following will happen:

> The researcher, Ms. Roche, will use your child's data (quiz information) from the four multimedia learning experiences and the prior knowledge inventory to determine if one multimedia design is more effective than another.

Risks and/or Discomforts
There are no known risks involved in this study. The content is part of the course and teachers will use quiz results from these four, multimedia learning experiences as feedback to focus their instruction. Your child's grade will not be affected by participation or not. After the completion of the study, your child will have access to all versions of the multimedia should he or she wish to view/review them.

To protect your child's confidentiality, your child's name will not appear in the data stored by Ms. Roche. The information obtained will not be shared with anyone, unless required by law. The digital records, which will not include student names, will be maintained by Ms. Roche and her faculty sponsor, Dr. Mathew Mitchell on a password protected flash drive.

Your child may quit this study at any time by simply saying "I do not wish to participate." Should your child quit the study, he or she will continue to receive instruction and complete the course work. His or her data will not be included for analysis in the study, but that data will continue to be used by the course teacher to inform instruction.

Benefits
There will be no direct benefit to you or your child from participating in this study. The anticipated benefit is that this study will help improve the design of multimedia created by teachers at High School and the greater educational community and may lead to changes that will better serve your child and family.

Costs/Financial Considerations
There will be no costs to you or your child as a result of taking part in this study.

Payment/Reimbursement
Neither you nor your child will be reimbursed for participation in this study.

Questions
If you have any questions or comments about participation in this study, you should first contact the researcher, Ms. Roche, at or via email at . If you have any questions about your child's rights as a participant, you may contact the University of San Francisco IRB by calling (415) 422-6091, emailing IRBPHS@usfca.edu, or by writing to USF IRBPHS, Counseling Psychology Department, Education Building 2130 Fulton Street, San Francisco, CA 94117-1071.

Consent Statement
I have been given online access via my child's religion class in Schoology to the "Research Subject's Bill of Rights," and this consent form if I would like retain a copy.

This completed form will be kept in the Learning and Instruction Department at the University of San Francisco. If you have any questions about this study, please contact Dr. Mathew Mitchell, the faculty sponsor of this project, at (415) 422-2794 or at mitchellm@usfca.edu.

PARTICIPATION IN RESEARCH IS VOLUNTARY. I am free to decline to have my child be in this study, or to withdraw my child from it at any point. My decision as to whether or not to have my child participate in this study will have no influence on my child's present or future status as a student at High School.

My signature below indicates that **I DO AGREE TO ALLOW** my child to participate in this study.

_____ _____
Signature of Student's Parent/Guardian Date of Signature

_____ _____
Signature of Student Date of Signature

I have chosen **NOT TO ALLOW** my child to participate in this study.

_____ _____
Signature of Student's Parent/Guardian Date of Signature

_____ _____
Signature of Student Date of Signature

Please have your child return this form to his or her religion teacher by MONDAY, August 24, 2015.

APPENDIX B

Site Permission

May 16, 2015

To: The Institutional Review Board for the Protection of Human Subjects at the University of San Francisco:

I am happy to provide this letter of support for Colette Roche's proposed research study *The Effect of More and Less Relevant Details and Teacher Voice on Student Retention and Problem-Solving Transfer in Teacher-Created Multimedia.*

As the Department Chair of Religious Studies , I have met several times with Ms. Roche to discuss her research interest (multimedia design using visual, verbal, and aural details not directly relevant to the instructional goals for adding interest vs. designing content to correspond exactly with instructional goals as well as investigating whether or not the teacher's voice is important), and its intersection with our needs in augmenting our curriculum with teacher-created multimedia. Over the last three years, our department has formally examined and begun revising existing curriculum. One area that teachers have expressed interest in is adding teacher-created multimedia to their courses-- in the form of screencasts, videos, or narrated PowerPoints.

In light of these interests, I have facilitated two meetings with the teachers of the course where Ms. Roche has explained her proposed research and the instructors shared their multimedia needs. The teachers were excited about collaborating and initiated a brainstorming session about four multimedia items they would like to create for the course. The proposed research and our department desire to augment our courses with teacher-created multimedia are well matched.

In closing, as the chair of the department, I assert that we understand the purpose of Ms. Roche's research (to test two ways of designing the same content as multimedia and to test if teacher's voice is important for students learning--i.e. will it be as effective for teachers to share what they create with other teachers to use in their classes), and we are fully supportive of it. We are committed to creating four multimedia products and following development guidelines from Ms. Roche. Additionally, we are committed to following the process of the study (using each of the four multimedia products as directed) in the Fall of 2015.

If you have any questions for me, please do not hesitate to contact me via email or by phone

Respectfully,

Diana L. Murray

Diana L. Murray, Ed.D.
Chair, Department of Religious Studies

May 14, 2015

Subject: Research Study

Colette M. Roche
Doctoral Candidate
Graduate School of Education
University of San Francisco

Dear Colette,

This letter serves as my approval of your request to conduct a research study at High School in the fall semester of 2015. Your study comparing two designs of multimedia (one with added visual and narrative details for interest vs. one that is strictly designed to meet instructional objectives) as well as examining the effect of teacher voice (one with teacher voice vs. one with a different teacher's voice) in freshmen religion classes has been explained and approved.

Pam Shay
Principal

DIOCESE OF OAKLAND
2121 Harrison Street, Suite 100 · Oakland, CA 91612-3488
510-628-2154 · FAX: 510-451-5331 · www.csdo.org
DEPARTMENT OF CATHOLIC SCHOOLS

May 22, 2015

Institutional Review Board for the Protection of Human Subjects
University of San Francisco 2130 Fulton Street
San Francisco, CA 94117

To Whom It May Concern:

On behalf of the Diocese of Oakland, I am writing to formally indicate my awareness of the research proposed by Colette M. Roche, a student at USF for her dissertation: *The Effect of More and Less Relevant Details and Teacher Voice on Student Retention and Problem-Solving Transfer in Teacher-Created Multimedia.* We are aware that Ms. Roche intends to compare designs of teacher-created multimedia (one with added visual and narrative details for interest vs. one that is strictly designed to meet instructional objectives) as well as examining the effect of teacher voice (one with teacher voice vs. one with a different teacher's voice) in freshmen religion classes at High School. As the Superintendent of Schools for the Diocese of Oakland, I give Ms. Roche permission to conduct her research. If you have any questions or concerns, please contact my office at

Sincerely,

Sister Barbara Bray

Sr. Barbara Bray
Superintendent of Schools
Diocese of Oakland

APPENDIX C

Content Expert Rating Sheet Model for Prior Knowledge Inventory

Background Knowledge Rating Sheet

The "test questions" on this survey are intended to identify levels of prior knowledge for 9th grade students about Creation Stories, History of Courtship, and Self-Disclosure. The background knowledge survey intends to directly and indirectly measure prior knowledge.

Three types of questions are provided on the student Background Knowledge survey:

Demographic Questions
Descriptive Short Answers
Matrix of Experience and Biblical topics

The full instrument has been provided for reference. Please complete the rating sheets through SurveyMonkey. Thank you.

Instructions for Background Knowledge Validation Experts:

Please select the best answer to the following questions, supplementing your answer with comments as you deem necessary. If you have any questions about the rating sheets, please contact Colette Roche ( ) immediately.

Adapted from Dr. Susan Prion's Content Expert Rating Sheet

[Question goes here]

a. .
b. .
c. .
d. .

1. Does the question clearly ask for information about prior knowledge? Comment:	☐Yes ☐No
2. In which manner does it ask for information about prior knowledge? ☐ Direct ☐ Indirect	
3 Is the intent of the question clear? Comment:	☐Yes ☐No
4. Is the language of the question clear and unambiguous? Comment:	☐Yes ☐No
5. Is the question clear and unambiguous in its content? Comment:	☐Yes ☐No
6. Is the question written at an appropriate level for 9th grade students? Comment:	☐Yes ☐No
7. Is the format of the question (e.g. use of terms, specific situation cited, grammar) clear and understandable? Comment:	☐Yes ☐No
8. Do you suggest a change in format? Comment:	☐Yes ☐No

Adapted from Dr. Susan Prion's Content Expert Rating Sheet

APPENDIX D

Prior Knowledge Assessment

Please answer the following questions carefully and honestly. These questions will help your teacher to have a general idea of what your class knows starting out in the course. There are no right or wrong answers and your teacher will not know your individual answers. There are some demographic questions included as well.

* 1. The following information is necessary for me to let your teacher know you completed this assignment.

First Name

Last Name

Period Number for Religion Class

Your Teacher's Name

* 2. What is your gender?

- ◯ Female
- ◯ Male

* 3. What is your ethnicity?

- ◯ African-American
- ◯ Asian-American
- ◯ European-American
- ◯ Latin-American
- ◯ Native American
- ◯ Pacific Islander
- ◯ Other (please specify)

* 4. In a short paragraph describe what you know about the Bible and how you have learned what you know.

* 5. Please mark the level of your experience/knowledge of the following items as they are found in the Bible:

	No knowledge	Heard of it	Heard it read in church/temple/house of worship	Read it	Studied it
Bible	○	○	○	○	○
Old Testament	○	○	○	○	○
New Testament	○	○	○	○	○
Genesis	○	○	○	○	○
Adam and Eve	○	○	○	○	○
The Garden of Eden	○	○	○	○	○
The Serpent	○	○	○	○	○
Creation story 1	○	○	○	○	○
Creation story 2	○	○	○	○	○

* 6. I attend religious services

- ○ Never
- ○ A few times a year
- ○ Several times a year
- ○ Once a month
- ○ A few times each month
- ○ Every week

* 7. I am

- ○ Catholic
- ○ Christian (Protestant)
- ○ Jewish
- ○ Orthodox
- ○ Muslim
- ○ Hindu
- ○ Sikh
- ○ Not Religious
- ○ Other (please specify)

* 8. In conversations with friends, what are three kinds of things that would be inappropriate to share?

* 9. In conversations with people you've just met, what are three things that would be appropriate to share?

* 10. Have you ever studied or learned about dating?

- ◯ Yes
- ◯ No

11. Where did you study/learn about dating? What did you learn?

* 12. Have you ever studied or learned about marriage?

- ◯ Yes
- ◯ No

13. Where did you study/learn about marriage? What did you learn?

Prior Knowledge Coding

Creation Prior Knowledge
(Score Possible 47 x 2 = 94)

Q4-describe what know about Bible and how learned it

- 0 – no response or nonresponsive
- 1 – some articulation
- 2 –very articulated description

Q5-level of experience/knowledge of Bible related items (9 sub items)

- 0 – no knowledge/no response
- 1 – heard of it
- 2 – heard of it in church etc.
- 3 – read it
- 4 – studied it

Q6-religious service attendance

- 0 – never
- 1 – few times a year
- 2 – several times a year
- 3 – once a month
- 4 – a few times each month
- 5 – every week

Q7-religious identification

- 0 – none or other or nonresponsive
- 1 – non-Christian but specific identification of a particular point of view
- 2 – other Christian (including Protestant denominations and Mormon)
- 3 – Jewish
- 4 – Catholic or Orthodox

Self-Disclosure Prior Knowledge
(Score Possible 6 x 2 = 12)

Q8-*inappropriate* things to share with friends

- 0 – no response or nonresponsive
- 1 – identified one relevant item
- 2 – identified two relevant items
- 3 – identified three relevant items

Q9-*appropriate* things to share with person(s) just met

- 0 – no response or nonresponsive
- 1 – identified one relevant item
- 2 – identified two relevant items
- 3 – identified three relevant items

History of Courtship Prior Knowledge
(Score Possible 10 x 2 = 10)

Q10-ever studied/learned about dating

- 0 – no
- 1 – yes

Q11a-where learn about dating

- 0 – no response or nonresponsive
- 1 – family and/or friends
- 2 – church, synagogue, school (any formal institution)

Q11b-what learn about dating

- 0 – no response or nonresponsive
- 1 – something concrete
- 2 – something well-articulated

Q12-ever studied/learned about marriage

- 0 – no
- 1 – yes

Q13a-where learn about marriage

- 0 – no response or nonresponsive
- 1 – family and/or friends
- 2 – church, synagogue, school (any formal institution)

Q13b-what learn about marriage

- 0 – no response or nonresponsive
- 1 – something concrete
- 2 – something well-articulated

APPENDIX E

Content Expert Rating Sheet Model for Assessment Questions

Content Expert Rating Sheet

The questions on this survey are intended for a series of four posttests for my dissertation research. Two areas are being measured in four content areas (Creation Stories, History of Courtship Rituals Part 1, History of Courtship Rituals Part 2, and Self-Disclosure):

- Retention (recognizing content)
- Problem-solving transfer (applying the underlying reasoning to a new situation)

Two item types are provided.

- Standard multiple-choice items with six possible responses, and one best choice
- Two-tiered, multiple-choice items where the first question is answered by applying the underlying reasoning about the content to a new situation. The second question is answered by selecting the reasoning for the answer.

A copy of the full instrument has also been provided for your reference. Please complete the rating sheets and the full instrument through SurveyMonkey. Thank you.

Instructions for content experts:

Please select the best answer to the following questions, supplementing your answer with comments as you deem necessary. If you have any questions about the rating sheets, please contact Colette Roche ( ) immediately.

Adapted from Dr. Susan Prion's Content Expert Rating Sheet

[**Question goes here]**

a. .
b. .
c. .
d. .

1. Does the question clearly relate to one of the two areas being measured? Comment:	☐Yes ☐No
2. In which content area does it best fit? ☐ Retention ☐ Problem-solving Transfer	
3 Is the intent of the question clear? Comment:	☐Yes ☐No
4. Is the language of the question clear and unambiguous? Comment:	☐Yes ☐No
5. Is the question clear and unambiguous in its content? Comment:	☐Yes ☐No
6. Is there only one correct answer? Comment:	☐Yes ☐No
7. Is the question written at an appropriate level for 9th grade students? Comment:	☐Yes ☐No
8. Is the format of the question (e.g. use of terms, specific situation cited, grammar) clear and understandable? Comment:	☐Yes ☐No
9. Do you suggest a change in format? Comment:	☐Yes ☐No

Adapted from Dr. Susan Prion's Content Expert Rating Sheet

APPENDIX F

Video 1 Assessment

Creation

Recall Questions (10)

1. According to Catholic teaching the Creation story is

A. An explanation of how the earth was created
B. Support for why theory of evolution is flawed
C. A way to share theological truths
D. The most important story in the Bible.
E. All choices except "None of the these"
F. None of these

2. In the Catholic tradition, reading scripture

A. Is discouraged except in a formal study group
B. Is to be done from a framework of literalism
C. Is similar to reading science
D. Is similar to reading fiction
E. All choices except "None of the these"
F. None of these

3. God says "Let us make humans in our image" to

A. Reveal that there was a prototype for humans
B. Reveal that humans are intended to be relational
C. Reveal that humans should think of themselves as gods
D. Reveal that humans are a weak copy of God
E. All choices except "None of the these"
F. None of these

4. On the 7th day God rested. The purpose of this part of the story is

A. To provide a logical conclusion to the creation story
B. To show that even God gets tired.
C. To model that humans should balance work and rest.
D. To demonstrate that creation involved a variety of actions
E. All choices except "None of the these"
F. None of these

5. Free will means that

A. Humans are able to make independent decisions
B. Humans can make choices but should do what they are told
C. Humans and animals are free to make independent decisions
D. Humans are encouraged to make choices and learn from them.
E. All choices except "None of the these"
F. None of these

6. We know from the creation story that

A. Men and women were created as equals
B. Men were created first because they are more important than women
C. God named the first man Adam.
D. Humans are the same or equal to God.
E. All choices except “None of the these”
F. None of these

7. Humans were created last because

A. They needed the rest of creation to survive
B. None of the other creatures were enough for God
C. It is a way to highlight the difference in intellect and social skills
D. It is good storytelling to create the most interesting creatures last
E. All choices except “None of the these”
F. None of these

8. According the creation story man and woman were created

A. To take care of the animals and the plants
B. To use the animals and the plants
C. For each other so that they would not be lonely
D. To explain how humans came to be
E. All choices except “None of the these”
F. None of these

9. The beginning of the Bible is important because it

A. Explains how the world came to be
B. Sets a foundation for understanding theological truths
C. Provides the basic rules for living a good life
D. Shows that there is a God and how God works
E. All choices except “None of the these”
F. None of these

10. The creation story repeats “God looked at what God had made and found it good” to convey that

A. God is proud of creation.
B. God only creates good.
C. God looks for the good in creation.
D. God creates in love.
E. All choices except “None of the these”
F. None of these

Transfer Questions (4 dual level)

To apply the 7 theological truths in the creation stories to modern life.

1A. In the cafeteria at lunch you notice a lot of trash left on the tables. What would be the best response based on this video?

A. To pick up what's left on your table and put it in the trash.
B. To tell the Deans who left their lunch remains on the table.
C. To ask the principal to get more trash cans.
D. To help your friends sort the materials in the tri-bin system.
E. None of these

1B. Why did you answer the question about the cafeteria this way?

A. Humans are given the responsibility to nurture creation.
B. Humans are given the responsibility to hold others accountable.
C. Order and balance are important.
D. Humans are given the responsibility to make choices.
E. Humans were created to follow rules.

2A. In your math class you notice that most girls don't raise their hands or answer questions. What would be the best response based on the video?

A. To tell the teacher to call on girls.
B. To tell your parents that your teacher picks on the boys.
C. To encourage the girls around you to answer when they know the answers.
D. To encourage the girls around you to answer even if they aren't sure they know the answers.
E. None of these.

2B. Why did you answer the question about the math class this way?

A. We learn best when we are relational.
B. We are each part of God's image.
C. Order and balance are important.
D. Humans are given free will to choose and create for better or worse.
E. None of these.

3A. Fred notices that his parents fight a lot when they are together and spend a lot of time apart when they can. They both tend to find fault with his grades, his room, his friends, their bosses, and their lives in general. Based on this video, what could Fred understand about relationships?

A. That Fred needs to get better grades.
B. That Fred's parents are unhappy because he is a failure.
C. That Fred's parents have high standards.
D. That Fred's parents have a difficult relationship.
E. None of these.

3B. Why did you answer the question about Fred's parents this way?

A. Relationships are always difficult.
B. Order and balance are important in life.
C. We find the most satisfaction in healthy relationships.
D. Humans are given the responsibility to nurture creation.
E. None of these.

4A. The first test in science class is coming up. You have paid attention, taken notes, completed all the homework, and you studied carefully for the test. You sit next to one of the most popular kids in your class. Before the test she tells you she isn't ready for the test and asks you to make sure your answers are visible to her. You let her copy your test. Based on this video, what would be your best option after the test?

A. Tell the teacher.
B. Ask the teacher to change the seating chart.
C. Tell her you can't let her cheat off you again, and offer to help her study for the next test.
D. Talk to her about why cheating is wrong.
E. None of these.

4B. Why did you answer the question about cheating this way?

A. We are encouraged to make choices and learn from them.
B. We are created in God's loving image and likeness.
C. We find the most satisfaction in life when we participate in healthy relationships.
D. We have a responsibility to nurture creation.
E. None of these.

APPENDIX G

Video 2 Assessment

Self-Disclosure
Recall Questions (10)

1. What is self-disclosure?

A. Revealing significant and private information about yourself
B. Having a conversation with a new friend
C. Revealing your recent test scores
D. Revealing your career goal
E. All choices except "None of these."
F. None of these

2. When is self-disclosure appropriate?

A. When sharing serves a healthy purpose
B. When sharing makes you popular
C. Whenever someone asks you a question
D. When only one person is sharing
E. All choices except "None of the these"
F. None of these

3. Which of the following information should never be shared?

A. Your password(s)
B. Your name
C. Your phone number
D. Your important thoughts
E. All choices except "None of the these"
F. None of these

4. What is the difference between self-disclosure in person and self-disclosure online?

A. Information and images posted online never go away
B. People online are nicer than people in person
C. Information can be completely controlled whether sharing in person or online
D. There is no difference
E. All choices except "None of the these"
F. None of these

5. What is sexting?

A. Sending nude or semi-nude images of yourself via electronic means
B. Sharing an "R" or "X" rated Netflix movie using your computer
C. Sharing nude or semi-nude images of others via electronic means
D. Sharing photos of yourself using your cellphone
E. All choices except "None of the these"
F. None of these

6. Why is sexting a bad idea?

A. It could cause embarrassment for you and your family
B. It could cause you to lose opportunities in the future
C. It could put your friendships and reputations at risk
D. It could be a crime
E. All choices except “None of the these”
F. None of these

7. What should you consider before sharing information?

A. Will I improve my social standing?
B. Will sharing this make other people think I am important?
C. Will it help others to know that someone else is creepy?
D. Will I feel good later about sharing this information?
E. All choices except “None of the these”
F. None of these

8. What does it mean to have a trusting relationship?

A. It means that you like each other.
B. It means that you feel comfortable with each other.
C. It means that you enjoy spending time with each other.
D. It means that you are honest, reliable, dependable and responsible.
E. All choices except “None of the these”
F. None of these

9. What should you consider before sharing a photo online?

A. Is it a good photo?
B. Am I proud of the photo?
C. Would I be okay if my family saw it?
D. Years from now will I feel good about making it public?
E. All choices except “None of the these”
F. None of these

10. What should you consider before you begin self-disclosing with someone?

A. Is this person important in the school?
B. Can you believe this person?
C. Do you like the other person?
D. Will your self-disclosure serve a healthy purpose?
E. All choices except “None of the these”
F. None of these

Transfer Questions (4 dual level)

1A. Mike is part of a new carpool formed by students in general neighborhood. What would be appropriate for him to share in his carpool?

A. His phone number
B. His Schoology password in case he forgets his computer and needs his homework.
C. How much money his family's business makes.
D. His parent's arguments
E. His family's travel plans during Christmas and summer breaks.
F. None of these.

1B. Why is it an appropriate example of self-disclosure?

A. The disclosure serves a healthy purpose.
B. The disclosure will help Mike to be responsible if he makes a mistake.
C. The disclosure will help Mike to know where he fits in with the carpool.
D. The disclosure will help Mike to communicate.
F. The disclosure will help Mike to build community in the carpool.

2A. Emma, a 9th grader, is part of a modern dance group. She has decided to use her phone to take photos and videos during rehearsals to post on her personal social media accounts to promote the group. Which photo(s) of the following should she share?

[There are four photos in this question in a grid—there is nothing inappropriate about any of the photos]

A. photo 1 (a group hip hop dance photo)
B. photo 2 (a smaller part of the hip hop group)
C. photo 3 (a lone dancer)
D. photo 4 (the name of the group without any images of people in it)
E. All of the photos
F. None of the photos

2B. Emma should share this photo because

A. It shows how athletic dance is
B. It shows the hard work in the group
C. It's cool
D. It's a positive group shot and everyone looks good.
E. It's the name of the group and Emma needs talk with the group members before posting their images.

3A. Dominique is very friendly and entertains her friends at lunch with funny stories that others have shared with her. You are new at the school and she has invited you to join the group for lunch and you end up hanging out after school. It would be appropriate to share

A. How sad you are that you had to move away from your friends.
B. The sports you played at your last school
C. Stupid things your friends did at your last school.
D. Access to your Instagram account
E. All choices except "None of the these"
F. None of these

3B. You should share this because

A. She is friendly and as a new student you want to make friends.
B. Eating lunch with her made you trust her.
C. This is an appropriate self-disclosure at this time.
D. This is self-disclosure for a healthy purpose.
E. None of these

4A. Henry, 10th grader, is in class when he receives a text from his friend James, also in 10th grade. The text includes a photo that James received a few months ago from his now ex-girlfriend, a 9th grader. The photo was originally sent to James as a sext. What should Henry do?

A. Delete the photo and ignore it.
B. Delete the photo and talk to James about why he shouldn't forward sexts.
C. Forward the photo to James's ex-girlfriend so that she knows.
D. Talk to James's ex-girlfriend about why it's a bad idea to sext.
E. Report the sext to a trusted adult.

4B. Why did you answer the question about Henry and the sext this way?

A. The photo isn't my business.
B. The photo is one the that James's ex-girlfriend won't feel good about.
C. The photo is not mine to share.
D. The photo is harmful to James's ex-girlfriend.
E. None of these.

APPENDIX H

Video 3 Assessment

Courtship Part 1

Recall Questions (7)

1. Courtship is a term that comes from

A. The French legal system and refers to the specific behaviors required in court
B. The Italian legal system and refers to the specific behaviors required in court
C. The French royal government and the specific behaviors required for political favors
D. The Italian royal government and the specific behaviors required for political favors
E. All choices except "None of the these"
F. None of these

2. During colonial times people married for the following reasons

A. To improve their economic situation
B. To have children
C. To improve their lives
D. To meet societal expectations
E. All choices except "None of these"
F. None of these.

3. During colonial times children were considered to be

A. A drain on the finances of a family
B. A blessing from God
C. Added worry for the family
D. A necessity for economic survival
E. All choices except "None of the these"
F. None of these

4. Women throughout most of the history of the United States have not been involved in "careers" because

A. It wasn't necessary because things were less expensive then
B. They couldn't physically do the kinds of jobs that were available
C. Pregnancy and childbearing took most of their time
D. Men thought they couldn't successfully manage a career
E. All choices except "None of the these"
F. None of these

5. The Victorian Era was characterized by

A. A rejection of Puritanical values
B. A shift from farms to the city
C. A movement to include men in the spiritual lives of their families
D. Women taking more responsibility for their lives
E. All choices except “None of the these”
F. None of these

6. Scripture is clear that men

A. Have complete authority over the family
B. Should decide family matters carefully
C. Are to put the interests of their wives and children before their own
D. Are responsible for the choices of their wives and children
E. All choices except “None of the these”
F. None of these

7. At the turn of the century public dating shifted to

A. Church socials
B. Bars
C. Nickelodeons
D. Saloons
E. All choices except “None of the these”
F. None of these

Transfer Questions (4 dual level)

1A. You land on an alien planet and observe the people there for a while. You notice the fashion choices of women. Women are wearing corsets and have carefully kept hair. What do you think might be going on with dating and marriage? What would you expect to see with the roles of men and women?

A. Men and women have similar roles.
B. Men and women have well defined roles.
C. Men and women have undefined roles.
D. Men and women are in a period of uncertainty.
E. None of these

1B. Why did you choose the answer you chose?

A. Fashion doesn't tell us anything about roles of men and women.
B. Fashion reflects the times—restrictive clothes are worn when roles are well-defined.
C. Fashion reflects the times—restrictive clothes are worn when roles are undefined.
D. Fashion reflects the times—restrictive clothes are worn when the times are uncertain.
E. None of these.

2A. Samuel and Eloise are married and have 3 children. They are Christians who read the Bible and attempt to follow it. Eloise has a fantastic job opportunity in New York. Their high school aged children are interested in colleges all around the country. Samuel has a good job that he enjoys in Oakland. Who should make the decision and how?

A. Samuel and Eloise should make the decision together by weighing the pros and cons.
B. Samuel should make the decision based on finances.
C. They should make the decision based on what the kids want.
D. Samuel should make the decision after considering what everyone wants and the financial picture.
E. None of these.

2B. Why did you choose the answer you chose?

A. Married people should decide together.
B. The man is the head of the family and should decide based on their financial picture.
C. Parents are responsible for their children and should decide based on what they want.
D. The husband should is the head of the family and should put what is in the best interest of his wife and children first.
E. None of these.

3A. Darius and Caitlyn are married with several children. Darius works 2 jobs so that Caitlyn can stay home with the children. They want to make sure that they are supportive of their children and each other so they divide up jobs with the children. What would be the best division of labor based on the video you just watched?

A. Darius will help with homework and Caitlyn will get the children to bed and help them say their prayers.

B. Darius will relax a little while Caitlyn helps with the homework and then he will take care of getting the children to bed and help them say their prayers.

C. Caitlyn will give Darius a break on Sundays by taking the children to church.

D. Darius will give Caitlyn a break on Sundays by taking the children to church.

E. Darius will help with homework and Caitlyn will get the children to bed and they will focus on prayer as a family at dinner.

3B. Why did you choose the answer you chose?

A. Scripture requires both men and women to be virtuous.

B. Helping with homework will help Darius get more connected to his children.

C. Women are better at getting children ready for bed.

D. Scripture shows women as the ones who take care of children.

E. None of these.

4A. You visit a foreign country and notice that everyone seems to have lots of children. What might you expect to find about the society? Choose the best answer based on the video.

A. It is a society that loves children.

B. It is a society that values families

C. It is a society that bases its economy on farming

D. It is a society that bases its economy on urban factories.

E. None of these.

4B. Why did you choose the answer you chose?

A. Societies encourage people to follow societal influence.

B. Societies that value families tend to have larger families.

C. Farming requires families to have more children in order to survive.

D. Urban factories work best with child labor.

E. None of these.

APPENDIX I

Video 4 Assessment

Courtship Part 2 Test Questions

Recall Questions (7)

1. The Roaring Twenties can be considered

A. The beginning of the sexual revolution
B. The beginning of an era of fear
C. The time when social struggles ended
D. The time when people felt that prohibition settled moral issues
E. All choices except “None of the these”
F. None of these

2. During World War II

A. People were open to societal change
B. Women proved that they could and should work outside the home
C. Women entered the workforce to replace men away at war.
D. People let go of old fears about change
E. All choices except “None of the these”
F. None of these

3. The stock market crash and Great Depression

A. Forced the country to immediately examine social structures
B. Forced people to take risks
C. Led to a return to tradition
D. Led to an examination of new ideas
E. All choices except “None of the these”
F. None of these

4. Prohibition is related to courtship and marriage because

A. It made it difficult to get a divorce
B. It reinforced family structures
C. It created an underground economy
D. It attempted to address abuse of women and children
E. All choices except “None of the these”
F. None of these

5. Societal attitudes during the Baby Boom included

A. 20% of women approving of premarital sex
B. Dating was for fun
C. Open discussions about sexuality
D. Open discussions questioning of societal norms
E. All choices except “None of the these”
F. None of these

6. Attitudes about dating and marriage were influenced by

A. Politics
B. Entertainment
C. Media
D. Academia
E. All choices except “None of the these”
F. None of these

7. During the Baby Boom most women

A. Went to college
B. Went to college to get married
C. Could have a career and raise children
D. Married at the age of 18
E. All choices except “None of the these”
F. None of these

Transfer Questions (4 dual-level)

1A. When the economy "crashed" in 2007, what would you have expected to see happen with courtship and marriage?

A. Weddings would be less expensive.

B. People would delay getting married.

C. Values about courtship and marriage would become more conservative.

D. Values about courtship and marriage would relax.

E. All choices except "None of the these."

F. None of these.

1B. I would expect that because

A. Economic uncertainty is connected to fear.

B. Economic uncertainty means that people have to take risks.

C. Economic uncertainty is connected to a return to traditional values.

D. Economic uncertainty makes people pay attention to money.

E. All choices except "None of the these."

F. None of these.

2A. Many companies are criticized for not having very many women in positions of management or leadership. More women will enter management and leadership jobs when

A. They get the education needed for the jobs.

B. They have husbands who will support them working in management and leadership.

C. Companies create family friendly policies so that women can have families and work.

D. They are as good at the jobs as men.

E. None of these.

2B. Why did you choose the answer you chose?

A. Women have had less access to higher education.

B. Women have been in the workplace for less time.

C. Pregnancy and raising children takes a lot of time away from work.

D. Women are brought up to want approval from their husbands.

E. None of these.

3A. Adam's parents were married right out of high school. They have made it clear that, unlike them, Adam will go to college. As Adam moves through high school, he starts thinking about what he will study in college and what he will do for a career. How do think this will impact his dating life throughout high school and college?

A. Adam will be likely to date people who share his career interests.

B. Adam's parents will have a lot of influence on who he dates.

C. Adam will be likely to date for fun until he is ready to settle down.

D. Adam will be likely to avoid dating.

E. None of these.

3B. Why did you choose the answer you chose?

A. Parents tend to have a lot of influence on who their children date.

B. Adam is likely to meet people who share his interests.

C. Adam is likely to be less focused on marriage in his dating because college has led to a longer period adolescence.

D. Adam is likely to have trouble meeting people.

E. None of these.

4A. For a long time, the United States has been at involved in a lengthy war in Iraq and Afghanistan. Troops have been significantly reduced and a large number of forces have returned to the United States. Which of the following would you expect to be true based on the lecture?

A. The conflict has lasted so long that US citizens don't really think about it unless they have family in the military.

B. US culture has new ideas.

C. US culture has become more traditional.

D. US citizens live in an era of surprising tranquility.

E. None of these.

4B. Why did you choose the answer you chose?

A. Societies at war typically don't have time for a lot of fear.

B. Societies at war become more traditional.

C. Soldiers returning home bring new ideas.

D. Societies tend to forget they are at war after a long time.

E. None of these.

APPENDIX J

Content Expert Rating Sheet for Multimedia Design

Multimedia Design Expert Rating Sheet

The PowerPoints on this survey are intended for a series of videos for my dissertation research. Two areas are designs are being tested in four content areas (Creation Stories, History of Courtship Rituals Part 1, History of Courtship Rituals Part 2, and Self-Disclosure):

- Non-Seductive Detail Design (Images and content related to the instructional objectives)
- Seductive Detail Design (25-30% Additional content and images not directly related to the instructional objectives selected to enhance interest for the viewer)

Two versions of design are provided for each content area.

- Non-Seductive Details Version
- Seductive Details Version

To complete this you will need to open the pdfs of the ppts. You will need to read both versions of each content area in order to complete the survey.

The pdfs have been provided for your reference. Please complete the rating sheets and the full instrument through SurveyMonkey. Thank you.

Instructions for multimedia design experts:

Please select the best answer to the following questions, supplementing your answer with comments as you deem necessary. If you have any questions about the rating sheets, please contact Colette Roche ( ) immediately.

Adapted from Dr. Susan Prion's Content Expert Rating Sheet

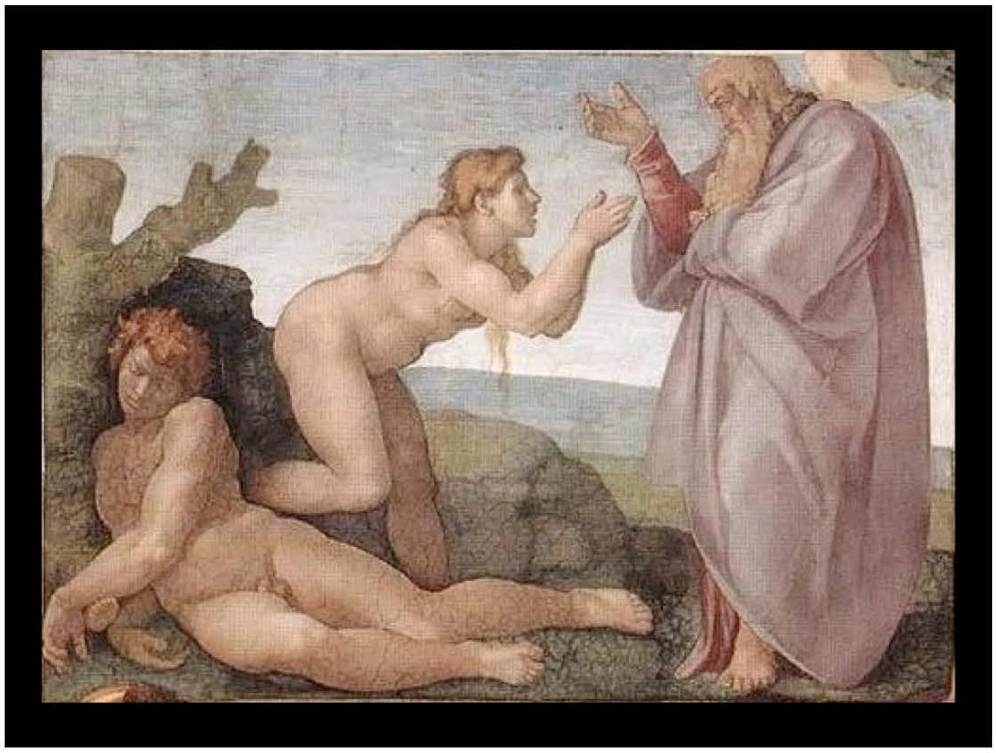
Review the PDFs for Creation Version 1 and Creation Version 2 for these questions.

1. Does *Creation Version 1* clearly relate to one of the two designs being measured? Comment:	☐Yes ☐No
2. In which design area does it best fit? ☐ Non-Seductive Detail ☐ Seductive Detail	
3 If this is the Seductive Detail version, which images do you find particularly interesting? Comment:	
4. If this is the Seductive Detail version, which text items appear to be unrelated to the learning objectives? Comment:	
1. Does *Creation Version 2* clearly relate to one of the two designs being measured? Comment:	☐Yes ☐No
2. In which design area does it best fit? ☐ Non-Seductive Detail ☐ Seductive Detail	
3 If this is the Seductive Detail version, which images do you find particularly interesting? Comment:	
4. If this is the Seductive Detail version, which text items appear to be unrelated to the learning objectives? Comment:	
5. Do you consider the content of both ppts to be generally the same? Comment:	

Adapted from Dr. Susan Prion's Content Expert Rating Sheet

APPENDIX K

Slides of the Video 1 No Seductive Details



"Then God said, let us make human beings in our image, after our likeness… in the image of God…male and female, God created them. God blessed them." Genesis 1:26-28a

These powerful words have set the foundation of centuries of human beliefs and behavior. Generation to generation, culture to culture, people of many races and tongues have understood their own selves through this perspective.

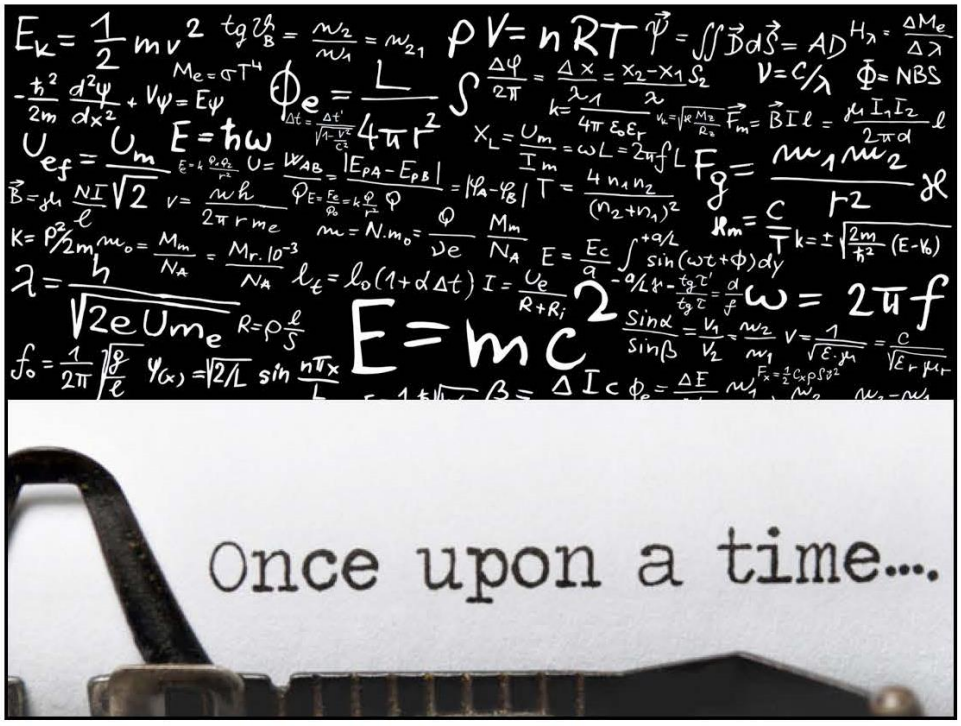
We are no different. In order to understand ourselves better in the context of this class, we need to look at the full creation story. Who created us? What is our purpose?

In the beginning, when God created the heavens and the earth— and the earth was without form or shape, with darkness over the abyss and a mighty wind sweeping over the waters—

Then God said: Let there be light, and there was light. God saw that the light was good. God then separated the light from the darkness. God called the light "day," and the darkness he called "night." Evening came, and morning followed—the first day.
(NABRE).

Beginnings are important. They set the foundation on which the rest of your structure can be built. Without a true foundation your structure cannot achieve its full potential. The beginning of the Bible is perhaps one of the most iconic, widely recognized, and profound of any work of literature . It has been read and cherished by many, it's meaning has guided the lives of devout believers and casual observers. That meaning might be hard to comprehend for some and a continued discovery evolves as we get to know the God who inspired its writing. Others find it confusing or even perhaps misunderstand it's author's purpose.

What we DO know is that the creation stories hold great importance to Jewish and Christian believers as they have been chosen to set the foundation for the theological truths of the entire Bible.



To understand the importance of the scriptures we must first understand how to read the scriptures in their proper purpose - thus we must understand the literary genre of the creation stories. All writing is not done in the same fashion: a science journal differs from a fiction novel as the first seeks to give facts about our physical world and the later might seek to tell a story that never really happened but can teach us important things about humans.

You wouldn't want to read a work of fiction to learn how to build a spaceship. You will fail to build a spaceship and you won't enjoy reading your book. The Creation stories are a unique type of genre - theological teaching. Those who read them for science (or for anything else for that matter), will miss the purpose the authors had in telling the Creation stories - and that purpose was to learn the foundational theological truths or spiritual understanding for human beings and for the creation of all things.

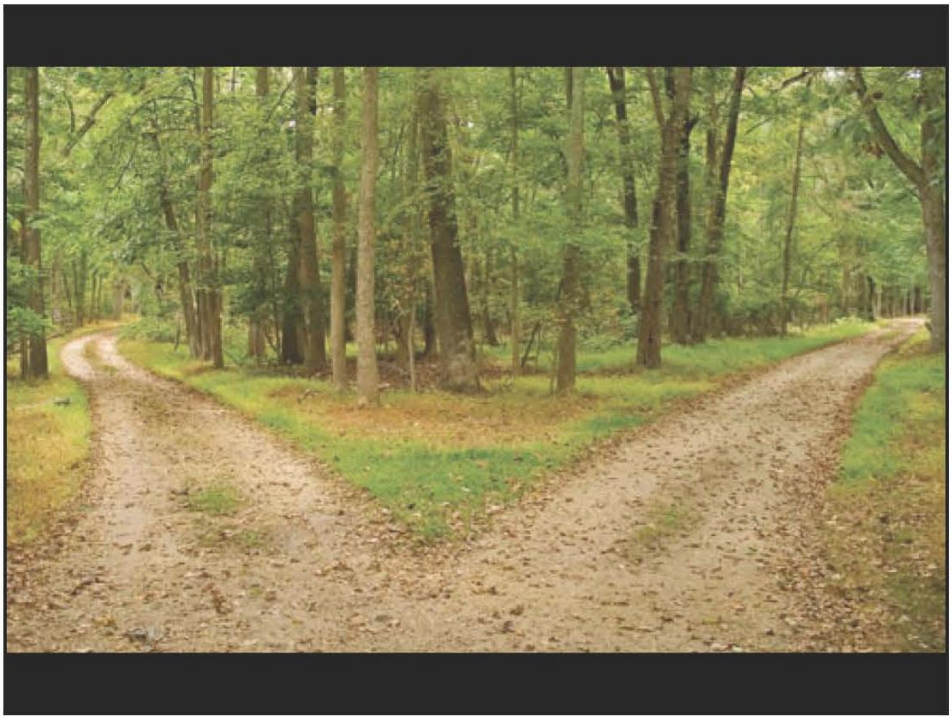
Since there are many theological truths for us to learn it should be no surprise that the editors of the Bible found it beneficial to include two creation stories for us to learn from. Both stories are found in Genesis chapters one and two, and have some similarities and some differences. However, both stories carry important teachings for our lives that work well together, and thus appear in succession as a grand opening monologue to the epic story that is the bible.

There are seven theological truths that we have discovered in the Creation stories that we will reflect on here.

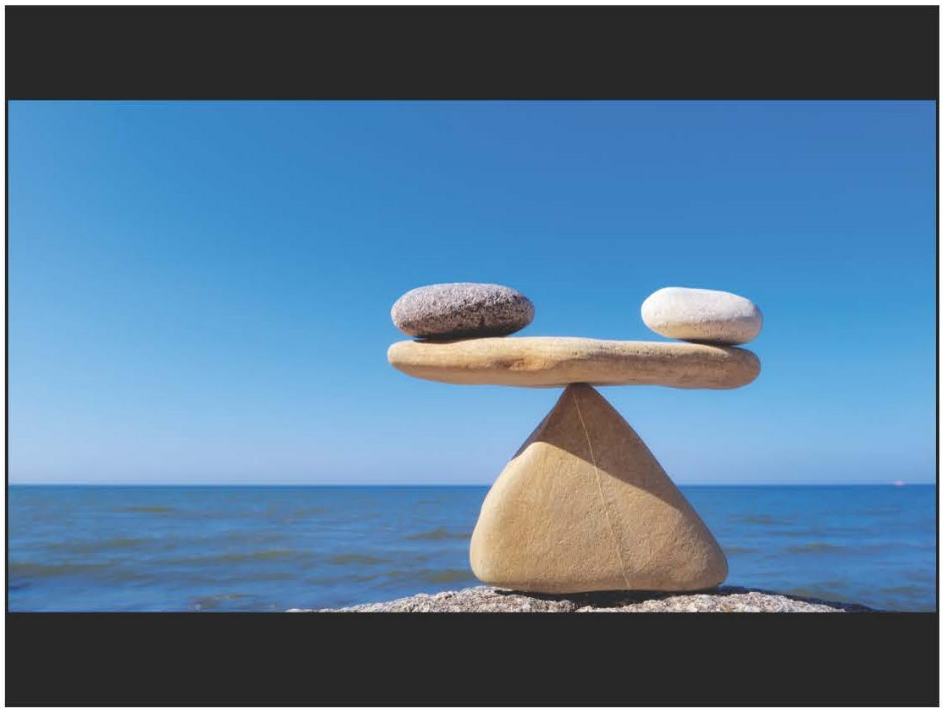
First, **creation is good and God creates in love.** In the opening day of creation and throughout each successive day, as God creates, God declares the creation to be good or even better as in the sixth day were "God looked at everything [God] had made, and [God] found it very good."

Second, **God's creation is given the ability to create.** As the authors reveal to us the creation of vegetation, animals and humans - all the things with life, a very important detail is included. Each was given the ability to create itself and this ability to create life was a blessing and something each was commanded to do - "Be fertile, multiply, and fill the water of the seas; and let the birds multiply on the earth." Life is a great gift and the ability to create new life is also a gift to be used responsibly and in love as God has done .

Third, **humans are given the responsibility to nurture creation.** This occurs several times in the story as God creates God also gives humans responsibility to care for all the creation. We are the last created on the sixth day of the first creation story, as to highlight both our extraordinary gifts of intellect and social skills above all the rest of creation but also to emphasize our responsibility to use all these gifts to care for all creation.

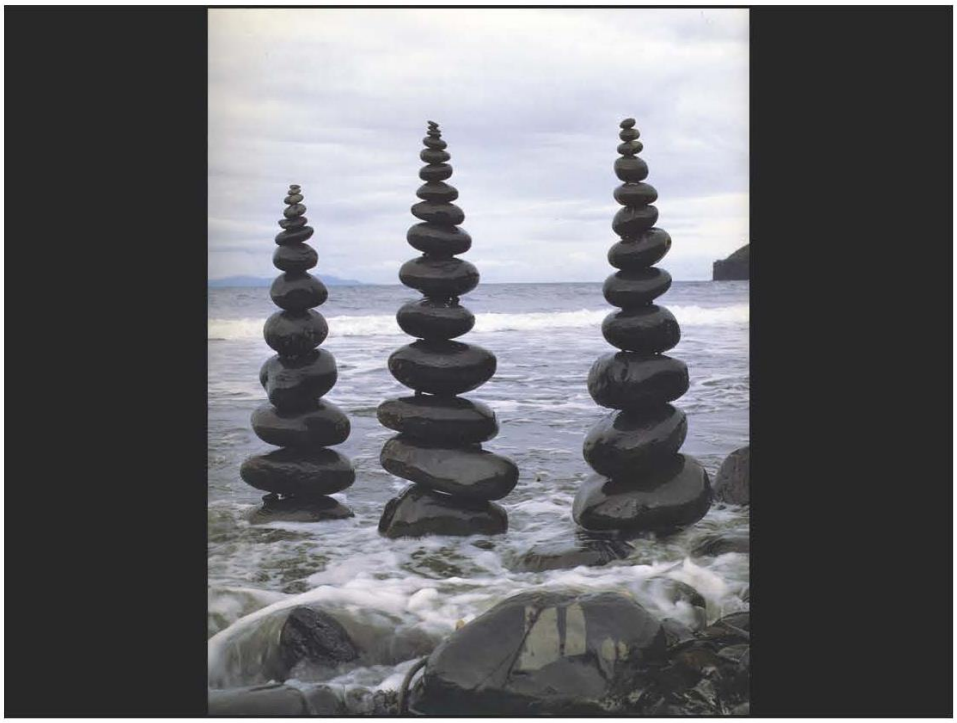


Fourth, **humans are given free will to choose our destiny and create for better or worse**. God loves us so much that God gives us the ultimate gift - that of free will. The second creation story tells us of how we can choose to understand our limitations or try to be like our own gods, and ignore the simple truths that can be discovered about God's created world. If we follow God's respect God's teaching we will be blessed and if we ignore it we will find ruin for ourselves and our world. But the choice is ours to make, and to learn from for God is also a God of second chances. We are encouraged to make choices and learn from them.



Fifth, **humans are created in God's loving image and likeness. Women and men are equals, each part of God's image**. The Hebrew word here is *adam*, which is generic although sometimes translated as male, it really is intended to mean all humans. Humans therefore are *like* God, not the same or equal to God. We have the ability to love, create, make choices and be caretakers of this world. The scriptures illuminate our likeness in countless ways over many hundreds of pages too numerous to fairly summarize here. But we are the daughters and sons of the most loving creator. We are God's heirs and should strive carry on with the same love and care for the creation that the creator has for the creation.
This is the "Love one another as I have loved you!" part.

Sixth, **humans (and all of creation) are relational, just as God is relational.** This theological truth is actually scattered throughout both creation stories emphasizing how important and foundational it is to us. In the opening scene of the first creation story the Trinity appears as God the father speaks light into existence with simply the spoken word, and the word we now understand is Jesus as taught in the Gospel of John "In the beginning was the Word, and the Word was with God, and the Word was God. He was in the beginning with God. All things came to be through him, and without him nothing came to be. What came to be through him was life, and this life was the light of the human race; the light shines in the darkness, and the darkness has not overcome it." Then finally we see the Holy Spirit hovers over the water, right there in the opening scene. This may be subtle but it becomes even more explicit in sixth day of creation when God says, "Let us make [humans] in our image." God is clearly referring to Godself as a plural, the trinity. God's very nature is to exist in relationship, not only with Godself but with God's creation. God is in relationship with humans and this is highlighted in the second creation story as God interacts very intimately with God's creation breathing life into us, blessing us and caring for us. God's desire to be in relationship with humans of course continues throughout the scriptures as the entire epic story of the bible is in part a simple love story of God wooing and pursuing humans to bring us back into relationship with God. Further, human's need for relationship is also highlight in the second story as God creates animals for our companionship and let's us name them. In addition, man and woman are created for each other so they will not be lonely . From this we learn how important it is for humans to be in healthy relationships. We are most human and find the most satisfaction in life when we participate in healthy relationships.

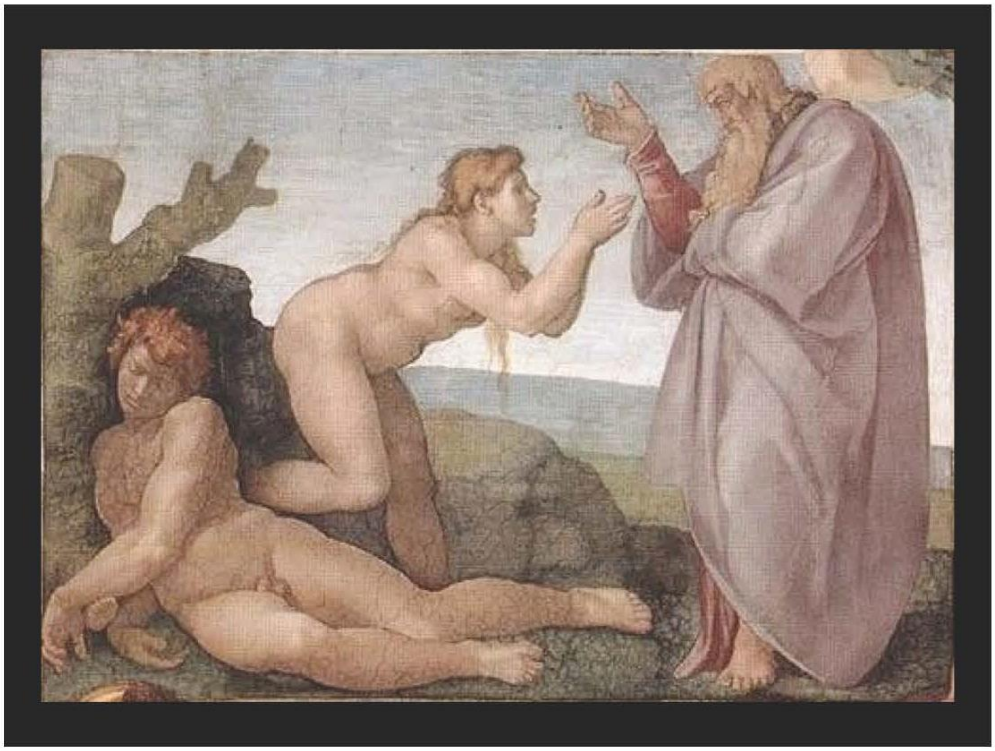


Seventh, **order and balance are important in life.** In the opening scene of the first creation story there is emptiness, void and darkness...the words paint a picture of bleakness. But in the next sentence the nature of God is revealed when God creates light which is good and useful and this creating continues on in successive steps as the authors build the grand narrative of God creating and ordering for use each part of the creation. The act of creating itself is done in a very orderly fashion in the first creation story as the first three days God creates outer space or the universe; oceans & sky; and earth & vegetation than in the same order over the next three days God fills each of those created spaces with the sun, stars and moon; fish and birds; and land animals and humans. Then to complete the orderly nature and demonstrate the need for balance, God does something completely different on the last day - God rests. This seventh day was understood to be different even by later scribes who separated it into the next chapter. It was different because "...God blessed the seventh day and made it holy, because on it [God] rested from all the work [God] had done in creation." God the creator of the world has a balance between work and rest and so too should humans.

So, from the creation stories we learn that the creation is good and God created in love. God's creation is given the ability to create and humans are given the responsibility to care for creation. Humans are given free will to choose our destiny and create new things for better or worse and to learn from those choices. Humans are created in God's image and men and women are co-equals, each part of God's image. Humans (and all of creation) are relational, just as God is relational and thus we our most human and thrive when we are in healthy relationships. Finally, we learn that order and balance are important in life, we all must find the right balance between work, play and rest.

APPENDIX L

Slides of the Video 1 Seductive Details



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"Many of your religion teachers studied scripture in college or graduate school. The research of biblical scholars is frequently called biblical criticism. It does not assume or deny belief in the supernatural origins of the scriptures. Instead, it applies to the Bible methods of textual analysis used in other disciplines of the humanities and social sciences. Many biblical use more traditional Jewish and Christian methods of interpretation, which may be called biblical exegesis or hermeneutics.

Historical research has often dominated modern biblical studies. Biblical scholars usually try to interpret a particular text within its original historical context and use whatever information is available to reconstruct that setting. Historical criticism aims to determine the origin, authorship, and process by which ancient texts were composed. Famous theories of from historical criticism include the documentary hypothesis which suggests that the Pentateuch was compiled from four different written sources, and different reconstructions of "the historical Jesus" based primarily on the differences among the canonical Gospels.

Most of the Jewish Bible, the Tanakh, which is the basis of the Christian Old Testament, was written in Biblical Hebrew, though a few chapters were written in Biblical Aramaic. The New Testament was written in Koine Greek, with possible Aramaic undertones, as was the first translation of the Jewish Bible known as the Septuagint or Greek Old Testament. As a result, if you go to college for biblical studies, you will learn at least some Hebrew, Greek and sometimes Aramaic." [wikipedia article with minor edits}

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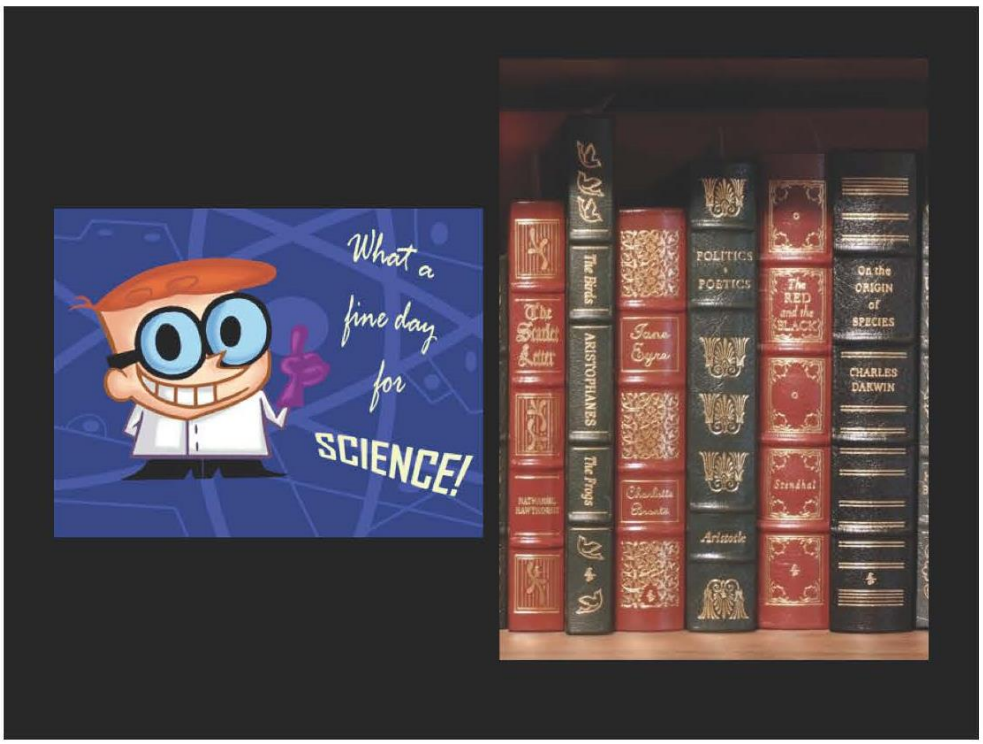

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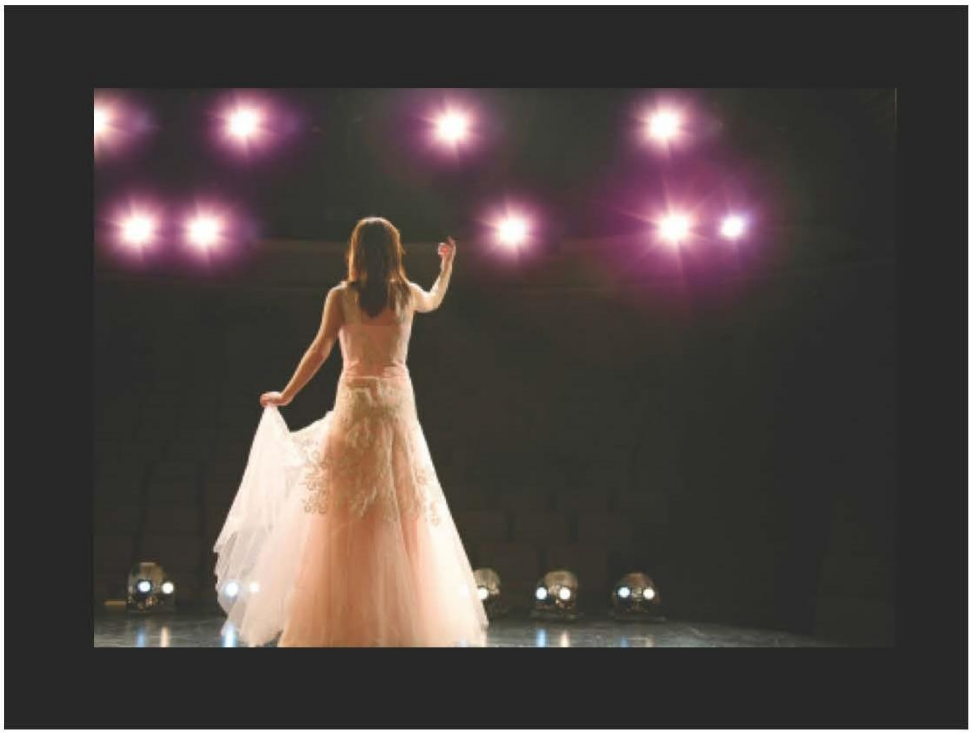

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Given this understanding of Genesis, how then can we reconcile it with the scientific theories of "Big Bang" and evolution? First, we must remember that a theory is a statement, or "story," which tries to explain a set of phenomena. Just as Genesis is a story– albeit inspired by the Holy Spirit– which presents truths of God's creativity, Big Bang coupled with evolution form a story or theory posited to explain scientific evidence surrounding creation. According to these theories, billions of years ago, an explosion– a "Big Bang"– started the expansion of the universe which continues to this day. In essence, creation has evolved over time and will continue to evolve. One must pause however and note that the Big Bang theory presents creation by chance, error, and dissonance rather than a reasoned, ordered, designed progression. Nevertheless, scientific evidence does give some credence to this theory, and for this reason the Holy Father said, "Today... new knowledge leads us to recognize that the theory of evolution is more than a hypothesis." Note, however, the Holy Father did not say that either theory– Big Bang or evolution– captures the whole truth surrounding creation.

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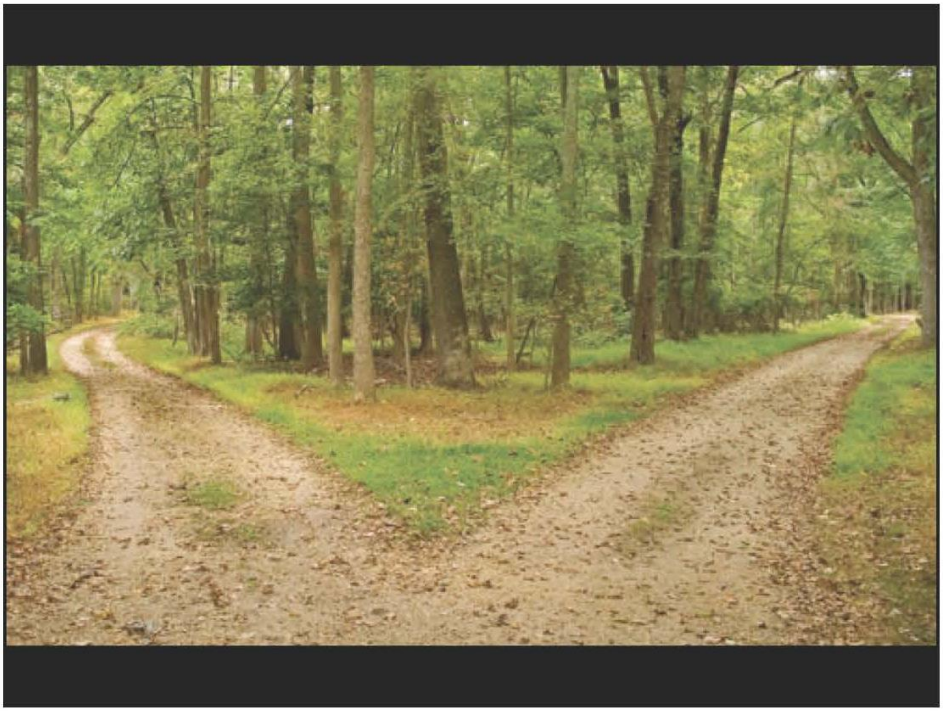
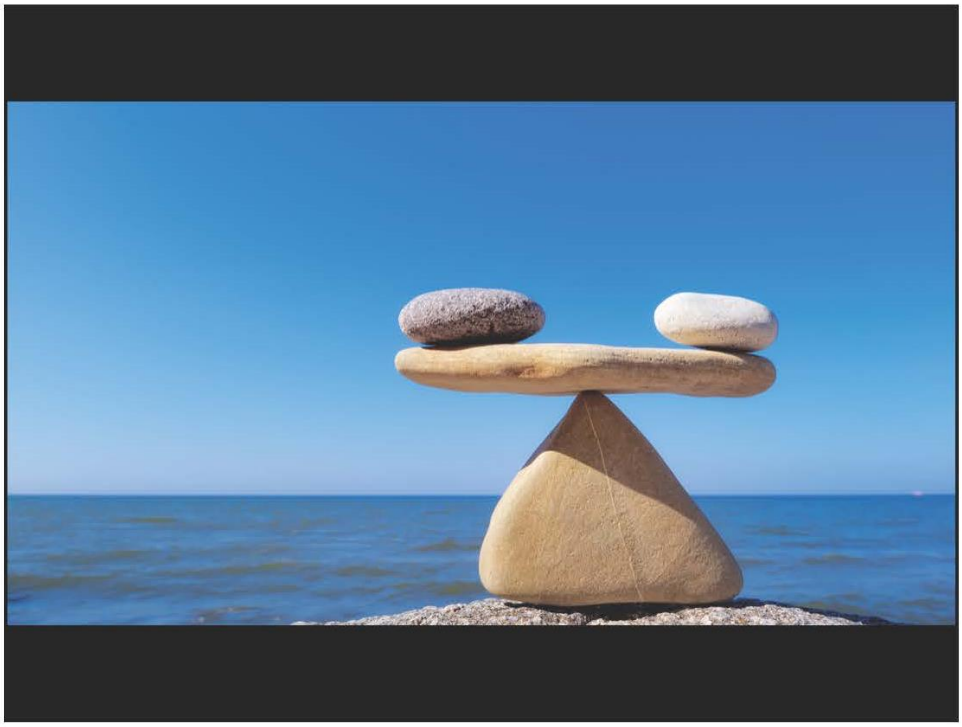
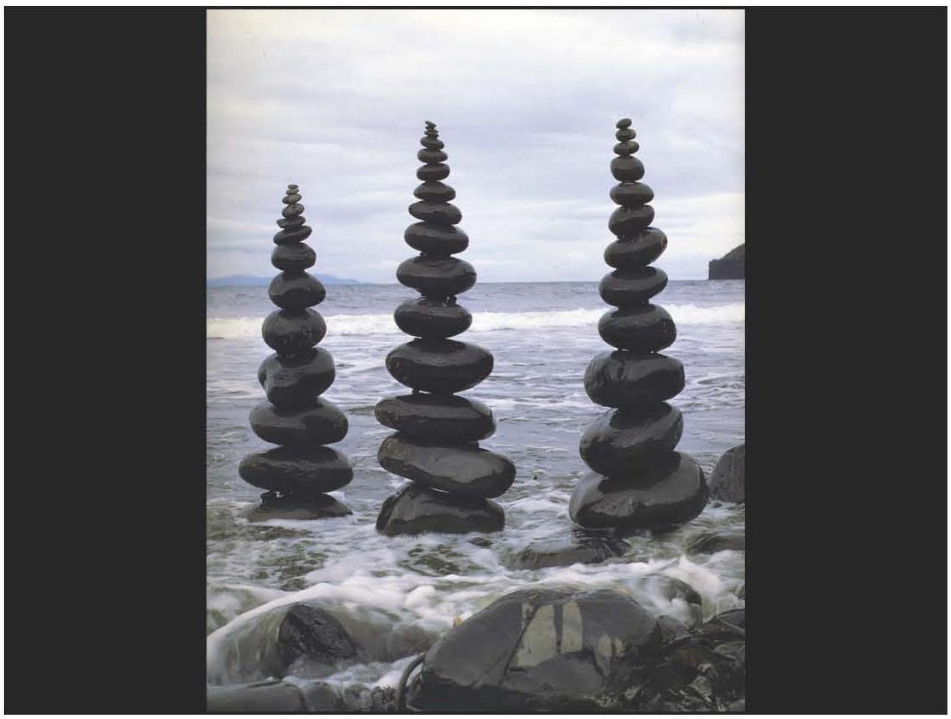


Fourth, **humans are given free will to choose our destiny and create for better or worse**. God loves us so much that God gives us the ultimate gift - that of free will. The second creation story tells us of how we can choose to understand our limitations or try to be like our own gods, and ignore the simple truths that can be discovered about God's created world. If we follow God's respect God's teaching we will be blessed and if we ignore it we will find ruin for ourselves and our world. But the choice is ours to make, and to learn from for God is also a God of second chances. We are encouraged to make choices and learn from them.



Fifth, **humans are created in God's loving image and likeness. Women and men are equals, each part of God's image**. The Hebrew word here is *adam*, which is generic although sometimes translated as male, it really is intended to mean all humans. Humans therefore are *like* God, not the same or equal to God. We have the ability to love, create, make choices and be caretakers of this world. The scriptures illuminate our likeness in countless ways over many hundreds of pages too numerous to fairly summarize here. But we are the daughters and sons of the most loving creator. We are God's heirs and should strive carry on with the same love and care for the creation that the creator has for the creation.

Sixth, **humans (and all of creation) are relational, just as God is relational.** This theological truth is actually scattered throughout both creation stories emphasizing how important and foundational it is to us. In the opening scene of the first creation story the Trinity appears as God the father speaks light into existence with simply the spoken word, and the word we now understand is Jesus as taught in the Gospel of John "In the beginning was the Word, and the Word was with God, and the Word was God. He was in the beginning with God. All things came to be through him, and without him nothing came to be. What came to be through him was life, and this life was the light of the human race; the light shines in the darkness, and the darkness has not overcome it." Then finally we see the Holy Spirit hovers over the water, right there in the opening scene. This may be subtle but it becomes even more explicit in sixth day of creation when God says, "Let us make [humans] in our image." God is clearly referring to Godself as a plural, the trinity. God's very nature is to exist in relationship, not only with Godself but with God's creation. God is in relationship with humans and this is highlighted in the second creation story as God interacts very intimately with God's creation breathing life into us, blessing us and caring for us. God's desire to be in relationship with humans of course continues throughout the scriptures as the entire epic story of the bible is in part a simple love story of God wooing and pursuing humans to bring us back into relationship with God. Further, human's need for relationship is also highlight in the second story as God creates animals for our companionship and let's us name them. In addition, man and woman are created for each other so they will not be lonely . From this we learn how important it is for humans to be in healthy relationships. We are most human and find the most satisfaction in life when we participate in healthy relationships.

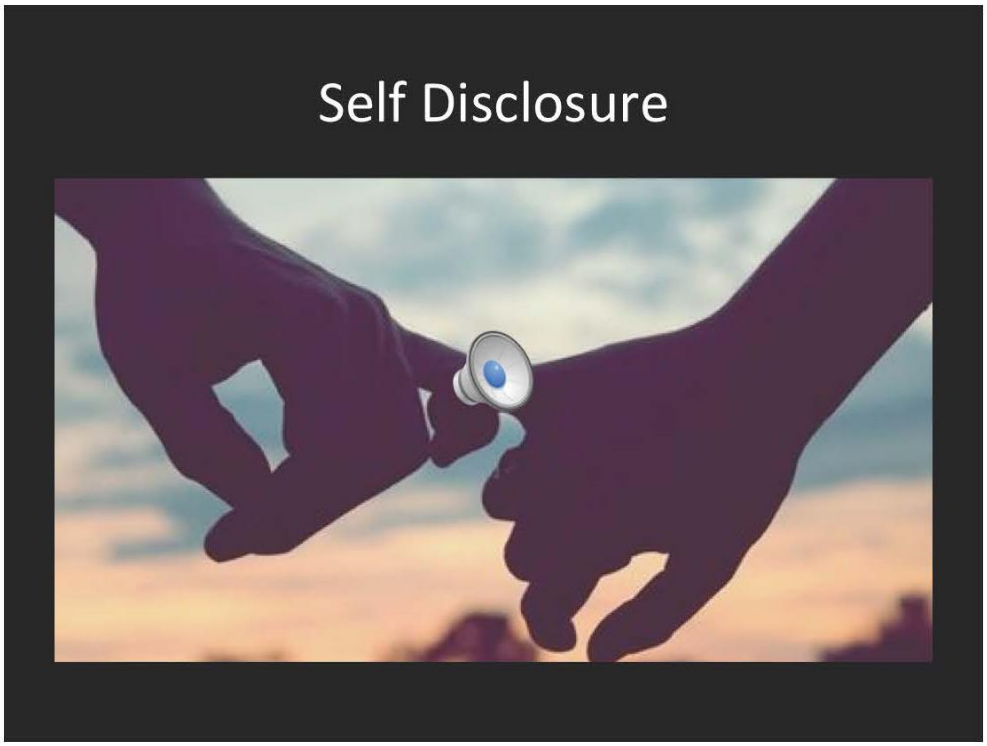


Seventh, **order and balance are important in life.** In the opening scene of the first creation story there is emptiness, void and darkness...the words paint a picture of bleakness. But in the next sentence the nature of God is revealed when God creates light which is good and useful and this creating continues on in successive steps as the authors build the grand narrative of God creating and ordering for use each part of the creation. The act of creating itself is done in a very orderly fashion in the first creation story as the first three days God creates outer space or the universe; oceans & sky; and earth & vegetation than in the same order over the next three days God fills each of those created spaces with the sun, stars and moon; fish and birds; and land animals and humans. Then to complete the orderly nature and demonstrate the need for balance, God does something completely different on the last day - God rests. This seventh day was understood to be different even by later scribes who separated it into the next chapter. It was different because "...God blessed the seventh day and made it holy, because on it [God] rested from all the work [God] had done in creation." God the creator of the world has a balance between work and rest and so too should humans.

So, from the creation stories we learn that the creation is good and God created in love. God's creation is given the ability to create and humans are given the responsibility to care for creation. Humans are given free will to choose our destiny and create new things for better or worse and to learn from those choices. Humans are created in God's image and men and women are co-equals, each part of God's image. Humans (and all of creation) are relational, just as God is relational and thus we our most human and thrive when we are in healthy relationships. Finally, we learn that order and balance are important in life, we all must find the right balance between work, play and rest.

APPENDIX M

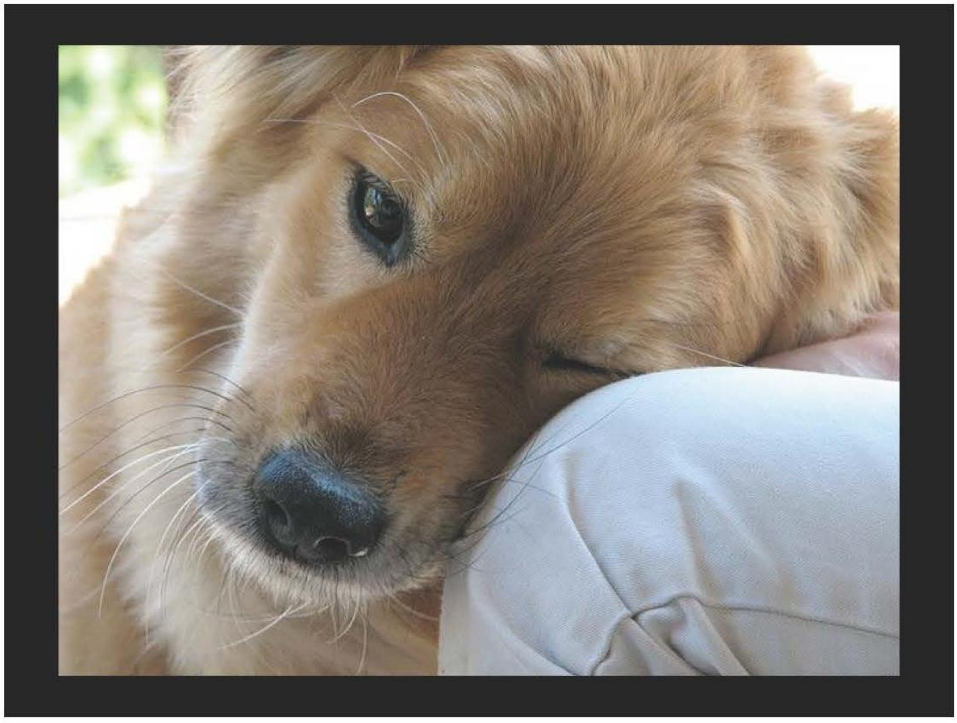
Slides of the Video 2 No Seductive Details



Self-disclosure is the process of revealing significant and private information about yourself. It lays the foundation for a very close relationship.

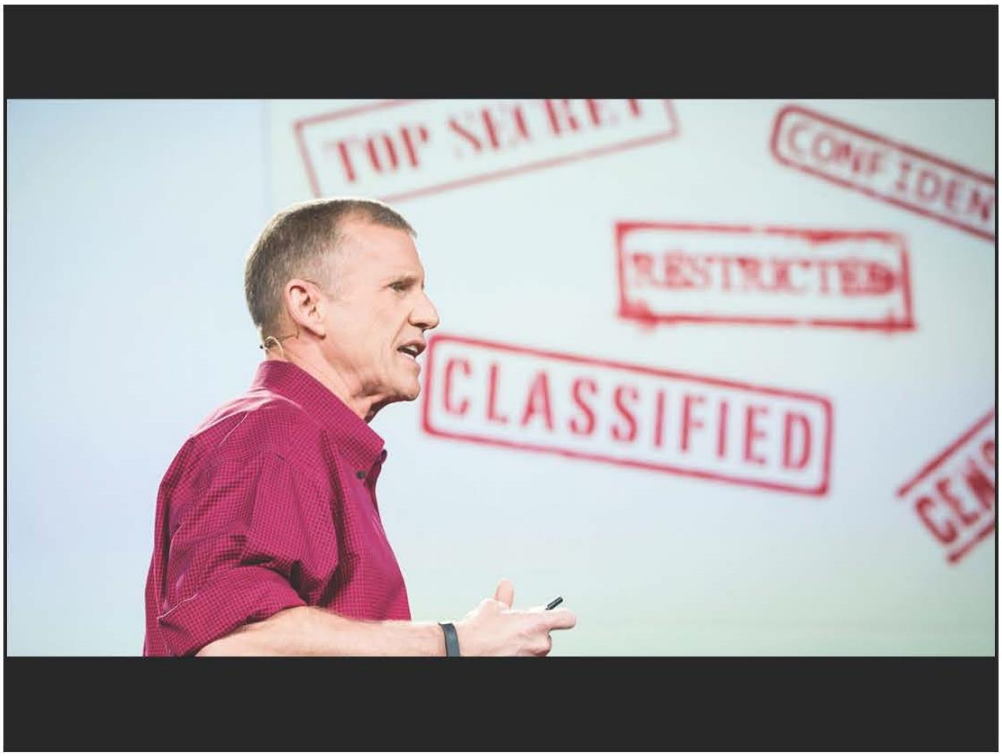
In any relationship, people have to be able to trust each other. This means being honest with the other person in the relationship. Having trust in a relationship also means proving to each other that you are **reliable, responsible, and dependable**.

*Think about the people in your life with whom you share the deepest part of yourself. Why? What about them makes you feel **comfortable**? Why do you **trust** them? What about the relationship makes you feel **safe**?*



A friend tells you something about her, you tell her something about you at a similar level
of intimacy. As two people get to know each other better, the information they share becomes more personal. Eventually, it becomes **comfortable** to share secret information, or information that reveals insecurities, fears, or faults. But this type of self-disclosure takes time.

It requires **trust** on both sides, the kind of trust that cannot be built quickly.



It is important to note that this special kind of sharing is not appropriate in every circumstance and for every relationship.

Sometimes, self-disclosure happens too quickly or is one-sided.
It is really important that you **think before you share**!...You'll see a theme here.

Before you begin **self-disclosing** with someone, ask yourself some important questions:

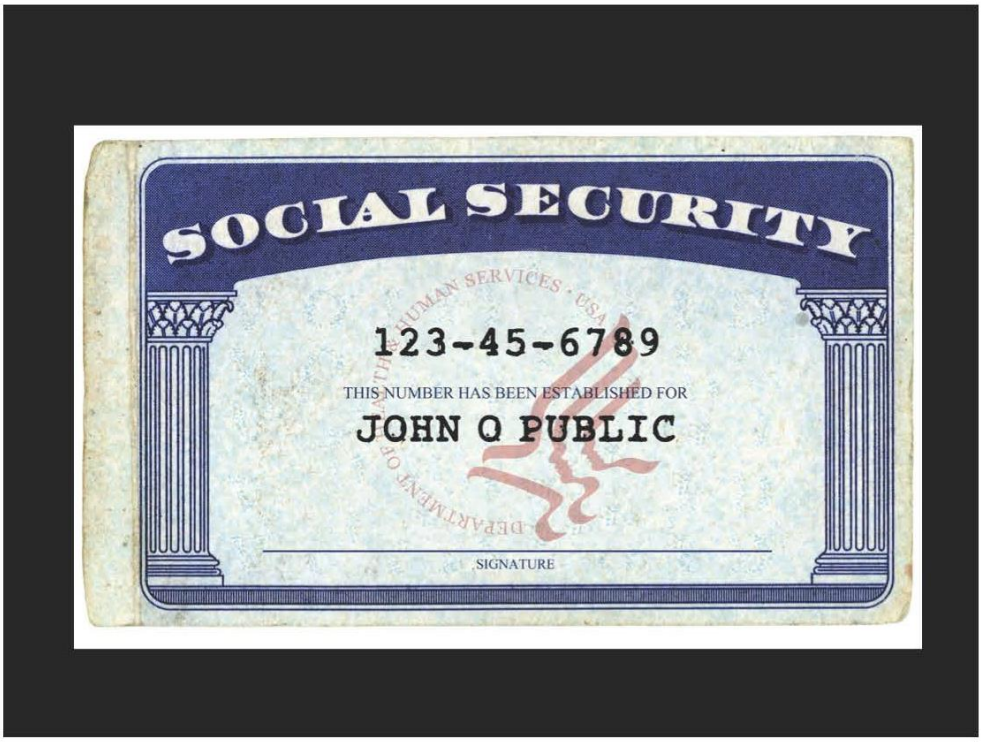
1. Is this person important to you?
2. Can you trust this person?
3. Does the other person feel comfortable self-disclosing with you?
4. Will your self-disclosure serve a healthy purpose?

Telling a close friend more about you makes the relationship closer. Learning another's thoughts ideas, and feelings is a part of communicating in a relationship.

However, being selective about what you tell others can save you the embarrassment of having your "business" spread all over school.

In a trusting relationship, you should be able to **share** information with your friend without worrying that he or she will share it with others or gossip about it. You should also avoid sharing any confidential information your friend tells you (unless keeping a secret puts him or her in danger, then you should always tell a trusted adult).

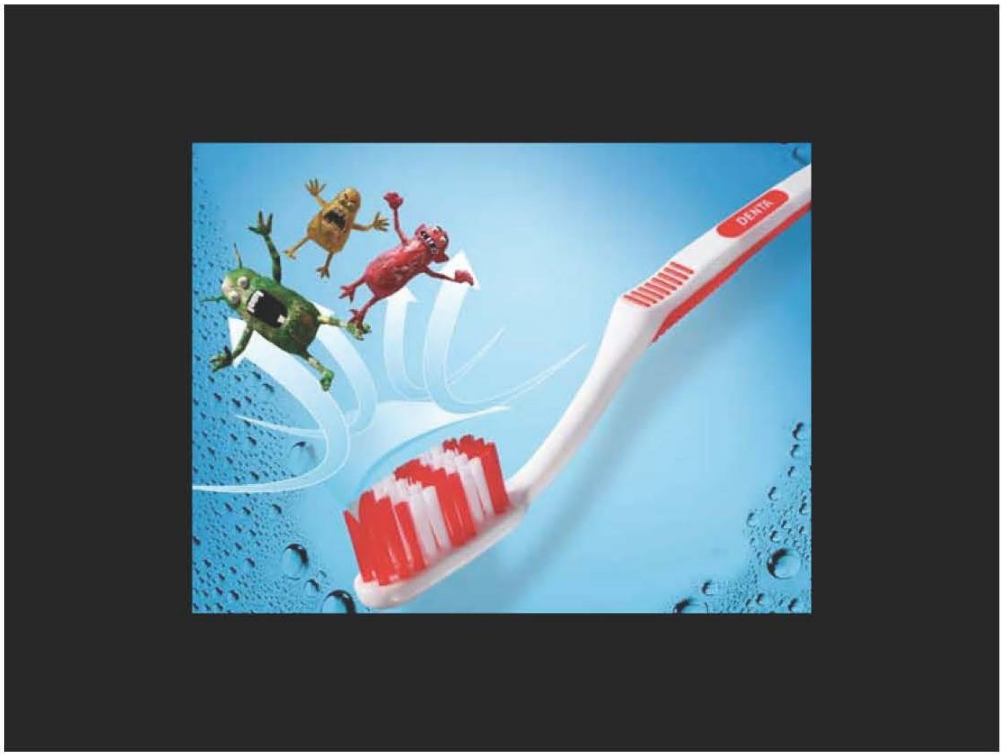
Speaking of self-disclosure...Have you ever been sorry that you shared something online?
Think beyond twitter, facebook, instagram, and snapchat. Online actions have real world consequences.



*First of all, some information should ALWAYS remain private…obviously, your social security number and family financial information like credit card numbers, but you should NEVER share **your passwords**!…EVER!*

Think of all the things you do with a password: Update your status, make comments about yourself and others, post photos, store your photos and files, complete and store your homework! Perhaps you even keep an electronic journal. If someone gains access to your password, they gain access to all of it!

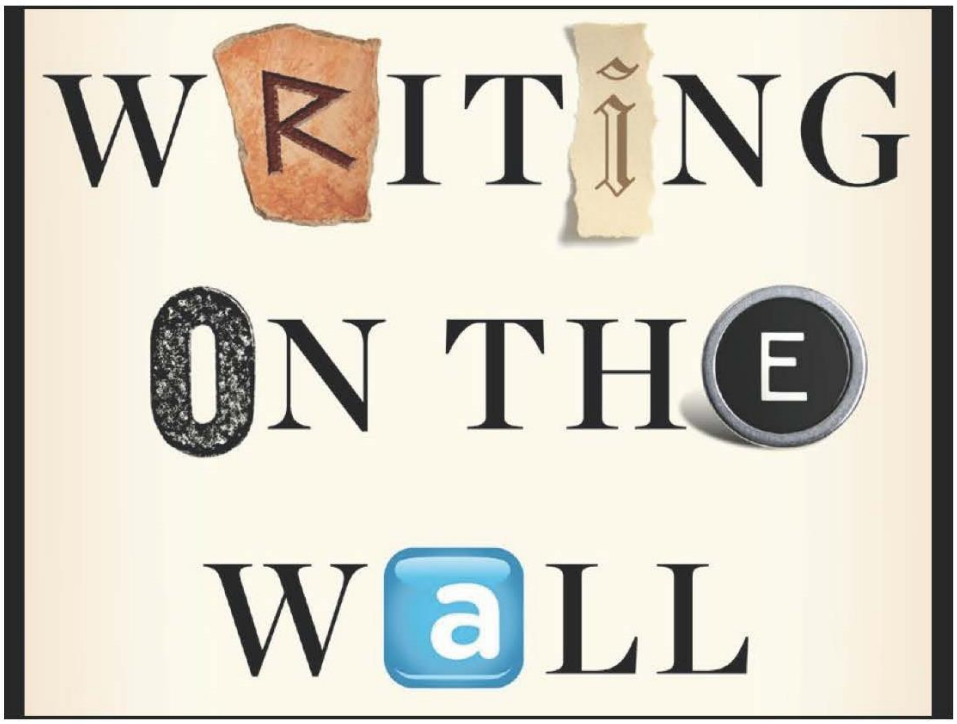
Whether out of anger, anguish, boredom, or in jest, that person could change your profile, delete your files and photos, share your files and photos…and worse yet, that person with whom you freely shared your password, could change YOUR password and block your access to your own accounts! **Think before you share!**



If you wouldn't share your toothbrush.... don't share your password!

So,...what about sharing your own **personal information and photos** online?

First of all, **know your settings**! Are your tweets and posts public or private? Do you know? Have you checked your friends list lately? Because, every time you share, you send that information or photo to everyone! And, once others receive it, you no longer have control. It is theirs to do whatever they want with your information or your photos! Remember that online actions have real world consequences.



Before you begin self-disclosing online by sharing your **personal information**, ask yourself some important questions:

1. Is this information mine to share?
2. Could this info get anyone into trouble?
3. Am I proud to share this info about me or my friends?
4. Am I aware that ANYONE can share it once it is posted?
5. Would I be okay if my family, coach, teachers, pastor or grandma saw it?
6. Will I feel good later about sharing this info today?

It is always best to err on the side of caution. You can always share later, but you can never take it back! And when you receive information that perhaps shouldn't had been shared in the first place, you are still responsible for what you do with it. Protect your own and others' private information online! Don't repost, "like", or comment positively on anything that disrespects or denies the dignity of someone else! In fact, it only takes one person to speak out against online stupidity. What you permit, you promote!

Now, let's look at **online photos**, but don't forget that online actions have real world consequences. Photos are just another way to self-disclose your significant and private self to lots and LOTS of people!

Before you begin self-disclosing online, by sharing your **personal photos**, ask yourself some important questions:

1. Is it a good photo, one that I am proud of?
2. If posting a photo of others, would they be proud of it?
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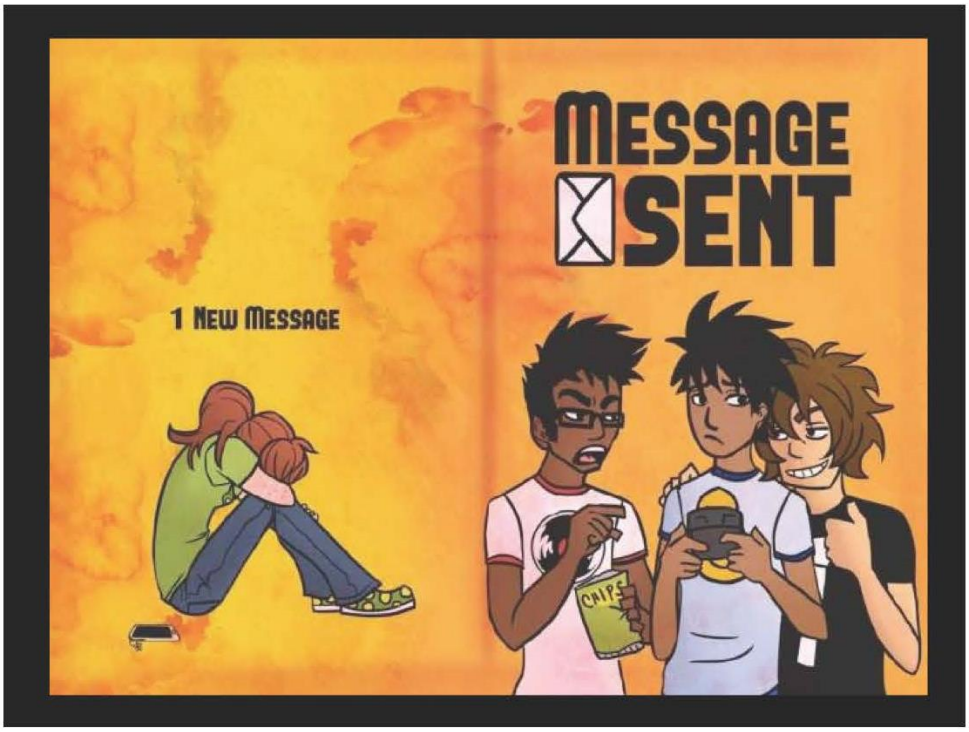
5. Would I be okay if my family, coach, teachers, pastor or grandma saw it?
6. Years from now, will I feel good about making it public?

Always protect your own and others' private information online!

Think before you share! STOP and consider before you post about yourself and others.
Because, once you post or send, you CANNOT take it back!



And speaking of photos you can never get back, what do you think about sexting? Sexting is the practice of sending nude or semi-nude images via electronic means. That means sending that sexually explicit photo using a cell phone or computer.

When that special person asks for that sexually explicit photo, it might make you feel romantic, sexy, and special…or uneasy, anxious, or even scared. But don't do it! Period! Think before you send. Your body belongs to you, and that includes your image.

Sometimes people who you don't know in person and don't have a relationship with may try to get you to send them photos of yourself. Self-disclosure with a stranger is never a good idea. Your body belongs to you, and that includes your image.

People who create, forward, or even save explicit photos and messages put their friendships and reputations at risk! Not to mention that they could be breaking the law.

Think about this…Let's say you begin dating at 16, and you plan to get married around 26, the odds show that the majority of people with whom you enter into relationships will eventually become a "former" or an "ex"!

Once you send a photo you can NEVER get it back!
That nice and loving, cute and compassionate person is now an "EX", and is in possession of your personal photo! What once you thought was totally private is now in the possession of someone who no longer feels the way they once did.

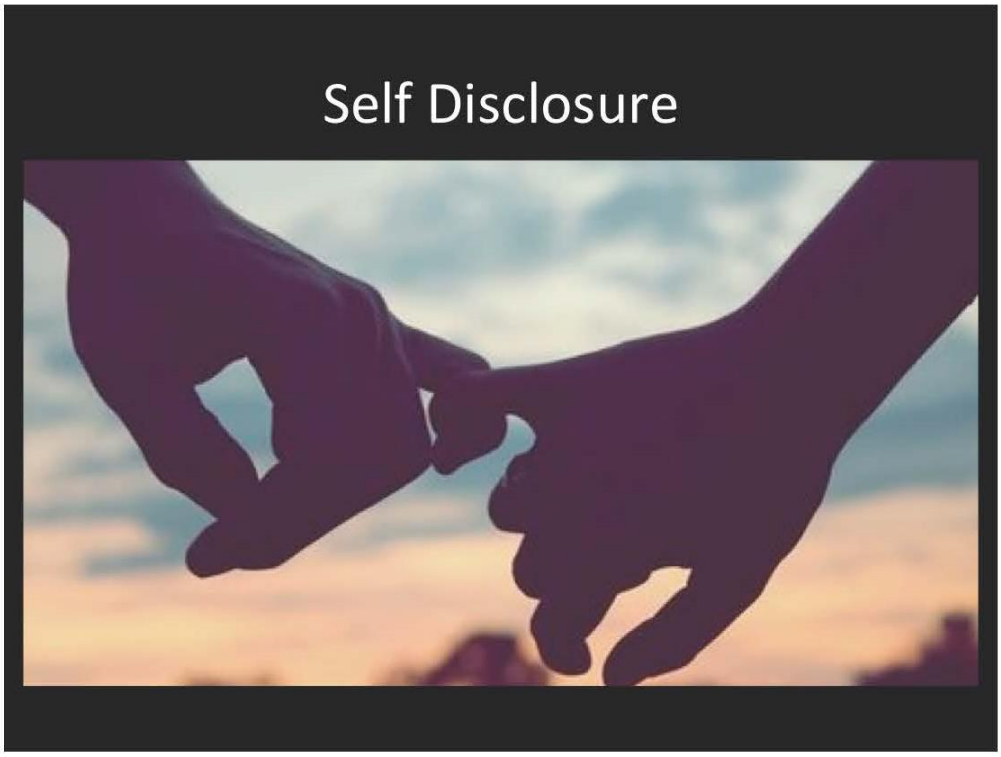
Human beings who are feeling rejected or hurt or angry are capable of acting irrationally and mean.
Don't put your reputation at risk! **Think before you share!**

Self-disclosure should always serve a healthy purpose.
There is NO good reason to ever share your password(s).
Always tell a trusted adult if you or someone you know is being hurt emotionally or physically by someone in their life--even if it's because of embarrassing photos.

Protect yourself by protecting your private information and your private parts.
In all relationships whether online or in person, treat yourself and others with dignity and respect.
And always...**think before you share!**

APPENDIX N

Slides of the Video 2 Seductive Details



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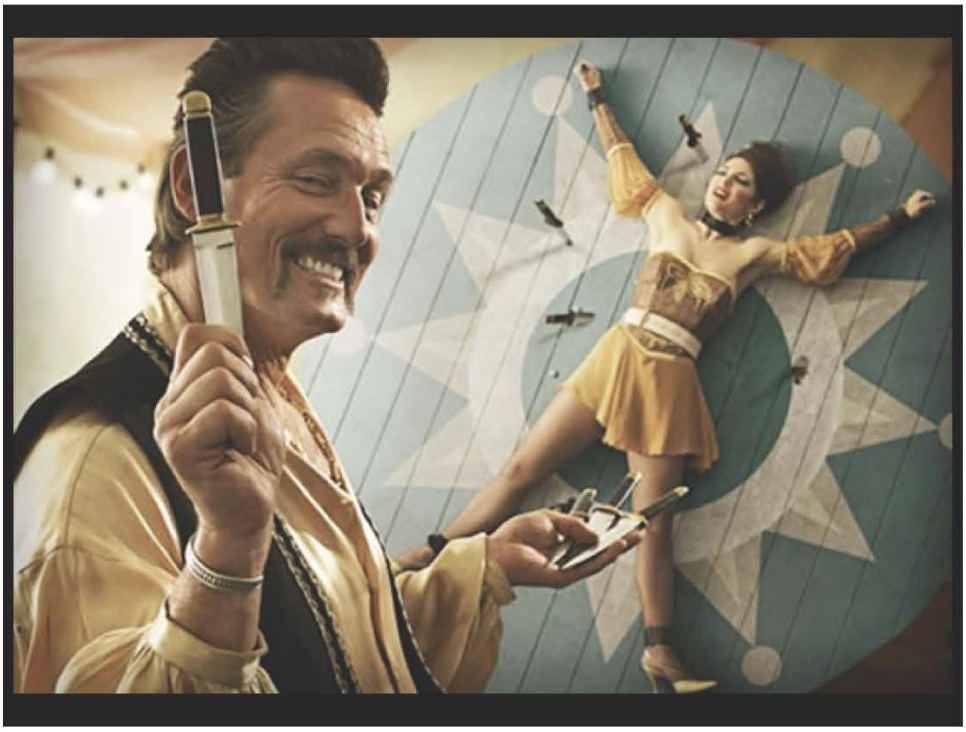

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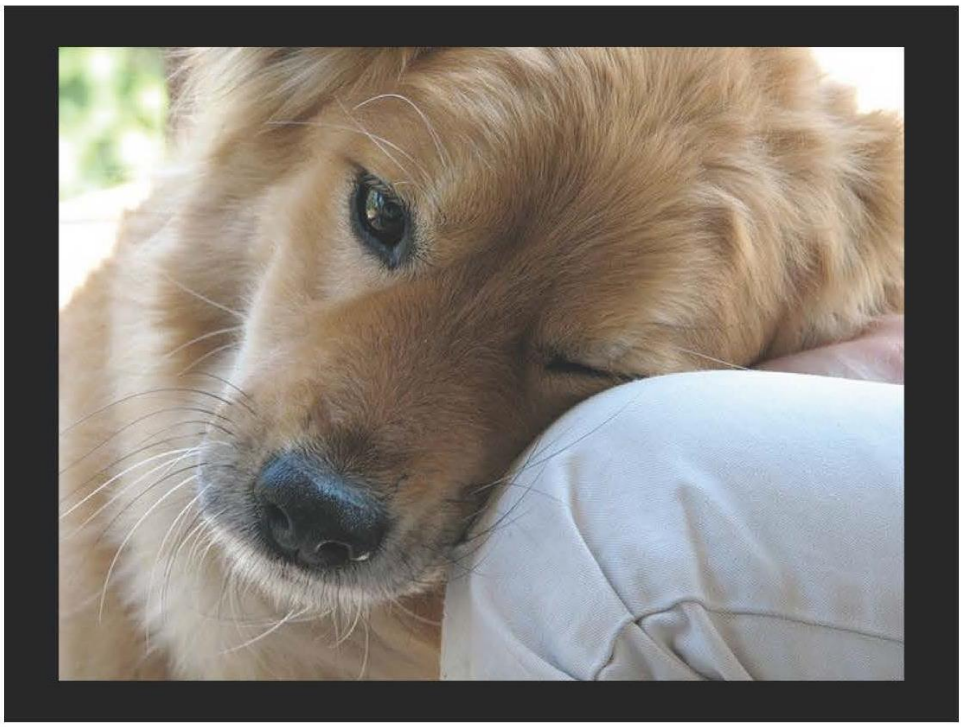

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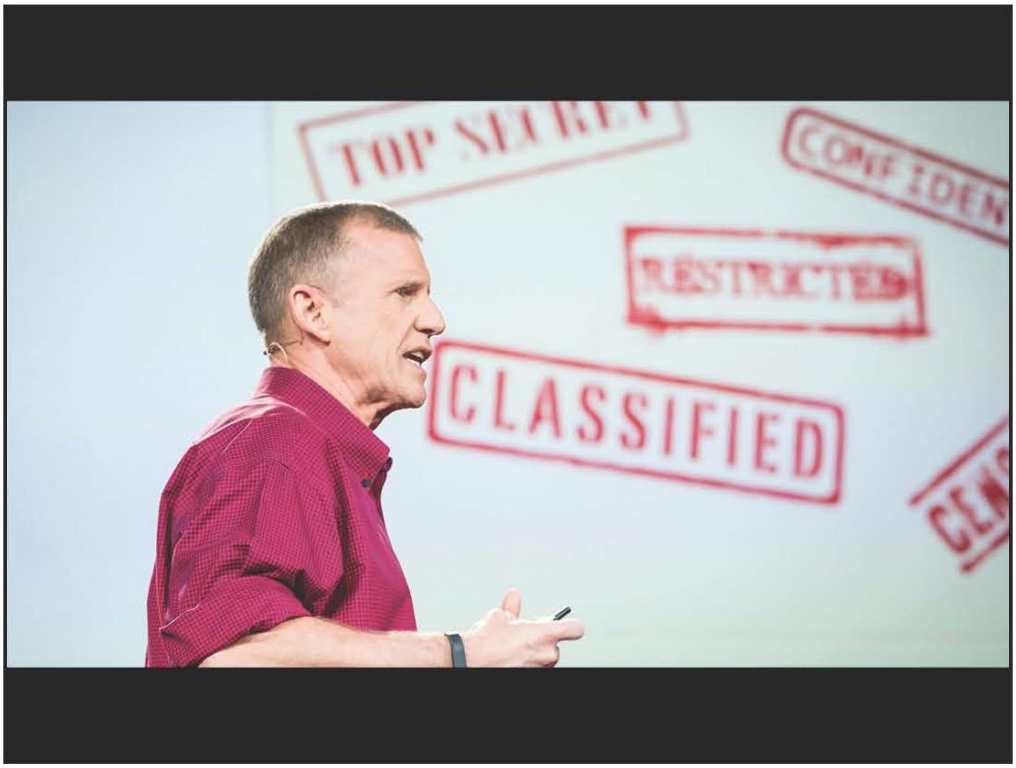

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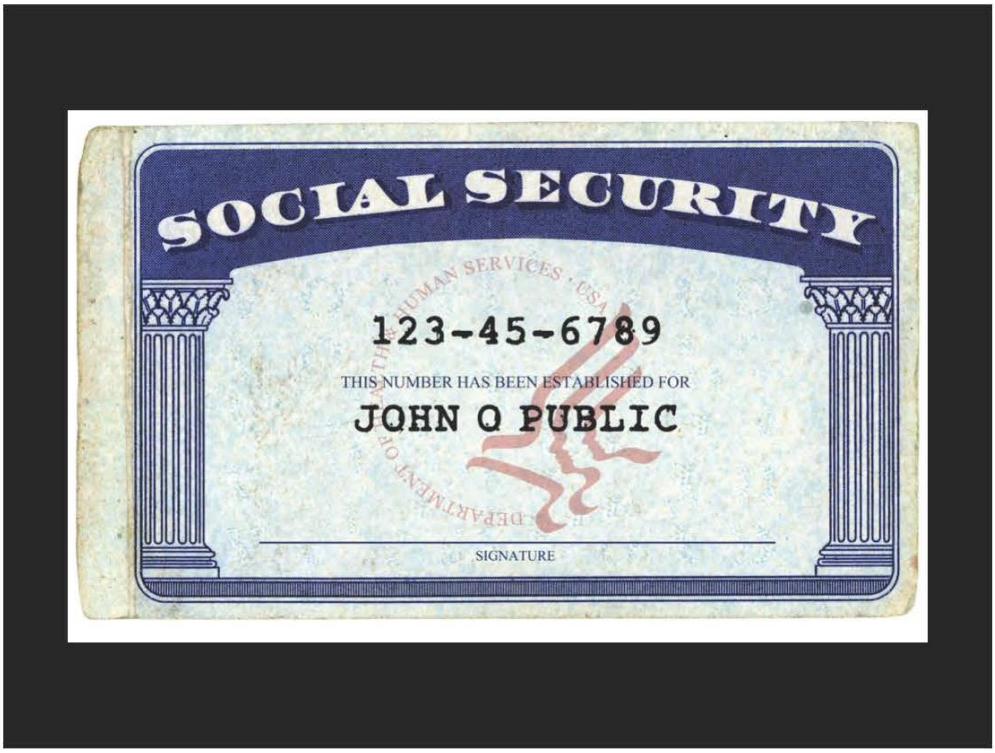
In a lot of ways, social media and the internet are like Lord of the Flies, a book you will read next year in English class. Basically, in the book, a plane carrying a group of British boys aged 6 to 12 crashes on a deserted island. There are no adults around and so the boys have to fend for themselves. They start out okay but then they become afraid of a "beast" somewhere on the island. Other problems come up regarding hunting vs. monitoring the signal fire (a fire that they hoped a passing ship would see and lead to their rescue). The boys involved in hunting become more and more violent and create their own "idol" of dead pig's head. Eventually, the conflicts lead to the murder of one boy and to battles between the groups of boys. Sometimes people aren't very nice online.

Getting back to self-disclosure …Have you ever been sorry that you shared something online? Think beyond twitter, facebook, instagram, and snapchat. Online actions have real world consequences.



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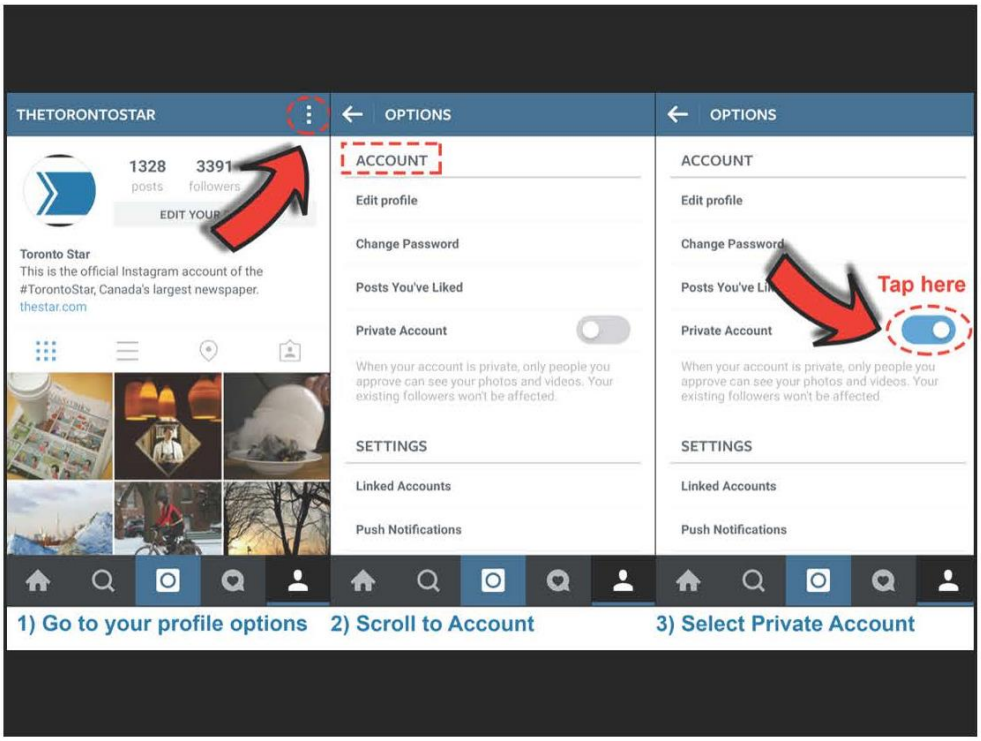

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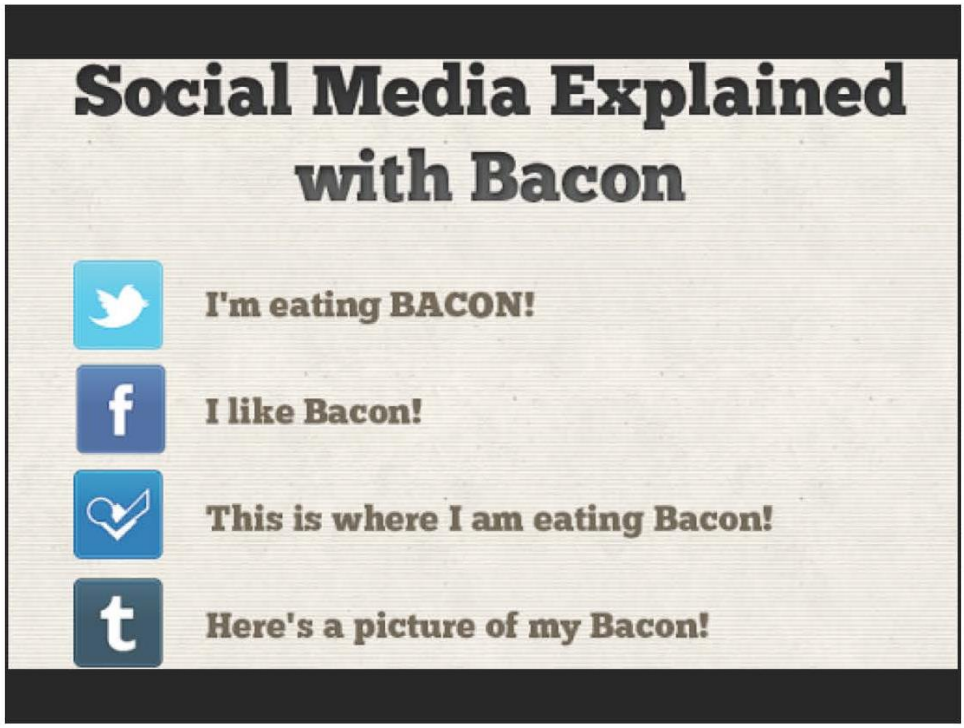

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It's also important to remember that you are probably connected to lots of people on social media that you either don't know that well or that you may not have really wanted to connect with to begin with. And this is true for adults as well as teens. It's really awkward sometimes when people insist on connecting online. Not all that long ago, I was talking to another teacher who told me this story (and I have permission to share it):

I was at a social gathering with a bunch of people I used to work with. It's always fun to catch up with people and what they are doing. One person there, Nicole, completely ignored me. We were at the same table and it was completely obvious that she was deliberately being rude. Although I thought it was odd, she can be a strange ranger, so I didn't spend a lot of time thinking about it. Several months later, I saw her at a funeral. She didn't ignore me but was a little awkward. Finally, there she asked fairly aggressively why I hadn't accepted her Facebook friend request. I told her that I don't use Facebook that much and so I don't accept many friend requests. But quite honestly, I also didn't want to because I wasn't interested in the online connection and thinking about what information I was sharing--even with limited use. Now I will rethink the Facebook friend request. But I will limit her by using settings to limit what is shared.

As you can see, even adults can end up with social media connections that they really don't want.

Now, let's look at **online photos**, but don't forget that online actions have real world consequences. Photos are just another way to self-disclose your significant and private self to lots and LOTS of people!

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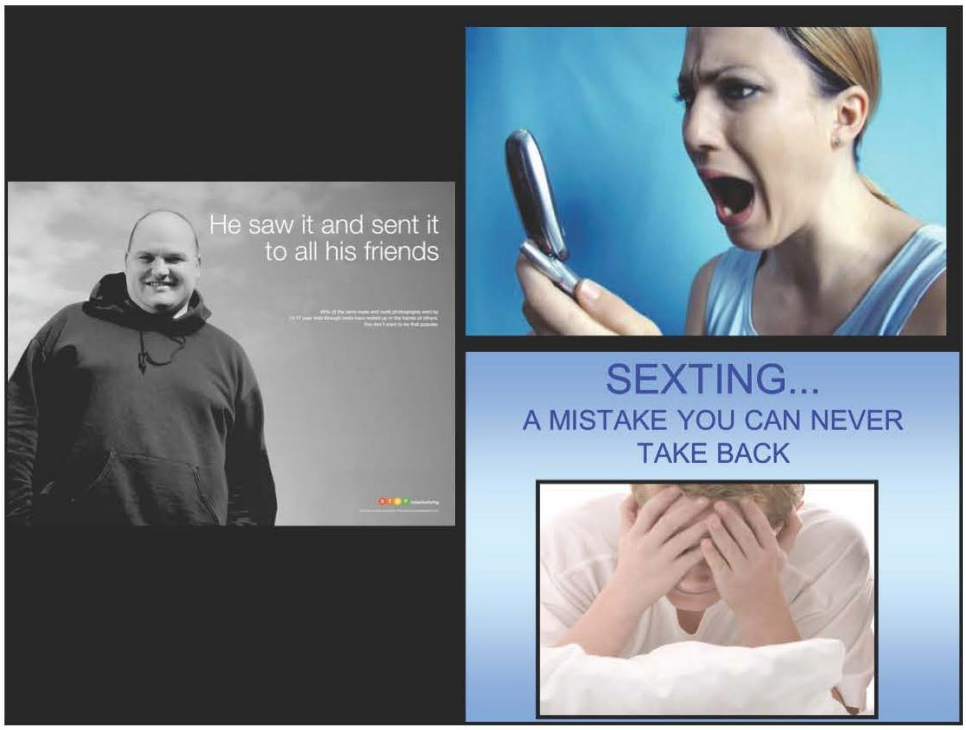

And speaking of photos you can never get back, what do you think about sexting? Sexting is the practice of sending nude or semi-nude images via electronic means. That means sending that sexually explicit photo using a cell phone or computer.

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Think about this...Let's say you begin dating at 16, and you plan to get married around 26, the odds show that the majority of people with whom you enter into relationships will eventually become a "former" or an "ex"!

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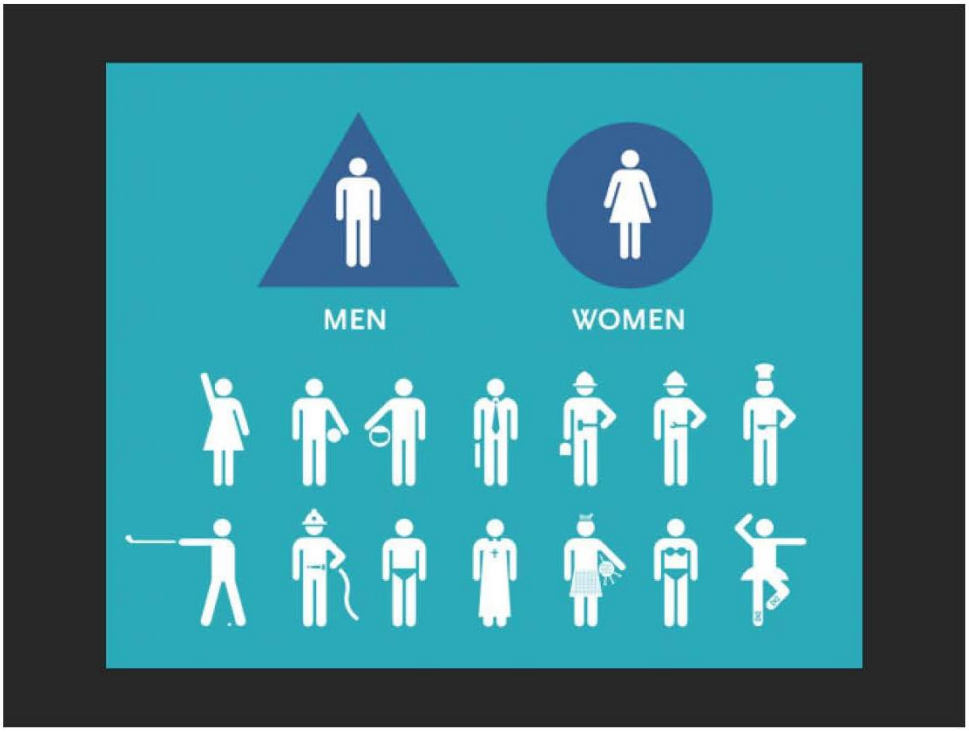
Protect yourself by protecting your private information and your private parts.
In all relationships whether online or in person, treat yourself and others with dignity and respect.
And always...**think before you share!**

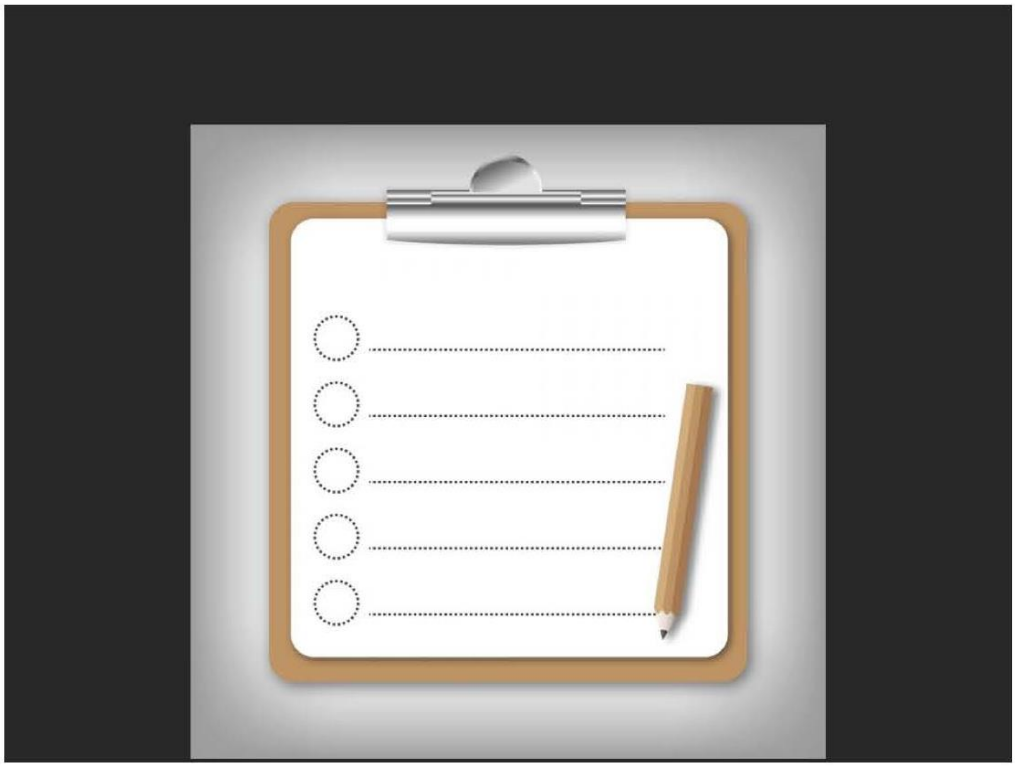
APPENDIX O

Slides of the Video 3 No Seductive Details

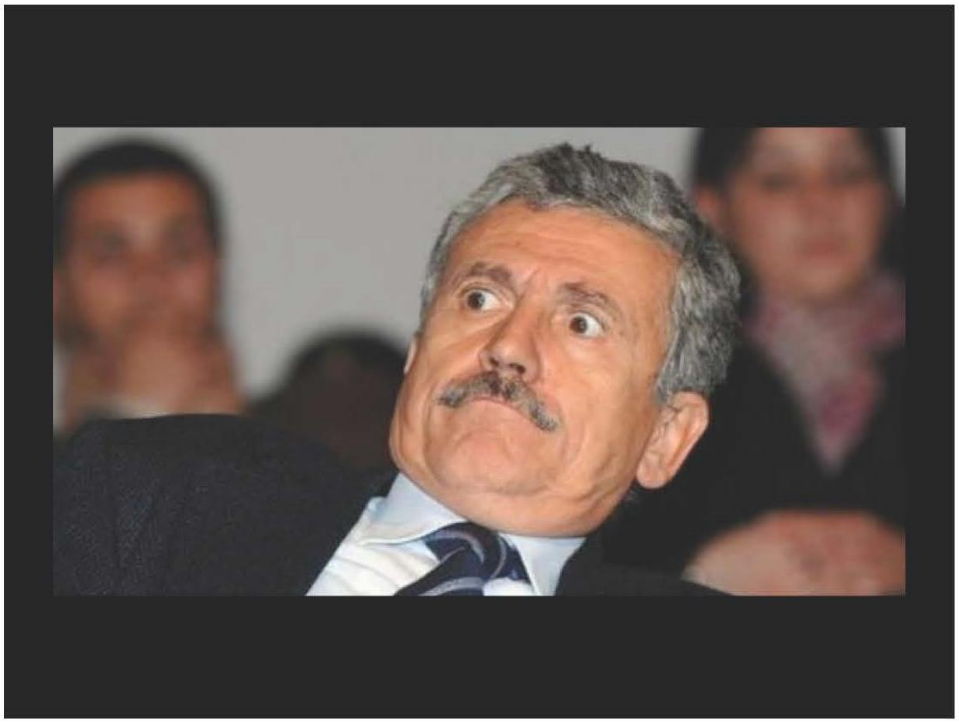
Courtship is the process of attracting, wooing or choosing a mate. The word is derived from the various "court" terms relating to royal courts of France. When in court, one was formal and polite as they attempted to gain political favors and influence from powerful people. Skills in flattering to gain political favor also could be used in romantic endeavors.



Some of the reasons why people marry and the societal roles of men and women have changed greatly over our history and some of them have not change much if at all. But in order to understand who we are it is helpful to understand where we came from.



The following is a short list of courtship practices, social norms, social customs and historical events that help shape American dating, marriage and sexuality.



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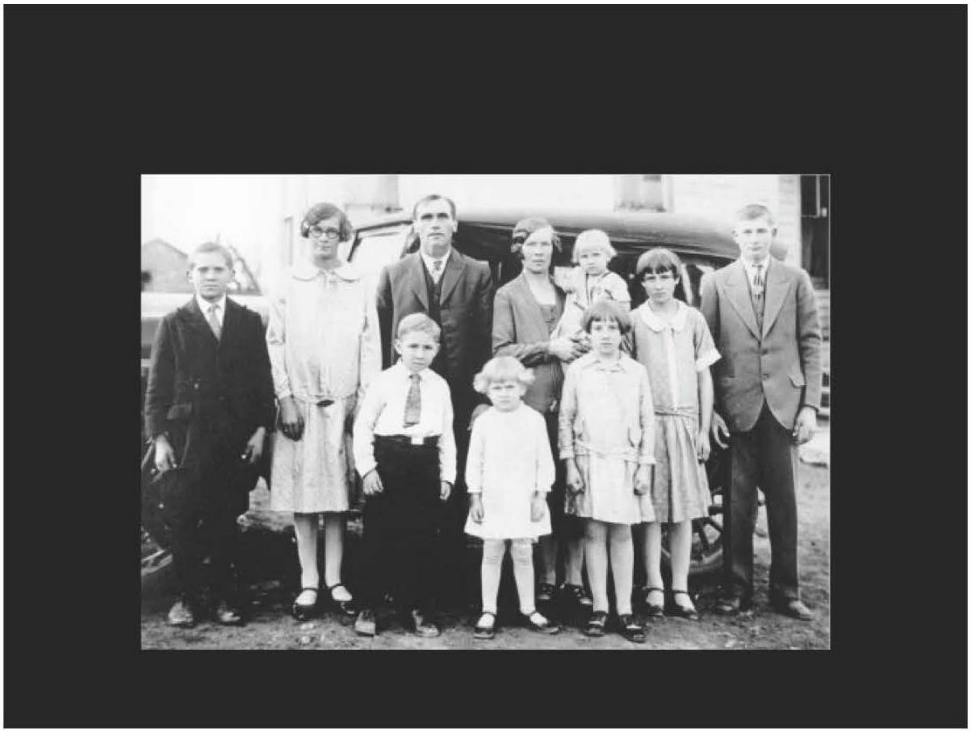

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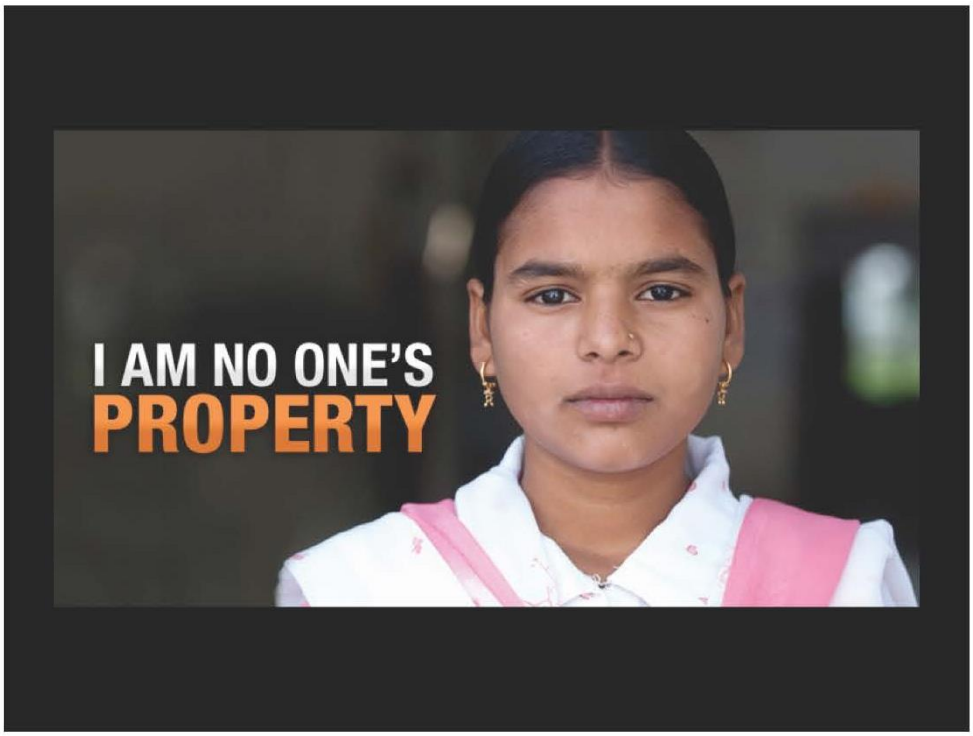

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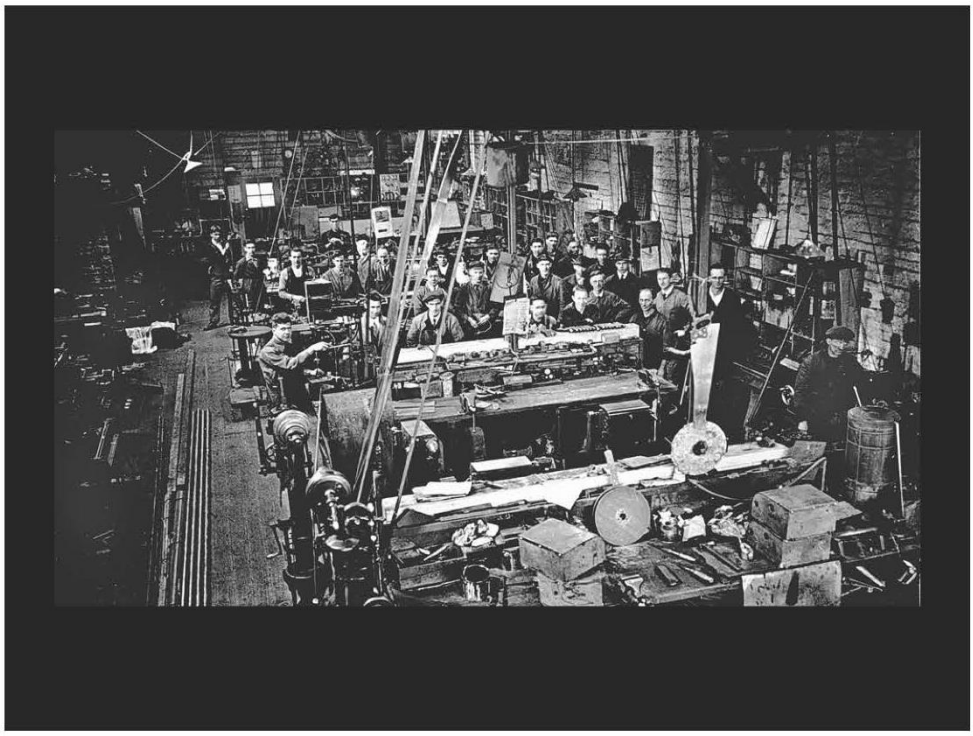

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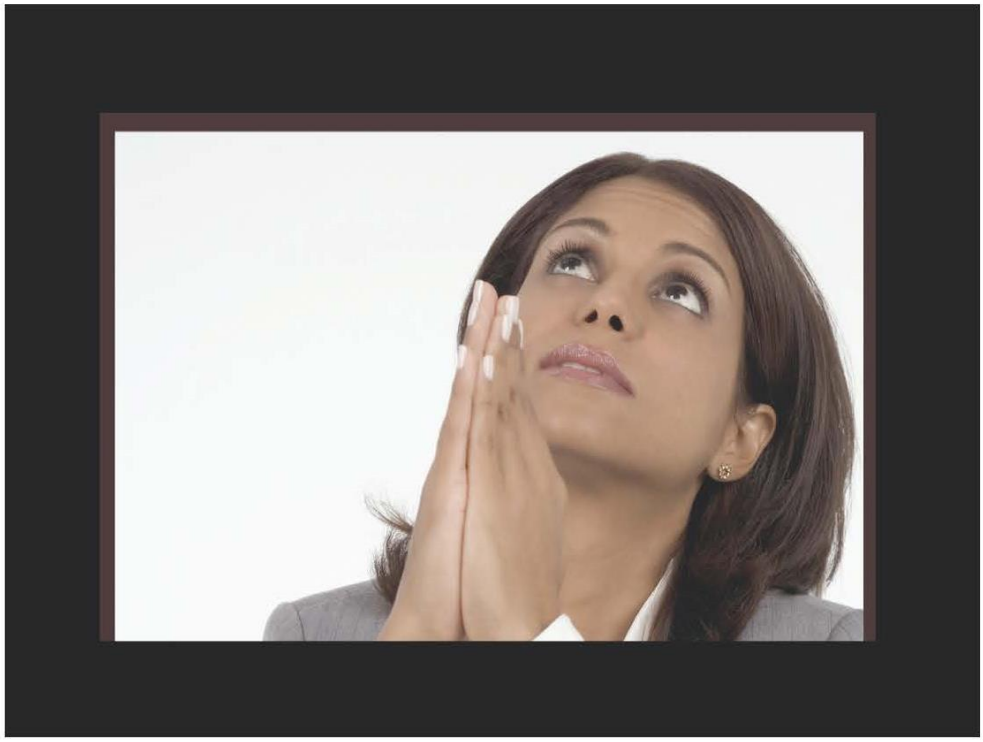

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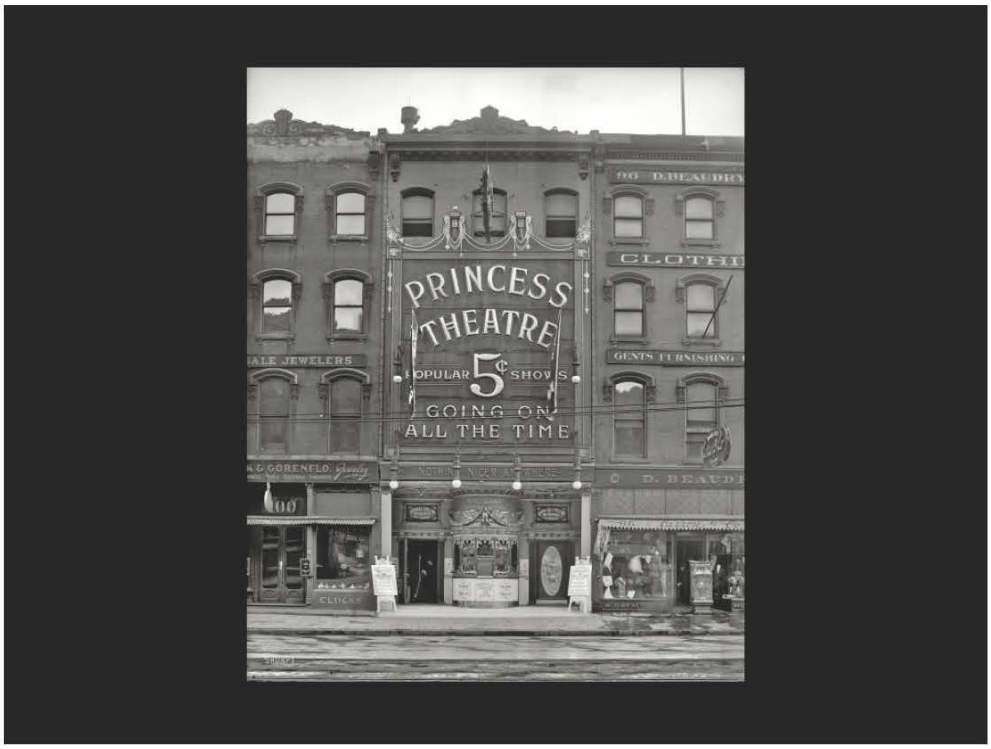

Dating life expanded outside the home as public places to meet expanded along with the growth of the city as we see a movement of people out of countryside and farms to cities and factories and offices. Romance continues to grow as a reason for dating and marriage as economic factors for marriage somewhat diminish. Public dating began to occur more in public gathering places like Nickelodeons ("nickel theaters"), salons, bars, and even church socials

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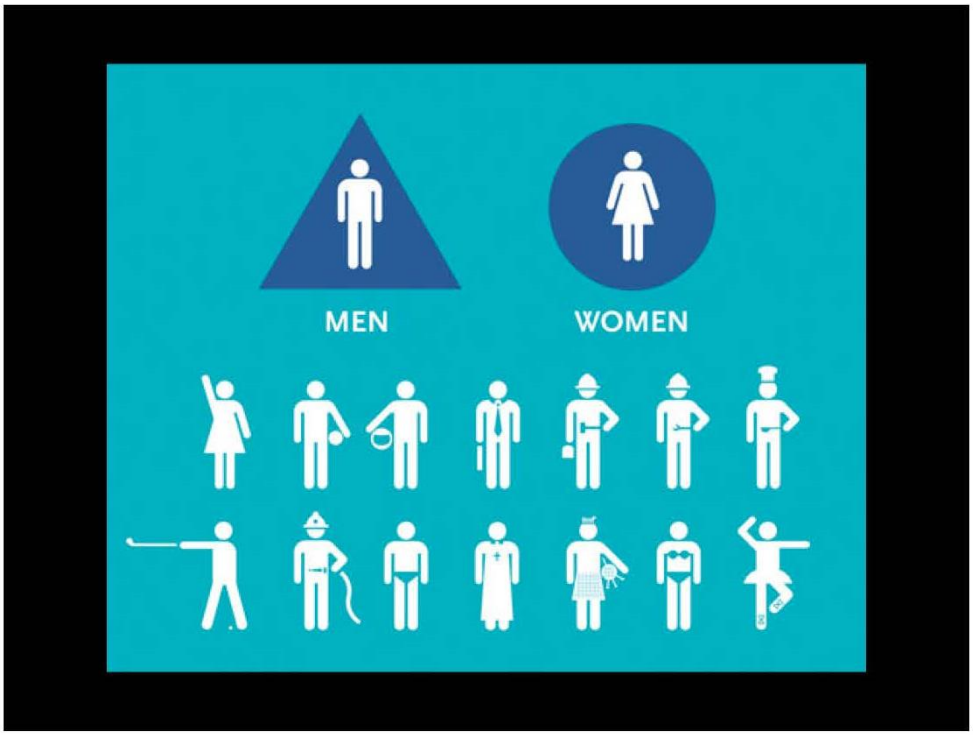
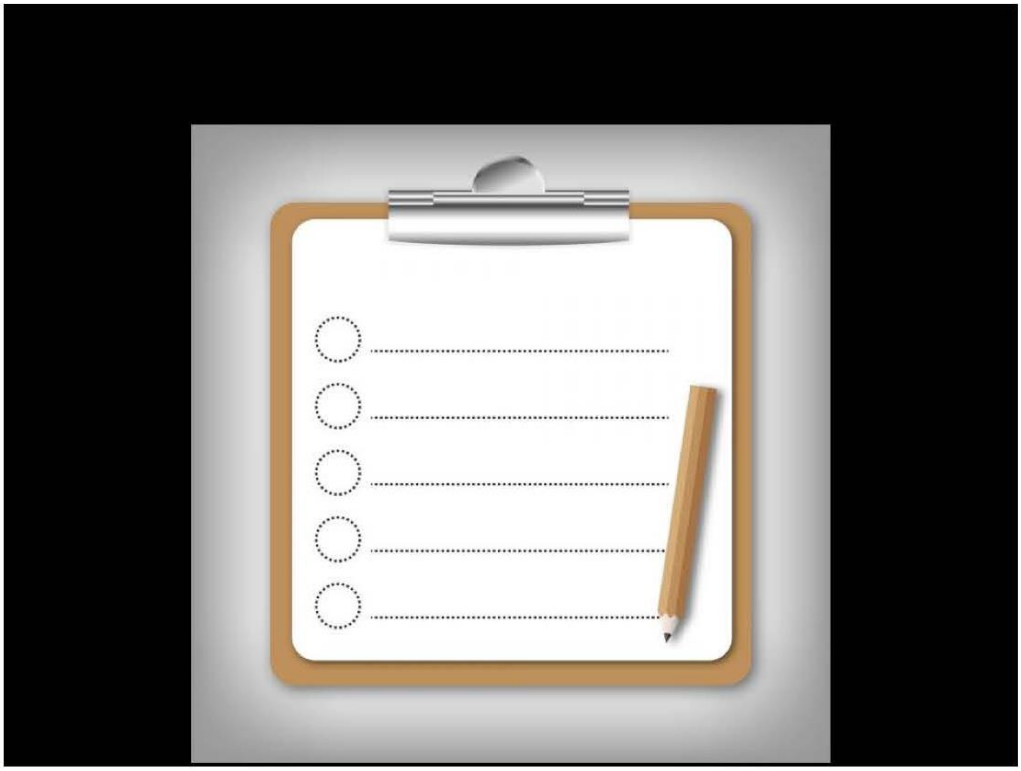
APPENDIX P

Slides of the Video 3 Seductive Details

Courtship is the process of attracting, wooing or choosing a mate. The word is derived from the various "court" terms relating to royal courts of France. When in court, one was formal and polite as they attempted to gain political favors and influence from powerful people. Skills in flattering to gain political favor also could be used in romantic endeavors.



Some of the reasons why people marry and the societal roles of men and women have changed greatly over our history and some of them have not change much if at all. But in order to understand who we are it is helpful to understand where we came from.



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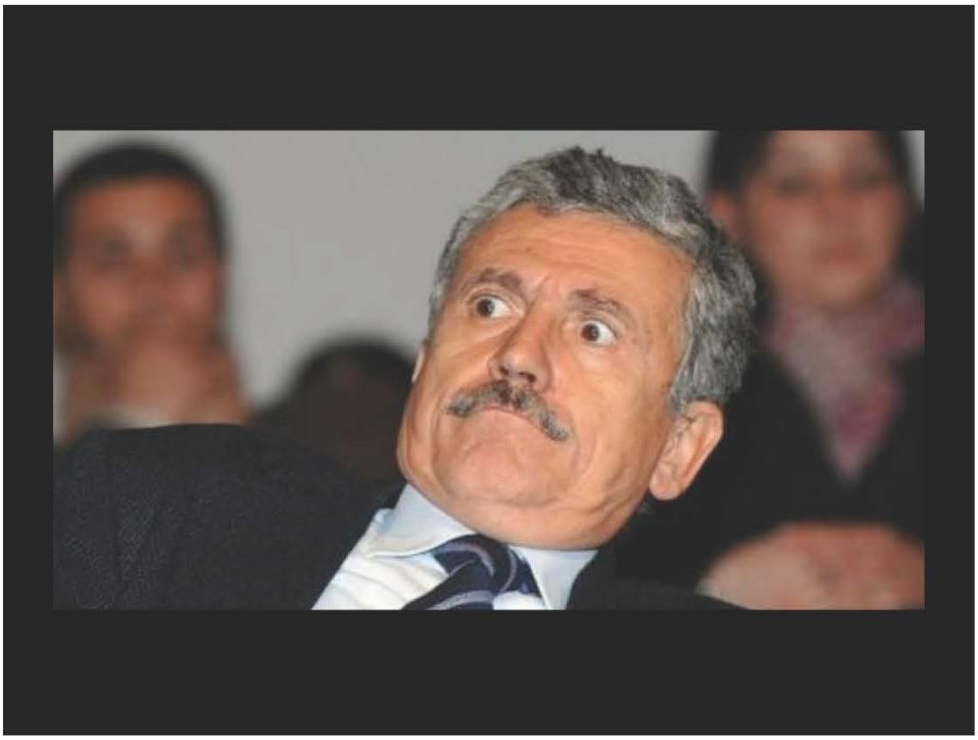

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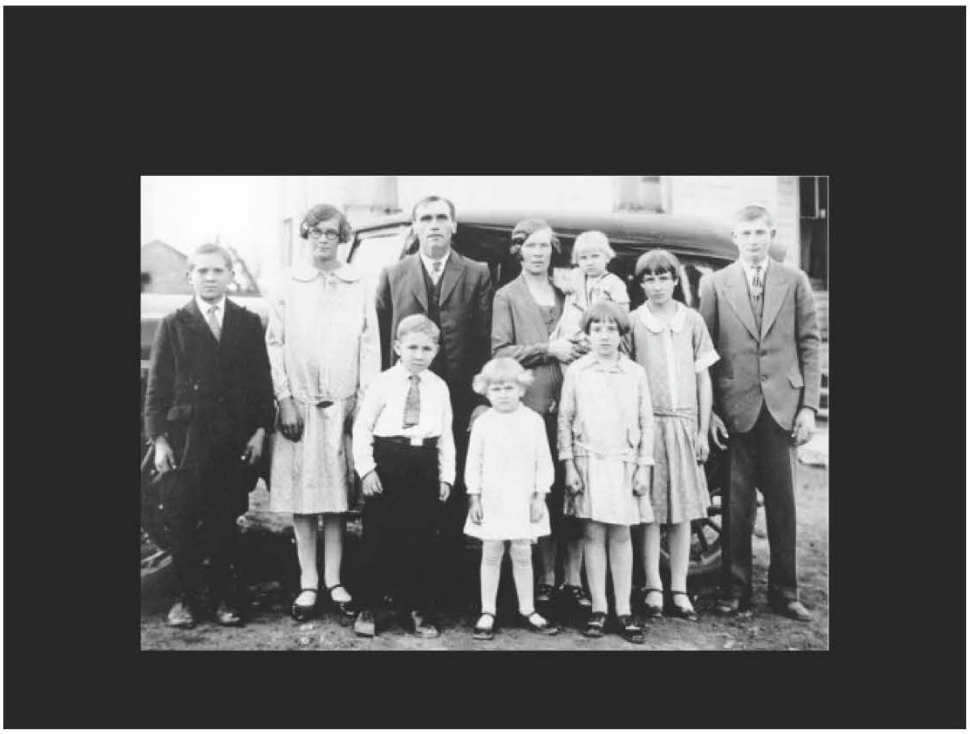

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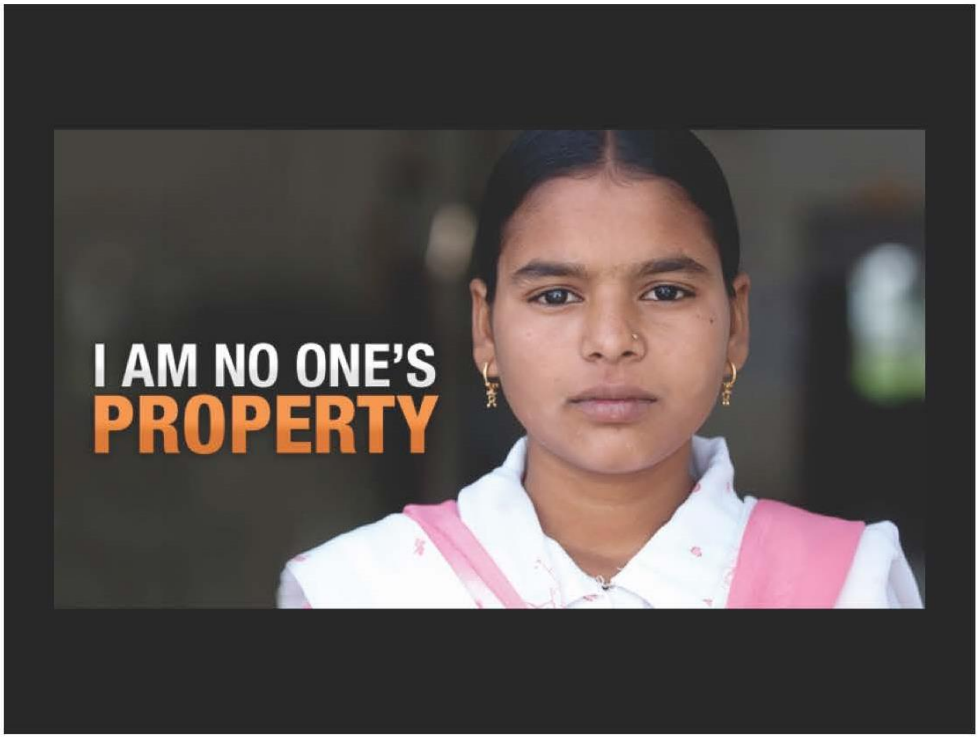

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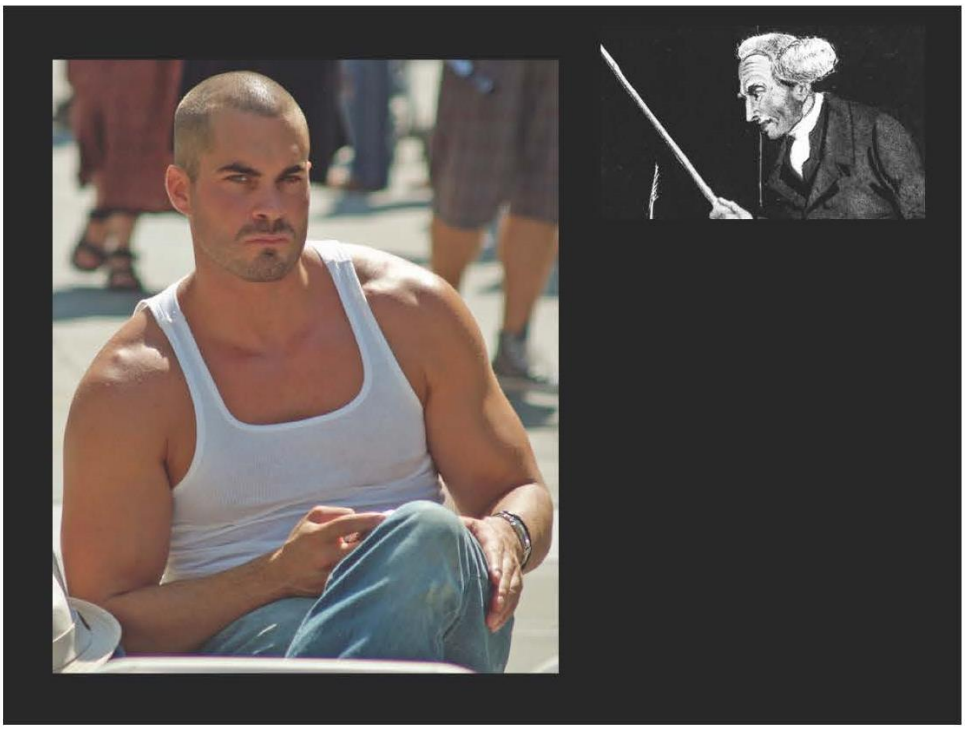

During this period, domestic violence was often considered to be acceptable because husbands were allowed to "correct" their wives with some physical violence. You may have heard that the expression "rule of thumb" comes from a rule that said it was okay for a husband to beat his wife with a stick as long as the stick wasn't thicker than his thumb. While an interesting story, there is no truth to it in Colonial America. Instead, even in the court records of Plymouth Plantation there are 10 cases dealing with domestic violence. Historians believe that most cases went unreported, but they also know that there was never an actual law defining acceptable levels of physical abuse. Historians also are clear that there were no explicit laws forbidding husbands from abusing their wives (or wives from abusing their husbands).

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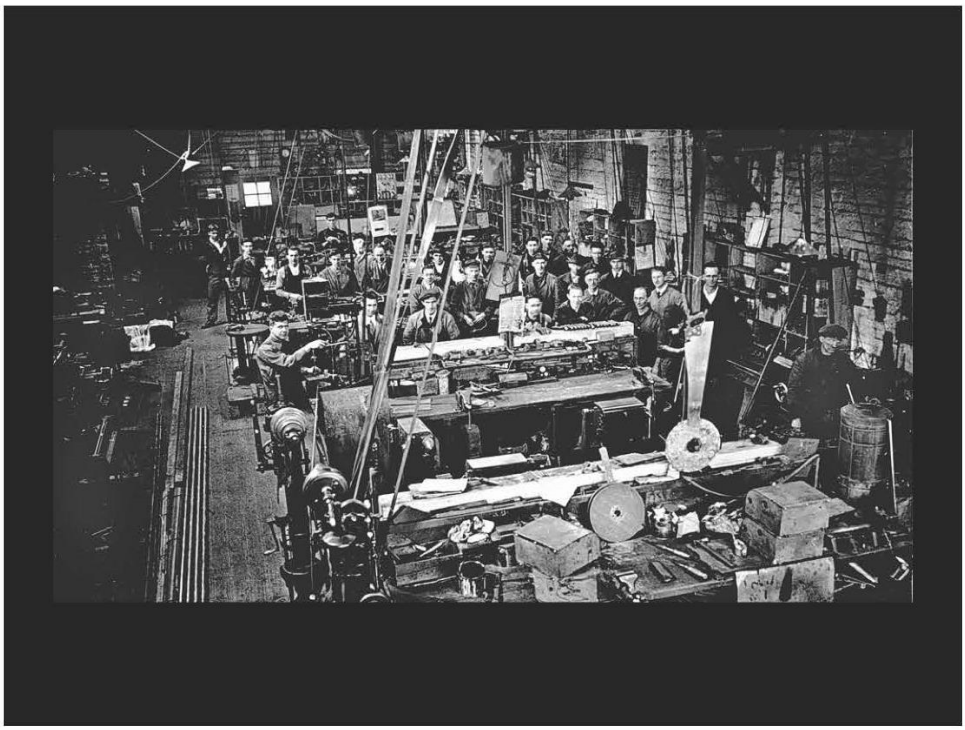

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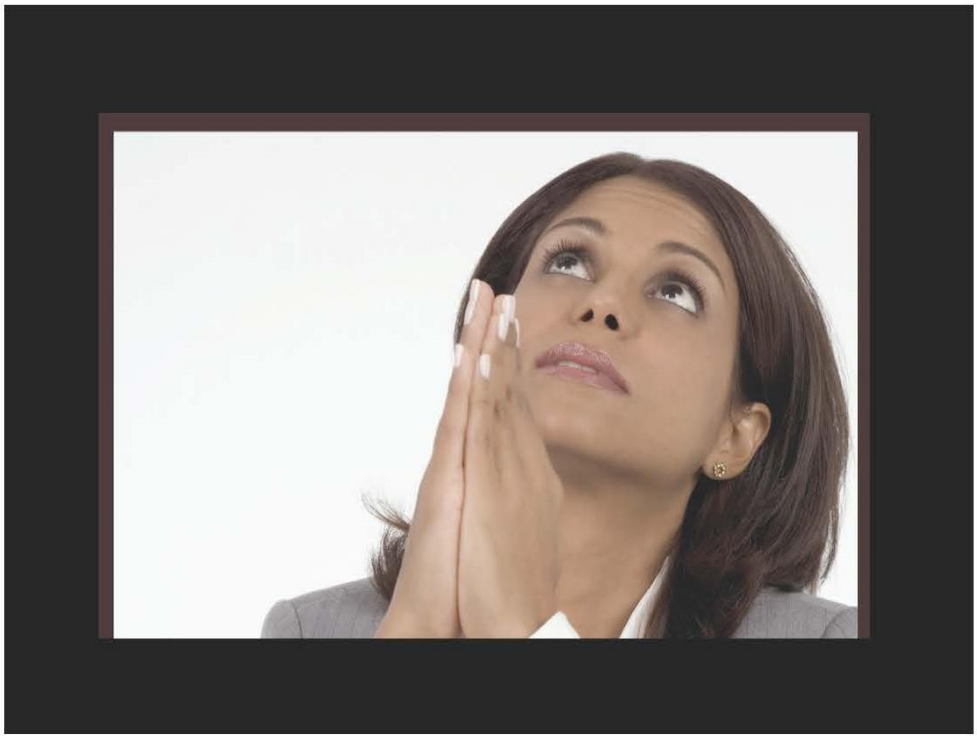

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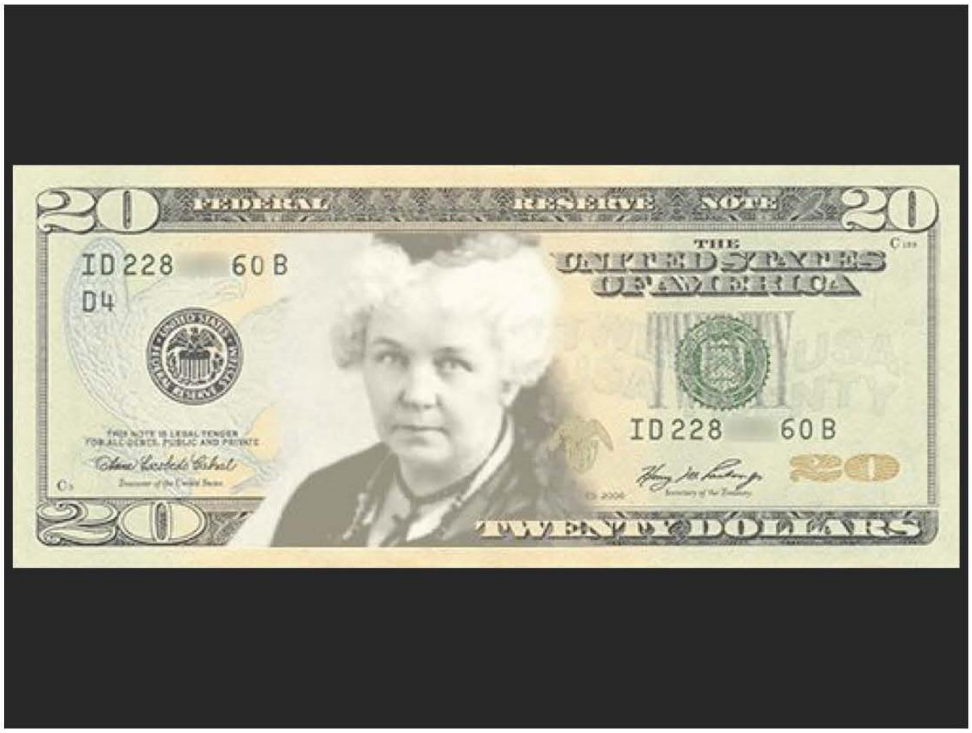


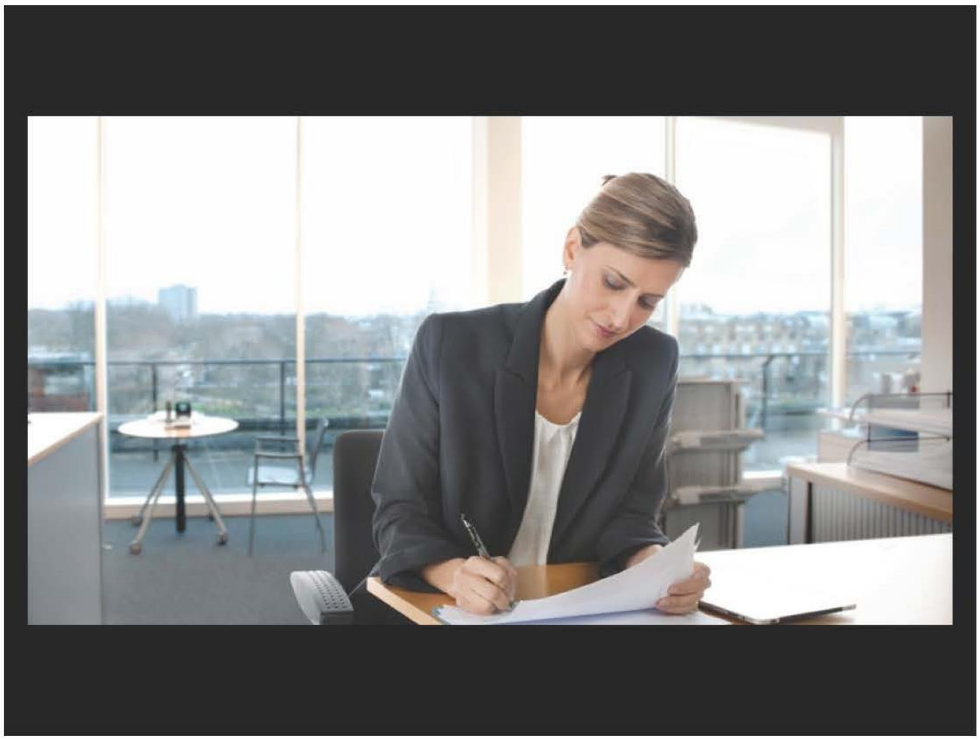
Elizabeth Cady Stanton was a leading figure in the women's rights movement throughout the 1800's. She was one of eleven children. Unlike many women of the time, she attended school and while she outperformed her male counterparts, she was not allowed to attend the same college that they attended because she was a woman. She was an activist who fought against slavery and later in favor the right for women to vote. She had a number of issues that she fought for including women's parental and custody rights, property rights, employment and income rights, divorce, the economic health of the family, and she was also an outspoken supporter of the 19th-century temperance movement, the movement to get rid of alcohol. She did all of these things while raising seven children. She and her husband were married for 47 years. She died before women received the right to vote.

Susan B. Anthony was born into a Quaker family and, as a young adult, like Stanton, was part of the abolitionist movement. She soon added the women's rights movement as her main work.

She worked with Elizabeth Cady Stanton in organizing and promoting the women's movement.

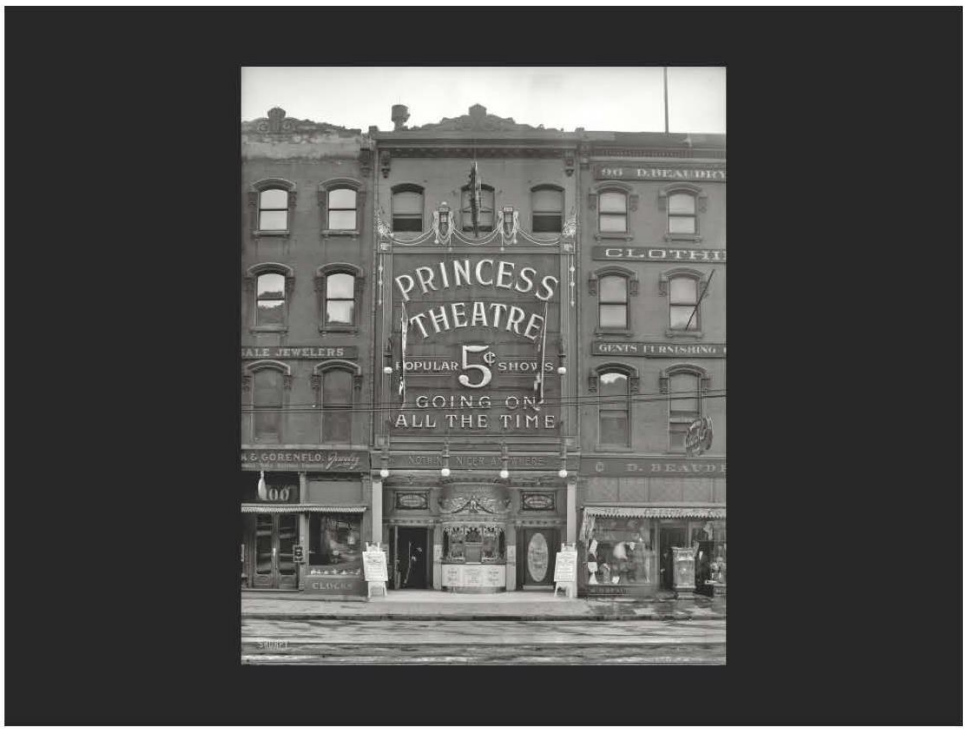
One thing Anthony is known for is her arrest for voting in the presidential election of 1872. She was trying to be arrested so that she could challenge the constitutionality of keeping women from voting. She was tried, found guilty and fined a $100. She refused to pay the fine and the judge refused to imprison her. If he had imprisoned her, she could have appealed the decision to the Supreme Court. The U.S. Supreme Court in 1875 put an end to the strategy of trying to achieve women's suffrage through the court system by ruling in *Minor v. Happersett* that "the Constitution of the United States does not confer the right of suffrage upon anyone". [108]

As a result the National Woman Suffrage Association decided to pursue the far more difficult strategy of campaigning for a constitutional amendment to guarantee voting rights for women.[101]



Anthony never married which gave her an important business advantage. A married woman at that time had the legal status of *feme covert*, which, among other things, excluded her from signing contracts (her husband could do that for her, if he chose). Because she wasn't married, she was able to sign contracts for speaking venues that benefitted the women's suffrage movement. Over her career she estimated that she averaged 75 to 100 speeches per year—and this is before it was easy to travel!

Susan B. Anthony may be known to you because she was the first non-fictitious woman to be on a US coin—the 1979 Susan B. Anthony dollar.



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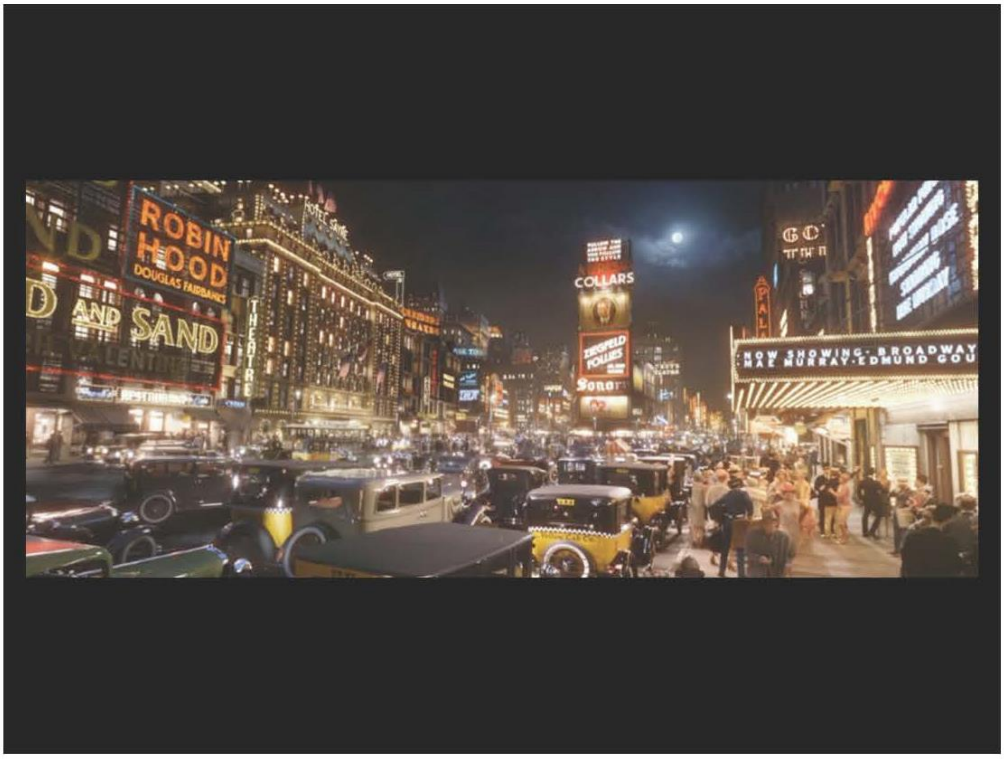
APPENDIX Q

Slides of the Video 4 No Seductive Details

In the last segment you learned about courtship and influences on it from the early days of this nation up through 1914. Today we will explore from 1914 to 1959.

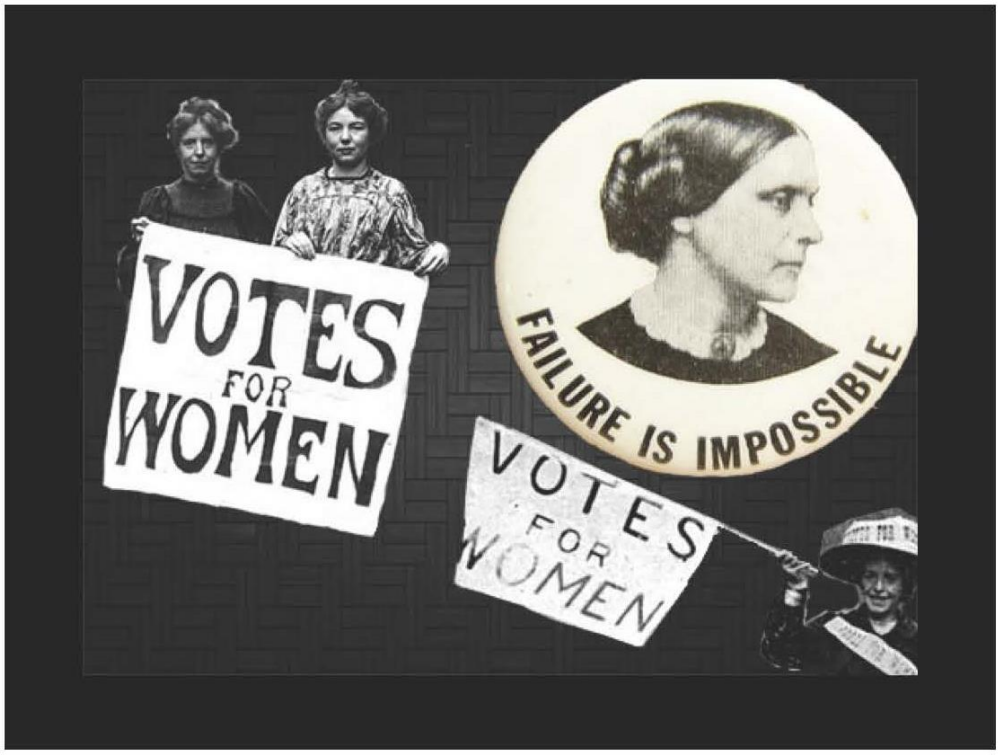
From 1914-1918 society has halted in many ways by World War I. The world was consumed with war and in America many men and a few women had been sent to fight in Europe. At home, there was a natural slowing of progress towards new ideas or willingness to change social norms as many felt the need to cling to their traditional beliefs and values for good or bad.

It is human nature that when we face a great threat like war, famine or economic strife, we are less willing to take chances that are not necessary to keep us alive. So we might risk greatly to find food or avoid death, but have little time to consider the social structures of our society and changes that might need to occur in these times of stress. But during the war, people who had gone overseas encountered new experiences that changed some people and those ideas were brought home.



After the war comes Roaring 20's, from 1920 to '29. People are relieved as the fear and worry of war is gone. This was the war to "end all wars" so now people are full of hope for new beginnings and change. The League of Nations was formed (the precursor to United Nations) to pursue world peace and cooperation. This was a uniquely new endeavor and gave great hope to new possibilities for the world.

The Roaring 20s refers to the great celebration of life and peace that existed after WWI as the world came alive with new culture. In many ways, it was the beginning of the Sexual Revolution and women enjoyed new economic and sexual freedom found in new dress, dance, dating and relationships where society became more revealing and carefree. American society was doing well economically, which encourages people to try new things bringing more freedom and acceptance in society.



Women finally earned the right to vote (August 26, 1920). Social struggles and debates on morality continue and play out in fashion, drinking and dance. In conjunction with women marching for the right to vote many rallied against alcohol which was often through alcoholism (which was more often found in men) a catalyst for abuse of women and neglect of family. So with the right to vote also came Prohibition which outlawed alcohol. But it was often sold in speakeasies where less morally strict men and women would go to socialize and party.

Flappers became the icon of this era. These were women with looser fitting clothes - a stark contrast to the victorian era o f clothing that covered every inch of a woman in a tight restrictive manner. The women of the roaring twenties also dance in a care free way with wild movement that all gave rise to the term flappers. Some saw flappers as looser women often who dressed in the latest fashions, danced and socialized outside the home with men. The home or church was losing ground as a place for courtship and with that came more equality in dating.

In 1929 the stock market crashed which began the Great Depression. The day of the crash became known as Black Tuesday. October 2 9, 1929 ended an era of freedom, openness and optimism. Another era of fear occurs (this time because of economic stress and not war) which results in people pulling back from new ideas and seeking tradition.

This sense of fear and unwillingness to consider new social norms continues through **World War II from '39 to 45.** Even as economic problems continue, war fears become paramount for many. But the war forced imported societal norms to be challenged as Americans dealt with the war. Rosie the Riveter became the poster icon for women in the work place. With American men at war, women were needed in the factories to build machines, weapons, and produce other important goods for the economy of America to survive and meet the needs of the war effort.

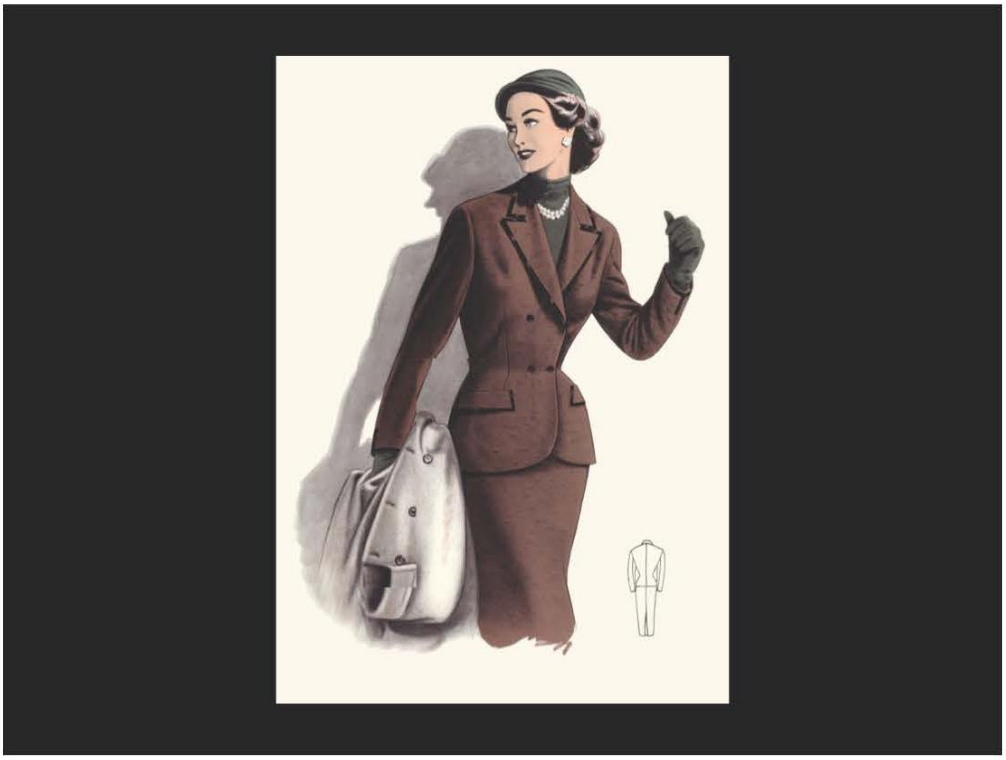
After WWII women mostly returned to the homes from working in businesses and factories. Not all willingly as many women enjoyed the new freedoms, but most did so because if they wanted marriage and children, working full time outside the home was still not an option practically. But an important change had occurred, now the debate was no longer "could" women work in these jobs, but "should" they. Even though most of America returned to the traditional male and female roles in society and marriage, there was a permanent change in the psyche of America about the possibility that roles might change.

Post War Baby Boom from '45 to'59 brought great change just as in the roaring twenties as period of great fear ends and ushers in an explosion of pent up desire for new things. With the return of men to the country and economic prosperity brought on by the end of the war, many new families began and new suburban living was created with the new wealth. With this came a resurrection of old debates on sexuality and roles of men and women in society. Many men had experienced new ideas overseas and many women had experienced new roles in factories and workplaces all of which encourage this discussion and change begins.

The American Family had the following features:

1. Most married after high school - almost 50% of brides were 19 years old.
2. Traditional family unit of father, mother and a few children gets smaller and is more often living by itself in a home (nuclear family). Divorce not common or acceptable.

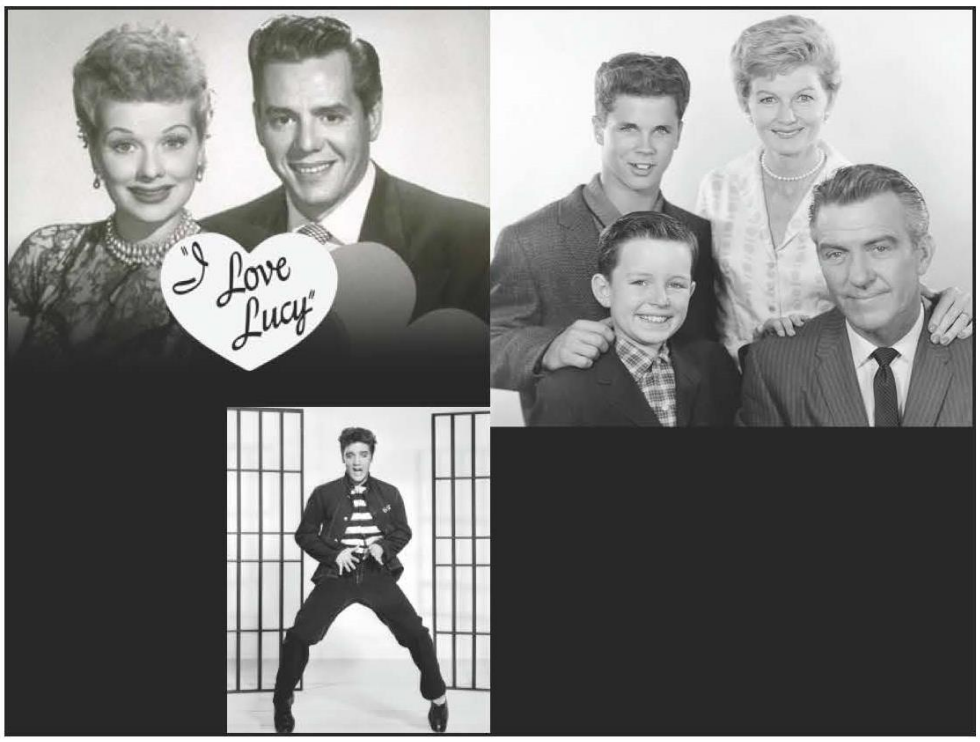
3. First real teenage era… more youth went to high school and college so adolescence grows, putting a larger gap between childhood and adulthood.
4. Marriage and motherhood were the goals; few women went to college or into a career. Those women who went to college usually drop out when they got married or pregnant so they could care for a family. Raising children and keeping a house before modern conveniences still required a full time effort by one adult. Even though some women wanted to have a career it usually meant giving up having a family.



30. Dating during the baby boom was characterized by the following attitudes:

1. 80% women disapproved of premarital sex.
2. Dating was expected to be serious and lead to marriage.
3. Women wore girdles and corsets to keep body rigid and confined, hair worn conservatively.

4. Much conformity and structure to majority view.
5. Little accepted in way of new thoughts on sexuality in open society but much is discussed especially in the "underground" culture of the young mostly. Beatniks, who were of the Beat generation questioned societal norms in all things including sexuality, dating and marriage. Jack Kerouac became famous writing about these people and their ideas.



Just as in earlier times, attitudes about dating and marriage were influenced by Academia, Politics and Entertainment/Media. During the Baby Boom, these are some specific influences to consider.

1. Academia started to discuss sexuality but this was controversial even to talk about in academic ways. The *Kinsey Reports*, which sought to record the sexual behaviors of men and women from a scientific point of view, were published with much controversy.

2. In Entertainment/Media there was a prudent view even for married couples - only twin beds were shown for the couple in the TV show I Love Lucy & no bedroom was shown for the couple in Leave it to Beaver

3. The Cold war ongoing as America led the western free world against communism and the Soviet Union. Fear of communism and outspokenness quelled other conversations in society.
4. Elvis' music was considered shocking because of the sexuality of his words and movement.

As you can see, there are many influences on attitudes about courtship and marriage. Later in this course we will examine more recent shifts in society and look at the impact on how we now view courtship and marriage

APPENDIX R

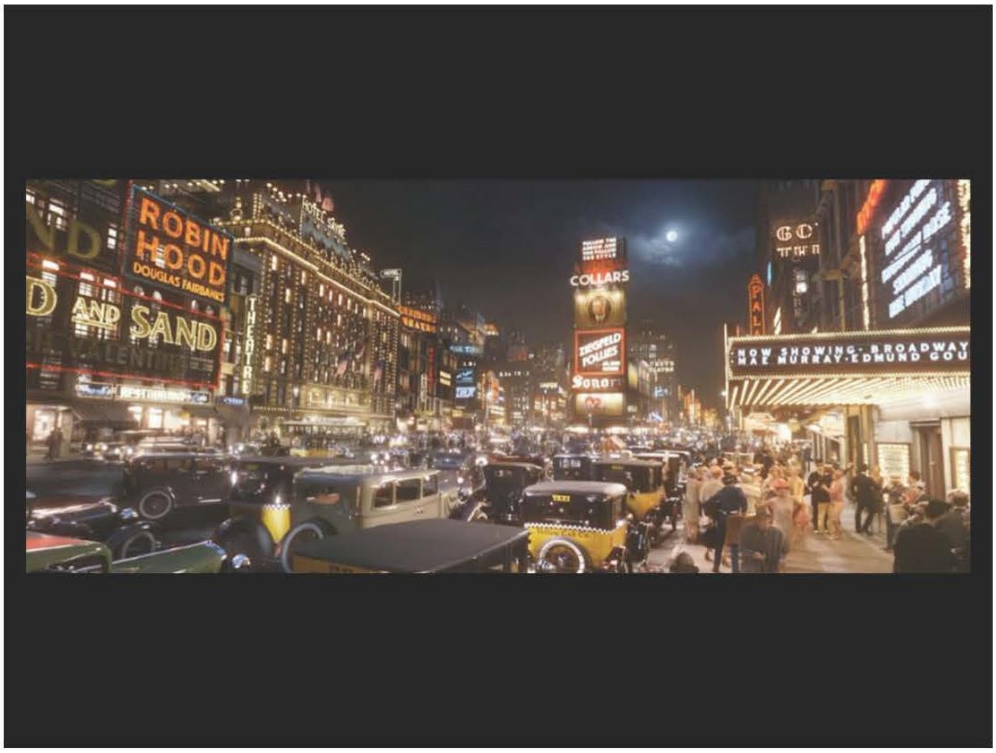
Slides of the Video 4 Seductive Details

In the last segment you learned about courtship and influences on it from the early days of this nation up through 1914. Today we will explore from 1914 to 1959.

From 1914-1918 society has halted in many ways by World War I. The world was consumed with war and in America many men and a few women had been sent to fight in Europe. At home, there was a natural slowing of progress towards new ideas or willingness to change social norms as many felt the need to cling to their traditional beliefs and values for good or bad.

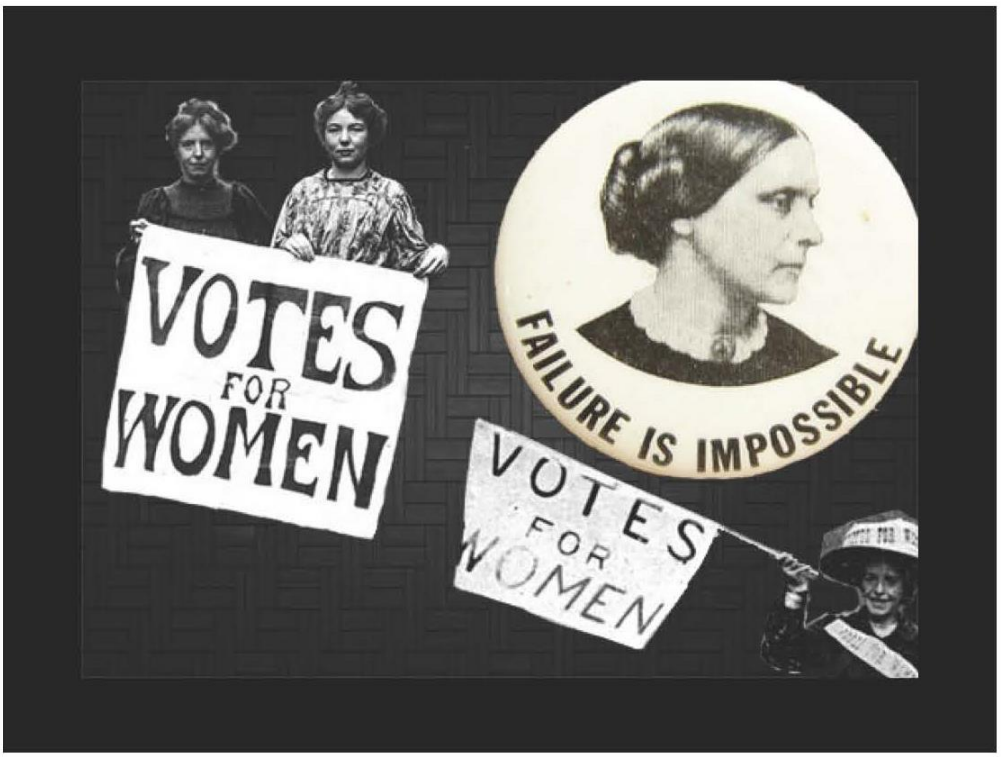
The United States declared war on the German Empire on April 6, 1917. The U.S. was an independent power and did not officially join the Allies. It closely cooperated with them militarily but acted alone in diplomacy. The U.S. made its major contributions in terms of supplies, raw material and money starting in 1917. American soldiers under General John J. Pershing arrived in large numbers on the Western Front in summer 1918. They played a major role until victory was achieved on November 11, 1918. Before entering the war, the US had remained neutral, though it had been an important supplier to Britain and other Allied powers. During the war, the US mobilized over 4,000,000 military personnel and suffered 110,000 deaths, including 43,000 due to the influenza pandemic.[1] The war saw a dramatic expansion of the US government in an effort to harness the war effort and a significant increase in the size of the US military. After a slow start in mobilizing the economy and labor force, by spring 1918 the nation was poised to play a decisive role in the conflict.

It is human nature that when we face a great threat like war, famine or economic strife, we are less willing to take chances that are not necessary to keep us alive. So we might risk greatly to find food or avoid death, but have little time to consider the social structures of our society and changes that might need to occur in these times of stress. But during the war, people who had gone overseas encountered new experiences that changed some people and those ideas were brought home.



After the war comes Roaring 20's, from 1920 to '29. People are relieved as the fear and worry of war is gone. This was the war to "end all wars" so now people are full of hope for new beginnings and change. The League of Nations was formed (the precursor to United Nations) to pursue world peace and cooperation. This was a uniquely new endeavor and gave great hope to new possibilities for the world.

The Roaring 20s refers to the great celebration of life and peace that existed after WWI as the world came alive with new culture. In many ways, it was the beginning of the Sexual Revolution and women enjoyed new economic and sexual freedom found in new dress, dance, dating and relationships where society became more revealing and carefree. American society was doing well economically, which encourages people to try new things bringing more freedom and acceptance in society.



Women finally earned the right to vote (August 26, 1920). Social struggles and debates on morality continue and play out in fashion, drinking and dance. In conjunction with women marching for the right to vote many rallied against alcohol which was often through alcoholism (which was more often found in men) a catalyst for abuse of women and neglect of family. So with the right to vote also came Prohibition which outlawed alcohol. But it was often sold in speakeasies where less morally strict men and women would go to socialize and party.

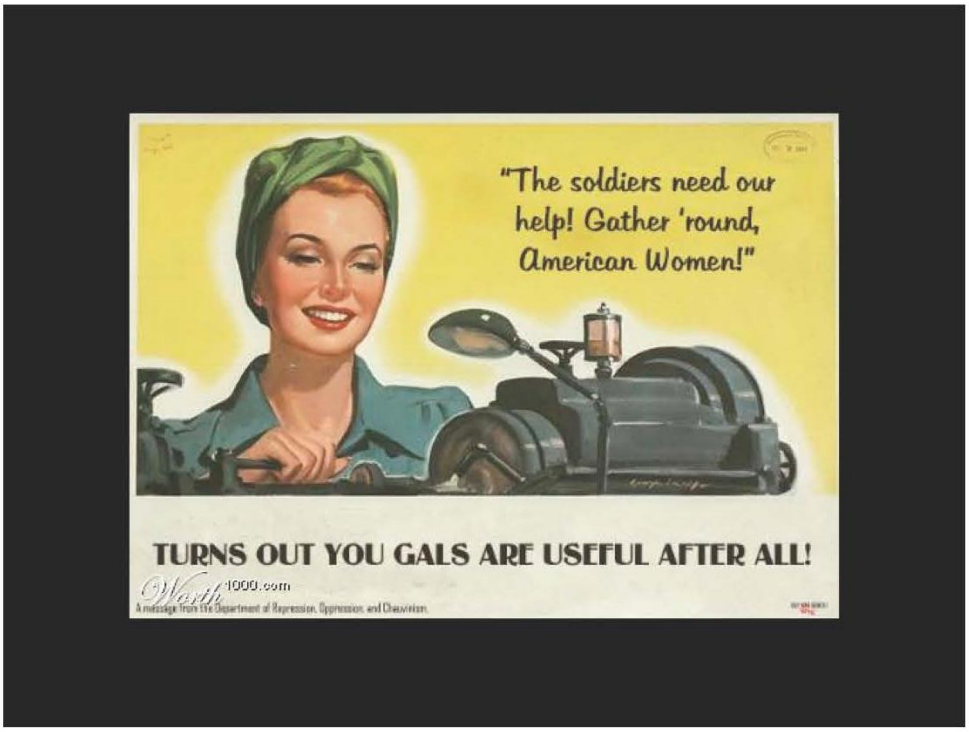
23b. **Prohibition in the United States** was a nationwide constitutional ban on the sale, production, importation, and transportation of alcoholic beverages that remained in place from 1920 to 1933. It was promoted by the "dry" crusaders, a movement led by rural Protestants and social Progressives in the Democratic and Republican parties, and was coordinated by the Anti-Saloon League, and the Woman's Christian Temperance Union. Prohibition was mandated under the Eighteenth Amendment to the U.S. Constitution. Enabling legislation, known as the Volstead Act, set down the rules for enforcing the ban and defined the types of alcoholic beverages that were prohibited. For example, religious uses of wine were allowed. Private ownership and consumption of alcohol was not made illegal under federal law; however, in many areas local laws were more strict, with some states banning possession outright. Nationwide Prohibition ended with the ratification of the Twenty-first Amendment, which repealed the Eighteenth Amendment, on December 5, 1933.

Prohibition marked one of the last stages of the Progressive Era. During the 19th century, alcoholism, drug abuse, gambling addiction, and a variety of other social ills and abuses led to the activism to try to cure the perceived problems in society. Among other things this led many communities in the late 19th and early 20th century to introduce alcohol prohibition, with the subsequent enforcement in law becoming a hotly debated issue. Prohibition supporters, called dries, presented it as a victory for public morals and health. Anti-prohibitionists, known as wets, criticized the alcohol ban. Though popular opinion believes that Prohibition failed, it succeeded in cutting overall alcohol consumption in half during the 1920s, and consumption remained below pre-Prohibition levels until the 1940s, suggesting that Prohibition did socialize a significant proportion of the population in temperate habits, at least temporarily.[1] Some researchers contend that its political failure is attributable more to a changing historical context than to characteristics of the law itself.[2] Criticism remains that Prohibition led to unintended consequences such as the growth of urban crime organizations. As an experiment it lost supporters every year, and lost tax revenue that governments needed.

Flappers were a "new breed" of young Western women in the 1920s who wore short skirts, bobbed their hair, listened to jazz, and flaunted their disdain for what was then considered acceptable behavior. Flappers were seen as brash for wearing excessive makeup, drinking, smoking, driving automobiles, and otherwise flouting social norms.

Flappers became the icon of this era. These were women with looser fitting clothes - a stark contrast to the victorian era of clothing that covered every inch of a woman in a tight restrictive manner. The women of the roaring twenties also dance in a care free way with wild movement that all gave rise to the term flappers. Some saw flappers as looser women often who dressed in the latest fashions, danced and socialized outside the home with men. The home or church was losing ground as a place for courtship and with that came more equality in dating.

In 1929 the stock market crashed which began the Great Depression. The day of the crash became known as Black Tuesday. October 2 9, 1929 ended an era of freedom, openness and optimism. Another era of fear occurs (this time because of economic stress and not war) which results in people pulling back from new ideas and seeking tradition.



This sense of fear and unwillingness to consider new social norms continues through **World War II from '39 to 45.** Even as economic problems continue, war fears become paramount for many. But the war forced imported societal norms to be challenged as Americans dealt with the war. Rosie the Riveter became the poster icon for women in the work place. With American men at war, women were needed in the factories to build machines, weapons, and produce other important goods for the economy of America to survive and meet the needs of the war effort.

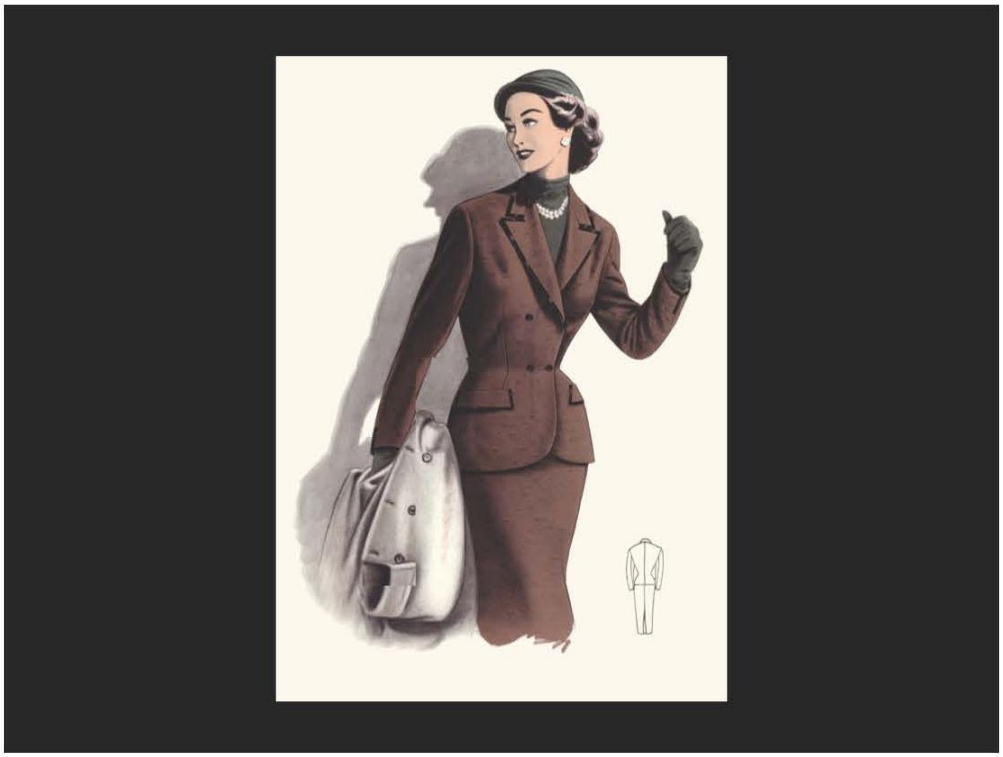
After WWII women mostly returned to the homes from working in businesses and factories. Not all willingly as many women enjoyed the new freedoms, but most did so because if they wanted marriage and children, working full time outside the home was still not an option practically. But an important change had occurred, now the debate was no longer "could" women work in these jobs, but "should" they. Even though most of America returned to the traditional male and female roles in society and marriage, there was a permanent change in the psyche of America about the possibility that roles might change.

Post War Baby Boom from '45 to'59 brought great change just as in the roaring twenties as period of great fear ends and ushers in an explosion of pent up desire for new things. With the return of men to the country and economic prosperity brought on by the end of the war, many new families began and new suburban living was created with the new wealth. With this came a resurrection of old debates on sexuality and roles of men and women in society. Many men had experienced new ideas overseas and many women had experienced new roles in factories and workplaces all of which encourage this discussion and change begins.

The American Family had the following features:

1. Most married after high school - almost 50% of brides were 19 years old.
2. Traditional family unit of father, mother and a few children gets smaller and is more often living by itself in a home (nuclear family). Divorce not common or acceptable.

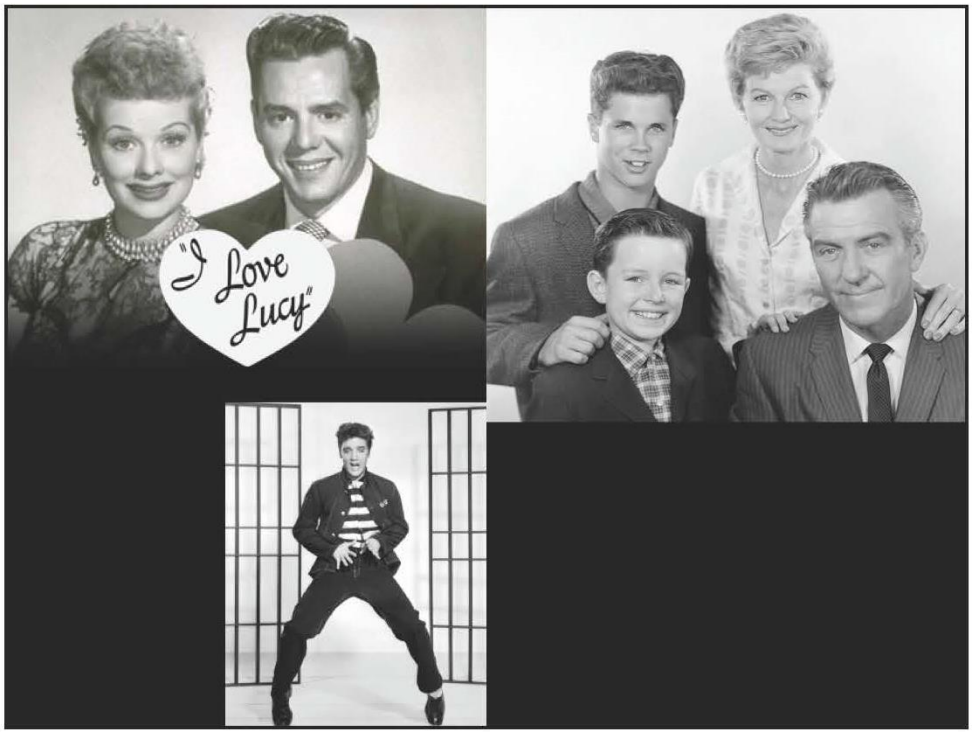
3. First real teenage era… more youth went to high school and college so adolescence grows, putting a larger gap between childhood and adulthood.
4. Marriage and motherhood were the goals; few women went to college or into a career. Those women who went to college usually drop out when they got married or pregnant so they could care for a family. Raising children and keeping a house before modern conveniences still required a full time effort by one adult. Even though some women wanted to have a career it usually meant giving up having a family.



30. Dating during the baby boom was characterized by the following attitudes:

1. 80% women disapproved of premarital sex.
2. Dating was expected to be serious and lead to marriage.
3. Women wore girdles and corsets to keep body rigid and confined, hair worn conservatively.

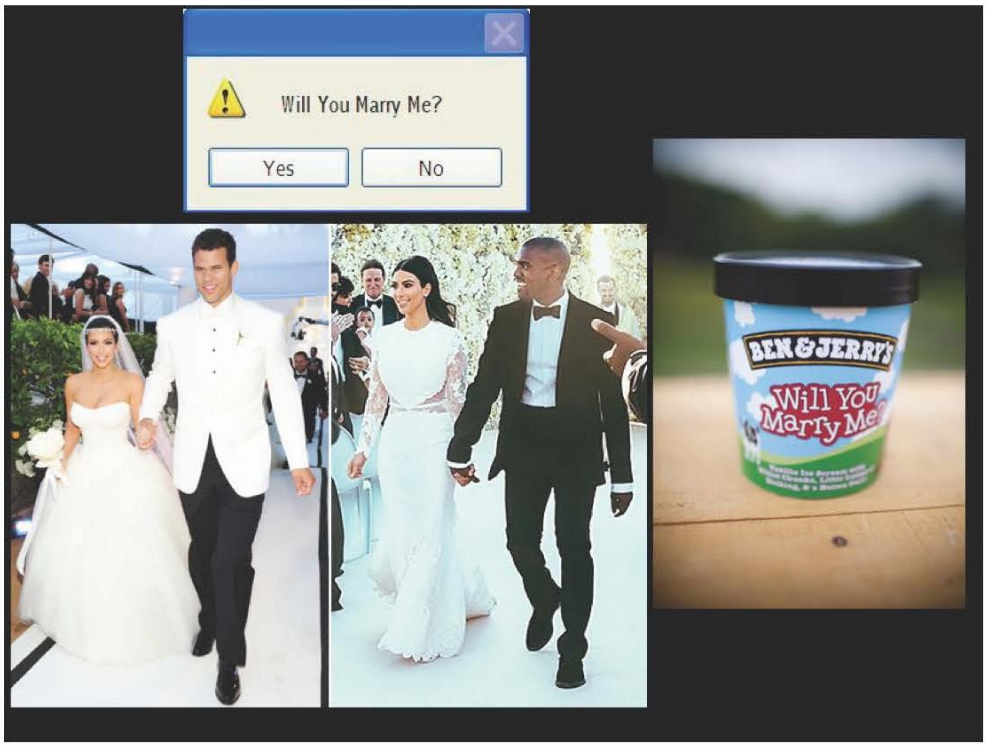
4. Much conformity and structure to majority view.
5. Little accepted in way of new thoughts on sexuality in open society but much is discussed especially in the "underground" culture of the young mostly. Beatniks, who were of the Beat generation questioned societal norms in all things including sexuality, dating and marriage. Jack Kerouac became famous writing about these people and their ideas.



Just as in earlier times, attitudes about dating and marriage were influenced by Academia, Politics and Entertainment/Media. During the Baby Boom, these are some specific influences to consider.

1. Academia started to discuss sexuality but this was controversial even to talk about in academic ways. The *Kinsey Reports*, which sought to record the sexual behaviors of men and women from a scientific point of view, were published with much controversy.

2. In Entertainment/Media there was a prudent view even for married couples - only twin beds were shown for the couple in the TV show I Love Lucy & no bedroom was shown for the couple in Leave it to Beaver
3. The Cold war ongoing as America led the western free world against communism and the Soviet Union. Fear of communism and outspokenness quelled other conversations in society.
4. Elvis' music was considered shocking because of the sexuality of his words and movement.



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APPENDIX S

Directions for the Teacher

Video 1

Directions for the instructors: Please monitor the room closely to make sure that students are watching the religion video. The videos look very similar, so you should be able to see if someone has begun watching other videos. Make sure that students use earbuds or headphones. I'll have a few extras. I estimate that it will take students about 10 minutes to complete the first survey, a minute to read directions, between 10 and 15 minutes to watch the video, and about 10 minutes to take the quiz at the end.

Read this to the class:

Today our classwork corresponds with the Research Study that you read about on the permission slip. If you have your signed form with you, please turn it in now.

Today you will find your work in a Schoology Class called *Christian Sexuality Multimedia Units.* Open the folder called "Creation" and complete each item in order.

You will start with a Background Knowledge survey. It includes some demographic questions (because researchers have to include those) and questions that will help me have an idea about the general class experience. I won't see your individual answers, but I will be given general information that will help me have a better sense of how best to teach you.

After the Background Knowledge Survey, you will read directions, then watch a video that's a little longer than 10 minutes, and then you will take a short quiz. Remember that I won't see your individual answers. I will just get general information that will help me plan future lessons on this topic. Please do your very best so that I can plan accurately for you.

You will need to use your earbuds or headphones for the videos so that you can listen at a comfortable volume for you.

The use of your data for the study is voluntary. If you decide that you don't want your data included, please tell me so that I can direct you to the researcher.

Please open your computer, go to Schoology, open the class called *Christian Sexuality Multimedia Units*, and begin. If you have a question during this segment of class, raise your hand.

After Students are Done: Please don't discuss this material now or experience. We will discuss it at length in future class sessions. Thanks for your help with this.

Video 2

Directions for the instructors: Please monitor the room closely to make sure that students are watching the religion video. The videos look very similar, so you should be able to see if someone has begun watching other videos. Make sure that students use earbuds or headphones. I'll have a few extras. I estimate that it will take students about 10 minutes to complete the first survey, a minute to read directions, between 10 and 15 minutes to watch the video, and about 10 minutes to take the quiz at the end.

Read this to the class:

Today you will find your work in a Schoology Class called *Christian Sexuality Multimedia Units.* Open the folder called "Self-Disclosure" and complete each item in order.

You will read directions, then watch a video that's a little longer than 10 minutes, and then you will take a short quiz. Remember that I won't see your individual answers. I will just get general information that will help me plan future lessons on this topic. Please do your very best so that I can plan accurately for you.

You will need to use your earbuds or headphones for the videos so that you can listen at a comfortable volume for you.

The use of your data for the study is voluntary. If you decide that you don't want your data included, please tell me so that I can direct you to the researcher.

Please open your computer, go to Schoology, open the class called *Christian Sexuality Multimedia Units*, and begin. If you have a question during this segment of class, raise your hand.

After Students are Done: Please don't discuss this material now or experience. We will discuss it at length in future class sessions. Thanks for your help with this.

Videos 3 & 4

Directions for the instructors: Please monitor the room closely to make sure that students are watching the religion video. The videos look very similar, so you should be able to see if someone has begun watching other videos. Make sure that students use earbuds or headphones. I'll have a few extras. I estimate that it will take students about a minute to read directions, between 10 and 15 minutes to watch the video, and about 10 minutes to take the quiz at the end.

Read this to the class:

Today you will find your work in a Schoology Class called *Christian Sexuality Multimedia Units.* Open the folder called "History of Courtship Part 1" and complete each item individually and in order. In other words, just do one thing at a time.

You will read directions, then watch a video that's a little longer than 10 minutes, and then you will take a short quiz. Remember that I won't see your individual answers. I will just get general information that will help me plan future lessons on this topic. Please do your very best so that I can plan accurately for you.

You will need to use your earbuds or headphones for the videos so that you can listen at a comfortable volume for you.

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After Students are Done: Please don't discuss this material now or experience. We will discuss it at length in future class sessions. Thanks for your help with this.