Introduction

The research underlying the Zeos standards mastery program is based on research from several different disciplines including educational research, psychology, neuroscience and sociology. The game-like elements are purposefully included in the product as a result of research on game-based learning which indicates that the engaging elements of games make them effective tools for learning (Sitzmann, 2011) and when properly designed and incorporated into a curriculum can provide improvements in student performance (Sitzman, 2011; Ke, 2009; Hays, 2005).

Instructional methods and skill building within the program are based on select principles of cognitive load theory which is “a universal set of learning principles that are proven to result in efficient instructional environments as a consequence of leveraging human cognitive learning processes.” (Clark, Nguyen & Sweller, 2006). The principle elements of cognitive load theory incorporated into the product are the concept of automaticity and the idea of giving learners control over the pacing of the instruction.

The purpose of this research report is to summarize the theoretical underpinnings, motivational models and empirical research studies that govern the functionality and features of Zeos. The program was carefully crafted to include elements that are backed by data and indicate improvements in either learning or motivation. The result is a product that is educationally effective and engaging for students based on sound principles and academic outcomes that lead to student motivation and achievements. This paper summarizes the student interface conventions and the structure of the product used to engage the students and provide the context for the elements and features contained within the Zeos standards mastery program and cites examples from research and links those examples to elements within the program.

Student Interface Conventions
Within the Zeos program, the interface conventions and how the students interact with the program were built upon research studies and supported educational theory. The purposeful design strategy provides...
the right level of engagement and interactivity balanced with the right approach to test preparation.

The elements included in the Zeos program that are specifically designed to gain and maintain student interest in the test preparation process include:

- Presenting a story as context for student activities
- Distributed practice
- Using an informal conversational tone
- Representing students as customizable avatars
- Encouraging pro-social behavior
- Developing automaticity in student test taking

**Research: Presenting a Story as Context for Student Activities**

Stories provide context, motivation and a purpose for activities and can serve as a powerful learning tool. Researchers have found that the human brain has a natural affinity for narrative construction and people tend to remember facts more accurately if they encounter them in a story rather than in a bulleted list (Carey, 2007). Additionally, individuals tend to use narrative to inform views of themselves and others (McAdams, 2006). The convention of narrative is often used for framing experiences and providing meaning to actions and activities (McAdams, 2006).

**Putting Research into Practice**

Zeos is wrapped in a story to provide students with a context in which taking multiple tests will be seen as enjoyable and desirable. The story of entering an academy for superheroes and acquiring powers over time is a familiar story to many students and provides a framework for their actions and activities. The story encourages the students to actively engage in the activities of Zeos and encourages them to stay within the product for longer periods of time to increase their preparedness for taking high-stakes tests.

**Research: Distributed Practice**

Distributed practice, spaced practice or spaced rehearsal, as it is sometimes called, is the technique of distributing study efforts over multiple short sessions with each session focused on the subject matter to be learned. The opposite of this technique is the mass practice technique (or cramming) where a student studies intensely for one long period of time in an attempt to master all the content at one time. Distributed practice or spaced practice is a robust and powerful phenomenon in learning (Ausubel & Youssef, 1965; Caple, 1996). Research indicates that distributed practice is a consistent and heavily supported learning phenomenon for long term retention and recall of content.

**Putting Research into Practice**

The story line surrounding Zeos provides incentives to revisit the story and for students to subsequently take multiple practice tests which provide a form of distributed practice.
Research: Using an Informal, Conversational Tone

A number of studies reinforce the fact that conversational style is more appropriate for communicating with students. A set of five experimental studies involving a computer-based educational game on botany and a multimedia lesson on lightning formation were conducted to determine an appropriate tone for presenting content to learners.

Researchers compared versions in which words were presented in a formal style with a version in which words were presented in a conversational style where content was presented in a personalized way so it seemed as if the computer was talking directly to the learner rather than formal third-person language (Moreno and Mayer, 2000). It turns out that participants in the conversational group produced between 20% and 46% more solutions to subsequent transfer problems than the group who was presented with formal language (Clark & Mayer, 2003). Under certain circumstances, people “treat computers like real people” and part of treating computers like real people is to try harder to understand their communications (Clark & Mayer, 2003).

In another experiment learners seated at a computer workstation received a narrated animation about lightning formation. The students then were asked to take a retention test, a transfer test, and to rate the speaker. Students performed better on the transfer test and rated the speaker more positively if the voice was human rather than machine synthesized. The retention test results were mixed (Mayer, Sobko, & Mautone, 2003).

Putting Research into Practice

Zeos uses an informal, conversational tone to convey messages and information to the students. This conversational tone is used to appeal to students. All of the characters the students interact with are presented as peer mentors and converse in an informal tone. The informal conversational tone provides students with an opportunity for higher transfer rates of content versus formal tones and also provides them with a positive experience while preparing for high-stakes tests which will encourage them to remain within the program or to return to the program frequently.

Research: Representing Students as Customizable Avatars

Research indicates that an experience as an avatar can change a person’s real life perceptions. It was found that negative stereotyping of the elderly was significantly reduced when participants were placed in avatars of old people compared with participants placed in avatars of young people (Yee & Bailenson, 2006).

It was also found that watching an avatar that looks like you performing an activity influences you to perform a similar or same activity in the future. Creating avatars and having a learner perform a task as an avatar influences a person’s actual behavior outside of the virtual environment. In one study, users watched an avatar that looked like them exercising...
and losing weight in a virtual environment, the result was that those that watched the avatar of their self subsequently exercised more and ate healthier in the real world as compared to a control group (Fox & Bailenson, 2009).

A similar study was conducted with three control groups (Yee, Bailenson & Ducheneaut, 2009). One where participants were exposed to an avatar representing themselves running on a treadmill, the second with avatar running that did not represent the participant and the third group with avatar representing themselves loitering. Within 24 hours after the experiment, participants who were exposed to the avatar running that represented themselves exercised significantly more than those in the other conditions (Yee, Bailenson & Ducheneaut, 2009).

Research also indicates that watching an avatar that resembles you changing in some way impacts future decisions. When college-aged students observed an avatar of themselves ageing in a virtual mirror, they formed a psychological connection to their “future self” and decided to invest more money in a retirement account as opposed to a control group (Ersner-Hershfield, Bailenson & Carstensen 2008).

**Putting Research into Practice**

Based on these findings, an integral part of Zeos is the ability of the students to customize their avatars. Students can create and customize an avatar and then watch the avatar perform activities related to successfully preparing for test taking. This provides students with a sense of ownership of the avatar and allows them to be vested in what happens to the avatar.

**Research: Encouraging Pro-social Behavior**

Two researchers conducted a study to determine if playing pro-social video games could increase pro-social behavior. The researchers concluded that playing video games with pro-social content is positively related to increases in different kinds of pro-social behavior. Participants who had played a pro-social video game were more likely to help researchers pick up spilled items, were more willing to assist in further experiments and were more likely to help an individual being harassed (Greitemeyer & Osswald 2010).

The conclusion that pro-social games have a positive influence on pro-social behavior has been repeated in other studies. In a study conducted by Douglas A. Gentil from Iowa state university with researchers from around the world, the findings indicated that video games in which game characters help and support each other in non-violent ways increase both short-term and long-term pro-social behaviors (Liau, et. al, 2009). The research team reported on three studies conducted in three countries with three age groups. In a correlational study, Singaporean middle-school students who played more pro-social games behaved more pro-socially. In two longitudinal samples of Japanese children and adolescents, pro-social game play predicted later increases in pro-social behavior. In
an experimental study, U.S. undergraduates randomly assigned to play pro-social games behaved more pro-socially toward another student. These similar results across different methodologies, ages, and cultures provide robust evidence that pro-social games can positively impact pro-social behavior (Liau, et. al, 2009).

**Putting Research into Practice**
Zeos includes elements to address the rising issue within many school districts of anti-social behavior or bullying. To counter inappropriate behaviors among students, pro-social elements are integrated to encourage pro-social behavior among students. This is based on a growing body of pro-social research on games. In the Zeos program, students will be encouraged to perform pro-social actions as superheroes. The actions will foster pro-social thoughts and influence students to be considerate of others.

**Research: Developing Automaticity in Student Test Taking**
Automaticity can be defined as “the status of any knowledge or skill that has been used so many times that it can be activated from long-term memory and applied using minimal working memory resources” (Clark, Nguyen & Sweller, 2006). Skills become automatic after repeated rehearsals of the activity. Research indicates that a task such as matching letters can take as many as two thousand practice sessions but that the result can be significant. For example, when a problem was presented to students in a form that permitted them to use automated information, on average, the problem was solved sixteen times faster than an identical problem that required the use of non-automated information (Clark, Nguyen & Sweller, 2006).

**Putting Research into Practice**
The idea behind Zeos is that students will engage in the product by taking tests over and over again to achieve desired rewards within Zeos to compete with fellow classmates and to fulfill teacher test practice requirements. Zeos uses the concept of repeated rehearsals to provide students with a level of automaticity. These multiple instances of test taking help students develop automaticity within the subject matter and with tasks involved in taking high-stakes tests.

**Summary**
The Zeos program has many game-like elements specifically included to engage students and to encourage them to spend time on the task of test preparation. The theoretical underpinnings, student interface conventions and empirical research studies that govern the functionality and features of Zeos all contribute to the overall test preparation activities and environment in which students will be participating. This paper clearly outlined the thought process of the design team and how evidence-based decisions influenced the design of the Zeos test preparation process with regard to student interface conventions.
About Dr. Karl Kapp
Karl M. Kapp, Ed.D., CFPIM, CIRM, is a scholar, professor of instructional technology and authority on gamification. His background teaching e-learning classes and knowledge of adult learning theory provide him with insights into the future of technology. He shares those insights and perspectives through writing, consulting and coaching with clients in the field of e-learning. Learn more at www.KarlKapp.com.

To learn more about the Zeos program, visit us at www.PearsonSchool.com/Zeos.
References


http://www.nytimes.com/2007/05/22/health/psychology/22narr.html?em&ex=1180065600&en=4d426931b2330fae&ei=5087%0A


Introduction
The research underlying the Zeos standards mastery program is based on research from several different disciplines including educational research, psychology, neuroscience and sociology. The game-like elements are purposefully included in the product as a result of research on game-based learning which indicates that the engaging elements of games make them effective tools for learning (Sitzmann, 2011) and when properly designed and incorporated into a curriculum can provide improvements in student performance (Sitzman, 2011; Ke, 2009; Hays, 2005). Instructional methods and skill building within the program are based on select principles of cognitive load theory which is “a universal set of learning principles that are proven to result in efficient instructional environments as a consequence of leveraging human cognitive learning processes.” (Clark, Nguyen & Sweller, 2006). The principle elements of cognitive load theory incorporated into the product are the concept of automaticity and the idea of giving learners control over the pacing of the instruction.

The purpose of this research report is to summarize the theoretical underpinnings, motivational models and empirical research studies that govern the functionality and features of Zeos. The program was carefully crafted to include elements that are backed by data and indicate improvements in either learning or motivation. The result is a product that is educationally effective and engaging for students based on sound principles and academic outcomes that lead to student motivation and achievements. This paper summarizes the motivational factors and the motivational models upon which Zeos was constructed and cites examples from research and links those examples to elements within the program.

Motivational Framework
One key concept behind the Zeos program is motivation. Students do not seem to be naturally motivated to take or practice taking tests. This is a major obstacle in test preparation and was a challenge that needed to be overcome by the design team.
To address the issue of motivation, Zeos combines intrinsic and extrinsic motivational factors. When considering the research on which to base the program, the design team was careful to distinguish between internal and external motivation. Motivation primarily driven from within the learner is called intrinsic motivation. Motivation from an external factor is known as extrinsic motivation. Understanding these two elements and the research discussing the relationship between the two is critical to understanding the motivational aspects of Zeos.

First, research by Lepper, Iyengar, Corpus (2005) found that when measured separately the relationship between intrinsic and extrinsic motivation were only moderately negatively correlated. This means that children’s intrinsic and extrinsic motivation can be viewed as two largely mutually independent constructs rather than the opposite ends of a single dimension. Lepper, et. al. (2005) also indicated that “in the classroom, it seems, intrinsic and extrinsic motivation do co-exist.” Additionally, some measures of motivation may be open to interpretation and it is complex to separate intrinsic from extrinsic motivation (Deci & Ryan, 1985; Lepper & Henderlong, 2000.)

Lepper, et. al. (2005) also indicated that it is conceivable that originally external motives could, over time become incorporated into one’s personal goal or value systems. They go on to state that there is some suggestion in the literature that internalized reasons do gradually supplant extrinsic reasons for engaging in disliked behaviors (Chandler & Connell, 1987) and that there are specific teaching practices that facilitate internalization (Deci, Ryan, Eghrari, Patrick, & Leone, 1994).

A careful combination of both types of motivation can enhance the experience for the student engaged in the test preparation process and extrinsic motivations could eventually lead to intrinsic motivation—a consideration underlying much of the Zeos program. For example, desiring good grades can indicate that children are engaging in academic behaviors merely as a means to some extrinsic end. However, grades can also provide useful information about competence and mastery, and desiring this sort of feedback may reflect an intrinsic interest in the material or activity rather than an extrinsic orientation. Given these points, the decision by the design team was to incorporate elements of both intrinsic and extrinsic motivation into the program.

**Motivational Models**

The motivational models used in Zeos and explained below include elements of both intrinsic and extrinsic. The first model was specifically designed to capture the motivation aspects of games. Second is a list of principles for developing motivating instruction which was used as guidelines for the Zeos program.

**Malone’s Theory of Intrinsically Motivating Instruction**

In the 1980’s Thomas Malone wanted to investigate why games are so much fun and motivational. He conducted a study that looked at a
number of games and dissected, as researches do, the elements of fun. Through this process he developed a model for looking at motivation in games and he developed an idea of what made those games fun to play, or, in other words, motivating. Based on his findings, he postulated three key elements that make a game motivational: challenge, fantasy, and curiosity (Malone, 1981).

Research: Challenge
Challenge depends on goals with uncertain outcomes. An environment is not challenging if the individual is either certain to reach a goal or certain to not reach a goal. Ways of making outcomes uncertain include variable difficulty level, multiple level goals, hidden information, and randomness (Malone, 1981).

Challenge is also flavored by the perception of the learner. If the learner sees a piece of software as a tool, they don’t want the use of the tool to be difficult because they are using it to achieve another external goal. Using a hammer should be easy because the goal is to drive a nail not figure out how to use a hammer. But if the learner sees a piece of software as a toy, he or she expects and is motivated by a challenge. They want to see if they can figure out the software. For them, that is a challenge. That is why people get frustrated at the complicated process of trying to use a computer program to edit a video to post on their daughter’s web site in time for her wedding but relish in the complexity of figuring out a difficult flight simulator game. One is a tool and one is a toy (Malone, 1981).

Putting Research into Practice
Zeos is a tool for helping students prepare for high stakes tests but is presented more from the perspective of a toy which motivates students and will keep them engage longer than if they perceive the product as a tool for test improvement.

Research: Fantasy
Malone defines a fantasy as environment that “evokes mental images of things not present to the senses or within the actual experience of the person involved.” He states that the use of fantasies can make instructional environments more interesting and more educational and that fantasy has both cognitive and emotional advantages for designing instructional environments (Malone, 1981).

Putting Research into Practice
The cognitive advantages of using fantasy are that the metaphors or analogies of the kind provided by fantasies can often help a learner apply old knowledge in understanding new things. Additionally, the fantasy provokes vivid images related to the material being learned, thus improving the learner’s memory of the material. The Zeos program uses the metaphor of a superheroes “leveling up” in power. This metaphor parallels a student’s achieving more knowledge and being better prepared for a test by scoring higher than their last attempt. The fantasy world of a
superhero academy makes the practice environment interesting and challenging.

**Research: Curiosity**
Environments can evoke a learner’s curiosity by providing an optimal level of informational complexity by providing a novel and exciting environment. He separates curiosity into sensory and cognitive components (Malone, 1981).

**Putting Research into Practice**
Sensory curiosity involves the attention-attracting value of changes in the light, sound, or other sensory stimuli of an environment. Malone states there is no reason why educational environments have to be impoverished sensory environments. Zeos uses rich colors, a variety of graphically interesting items and aesthetics to appeal to students.

Cognitive curiosity is evoked by the prospect of modifying higher-level cognitive structures and he suggests that cognitive curiosity can be aroused by making learners believe their knowledge structures are incomplete, inconsistent, or unparsimonious. The learners are then motivated to learn more, in order to make their cognitive structures better-formed. Zeos accomplishes this process by providing students with feedback regarding their practice tests and indicating scores showing how well they’ve mastered certain content areas.

To engage the learner’s curiosity, Malone suggests that feedback should be surprising and it should be constructive. For surprising feedback, he suggests an easy way to add that element is by using randomness. This aspect is covered by the design team’s employment of a “spinning wheel” which provides an uncertain outcome to the students after they have completed a practice test. This will be described in more detail in a later section of this paper.

**Lepper’s Instructional Design Principles for Intrinsic Motivation**
Another method of looking at motivating learners was proposed by Mark Lepper, a researcher from Stanford University, he proposed a series of design principles for promoting intrinsic motivation in instructional activities and to avoid having to rely on extrinsic motivational techniques (Lepper, 1988). Lepper lists four principles and all of those principles are included within the Zeos program.

**Research: Control**
Provide learners with a sense of control over the learning activity. Let them have some say into when to initiate and when to terminate an activity. Allow the learner to make decisions independently of outside influences. Create an environment that minimizes extrinsic constraints on an activity and decrease any existing extrinsic constraints over time (Lepper, 1988). A sense of control within instructional environment is also a tenant of cognitive load theory. It turns out that the more control a program gives the learner over the rate of content display, the more
efficient the learning (Clark, Nguyen & Sweller, 2006).

**Putting Research into Practice**
In Zeos, students are able to earn rewards and coins and then spend those coins on whatever item they would like. This gives them a sense of control. The students are also able to choose to take a test presented by the teacher, by peers or by the software itself. This, again, provides the students with control over the environments. Additionally, students have control over how their avatar looks and the items they want to display to others.

**Research: Challenge**
Create an activity that is continually challenging to the learner. This can be accomplished by presenting goals of uncertain attainment and of an intermediate level of difficulty. Provide timely feedback regarding accomplishments. If possible, provide multiple goals or multiple levels of goals to ensure the activity provides goals that are at the appropriate level and that the learner can be continuously challenged as they proceed through the instruction (Lepper, 1988).

**Putting Research into Practice**
During their interactions with program, students will be challenged to achieve goals by performing well on practice tests and will be encouraged to retake tests in areas where they may not be as strong. A critical element in reinforcing this behavior is the ability for students to see the rewards their peers have earned. This visibility serves to motivate students to “outearn” creating camaraderie through friendly competition.

**Research: Curiosity**
Appeal to the learner’s sense of curiosity. This can be accomplished by highlighting areas of inconsistency, incompleteness, or even inelegance in the learner’s knowledge base. Employ activities involving content, or problems of inherent interest to the learners (Lepper, 1988).

**Putting Research into Practice**
The Zeos program provides the student the ability to unlock new items when they master content and provides new objects when they accomplish goals. Student curiosity will be peaked when they engage in the product to answer the question, “What can I get next?”

**Research: Contextualization**
Present the activity in a functional simulation or fantasy context and, if possible, highlight the functionality of the activity (Lepper, 1988).

**Putting Research into Practice**
The context of Zeos is that of a fantasy school where students are encouraged to take tests to improve their super powers and to earn desirable items.
Self-determination Theory

Self-determination Theory (SDT) is a macro-theory which explains human motivation to perform a task or an activity as being internally driven as opposed to the externally driven theories of behavior (Ryan & Deci, 2000). The theory has been used to describe motivation in a broad range of human activities including sports, healthcare, religion, work and education.

Self-Determination Theory addresses factors that either facilitate or undermine motivation. The theory has several sub-theories including cognitive valuation theory which proposes that events and conditions that enhance a person’s sense of autonomy and competence support intrinsic motivation. In addition, factors that diminish perceived autonomy or competence undermine intrinsic motivation.

Researchers have found evidence that “the psychological ‘pull’ of games is largely due to their capacity to engender feelings of autonomy, competence and relatedness, and that to the extent they do so they not only motivate further play, but also can be experienced as enhancing physiological wellness” (Ryan, Rigby, & Przybylski, 2006).

In fact, in a research study examining SDT and game play, it was determined that perceived in-game autonomy and competence are associated with game enjoyment, preferences and changes in well-being as a result of game play. Additionally it was found that competence and autonomy perceptions were related to the intuitive nature of game controls and the sense of presence or immersion participants felt in their game play experience (Ryan, Rigby, & Przybylski, 2006).

In a study of gamers in an on-line community it was discovered that autonomy, competence, and relatedness all independently predicted enjoyment and future game play (Ryan, Rigby, & Przybylski, 2006). Crafting a motivational game using Self-Determination Theory, and its sub-components, requires that players feel that they are autonomous and in control of their own actions, that they experience competence in achieving the tasks within the game-space and they feel somehow related to others who either are playing the game with them at the moment or who have played before.

Research: Autonomy

One of the first elements of SDT is autonomy which is the feeling a person has that they are in control and can determine the outcome of their actions. It is the feeling of having control over one’s actions and is an integral part of SDT.

Putting Research into Practice

The elements of avatar customization and control over what a student can display in Zeos were discussed previously.
**Research: Competence**

Another key aspect of the theory is competence. The concept of competence is defined as a need for challenge and a feeling of mastery. Cognitive evaluation theory proposes that factors enhancing the experience of competence, such as the opportunity to acquire a new skill or the chance to be appropriately challenged enhance perceived competence, and, in turn, are intrinsically motivating.

**Putting Research into Practice**

This is the ability of the student to see progress on his or her ability to master tests in different subject areas which is available through the Zeos program.

**Research: Relatedness**

The third major element in SDT is the concept of relatedness. Relatedness is experienced when a person feels connected to others. This can happen most often in an online multiplayer game.

**Putting Research into Practice**

In Zeos, the design team added social element such as the ability for one student to demonstrate approval for others by “zapping” their character. This is just one of several social elements that foster the feeling of relatedness.

**Element of Uncertainty**

In terms of creating a reward structure, the Zeos team developed a system where students can obtain items of differing value and a currency system allowing students to purchase items when they have obtained enough currency. Additionally, the design team added an element of uncertainty to the rewards structure based on research findings. The basis for the reward structure and the addition of uncertainty in the process is described below.

The value, or size, of an anticipated reward influences the motivational signal sent to the brain only within the contexts of the reward system. The maximum signal sent to the brain corresponds with the maximum available reward within that context. Meaning that if a person played two different games with one game having a maximum prize of $10 and the other having a maximum prize of $100, the dopamine released by anticipating each prize would be the same. When the player reached the maximum prize level, dopamine is released in the same amount regardless of the size of the prize (Howard-Jones & Demetriou, 2008).

The uncertainty of an outcome influences the brain’s response to reward, uncertain rewards release more dopamine than predictable rewards. In a study of the primate brain, researchers studied reactions to the frequency of rewards by presenting a stimulus with a subsequent reward. In one condition, they provided the reward after the stimulus 100% of the time. In the other, they provided the reward after the stimulus 50%
of the time. By monitoring the brain activity they found that the stimulus associated with the imminent arrival of 100% certain reward generated a similar spike of dopamine activity as the reward itself arriving entirely unexpectedly. But the actual arrival of the reward produced little effect at all because it was an entirely predictable event. They already got excited about receiving the reward after the stimulus and the reward itself didn’t induce additional dopamine. However, when the stimulus only produced a reward about 50% of the time, the stimulus generated a spike in dopamine and then the dopamine began to ramp up again reaching another maximum at the moment when the reward might or might not appear. The original spike of dopamine induced by the stimulus and the subsequent ramping up of dopamine while wondering if a reward will appear or not resulted in more overall dopamine (Howard-Jones & Demetriou, 2008).

The right level of uncertainty to introduce in games of chance to heighten motivation is 50%. It appears that having a 50/50 chance of success keeps players motivated toward achieving the reward they are seeking (Atkinson, 1957).

Putting these findings into an educational perspective is an interesting study related to Zeos. In the study, a class of 11-12 year olds in Cyprus, Greece was asked to practice mental mathematics by playing a simple computer game. Students were given 30 true/false questions (e.g. 13 x 42 = 564) with the goal of getting the maximum possible score. Before students could answer a question, they were faced with a choice of having the question asked by Mr. Certain or Mr. Uncertain. Both provided the same questions, but if a participant answered correctly, he/she would receive one point from Mr. Certain and either zero points or two points from Mr. Uncertain, depending on the toss of an animated coin. The design of the software ensured that each question was presented once, and the order of presentation was randomized for each participant. It was made clear to the children that there was an equal chance of receiving 2 points or zero points from Mr. Uncertain for a correct answer (Howard-Jones & Demetriou, 2008).

Over the 50 participants in the study, the mean percentage of occasions that Mr. Uncertain was chosen was 61.4% which was a statistically significant preference and over the course of the game, the preference for choosing Mr. Uncertain increased. Overall, thirty of the 50 participants chose Mr. Uncertain more times than Mr. Certain (Howard-Jones & Demetriou, 2008).

Howard-Jones and Demetriou (2008) concluded that the results demonstrated a clear preference of primary school children for the incorporation of gaming uncertainty in a mathematical quiz. They add that the preference for gaming uncertainty shown by children in this study and the tendency of this to increase with repetition of the task, concur with current neuropsychological concepts. Gaming uncertainty in reward structures keep children motivated to play instructional games and the
longer they play the game, the more they utilize the uncertainty elements—they take bigger risks for higher rewards.

The authors of the study indicated that learning was achieved in terms of being able to correctly answer questions that had previously been incorrectly answered as shown in pre/post-test design. They also observed an intermingling of a game talk and learning talk during the game. The authors stated:

Fairness was discussed with respect to differences in player—opponent ability but not with respect to losses due to chance (i.e. gaming uncertainty). Such losses produced significant emotional responses, but did not appear to deter the players. Indeed, the gaming element appeared to offer hopeful encouragement as a potential means by which to compensate for disparities in player—opponent ability level. During playing of the game, the artificial opponent became personified as something of a “hate figure”. The game appeared to provide high levels of motivation, but was described as both fun and annoying echoing a mild form of the dissociation between motivational elements of appetite (wanting) and consumption (liking) (Howard-Jones & Demetriou, 2008).

Gaming uncertainty appeared to subvert the conventional learning discourse and the traditional concepts of classroom fairness (always earning points for correct answers) and the sting of failure was mitigated by the chance to win the game on the next roll of the dice. Failure was attributed to bad luck and big losses the result of chance (Howard-Jones & Demetriou, 2008).

**Putting Research into Practice**

Zeos employs a spinner which is presented to students when they achieve a certain score on an assessment. The spinner adds an element of uncertainty in terms of the presentation of the reward structure.

**Social Networking and Social Interactions**

An important aspect of student interactions in the 21st Century is their understanding and proper usage of social media tools to communicate and relate to one another. Over 95% of all teens between the ages of 12 and 17 go online on a regular basis and 84% of kids ages 12-13 and 89% of kids ages 14-17 send instant messages or chat with friends (Lenhart et al., 2011).

Yet, there are instances of improper use of social media. In fact, 12% of kids ages 12-17 reported that they frequently witness online cruelty and meanness (Lenhart et al., 2011). Part of the problem with kids being online and communicating via social media is that students are never formally taught the proper methods of using social media or social media etiquette. Social media is used in an unsupervised manner and students have no “practice” in proper use of social media.
For students to become good social citizens and to properly understand how to use social media, they need to experience the use of social media in a controlled setting within a monitored environment such as the one designed into Zeos.

The incorporation of social media also taps into the “relatedness” concept of Self-Determination Theory. It allows students to feel connected and related to each other as they share the common experience of preparing for tests.

In addition, teaching students to become responsible users of tools like messaging is mentioned several times in the literature surrounding the Common Core State Standards. The standards discuss that students need to know how to “use technology and digital media strategically and capably” and that the students, “with guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.”

**Putting Research into Practice**

The Zeos development team has purposefully included two key social networking tools within the program to make it enticing to teens, to foster the idea of feeling connected online and to encourage students to practice the proper methods of using social media to communicate. One social media tool is the ability for students to send messages to each other. The students will not feel isolated or alone while preparing for the tests because they can send messages and engage in discussions while within the Zeos environment. Sharing of common experiences is motivational and encouraging to students and will keep them engaged. Another is the ability to “zap” or “like” something another student has done or achieved.

Zeos also helps meet Common Core State Standards for using technology and digital media by providing an opportunity for students to use social networking tools in a controlled and monitored environment.

**Summary**

The Zeos program has many game-like elements specifically included to engage students and to encourage them to spend time on the task of test preparation. The theoretical underpinnings, motivational framework and models, and empirical research studies that govern the functionality and features of Zeos all contribute to the overall test preparation activities and environment in which students will be participating. This paper outlined the thought process of the design team and how evidence-based decisions influenced the design of the Zeos test preparation process with regard to motivation. Through the use of Zeos, students will be motivated to spend time on-task preparing for high-stakes tests.
About Dr. Karl Kapp

Karl M. Kapp, Ed.D., CFPIM, CIRM, is a scholar, professor of instructional technology and authority on gamification. His background teaching e-learning classes and knowledge of adult learning theory provide him with insights into the future of technology. He shares those insights and perspectives through writing, consulting and coaching with clients in the field of e-learning. Learn more at www.KarlKapp.com.

To learn more about the Zeos program, visit us at www.PearsonSchool.com/Zeos.
References


