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About

The Journal for Applied Instructional Design

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The purpose of this journal is to bridge the gap between theory and practice by providing reflective scholar-practitioners a means for publishing articles related the field of Instructional Design.

JAID's goals are to encourage and nurture the development of the reflective practitioner as well as collaborations between academics and practitioners as a means of disseminating and developing new ideas in instructional design. The resulting articles should inform both the study and practice of instructional design.

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Guest Editorial

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On behalf of the staff of the Journal of Applied Instructional Design, we welcome you to this issue of the journal. Many individuals have contributed mightily to this young journal already, so we also wish to thank AECT and all of you in the field for your work and support. Instructional design is a vibrant and ever -evolving field. We are particularly pleased to offer our readers a number of fine articles which each present fresh insights and contributions to the research, development and practice of instructional design.

When we look back a few short months to the premier issue of JAID, we can see in the comments of Editor Les Moller the value of the journal for our field. As Dr. Moller noted, the journal is "focused on the role and relationships of the scholar-practitioner" who contributes to improving "the practice and knowledge base of ID" (Moller, 2011). We think you will agree that these authors have certainly forwarded the mission and purpose of the journal, and exemplify our theme of emerging aspects of instructional design.

In this issue we are offered examples of unique research and practice that extend the field of instructional design via their contributions in the areas of sound/audio design for learning materials (Bishop & Sonnenschein), instructional design models that are deeply embedded in motivational theories to support a high-technology virtual tutee system (Park & Kim), and design of field experiences for teachers who will increasingly be teaching online (Kennedy & Archambault). Other authors present a new model for instructional design that is exemplified in training for college teaching assistants (Hardre), and an example of design and development research on applied to the a simulation-based nursing education course (Wilson & Klein).

One theme across these articles is "extending" the field of instructional design in new ways. For instance, we have in this issue new models; incorporation of neglected research in motivation; new principles for incorporating a neglected multimedia medium, sound; new principles for training of teachers and TAs; high-tech applications of ID for simulation in medical education; and extending how IDs learn ID by embedding their work in group-based civic service. This work is particularly valuable in our field in a time when instructional design is sometimes seen as a bit old-fashioned or limited. (This author is a dyed-in-the-wool instructional designer, who, of course, disagrees, contending that ID that is limited is the fault of us as designers.)

As readers can see, a theme that is additionally exciting about the manuscripts included in this issue is the breadth of audiences that are benefitting from this new work in applied instructional design. These authors tackle relevant and timely projects that ultimately affect very broad audiences. Bishop and Sonnenschein's principles for audio design can potentially be applied in most multimedia instruction and e-learning, for instance. The work of Park and Kim is being carried out in normal undergraduate college classrooms, not in labs, and involves helping students to read better; who could argue that this skill can enhance the academic career of any college student? These authors have also extended instructional design principles to include considerable motivational and interest-enhancing research and practice, exemplified in a novel virtual tutee (rather than tutor) system, that becomes a practical, and potentially scalable way to apply the tested research on the value of being a tutor to help a student learn. Kennedy and Archambault, based on their many years of research and practice in the world of K-12 virtual schools and online learning, have developed principles that teacher education programs anywhere could apply to the design of field experiences in online and virtual school learning. Their work thus applies to thousands of novice and early-career teachers, as well as, potentially, their thousands to millions of K-12 students. The audience for Hardre's work, too, is very broad; she has developed a new ID model, called SUCCESS; in her manuscript she describes how the model was applied to building training for over 200 teaching assistants. In this project alone, then, her ID work potentially impacts the learning achievement of several thousand college stu-

Guest Editorial (continued)

she describes how the model was applied to building training for over 200 teaching assistants. In this project alone, then, her ID work potentially impacts the learning achievement of several thousand college students. The work of Wilson and Klein, too, broadens the impact of ID to medical personnel who are engaging in highly-interactive simulations.

We would also like to acknowledge the support and work of many individuals in preparing this issue of JAID. First and foremost, we thank Les Moller, JAID Editor, for the opportunity to guest-edit this issue. Secondly, JaYoun Kwon deserves much appreciation for her service as guest editorial assistant for this issue. We also relied upon the professional service of many guest reviewers as well as the JAID Review Board members who helped with this issue. Finally, as always, we appreciate the hard work on behalf of JAID of Don Robison, Ben Erlandson and Jason Huett.

We look forward to your comments and views as you respond to this issue. As always, we welcome your contributions to JAID.

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Designing with Sound to Enhance Learning: Four Recommendations from the Film Industry

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ABSTRACT: While we rely heavily upon sound to understand our environments, instructional designers often overlook using sound to facilitate learners' selection, analysis, and synthesis of material under study. This neglect appears to be a matter of just not knowing how to sonify instructional designs to enhance learning. In contrast, increasingly more advanced and refined degree of film sound use has changed the way audiences experience and understand spectacle and storytelling in contemporary cinema. This paper explores what recommendations the film industry might have for instructional designers about ways sound can be designed to help enhance learning from their products.

Keywords: sound design, instructional design, instructional message design, media production, multimedia instruction

Introduction

Sound technologies have always trailed behind visual technologies. Sound was not recorded until the late 19th century, thousands of years after the first images were recorded (Altman, 1992). Sound was not studied as a physical phenomenon until the 1920s and '30s (Blauert, 1983). Sound's role in film was not even discussed until Hollywood released the first "talkie" in 1927 —a full 25 years after sound cinema was mechanically possible (Williams, 1992). And the technological barriers that had prevented the full integration of sound into all types of computer software were not overcome until the early 1990s.

So, it is hardly surprising that little attention has been paid over the years to sound's role in the user-computer interface (Buxton, Gaver, & Bly, 1987; Mountford & Gaver, 1990) and that even less attention has been paid to sound's potential contributions in computerized instructional environments (Barker, 1986; Mann, 1992, 1995). According to Bishop, Amankwatia, and Cates (2008), recently published instructional software programs are not using sound very extensively to support learning. When sound is incorporated, it appears to be used mostly as an attention-getting device or to narrate what might have otherwise been done just with text.

Further, it appears few guidelines are available for those instructional designers who are interested in finding theoretical and conceptual direction for incorporating sound most effectively. Even newer texts published since sound's use has become more technologically feasible provide little guidance on how to design with sound or its appropriate use. For example, Morrison, Ross, and Kemp's *Designing Effective Instruction* (2001) included a section on designing with graphics, but said nothing about designing with sound. Galitz's *The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques* (2002) dedicated a mere 4 of 730 pages to sound's instructional use, addressing only sound's potential role in supplying verbal redundancy and facilitating dual coding. And, while Clark and Mayer's *e-Learning and the Science of Instruction* (2003) devoted 29 of 293 pages to sound's use, the only sound type considered in 25 of those pages was speech. The remaining 4 pages focused on avoiding the use of "extraneous" background music and environmental sound effects, without suggesting ways in which non-speech sounds might be used to enhance learning. Generally, the authors of instructional design guidelines seem to recommend that sound's major function --other than supplying occasional bells and whistles to gain attention-- should be either to narrate screen text or to provide stand-alone audio examples (like a musical performance or an historical speech).

In contrast, sound is used extensively in the film industry to enhance the storyline or narrative flow by establishing mood, time, location or period; adding pace, excitement, and impact; completing the illusion of reality or fantasy; creating the impression of spatial depth; and adding continuity between a number of discontinuous shots edited together (Wyatt & Amyes, 2005). Increasingly, audiences have come to expect a more advanced and refined degree of film sound use, which has changed the way they experience and understand spectacle and storytelling in contemporary cinema (Whittington, 2007). As a result, sound editing has become an established career in Hollywood and a number of recognized academic institutions, like the University of Southern California, offer graduate degree programs in the field. Further, numerous books on sound design for cinema, like Sonnenschein's (2001) *Sound Design*, help filmmakers understand the expressive power of music, voice, and sound effects and provide concrete ideas for creatively using sound to enhance the filmgoer's experience.

If successful film sound design requires this much expertise, it appears there may be more to enhancing learning through instructional sound design than simply adding sounds as afterthoughts. Instructional designers need guidance on the psychoacoustical ways humans interact with sound and practical guidelines for how to create/select and integrate sounds in ways that will capitalize on its affordances. Thus, exploring what we can learn from the film industry about how sound can help convey instructional messages more effectively and efficiently has been the motivation behind our recent collaborations. The first author is an instructional technology professor with many years of experience in instructional software design and development and the second author is an experienced musician, filmmaker, and sound designer who has also done extensive research in the areas of psychoacoustics, the human voice, Gestalt psychology, and therapeutic uses of sound. In this paper, we explore the ways in which sounds can support learning, present four recommendations derived from "best practices" of film industry sound design and apply them to the process of designing instructional technologies that make optimal use of sound to enhance learning.

How Sounds Can Support Learning

Our discussion should begin by explaining that when we say *sounds*, we are talking about all kinds of auditory stimuli --music, voice, and environmental sounds. While definitions are difficult and the distinctions between each category can get quite fuzzy, by *music* we are referring to the deliberate organization of sound into longer harmonic, melodic, and rhythmic passages; by *voice* we mean the human articulation of auditory language or any other sounds made with the tongue, lips, and other speech organs; and by *environmental sounds* we mean all the other non-musical and non-voice sounds that things make as part of the actions and events that occur within an environment. Sounds can support learning by facilitating cognitive processing in a variety of ways.

For example, sounds are particularly good at gaining attention because, unlike eyes, ears can never be averted or shut with "earlids" (McDonald, Teder-Sälejärvl, & Millyard, 2000; Wickens, 1984). Sounds are generally more effective than images for gaining and focusing attention (Schmitt, Postma, & de Haan, 2000). Sounds like a far-away siren or the whine of a puppy can be particularly effective in focusing our attention by immediately activating existing images and schemas (Bernstein, Chu, Briggs, & Schurman, 1973; Bernstein, Clark, & Edelstein, 1969a, 1969b, Bernstein & Edelstein, 1971; Bernstein, Rose, & Ashe, 1970a, 1970b). Other sounds —like the wind rustling leaves or inspirational music— can hold our attention by making our environment more tangible or by arousing our emotions (Thomas & Johnston, 1984). Thus, sounds might be used not only to gain attention, but also to help focus attention on appropriate information and engage a learner's interest over time.

Sounds provide a context within which individuals can consolidate, elaborate upon, and organize details about their surroundings, thinking actively about connections between and among new information (McDonald, Teder-Sälejärvl, Millyard, 2000; Schmitt, Postma, & de Haan, 2000; Stein, London, Wilkinson, & Price, 1996). Sounds like the steely clank of a metal door closing or a liquid being close to the top of its container supply us with volumes of complex information that we easily interpret in order to extrapolate important details about the world around us (door is not wooden) and make decisions about how to respond (stop pouring) (McAdams, 1993; Perkins, 1983). Like visuals that form hierarchical clusters organized in space, combinations of sounds also form hierarchical clusters –they are just organized in time (Winn, 1993). According to Bregman (1990), temporal organizational clues within a composite of sounds —like a factory operating, a person speaking, a helicopter flying, a truck idling, and a motorcycle running— allow most people to ascertain almost instantly that five sound sources are present, to determine each source's identity, and to locate the sources spatially. In these ways, sounds might also be used to help learners organize and see interconnections among new pieces of information.

Sounds also help individuals tie into, build upon, and expand existing constructs in order to help relate new information to a larger system of conceptual knowledge. According to Gaver (1986; 1989; 1993a; 1993b; 1993c, 1994), we often compare what we are hearing to our episodic and semantic memories for the sounds objects make in order to draw from and link to existing constructs and schemas to support our understanding of what is happening. The metaphorical language we later use to describe these sounds provides us with the means to discuss the experience with others and to transfer this new knowledge to new situations, which can develop even deeper understandings. Consider, for example, "The baby wailed like a siren;" "the mindless bureaucrat squawked like a parrot;" and "the coward squealed like a pig." Thus, it appears sounds might also be used to provide a familiar setting within which learners can relate incoming information to existing knowledge (Winn, 1993; Yost, 1993).

The Recommendations

Given that sound may hold great promise to support learner's selection, analysis, and synthesis of new information, how might instructional designers begin to think more systematically about sound's appropriate use in instructional products in order to capitalize on its affordances? What follows, below, are four recommendations for designing the sound track of a learning environment, which may include music, voice, and/or environmental sounds in any combination.

#1: Consider Sound's Use from the Start of the Design Process

In the film industry, a sound designer's job is to support the storytelling by invoking myth, suspending reality, and creating emotion –to auditorially enhance the audience's ability to perceive what is happening and to assure that it is, indeed, registering in the brain. With the sound designer's contribution, the audience will be led down the path in an integrated, yet most often subconscious manner toward an experience that is authentic and human, a metaphor for the life experience itself. Achieving this goal requires that the sound designer be totally immersed in the story, characters, emotions, settings, theme, and genre of the film.

In order to create audio/visual environments that engage an audience, therefore, the film sound designer must be involved from the start of production. During shooting and editing, the sound designer can offer extremely beneficial advice. For example, he or she might suggest

removing shots that might otherwise be substituted with dialog; or incorporating a counterpoint ambient sound to help lift a voice into more definition (such as a puppy barking against the miserly growl of a gruff old man); or adding non-verbal vocal sounds to amplify a plot point (like adding a wheeze when the character's back is turned to emphasize his worsening disease); or specifying music, where appropriate, and how it might be integrated with the other audio elements.

Like film sound design, the sounds used in instructional materials could be used to support the storytelling by helping learners acquire, organize, and synthesize the material under study (Bishop, 2000; Bishop & Cates, 2001). But selecting or creating the right sounds to achieve these outcomes requires careful harmonization with the subject matter, learner characteristics, pedagogical strategy, and learning objectives for the instruction being developed. Taking our cue from the film industry then, in order to design auditory elements aimed at enhancing the learning environment, it appears best to plan for them from the start of the design process. As with film, the ideas that emerge from early thinking about sound's potential contribution to the instruction can influence other aspects of the overall production as well, such as identifying ways sounds might be combined with still images to convey a larger, moving concept without the need for animation or video (photo of a rainforest combined with bulldozer sounds to represent disregard for the environment); suggesting the overall theme for instruction (lively '60s dance music inspiring the "mod" theme for a unit on modular mathematics); or specifying environmental sounds coupled with visuals that can then be repurposed to reinforce concepts covered (like the animation and sound of an arrow hitting –and then missing– a target to reinforce the concept of accuracy throughout an information literacy lesson).

#2: Identify Key Storytelling Elements to be Amplified By Sound

Ideally, film sound designers begin their work with an initial reading of the script –well before the film has been shot. Throughout this initial reading of the script, the sound designer is "listening" for objects, actions, environments, emotions, and physical or dramatic transitions that can be fleshed out auditorially using the various sound types. Even if the film has been shot, sound designers still will often avoid viewing the dailies until reading the script in order to prevent being influenced by the impression that the visuals will make, potentially short-circuiting their creative process.

Next, the film sound designer meets with the director in order to confirm his/her impressions after the initial script reading and to learn more about the director's artistic intent for the film. The purpose of this meeting is for the sound designer to come away with a firm understanding of the film's key storytelling elements that might be amplified by sound, such as the subject (love story or war story?), genre (comedy or horror?), theme or message (such as "Crime doesn't pay" or "If you try, you will succeed"), and underlying conflict that will drive the story (honesty vs. dishonesty, good vs. evil, and the like). It is important this meeting be a brainstorming opportunity during which the sound designer and director take turns proposing alternate scenarios that provoke additional creative ideas in the other. Through the collaborative paradigm of thesis-antithesis-synthesis within these dialogs, some of the richest ideas can be generated for using sound to enhance the audience's experience with the film.

Thus, whether you are the sole instructional designer/developer with the freedom to do as you please or a member of a design team taking direction from a lead designer, it appears that thinking about instructional sound design should begin immediately after the initial front-end analysis or scripting of the learning context. It is at this point when most instructional design process models move into a production or design phase that systematically specifies the pedagogical, media, and technical strategies to be employed – essentially, what the learner's experience with the instruction will be (Clark & Lyons, 2004; Smith & Ragan, 1999). The individual(s) responsible for media production should carefully review the entire design document (including the findings from the front-end analysis) and, while reading, consider ways that the various sound types might be employed within the specific learning context to facilitate learning the material under study.

Further delineating media specifications for the instruction, particularly the role sounds might play in the overall production, might then be best accomplished in a brainstorming session where at least two members of the design team, likely the lead instructional designer and instructional media developer, carefully listen to and learn from the other's ideas. If the lead instructional designer and instructional media developer are one in the same person, we suggest asking some other colleague to read through the design document and work through some ideas with you. Similar to film production, the nature of the collaboration between these individuals at this stage of instructional development will vary depending on their expertise, prior experiences, and the specified division of responsibilities within the team (Dick, Carey, & Carey, 2001). However this relationship unfolds, it is important that the person responsible for developing the instructional media for the production comes away with a firm understanding of the overall vision for the instruction, including the nature of the subject matter to be learned (such as declarative knowledge, intellectual skills, cognitive strategies, attitudes, or psychomotor skills) (Gagné, 1985); the primary and any secondary learning objectives for the instruction; the instructional strategies likely to be employed (direct instruction versus exploratory learning); and any areas of potential difficulty that the designer anticipates learners might have with the instruction. With these key storytelling elements for the instruction identified, the media developer can begin matching them up with sounds that might help to amplify key concepts, scaffold organizational structures, and/or relate the material under study to learners' existing constructs.

#3: Capitalize On the Way People Listen to Sounds

But it may be that the type of sound used in an instructional product is less important than the kind of listening it encourages (Gaver, 1993, 1989). Borrowing from Michel Chion, the French film theorist, Sonnenschein (2001) distinguished between four types of listening modes: reduced, causal, semantic, and referential. Each is described in more detail below.

Reduced: Reduced listening involves listening only to the qualities of the sound itself and not the source or its meaning. This is how a sound engineer listens, describes, and manipulates sounds through filtering, processing, and mixing. For example, in reduced listening the sound of an ambulance siren would be described as being loud, varying pitch, simple timbre, long duration, and the like.

Reduced listening is contingent on one's ability to discern even small variations in sound quality. Despite the fact that we are primarily visually oriented and, consequently, the visual sciences have usually dominated the corresponding auditory sciences, we really do also have a very high level of auditory acuity. We can easily differentiate sounds as they vary across sound qualities --intensity, pitch, timbre, speed, rhythm, shape, reverb/echo, directionality, and harmony. Our ability to perceive these parameters and the associations we have with the "bi-polarities" at their extremes is governed by the capabilities and limitations of our hearing (see Table 1). Consequently, novel changes in sounds that encourage reduced listening in an instructional environment can be particularly good at gaining learners' attention, focusing it on particularly important content points, and holding it over time (Bernstein, Chu, Briggs, & Schurman, 1973; Kohfeld, 1971; Posner, Nissen, & Klein, 1976; Thomas & Johnston, 1984).

Causal: Causal listeners are gathering information about a sound's cause, both in terms of its source and environment. In causal listening one identifies the sound's source and places it into a descriptive category that is either personally or culturally significant. We label the sound with a recognizable name or word that is useful for communicating verbally or in text form (my mother, a dog, a Harley Davidson motorcycle). This label for the sound can also include a description of the environment that may be influencing the nature of the sound as in, for example, a shower. Water pouring into a bath with hard walls that reflect the sound will help the listener identify this as a shower, hearing both the water itself and the place where it is falling.

Unlike film, which demands a certain amount of realism (when a bus crosses through the screen from left to right the audience expects to hear a bus sound moving from left to right), there are many elements within a technology interface that have no natural sound, leaving the media developer free to create his/her own sound for that event –just what does a button click on a computer screen sound like, for example? In fact, within the context of your interface a real world sound may be inadequate. It may be necessary to embellish upon the sound chosen to convey the exact idea. Sounds used within a technology interface do not need to be realistic but should facilitate causal listening by being strongly associated (at least initially) with an on-screen event, then consistent and expected (Laurel, 1993). Further, sounds that encourage causal listening can help orient learners in complex learning environments. A sound made in the real world contains cues that help us to localize or judge very precisely its source's distance (using sound's overall volume, for example) and position (relying primarily upon the ratio of the sound's volume between our left and right ears) (McAdams & Bigand, 1993). When possible, try using the spatial cues in sounds to help learners with their visual searches for the sound's source in the interface.

Semantic: Semantic listening involves processing the auditory code systems (like language) that symbolize things, actions, ideas, and emotions in order to determine the meaning of a sound. Semantic listening includes both informational and emotional communication. For example, a voice will transmit information through the symbols of words as well emotion through the melody (or prosody) of the phrase. A child will know when his parent is angry or pleased by both the intonation and verbal ideas presented (and may sense confusion if these are contradictory). An ambulance siren will have different semantics depending on who and where the listener is: a) coming from behind a driver, says "Pull over to the side" b) passing on a cross street far ahead of a driver, says "Slow down" c) driving past a pedestrian, says "You're okay, we're helping someone else in need."

Table 1: Listener's auditory acuity and associations with sound quality extremes (American National Standards Institute, 1973; McAdams & Bigand, 1993; Levitin, 2006).

Sound Quality	Human Perception	Associations
Intensity (soft/loud): Perceived volume of sound.	Intensity is measured in energy increments called decibels (dB), a logarithmic scale of sound energy with each ten points representing ten times the loudness. Humans can hear over a 120dB dynamic range and discern sound volume changes of less than one decibel.	Soft sounds can be soothing (a babbling brook) or imply weakness (the whisper of a terminally ill patient). Loud sounds can be irritating (a wailing siren) or convey great strength (the opening measures of Beethoven's 9th Symphony).
Pitch (high/low): Degree of highness or lowness of a tone governed by the rate of vibrations producing it.	Humans' ability to perceive pitch in normal hearing ranges from about 20Hz to 20,000Hz (Hertz, or cycles per second).	High pitches can suggest small size (the squeak of a mouse) or youth (the happy squeal of a baby); low pitches suggest large size (the rumbling of a ship's engine) and have been known to cause feelings of awe or fear.
Timbre (simple/complex): Quality of sound distinct from its intensity and pitch.	Sound waves pulsing at regular intervals create a pure tonal or simple sound (a flute), as opposed to a noisy or complex sound (an explosion) made of overlapping and intermingling frequencies that produce highly complicated waveforms. With experience, humans identify sound sources at a surprising level of acuity.	Through traditional folk associations, metaphorical interpretations of sound quality, and repeated use, certain timbres have become associated with particular moods, emotions or situations (harp = angel and oboe = pastoral, for example).
Speed (fast/slow): Speed with which acoustic impulses are repeated.	At the upper extreme of 20 beats per second, individual sounds begin to blur into a steady pitch (or low frequency). At the lower extreme, resting cardiac pulse and the lethargic march of a funeral procession are examples of slow forms of sound making.	Fast sounds convey a sense of urgency (the sound of running footsteps) or excitement (the rapid speech of a surprised child); slow sounds can convey a lack of urgency (the sound of leisurely footsteps) or disinterest (the sluggish speech of a bored child).
Rhythm (ordered/chaotic): A strong, regular, repeated pattern of sound over time.	Ranging from an absolutely regular clock tick or resting heartbeat (ordered) to the spastic squeals of feeding pigs or the cacophony of a bicycle crash (chaotic). Humans can detect rhythm changes in the low millisecond range.	Ordered rhythms can lend a certain tranquility and assuredness, or nagging oppression. Chaotic rhythms can keep one alert, frightened, confused, or in fits of laughter.
Shape (impulsive/ reverberant): Defined by its attack (onset, growth), body (steady-state, duration), and decay (fall-off, termination).	Ranging from more impulsive beginning rapidly, peaking, and decaying rapidly to more reverberant – gradually rising and falling. Listener's perception of sound shape depends not only on the waveform created by the source, but also on the distance and reverberation properties of the surrounding space.	Listeners tend to think of sounds with more impulsive shapes to be more "spontaneous" and "short-lived" (gunshots, slaps, door slams) whereas sounds with more reverberant shapes are more "deliberate" and "persistent" (a dog growl, slowly tearing a sheet of paper, far-away thunder).
Reverb/echo (dry/wet): Governed by types of surfaces in the physical environment that reflect and absorb the sound waves, and the distance of sound to these surfaces.	Reverberations are diffuse, reflected from complex surfaces and have no distinguishable repetitions (e.g. concert hall, cathedral, hard-walled living room), whereas echoes are discrete repetition of a sound based on simple surface geometry (e.g. stone canyon, sewage drain, exterior building wall). Carpets, curtains, foliage or dirt are highly absorbing and create an acoustically dry or "dead" space (e.g. a bedroom). At the other extreme, a hard surface like stone, glass, concrete or polished wood will have a high degree of reflectivity that will create a very wet or "live" space (e.g. a tiled bathroom).	Because the proximity of the surfaces will determine the rate of decay of the reverb or echo, listeners tend to relate shorter decays to smaller spaces and longer decays to larger spaces. In addition to the physical clues revealed by reverb and echo, these can also indicate a change in subjective space --for example, internal thoughts or dream sequences in a film.
Directionality (narrow/ wide): The source of the sound may emanate from a narrow, specific region in the acoustic space (monoaural) or from a widespread area (stereophonic or surround sound).	Humans rely on specific cues within the sound that help to "localize" or judge very precisely a source's distance (using sound's overall volume, for example) and position (relying primarily upon the ratio of the sound's volume between our left and right ears).	A single source (e.g. human voice, bird, car) is normally identified as coming from one narrow point in space, whereas multiple sources (e.g. crowd murmur, forest ambience, traffic) are originating from a wide, non-specific place. The movement of a single source from left to right, for example, can widen the directionality of the sound over time, which makes the listener believe the acoustic event is happening over a larger space.
Harmony (consonant/ dissonant): *The relationship between two or more different pitches.*	A pitch of 440 Hz together with its octave 880Hz is perceived a extremely consonant and pleasing to the ear, whereas a 440 Hz with a 450 Hz pitch will be very dissonant. The principle of harmony can also be applied to any cluster of non-musical sounds that have distinguishable fundamental frequencies (e.g. individual human voice, telephone ring, bird songs), but not to those with extremely complex timbres (e.g. crowd murmur, waterfall, rustling leaves).	Consonant sounds tend to be perceived as soothing, ordered, and aesthetically pleasing. Dissonance between sounds can lead to feelings of tension, confusion, and displeasure.

Semantic listening makes it possible to create an *auditory syntax* for particular concepts and variations on that concept within a learning environment. By auditory syntax we mean establishing and repeating a set of consistently used sounds and rules for their use that helps learners more easily understand their connections and their relations. The power of this sound design approach to facilitate learning is even greater if the syntax is consonant with the theme or metaphor for the instruction and the content. For example, if one were to use eating sounds throughout a course on relevance ("ptewie" for irrelevant and "chomp" for relevant), one could vary those sounds according to the sort of source being "eaten." Sources that are clearly relevant might make a satisfying "munch" sound whereas sources that are relevant but need to be "softened up a bit" to be appropriate for the assignment's audience might make a teeth-shattering "crunch" sound. Once the syntax has been established, you can then bring back echoes of it later with new feel and meaning to establish new paradigms (transfer) (Emmert & Donaghy, 1981; Fiske, 1990).

Referential: Referential listening involves listening to the context of a sound, linking not only to the source but principally to the emotional and dramatic meaning as well (internal and external). Referential sounds can be *universal* or applicable anywhere, anytime (such as breathing, heartbeat, or wind) or *specific* to a particular setting, culture, or time period (such as pine forest sounds, Moroccan marketplace sounds, or pre-Industrial sounds). These sounds tend to mentally refer us to the person or objects making them. This referential listening is, perhaps, most clearly evidenced by the language we use to describe these sorts of sounds: "a monotonous speaker," "a screeching violin," "a squeaking door," and the like. One must take care to avoid, however, using sounds that evoke "unintended" references based on personal interpretation, multicultural differences, and other prior experiences. For example, it will likely be some time before sound designers can incorporate rhythmic breathing through a scuba tank into their productions without listeners equating the sound to *Star Wars'* Darth Vader.

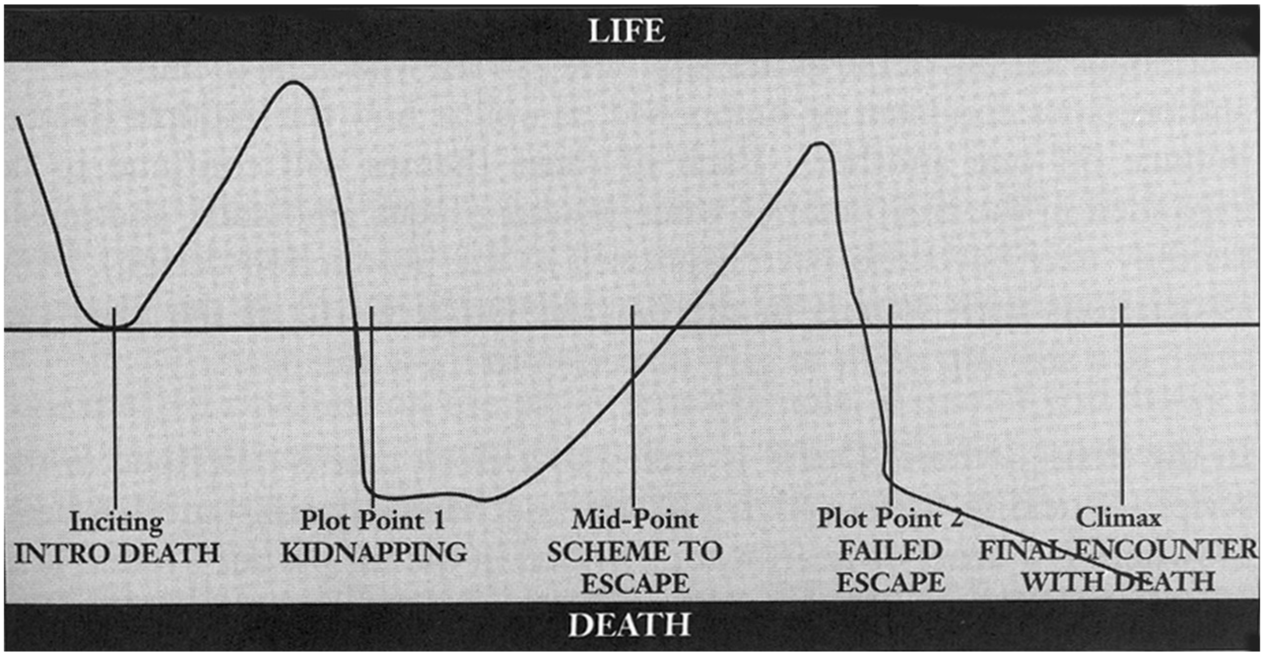
Because referential sounds can be highly image evoking, educators should consider exploiting this dual-coding to help learners process the material under study more deeply (Paivio, 1986). Also, since referential sound effects easily evoke images of familiar things, they might be used to augment or establish a mental model or metaphor for the content under study. Metaphors help us to understand new information by putting it in terms of other, more familiar information, without ever directly stating the comparison (Lakoff & Johnson, 1980). For example, one might consider using the sound of a racing automobile to accompany a cartoon character's hasty retreat in order to build upon learners' understanding of the action. Although mental models more directly state the comparison, they are very much like metaphors in that they help us to understand new information by putting it in terms of other, more familiar information. As with metaphors, referential sounds might be used to help build mental models within the learning environment because they easily evoke images of familiar things.

#4: Be Systematic About How Sounds Are Incorporated

Sound design for film is fairly linear and flows from scene to scene. The story is always dictated by a beginning, a middle, and an end (or climax). Sound designers work systematically within this framework and literally map out across a timeline when and where chosen sound groupings (or voices) will be incorporated as the story unfolds (see Figure 1). While instruction tends not to be quite as linear (not even direct instruction is entirely linear), the nature of human learning and the fundamental order of how we present content within a learning environment does typically flow from "select, analyze, to synthesize" in a way that could be considered to be analogous to film's "beginning, middle, and end."

Recognizing the need to provide a more complete picture of sound's instructional potential, Bishop (2000) has suggested a framework for thinking systematically about designing instruction with sound that is based on this select, analyze, and synthesize flow of instruction (see Table 2, Bishop, 2000; Bishop & Cates, 2001). The framework's nine cells combine information-processing and communication theories to derive strategies for how music, voice, and environmental sounds might be used more effectively at each level of learning (see selection, analysis, synthesis rows) by facilitating information processing (see acquisition, processing, and retrieval columns). Following the cells vertically down the information-processing columns, the framework anticipates deepening attentional, organizational, and relational difficulties at each subsequent phase of learning (top to bottom). When tracing the cells horizontally across the

Figure 1. Visual map for film sound design (Sonnenschein, 2001).



learning phases, the framework similarly anticipates waning interest, curiosity, and engagement at each deeper level of processing (left to right).

Thus, when one traces the first, selection-level row of cells horizontally across the information processing stages, the framework suggests that learner interest may be captured by instruction that employs sound to gain attention with novelty (cell 1), to isolate information through increased salience (cell 2), and to tie into previous knowledge by evoking existing schemas (cell 3). Similarly, learner curiosity might be aroused using sound to focus attention by pointing out where to exert information-processing effort (cell 4), to organize information by differentiating between content points and main ideas (cell 5), and to build upon existing knowledge by situating the material under study within real-life or metaphorical scenarios (cell 6). Likewise, a learner's level of engagement might be increased using sounds to hold attention over time by making the lesson more relevant (cell 7), to elaborate upon information by supplying auditory images and mental models (cell 8), and to prepare knowledge for later use by providing additional knowledge structures that might be useful in subsequent learning (cell 9). When designed systematically into the instruction in this way, sound might supplement instruction by providing the additional content, context, and construct support necessary to overcome many of the acquisition, processing, and retrieval problems one might encounter while learning.

Conclusion

While it appears that human beings rely heavily upon sound to learn about their environments, instructional designers often make little use of auditory information in their computerized lessons. The prevailing attitude seems to be that, after all of an instructional software product's visual requirements are satisfied, the designer might then consider adding a few "bells and whistles" in order to gain the learner's attention from time to time (see, for example, Adams & Hamm, 1994; Brown, 1988; Reiser & Gagné, 1983; Shneiderman, 1998). While instructional designers need to stop ignoring this important channel for communicating instructional messages, this neglect of the auditory sense appears to be less a matter of choice and more a matter of just not knowing how to sonify instructional designs to enhance learning.

That said, it is important that sounds be used only insofar as they reduce the interface's cognitive load and contribute to the instruction —everything else is just noise. If sound has a larger role to play in instructional materials –as it does in film– its use should be planned from the start, well-grounded in key aspects of the material under study, predicated on the way learners' listen to sound, and incorporated systematically in a way that will facilitate learners' selection, analysis, and synthesis of the material under study.

Table 2. Sound-use instructional design strategies framework (Bishop, 2000; Bishop & Cates, 2001).

	ACQUISITION	PROCESSING	RETRIEVAL	
SELECTION	**1. Use sound to gain attention.** Employ novel, bizarre, and humorous auditory stimuli.	**2. Use sound to isolate information.** Group or simplify content information conveyed to help learners isolate and disambiguate message stimuli.	**3. Use sound to tie into previous knowledge.** Recall learner's memories and evoke existing schemas.	**INTERESTED**
ANALYSIS	**4. Use sound to focus attention.** Alert learners to content points by showing them where to exert information-processing effort.	**5. Use sound to organize information.** Help learners differentiate among content points and create a systematic auditory syntax for categorizing main ideas.	**6. Use sound to build upon existing knowledge.** Situate the learning within real-life or metaphorical scenarios.	**CURIOUS**
SYNTHESIS	**7. Use sound to hold attention over time.** Immerse learners by making them feel the content is relevant, by helping to make it more tangible, and by bolstering learner confidence.	**8. Use sound to elaborate upon information.** Supplement the content by supplying auditory images and mental models.	**9. Use sound to integrate with existing knowledge.** Help learners integrate new material into overall knowledge structures and prepare for transfer to new learning contexts.	**ENGAGED**
	ATTEND (CONTENT SUPPORT)	**ORGANIZE (CONTEXT SUPPORT)**	**RELATE (CONSTRUCT SUPPORT)**	

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A Design Framework for a Virtual Tutee System to Promote Academic Reading Engagement in a College Classroom

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Abstract: Poor academic reading habits among students in higher education have been commonly acknowledged. Pre-service teachers are not exceptions as they do not always complete assigned course readings and frequently exhibit a shallow level of reading strategies. This paper proposes one approach to improve college students' engagement in academic reading, a Virtual Tutee System (VTS). The VTS presents a Web-based peer-tutoring environment in which students take the role of tutor and teach a virtual avatar character. According to research on peer tutoring, students are likely to develop active engagement in learning when they adopt the role of a tutor. This paper provides an elaboration of the design framework of the VTS with design examples applied to a teacher-education course. The framework consists of four design principles, including component guidelines for each principle, grounded in role theory and self-determination theory. The peer tutoring literature is briefly reviewed along with two theories that provide the foundation of the VTS. The paper concludes with a presentation of the potential for the VTS in college classrooms and directions for future research.

Keywords: Peer tutoring; Reading engagement; College course reading; Pre-service teachers; Role theory; Self-determination theory

Introduction

In many college classes, students are assigned to read course texts before class (Hilton, Wilcox, Morrison, & Wiley, 2010; Tomasek, 2009). Although college instructors provide lectures to introduce major ideas and concepts in class, they cannot cover every detail of the materials students are supposed to learn, due to limited time and resources. The instructors thus expect students to study and learn through reading textbooks and other materials in order to gain familiarity with, as well as a deeper understanding of, the topic (Bramhall, 2009). As a result, textbooks and other supplementary readings are integral components of college learning (Berry, Cook, Hill, & Stevens, 2011; Dávila & Talanquer, 2010). This is true of most college settings, regardless of how many educators would like to see a different learning paradigm in place.

However, a low level of engagement in course readings is commonly observed in college classrooms. A low completion rate of assigned readings has been reported at all levels of higher education from community college classrooms (e.g., Burgess, 2009) to graduate classes (e.g., Clump & Doll, 2007) as well as across different disciplines including accounting (e.g., Fitzpatrick & McConnell, 2009), psychology (e.g., McMinn, Tabor, Trihub, Taylor, & Dominguez, 2009), education (e.g., Arquette, 2010), and chemistry (e.g., Smith & Jacobs, 2003). Moreover, college students invest minimum effort to complete course readings. For example, they seldom make notes or draw inferences while reading course materials and rely on skimming (Phillips & Phillips, 2007; Taraban, Rynearson, & Kerr, 2000). Even when studying for exams, college students tend to focus on memorizing and retaining information rather than understanding materials (Barnett, 2000).

This issue of poor academic reading engagement has been reported with pre-service teacher-students in teacher education as well. Lesley, Watson, and Elliot (2007) surveyed pre-service teachers with regard to their behaviors with, and attitudes toward, assigned readings and found strongly reluctant reading behaviors. Pre-service teachers reported that they disliked completing assigned readings; they either read part of them or decided not to read them at all. Furthermore, many pre-service teachers engaged in only a superficial level of reading, such as skimming and scanning, and indeed demonstrated a minimal understanding of the text. Similarly, Akyol and Ulusoy (2010) found that the majority of pre-service teachers not only spent an insufficient amount of time on course-related reading but also exhibited a limited use of reading strategies. Such low reading engagement among pre-service teachers has apparently persisted for years, as Gupta and Saravanan (1995) reported a similar issue more than 15 years ago: "Our (teacher) trainees rarely read, could not cope with their academic readings, and were unaware of effective strategies to manage their own reading" (p. 354).

Given that reading is fundamental to all domains of learning, teachers in any area should serve as good reading models for their students. Teachers' reading habits and attitudes influence those of students. For example, teachers who are enthusiastic about reading are more likely to demonstrate practices that promote students' engagement in reading (Morrison, Jacobs, & Swinyard, 1998). These teachers may encourage students to develop positive attitudes toward reading and use effective reading strategies. Hence, the development of good academic reading habits is critical for every teacher.

Poor academic reading engagement among pre-service teachers should have an adverse influence on their own learning. Numerous studies indicate that academic engagement is closely related to quality learning (see Fredricks, Blumenfeld, & Paris, 2004). For example, Wigfield and colleagues (2008) found that the level of reading engagement positively influenced reading comprehension. Engaged readers usually demonstrate higher reading motivation and better use of reading strategies (Guthrie et al., 2004; Guthrie & Wigfield, 2000). Considering that college reading often involves extensive academic reading (Smith, Holliday, & Austin, 2010), reading engagement in higher education should have a significant influence on learning. Given the importance of the reading behaviors of pre-service teachers, intervention is needed to help future teachers engage in their own academic reading.

This paper proposes a virtual tutoring approach to improve the poor academic reading behaviors of pre-service teachers or college students through enhancing their engagement in course reading. Our approach to promoting reading engagement involves providing students with an opportunity to teach their peers, that is, *learning-by-teaching*. Learning-by-teaching (Gartner, Kohler, & Riessman, 1971) is a promising technique that can facilitate engagement in academic tasks. Learning-by-teaching refers to a process in which students learn more and better when they teach others. The effects of learning-by-teaching have been commonly reported in the literature on peer tutoring (Robinson, Schofield, & Steers-Wentzell1, 2005; Roscoe & Chi, 2007). Prior research on peer tutoring indicated that students who serve as tutors of their peers not only enhance their own academic achievement but also show improvement in psychological and behavioral outcomes of learning (e.g., motivation and attitudes) (Miller, Topping, & Thurston, 2010; Keith J. Topping & Bryce, 2004; van Keer & Verhaeghe, 2005). Likewise, an opportunity to teach peers seems to have a positive influence on the quality of students' learning, including academic engagement as well as their performance. Even greater effects of a tutoring opportunity can be expected with pre-service teachers who presumably have high motivation for teaching.

However, learning-by-teaching, or peer tutoring, is seldom applied in a higher education setting. Peer tutoring in higher education is mostly implemented outside the classroom as a part of academic support services for students in need (e.g., Vogel, Fresko, & Wertheim, 2007) or in a format in which upper-level students provide additional assistance in class (e.g.,Tang, Hernandez, & Adams, 2004). College students rarely have an opportunity to learn course materials by teaching their classmates. The dearth of peer tutoring in college classrooms could be due to the way most college classes are structured. Unlike primary and secondary school classrooms, college students do not necessarily know fellow students, and they meet for only a few hours a week rather than on a daily basis. This arrangement presents a challenge, making it difficult for students to engage in meaningful interactions and build rapport with their classroom peers. Also, many college classrooms are lecture-based and involve a large number of students, which makes it difficult for instructors to create and oversee peer-tutoring or other group activities.

Given these constraints, a Virtual Tutee System (VTS) has been developed, which implements learning by teaching in a college classroom through the affordance of agent technology. The VTS is a Web-based peer-tutoring environment in which students become the tutor of a virtual agent who is represented as a peer student. The VTS introduced in this paper was developed specifically for a teacher-education course. In the VTS, students, or pre-service teachers, are required to teach a virtual peer about what they have learned from their course texts. The main strategy for promoting reading engagement embedded in the VTS is the incorporation of a learning-by-teaching process into reading tasks as described in more detail later in this paper.

The purpose of this paper is to provide the design rationale and framework for the VTS. The framework consists of four design principles, each of which is accompanied by component guidelines. These principles and guidelines are grounded in research on learning by teaching, role theory, and self-determination theory. In the following sections, the peer tutoring literature is briefly reviewed to describe the observed effects of learning by teaching. Next, two theories underlying the learning by teaching effect (i.e., role theory and self-determination theory) are discussed. Finally, the VTS design framework and its four design principles along with design examples are presented within the context of a college course teaching pre-service teachers to integrate technology in the classroom.

Previous Research on Peer Tutoring

Peer tutoring refers to one approach to educational practice in which students provide instruction to their peer students (Topping & Ehly, 1998). Numerous studies examining the effects of peer tutoring have indicated that students who are tutored improved their academic performance (e.g., Cook, Scruggs, Mastropieri, & Casto, 1985; Ginsburg-Block, Rohrbeck, Lavigne, & Fantuzzo, 2008). Although a majority of the studies were conducted with elementary and secondary school students, other studies have also showed the effectiveness of peer tutoring with college students. For example, Lake (1999) reported that students in an advanced physiology class achieved a higher course grade when they received peer tutoring. Researchers note that the individualized instruction and immediate feedback available through peer tutoring are believed to enhance student performance (Dineen, Clark, & Risley, 1977).

Moreover, peer tutoring is not only beneficial for students who are tutored but also for those who provide tutoring. Wright and Cleary (2006) found that advanced elementary students (3rd and 4th grade) showed a substantial improvement in their reading fluency after teaching reading skills to students in the second and third grade. Similar effects were observed with college students. After 4th year medical students facilitated classroom discussions for 2nd year students, they demonstrated significant improvement in their own knowledge and skills (Tang et al., 2004). Rae and Baillie (2005) also reported that junior-year students who taught freshmen about college study skills improved their own study skills.

Furthermore, some studies have indicated that the benefits of peer tutoring are even greater for tutors than for tutees. In an experimental study by Annis (1983), college students were assigned to one of five conditions: (i) read only, (ii) read to teach but not actually teach, (iii) read and teach, (iv) be taught only, and (v) read and be taught, with the students in each group taking approximately 30 minutes to fulfill the given activities. One week later, students in all groups completed a reading comprehension test. The study found that students who had taught peer students outperformed those who had been taught but not served as tutors. More recent studies have also reported a stronger impact of peer tutoring on the performance of tutors than on that of tutees (Robinson et al., 2005; Roscoe & Chi, 2007; van Keer & Verhaeghe, 2005). For example, Knobe and colleagues (2010) compared the effects of peer teaching with those of instructor-led teaching on 3rd and 4th year medical students. Students who had served as student teachers significantly outperformed those who had been taught by either their peers or the instructor.

In addition to enhanced academic achievement, students who serve as tutors also tend to demonstrate high engagement in academic tasks. For example, college students spent time focusing on conceptual understanding of the materials rather than on rote learning as they prepared for tutoring (Galbraith & Winterbottom, 2011). Arco-Tirado, Fernández-Martín, and Fernández-Balboa (2011) similarly reported that students improved their use of cognitive and metacognitive strategies of learning after tutoring their peer students. Student tutors also exhibited an increase in time on task, assignment completion, and class participation (Cushing & Kennedy, 1997; Lieberman, Dunn, van der Mars, & McCubbin, 2000). Furthermore, many studies have reported that students become more confident about themselves as learners and develop positive attitudes toward academic tasks after tutoring their peers (Bierman & Furman, 1981; Cohen, Kulik, & Kulik, 1982; Franca, Kerr, Reitz, & Lambert, 1990; Greer & Polirstok, 1982; Topping, Campbell, Douglas, & Smith, 2003). For example, students reported greater enjoyment with and interest toward a subject that they were to teach as compared to instances when they were not engaged in any tutoring experience (Utay & Utay, 1997). Also, students increased their self-efficacy beliefs about an academic task on which they tutored their peers (Legrain, D'Arripe-Longueville, & Gernigon, 2003; van Keer & Verhaeghe, 2005). These studies imply that a tutoring activity facilitates students' engagement in learning, which may lead to enhanced academic performance.

Several studies have indicated that the expectation of teaching by itself, without actual teaching, can lead to enhanced learning of student tutors. In the Annis (1983) study previously described, superior learning gains were observed with students who read with the expectation of teaching as well as with those who actually taught their peers. Bargh and Schul (1980) also reported a similar finding that college students who prepared to teach yielded a higher performance on a retention test than those who studied the same reading material in order to learn it for themselves. Moreover, Benware and Deci (1984) found improvement in students' academic motivation and engagement following students' expectation of teaching. In Benware and Deci's study, college students in one group were asked to read an article as if they would teach the contents of the article to another student, but they did not actually teach other students. Students in the other group were told that they would have an exam on the same article. Results of the study indicated that students who studied the assigned article in order to teach expressed a higher task interest and enjoyment and a greater willingness to devote additional time to the same task, when compared with those who studied in order to be examined. Also, students with the expectation of teaching perceived themselves to be more engaged with the learning environment. Benware and Deci (1984) concluded that preparation for teaching promotes more active engagement in learning with students taking the initiative and showing greater commitment to learning.

In short, peer tutoring contributes to the learning of both those students who serve as a tutor and those who are tutored, or are tutees, and the tutor seems to benefit more than the tutee from the tutoring activity. Student tutors tend to develop positive academic self-concepts and favorable learning attitudes and motivation, which should promote active engagement and enhanced learning outcomes. Several studies have indicated that these benefits of tutors could only be achieved with an expectation of future teaching before performing the actual teaching. Recently, some researchers have found that the deeper cognitive engagement of tutors, such as integration of new and prior knowledge and elaboration of knowledge, is the main source of the learning by teaching effect (Roscoe, 2008; Roscoe & Chi, 2007). However, the mechanism by which the learning by teaching environment promoted this deep level of engagement has rarely been discussed in the literature (e.g., Robinson et al., 2005; Roscoe, 2008). In the next section, this paper discusses role theory and self-determination theory (SDT) as two aspects of a theoretical framework to explain how the elements of learning by teaching contribute to a tutor's enhanced engagement and learning.

Theoretical Foundations of the Tutoring Effects

Role Theory

According to role theory, a role is associated with a set of specific behaviors and attitudes generally determined by society (Sarbin & Allen, 1968; Turner, 2002). When individuals assume any particular role, they are likely to behave and hold attitudes consistent with the assigned role and perceive themselves constrained by the expectations of other people (Sarbin & Allen, 1968; Thomas & Biddle, 1966). In the context of peer tutoring, students who serve as tutors adopt characteristics of the role similar to those of the teacher (Allen & Feldman, 1973; Hogg & Vaughan, 2005). Students with the tutor role thus perceive a responsibility for a tutee's learning and develop a commitment to learning, finding learning materials more useful and important than students without a tutoring role

(Robinson et al., 2005). Allen and Feldman (1976) suggested that the role of tutor also implies independence and authority in that the tutor has been recognized as having the capability to help others. Therefore, by taking on the role of a tutor, students perceive a greater competence with and control over a learning situation, as the role of tutor allows for a position wherein students can choose and determine what to learn and what to teach.

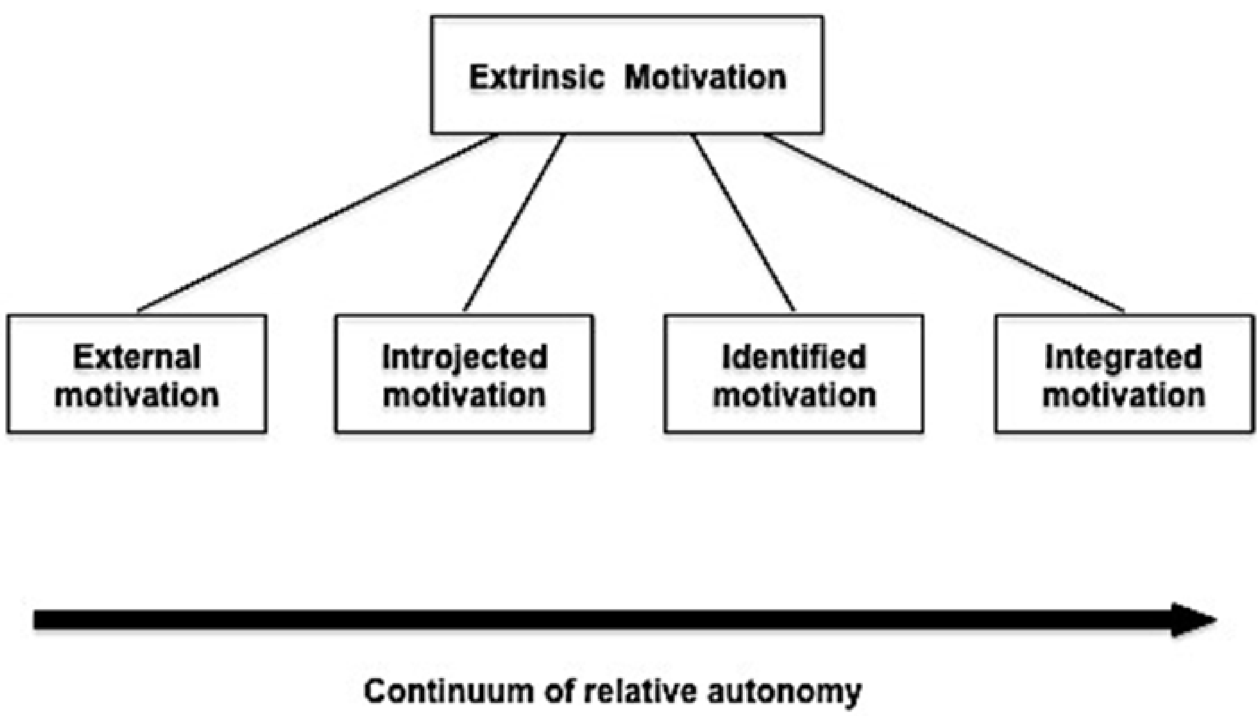
Self-Determination Theory

Self-determination theory (SDT), first proposed by Deci and Ryan (1985), further explicates how the adoption of the role of tutor can foster a student tutor's engagement. According to SDT, human motivation can be categorized into different types. These diverse forms of motivation are closely related to the varying levels of engagement and learning outcomes. That is, certain types of motivation can lead to deeper engagement and learning. The two most basic types of motivation are *intrinsic motivation* and *extrinsic motivation* (Deci & Ryan, 1985). Intrinsic motivation refers to behaviors enacted for one's inherent interest and enjoyment (R.M. Ryan & Deci, 2000). Such behaviors are thus experienced for the sake of an individual's inner pleasure. On the other hand, extrinsically motivated behaviors are performed because they are instrumental to some outcomes separable from the activity itself (Ryan & Deci, 2000). For example, a student reads a textbook in order to get good grades rather than for the inner pleasure and satisfaction from reading.

It is natural for people to be likely to engage in activities in which they are interested. Thus, intrinsic motivation often results in active engagement and high -quality learning (Deci & Ryan, 2000). However, most learning-related activities are not inherently fun or interesting. For example, reading a textbook is probably not an intrinsically motivating activity for most college students. Rather, it is extrinsically motivating, for students usually read textbooks in order to receive higher scores on a test. Although not intrinsically motivated, students can show differing levels of engagement with an extrinsically motivating activity. According to Ryan and Deci (2000), "students can perform extrinsically motivated actions with resentment, resistance, and disinterest or, alternatively, with an attitude of willingness that reflects an inner acceptance of the value or utility of a task" (p.55). Self-determination theory thus introduces four different types of extrinsic motivation (see Figure 1).

The four forms of extrinsic motivation in SDT do not represent distinct categories but rather exist in a continuum (Ryan & Deci, 2000). They differ in the degree to which the motivation for one's behavior

Figure 1. Types of extrinsic motivation (Adapted from Ryan & Deci, 2000).



arises from one's self or the motivation is self-determined. For example, *external motivation*, located at the far left in Figure 1, refers to behaviors performed in order to achieve a reward or avoid a punishment. An incentive of the externally motivated behavior thus lies outside the self, representing the least self-determined motivation. Another type of extrinsic motivation is *introjection*. *Introjected motivation* involves behaviors performed to avoid guilt or to attain a feeling of self-worth. This type of motivation is still not considered to be self-determined because the behaviors are instead initiated and controlled by internal pressure. On the other hand, *identified motivation* is signified when an individual recognizes the value of an activity and accepts it as personally important. For example, a college student might complete a textbook reading because he believes that it will help him master the course content, which is important for competence in more advanced courses. Finally, *integrated motivation,* at the far right of the continuum, is the most autonomous, self-determined form of extrinsic motivation. It occurs when the identified value of an activity is fully integrated with a part of the self. For example, a college student might apply for a study-abroad program because she can learn and appreciate the cultures of other countries, which is consistent with her deep-rooted values and interests.

Many studies have reported that greater autonomous and self-determined motivation, although extrinsic, yields deeper engagement and enhanced learning. Ryan and Connell (1989), for example, reported that the more students were externally motivated, the less they exhibited interest, endorsed the task's value, and/or exerted effort. Furthermore, identified motivation was correlated with enjoyment of school and adaptive coping styles, whereas introjected motivation was related to anxiety and negative coping strategies. Connell and Wellborn (1991) also found that elementary students with a greater autonomous motivation were rated as paying more attention, demonstrating on-task behavior, and being active in class. Black and Deci (2000) reported similar results - namely, college students who had a greater autonomous motivation for learning organic chemistry demonstrated a higher perceived competence, more enjoyment in class, and less anxiety. All of these studies indicate that the more autonomous, self-determined forms of extrinsic motivation are crucial for facilitating constructive and high-quality learning experiences.

Given these advantages of autonomous types of extrinsic motivation, SDT is concerned with how non-intrinsically motivated behaviors can become internalized and self-determined. SDT introduces three basic psychological human needs that play a fundamental role in the development of autonomous motivation: the needs for autonomy, competence, and relatedness. In essence, greater autonomous motivation is facilitated if the learning environment is structured in a way that satisfies these innate human needs.

The need for competence refers to the need to feel efficacious. Individuals are more likely to sustain their motivation for a certain task when the task is structured in contexts that lead them toward feelings of competence. Optimal challenges and positive feedback, for example, contribute to the experience of perceived competence (Ryan & Deci, 2000). SDT further suggests that perceived competence alone does not promote internalization of extrinsic motivation; people must experience a sense of autonomy in addition to feelings of competence. A need for autonomy refers to a desire to experience one's behaviors as volitional and self-endorsed. Autonomy is closely related to a feeling of freedom to choose and determine one's own actions. Human autonomy can be supported by a provision of choices and acknowledgement of feelings but undermined by external rewards, threats, and evaluation pressure (Ryan & Deci, 2000). Lastly, the need for relatedness refers to the desire to experience a sense of belongingness and connectedness to others. People tend to engage in activities that are valued by their significant others or those to whom they want to feel connected (Deci, Vallerand, Pelletier, & Ryan, 1991). The need for relatedness can be supported when people feel respected and cared for during the activity.

Numerous studies have reported that students show more internalized extrinsic motivation and productive learning behaviors when the psychological needs for autonomy, competence, and relatedness are satisfied. For example, Chirkov and Ryan (2001) found that students who perceived autonomy support from their teachers and parents were more likely to show self-determined types of motivation. Reeve, Jang, Carrell, Jeon, and Barch (2004) also reported that high-school teachers who were trained to support students' autonomy demonstrated more autonomy-supportive behaviors and that students of these trained teachers showed a higher engagement in class. Moreover, Miserandino's (1996) study indicated the importance of support for competence. In this study, students with low perceived competence exhibited more negative affect and lower engagement, even though they were academically high achievers in class. Furthermore, Furrer and Skinner (2003) studied feelings of relatedness among elementary-school students and their relation to academic engagement and performance. Results indicated that students who were more connected to their teachers and parents demonstrated greater engagement and higher performance. In sum, a classroom environment that supports the needs for autonomy, competence, and relatedness promotes more internalized, autonomous forms of extrinsic motivation, and accordingly, enhances student engagement and learning.

Returning to role theory, peer tutoring enables students who serve in the role of tutor to experience control over learning activities, or autonomy, as well as enhanced competence. Thus, peer tutoring seems to inherently support the needs for competence and autonomy. Benware and Deci (1984) found that when undergraduate students were expected to teach others, they were more intrinsically motivated and actively engaged with the learning environment. In addition, results of several studies have also supported that peer tutoring increases tutors' self-confidence (e.g., Cochran, Feng, Cartledge, & Hamilton, 1993; Miller et al., 2010; Top & Osguthorpe, 1987; Topping et al., 2003). For example, students rated themselves to be smarter and more competent after tutoring another student (Allen & Feldman, 1976; Bierman & Furman, 1981). These findings indicate that adopting the role of tutor promotes a sense of autonomy and competence. Furthermore, peer tutoring naturally addresses the need for relatedness. As student tutors engage in tutoring activities, they interact with their peers. Serving in the role of tutor, students may also feel respected and important. Indeed, several studies reported that students acting as tutors increased their feelings of belonging and social acceptance, a condition that fulfills the need for relatedness (Fantuzzo, Davis, & Ginsburg, 1995; Nazzal, 2002). In short, peer tutoring provides an environment that satisfies the basic psychological needs for autonomy, competence, and relatedness of students who serve as tutors. Thus, the high quality engagement and learning associated with student tutors may have resulted from the satisfaction of their basic psychological needs as suggested in SDT.

Virtual Tutee System

Given the deep level of engagement of tutors reported in the peer tutoring literature, a Virtual Tutee System (VTS) was developed to improve the academic reading experiences of college students by placing them in the role of a tutor through the application of agent technology. The VTS is a Web-based peer-tutoring environment in which students take the role of tutor and teach a virtual character, or a virtual tutee, about what they read in their course texts. A *Teachable Agent* (TA) is the specific inspiration for the VTS. A group of researchers have developed the TA, which is a computer-simulated peer that students are asked to tutor (Brophy, Biswas, Katzlberger, Bransford, & Schwartz, 1999). For example, middle-school students draw a concept map about river ecology on a computer program to teach a TA named Betty (Biswas, Leelawong, Schwartz, Vye, & TAG-V, 2005). Based on whether students have correctly provided the concept map, Betty can or cannot answer quiz questions. Consistent with the peer tutoring literature, TA studies reported that students demonstrated a significant improvement in learning after teaching the TA (Chase, Chin, Oppezzo, & Schwartz, 2009; Leelawong & Biswas, 2008). However, most TA research has focused on supporting knowledge and skill acquisition of students. Although the TA has been found to enhance student motivation and engagement (e.g., Chase et al., 2009), the design of a TA did not explicitly address this aspect of learning. Furthermore, a TA has been applied mostly to K-12 settings but rarely to college environments. Accordingly, the VTS is designed to capitalize on a tutor's active engagement in learning, reported in the peer tutoring literature, and to replicate such effects in the context of college reading tasks.

Based on role theory and self-determination theory, the VTS employs specific design strategies that augment support for the basic psychological needs for autonomy, competence, and relatedness of peer tutors. Some studies indicated that a peer tutoring environment with restricted support for these psychological needs yielded no learning gains with student tutors. For example, when the student tutors' autonomy was diminished, only a minimal effect for peer tutoring was observed. Rohrbeck, Ginsburg-Block, Fantuzzo, and Miller (2003) found that student tutors did not show significant improvement in learning when they were not allowed to set their own goals for the tutoring lessons. Similarly, student tutors who were frequently

Table 1. Design principles and guidelines for the VTS

Design Principles	Component Guidelines
In order to support perceived competence and autonomy, the VTS should enhance students' identification with the role of tutor.	• Responsibilities of the tutor are clearly communicated to students. • A virtual tutee's performances are evaluated. • Students are able to view the progress of virtual tutees' performances.
In order to enhance student autonomy, the VTS should provide students with choices regarding tutoring activities.	• Students set their own instructional goals and objectives. • Students determine how to deliver a lesson. • Students choose whom they want to teach.
In order to support the need for relatedness, the VTS should emulate social interactions between tutor and tutee	• Virtual tutees ask students questions related to the lesson. • Virtual tutees express positive attitudes toward learning. • Interactions between students and virtual tutees continue throughout the entire semester.
In order to support individual students' motivational problems, the VTS should address the respective needs of individual students.	• Goal orientation: virtual tutees express their own aspirations for learning. • Task value: virtual tutees acknowledge the utility value and importance of the learning materials.

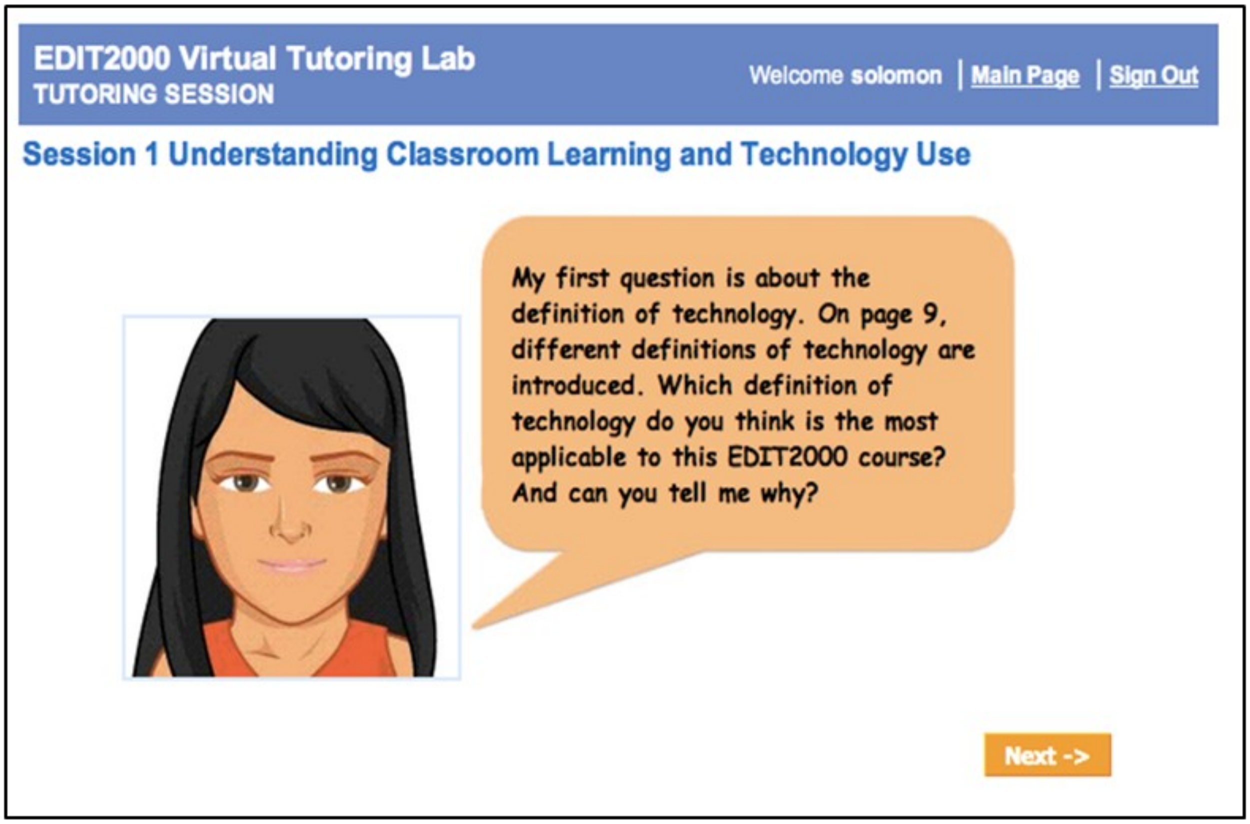
interrupted with regard to their use of resources and feedback failed to show significant learning gains (Biswas et al., 2005; Chan & Chou, 1997). Therefore, the VTS is carefully designed to fulfill each psychological need, as summarized in the four design principles and subsequent guidelines (see Table 1). The following section introduces each of the design principles and guidelines of the VTS and elaborates them with examples developed for a teacher-education course in which students, that is, pre-service teachers, learn how to integrate technology in the classroom.

A Design Framework for the Virtual Tutee System

Principle 1: Identification with the Role of Tutor

The first design principle of the VTS concerns identification with the role of tutor. According to role theory, involvement in a role is one factor that contributes to the degree of role commitment and enactment (Sarbin & Allen, 1968; Allen & Feldman, 1976). College students must be involved in the role of tutor so that they can adopt the characteristics of the role and experience a sense of autonomy and competence. To facilitate involvement in the role of tutor, first of all, the *responsibilities of the role of a tutor should be clearly communicated to students*. In the beginning of the VTS, students (pre-service teachers) are provided with a guide video that explains what their task is (i.e.,

Figure 2. An example screen of a virtual tutee asking a question.



to teach their virtual tutees) and what virtual tutees are expected to achieve. To establish a more authentic peer -tutoring environment, secondly, *virtual tutees' performances should be evaluated*. During the tutoring session, the virtual tutee asks several questions regarding the tutored materials (see Figure 2). The accuracy of students' responses to the questions is then used as an indication of the virtual tutees' performance. Further, *the progress of the virtual tutees' performances should be monitored throughout the entire learning course*, which serves as feedback about students' tutoring. Although the current version of the VTS has not yet included this feature, the future VTS will record tutees' performance, assessed through students' responses to the tutees' questions, on each lesson and present the information graphically so that students can keep track of it.

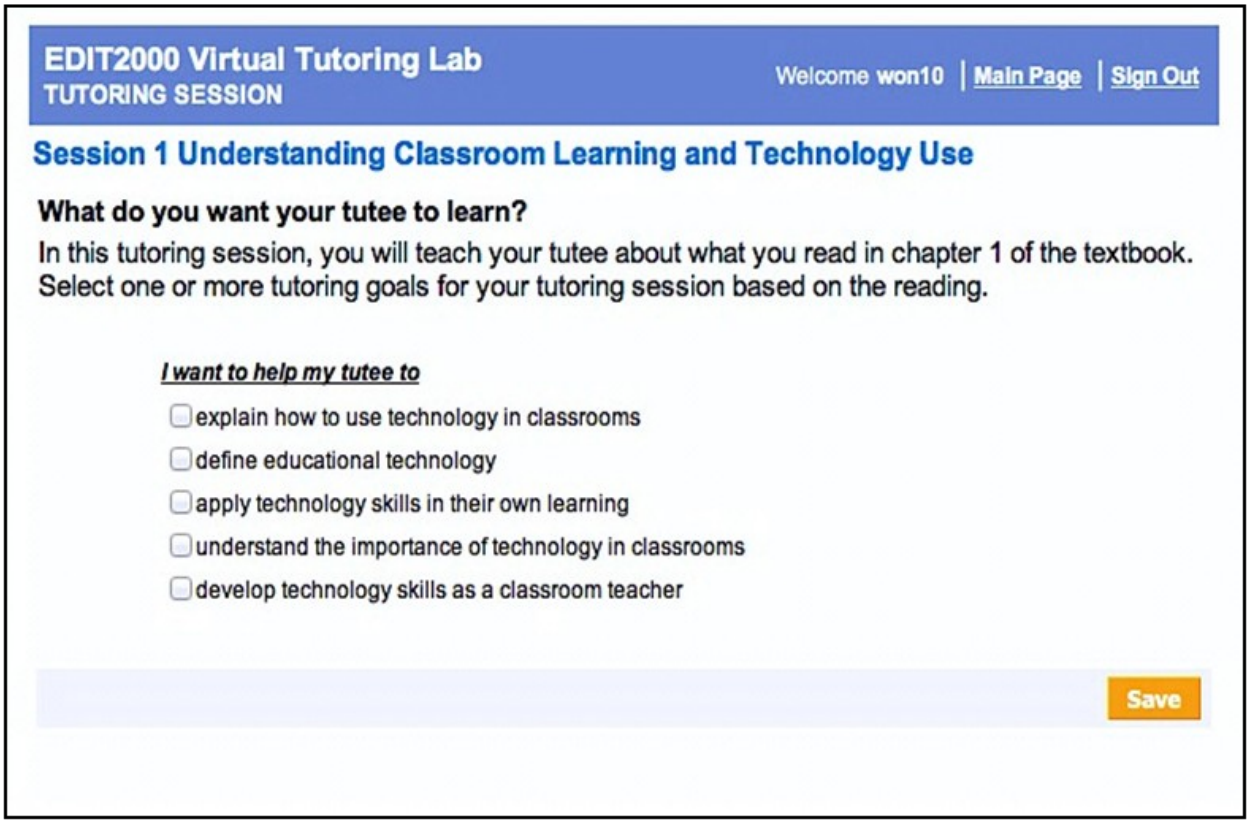
Principle 2: Choices in Tutoring Activities

The second principle concerns the strategies that further support students' autonomy as a tutor. According to self-determination theory, providing choices enhances a sense of autonomy (Deci & Ryan, 2000). The VTS presents three different choices that students need to make for their tutoring. First, *students should set goals and objectives for tutoring*. As shown in Figure 3, students are given a list of instructional goals pertinent to the assigned part of the course text and asked to choose one or more goals for their tutoring lesson. In addition, *VTS provides a choice about how to deliver a lesson to their virtual tutees*. For example, students may choose to create a concept map, write a summary, or provide definitions of key terms. Lastly, *students can choose whom they want to teach*. The VTS provides a list of available tutees along with their profile information. This strategy not only engages students' interest but also enhances their ownership, which in turn promotes involvement in the tutor role.

Principle 3: Social Interactions between Tutor and Tutee

The third principle is proposed to facilitate social interactions between tutor and tutee. Although virtual tutees are not identical to human peers, several studies indicated that people respond to computers as if they are social actors (e.g., Bracken & Lombard, 2004; Nass, Fogg, & Moon, 1996; Nass, Moon, & Green, 1997). For example, college students showed more favorable responses to computers that generated voice

Figure 3. An example screen of instructional goal selection.

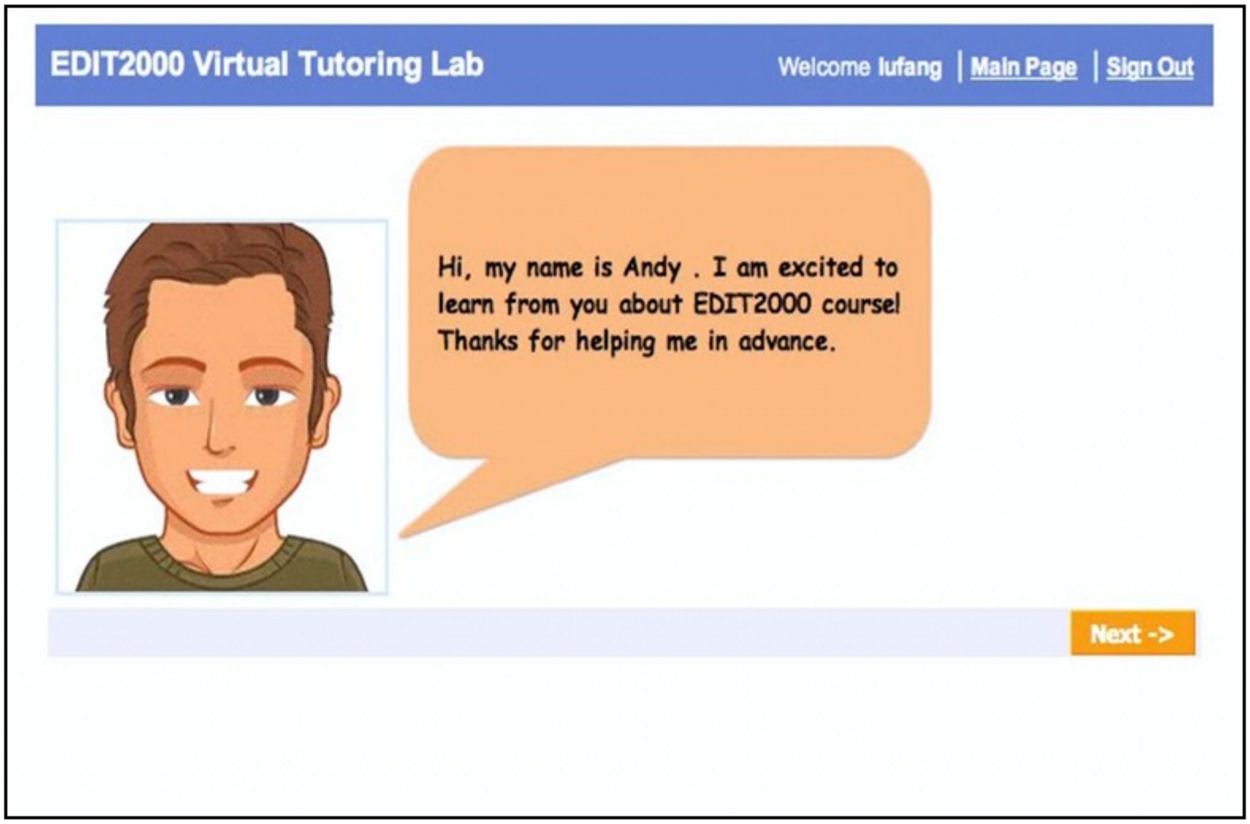


cues matching with their own personalities (Nass & Lee, 2001). Thus, the VTS is designed to simulate the experience of a human tutor-tutee interaction with the goal of satisfying the need for relatedness. Three strategies are employed to augment social interaction in the VTS. First, as shown in Figure 2, *virtual tutees ask student tutors questions*. Asking questions is a typical behavior of tutees. By responding to tutees' questions, students realize their role of tutor and become more involved. Second, *virtual tutees express positive attitudes toward learning*. For example, virtual tutees occasionally send a message expressing their interest in the tutored materials (see Figure 4). Positive attitudes may serve as positive feedback for tutoring, which can enhance student tutors' feelings of being respected and important. Student tutors may model a virtual tutee's positive attitudes as well. Finally, *interactions between students and virtual tutees should continue throughout the entire semester*. The VTS should be designed for an entire learning course rather than for a one-time intervention. Students develop relationships with their tutee for a longer period of time so that they can increase their commitment, as well as sustain their motivation.

Principle 4: Needs of Individual Students

The three design principles discussed above focus on creating a learning environment that promotes active engagement. However, even if a learning environment is arranged to support basic psychological needs, the motivational beliefs of individual students could have an adverse effect on their engagement. Deci & Ryan (2000) pointed out that individuals' goals also influence the internalization of motivation (the autonomous types of extrinsic motivation). They argued that pursuing a certain type of goal may be conducive to the satisfaction of the basic psychological needs. That is, people who pursue intrinsic goals (e.g., personal growth, health, and affiliation) are more likely to demonstrate self-determined motivation, whereas people with extrinsic goals (e.g., wealth, image, and fame) tend to exhibit less autonomous motivation. In support of this, Vansteenkiste, Simons, Lens, Sheldon, and Deci (2004) reported that undergraduate students who were given intrinsic goals (contribution to community, personal growth, and health) showed autonomous mo-

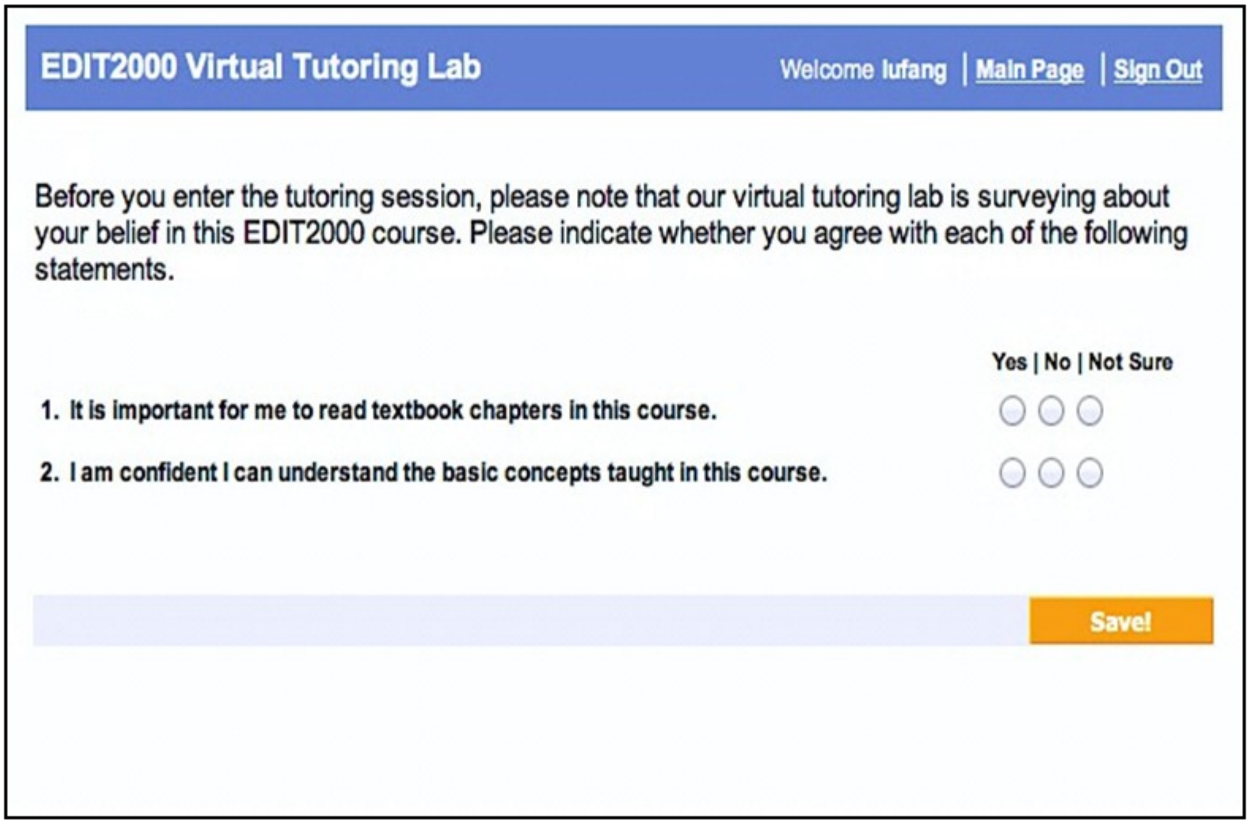
Figure 4. An example screen of a virtual tutee's positive attitude toward tutoring.



tivation, which in turn yielded deep processing, high test performance, and persistence. Similarly, Standage, Duda, and Ntoumanis (2003) examined secondary students' motivation in physical education and found that students in a mastery-oriented classroom were more likely to experience self-determined motivation and more leisure-time physical intentions. Thus, promoting intrinsic goal orientations may lead to more autonomous types of motivation. In addition, another motivational belief that contributes to the development of autonomous motivation is perceived task value. One distinct element that differentiates between autonomous motivation (e.g., identified motivation) and less autonomous motivation (e.g., introjected motivation) is identification with the value of a learning activity. As described above, when students find a learning task to be important and personally meaningful, they exhibit self-determined motivation (Deci & Ryan, 2000). That is, students should recognize and understand the value of the activity. In fact, task value has long been recognized among motivation researchers as a critical factor in student motivation and learning (e.g.,Eccles, 1984; Pintrich & De Groot, 1990; Pintrich & Schunk, 1996; Wigfield & Eccles, 2000). All these studies support that students show active engagement, invest more effort, and achieve more when they acknowledge the value of learning activities. Several self-determination theorists have also examined the relationship between task value and the internalization of academic motivation and performance. For example, Reeve, Jang, Hardre, and Omura (2002) provided students with a rationale for why putting in an effort is worthwhile and useful during an uninteresting activity and tested the effects of the provision of a rationale on student achievement. Results showed that students provided with the rationale reported a higher task value (i.e., the importance of the activity), more internalized or autonomous motivation, and greater effort as compared with students who were not given the rationale. Therefore, it is critical that students understand the importance and usefulness of learning activities and truly value them in order to experience self-determined motivation and active engagement.

Given the critical role of goal orientation and perceived task value in promoting active engagement, the VTS will provide support to promote these two moti-

Figure 5. Individual needs assessment screen.



vational beliefs, which relates to the fourth design principle of the VTS. In the beginning of each tutoring session, as shown in Figure 5, the VTS assesses student tutors' perceived value of course reading and their academic goal orientation. For students who demonstrate an extrinsic goal orientation, *virtual tutees will express their own aspirations for learning in this course* so that students can model them. If students recognize little value for the course readings or course materials, the VTS may foster perceived task value by having *virtual tutees acknowledge the importance of textbook reading and course materials*.

Conclusion

Although it is important that pre-service teachers develop and demonstrate exemplary academic reading behaviors for their future teaching, a majority of them have exhibited poor engagement in their own academic readings. They often do not complete the assigned readings, or they only skim the course texts. In response to this particular problem, this paper proposed a Virtual Tutee System (VTS) that aims to facilitate pre-service teachers' engagement in their own course readings. The VTS is grounded on findings reported in the peer tutoring literature that peer tutors demonstrated active engagement and enhanced performance with the expectation of teaching. Thus, the VTS is designed to capitalize on the mechanism of these learning by teaching effects as suggested in role theory and self-determination theory.

The major activity in the VTS involves teaching the virtual tutees about what the student tutors (pre-service teachers) have read in their course texts. The role of tutor allows students to experience a sense of competence and feeling of autonomy as well as to engage in social interactions with their virtual tutee. The specific design strategies employed in the VTS are arranged to augment support for the basic psychological needs for autonomy, competence, and relatedness of tutors. This paper summarized these strategies in the four design principles and guidelines of the VTS. With fulfillment of the three basic human needs, it is expected that the VTS will enable pre-service teachers to develop a more active engagement toward their own course readings.

Although the VTS is proposed with a strong theoretical groundwork, it has not yet been validated through empirical research studies. Future studies should examine the effects (or effectiveness) of the VTS as well as to refine its design framework according to study findings. For example, here we have suggested using the VTS throughout the semester so that students can establish a stronger commitment to their virtual tutee. However, it could transpire that students may become frustrated with the repetitive structure of the VTS after interacting with it for some period of time. In this case, the tutoring activities in the VTS should be varied or an intermittent use of the VTS should be considered.

The VTS is a distinctive application of peer tutoring as it employs a virtual character as an object who receives tutoring. One of the significant limitations of the VTS concerns the degree to which a virtual tutee can simulate an actual human tutee. It would strongly contribute to the success of the VTS to facilitate more authentic-like interactions between students and their virtual peers. Future studies should investigate how much simulated tutor-tutee interaction is desirable. The VTS can be further improved if it incorporates recent advances in virtual agents that are designed to have appropriate social competencies and to express and respond to emotions (e.g., Bickmore & Cassell, 2005).

The VTS offers much potential to resolve the problem of poor reading engagement among pre-service teachers, as well as to promote their academic performance. Research on the VTS has only taken the first step and there are several further studies to be completed. It is expected that future studies will not only refine the design of the VTS but also contribute to the existing literature of peer tutoring and extend the application of peer tutoring into different contexts.

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Design and Development of Field Experiencesin K-12 Online Learning Environments

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Abstract: This article describes the instructional design of field experiences in K-12 online learning environments. Couched in the theory of situated cognition and based on established K-12 online teaching standards, these field experiences are slowly gaining popularity in teacher education programs. This is a result of the field beginning to gain awareness of the exponentially growing area of online learning in grades K-12. Teacher education programs need to prepare teachers for online teaching, many of whom will be teaching in fully online and/or blended learning environments. This article offers guidance on how these field experiences might be designed and discusses suggestions for teacher education programs that are readying teachers for K-12 online teaching.

Keywords: field experiences, teacher education, K-12 online learning, virtual schools

In light of the many reform movements underway in elementary and secondary school settings, K-12 online learning is taking the field of education by storm. Although still in its infancy, with a little over 20 years of existence, online learning has spread to every state in the U.S. (Watson, Murin, Vashaw, Gemin, & Rapp, 2011). According to the most recent data (as of 2009-2010), there were over 1.8 million enrollments, representing roughly 55% of public school districts that reported having students enrolled in online learning courses. Students in these online classes were predominately at the high-school level (Queen, Lewis, & Coopersmith, 2011). Above and beyond these supplemental enrollments, over 500,000 full-time students were recorded in statewide virtual schools (Watson et al., 2011). The number of online students is expected to increase as demand on the part of students increases and as more K-12 schools explore the potential advantages of offering online classes, such as dealing with the difficulties of limited space, scheduling conflicts, credit recovery, and meeting the needs of specific groups of students (e.g., at-risk, gifted, homebound, etc.) (Queen et al., 2011; Setzer & Lewis, 2005).

Another force driving the growing numbers of K-12 online students is state-level policy. Certain states have begun requiring K-12 students to take an online course by the time they graduate high school (Michigan, 2006; Alabama, 2008; New Mexico, 2009; Indiana, 2011; Idaho, 2012). Florida has mandated that all school districts provide online learning opportunities to all K-12 students (Florida Senate, 2011). Idaho (2010) adopted online teaching standards and is also the second state after Georgia (2006) to establish a state -level online teaching endorsement. Currently, the fastest growing trend in the field of K-12 online learning is the expansion of blended learning, where the learning environment includes both face-to-face as well as online learning components in addition to homegrown school-district-level online learning programs (Watson, Murin, Vashaw, Gemin, & Rapp, 2010).

Because of this increase, a growing number of qualified K-12 online teachers will be necessary to meet the burgeoning demand. Preservice and inservice teachers will need to learn how to teach online, since many of them will teach in these environments, whether it be in a blended, hybrid, or fully online capacity. In addition to relevant coursework in online pedagogy, instructional design within online learning environments, and curriculum centered on technology tools, teacher education programs need to provide active and contextual field experiences in order for novice online teachers to experience what it is like to teach in a K-12 online learning program. Field experiences have typically taken place in traditional school settings; recently, these experiences have surfaced in K-12 online learning programs. In order to understand the growth of these experiences, it is helpful to examine their evolution.

History of Virtual School Field Experiences

Virtual school field experiences began in 2007 when Iowa State University (ISU) was awarded a Fund for the Improvement of Post Secondary Education Grant for TEGIVS, or Teacher Education Goes Into Virtual Schooling (Compton, Davis, & Mackey, 2009). This initial virtual school field experience at ISU offered practical experiences in Iowa Learning Online (ILO) to first and second year preservice teachers. In the experience, the ratio of mentor teacher to preservice teacher was 1:2. The preservice teachers were enrolled in a one-credit course at ISU, requiring them to spend 15 hours in ILO. The cooperating teacher provided guided observation and hands-on experiences, allowing the preservice teachers to interact with K-12 online students, parents, other online teachers, and course facilitators.

In 2008, Archambault (2011) conducted a national survey to examine the preparation levels of K-12 online teachers. She documented the need for preparation among approximately 600 online teachers. While they reported being somewhat prepared with respect to pedagogy, content, and pedagogical content in their teacher education programs, they reported not being prepared when it came to issues of technology and technological pedagogical content knowledge.

Then, in 2009, Florida Virtual School partnered with a number of the state universities in Florida, including the University of Central Florida, the University of South Florida, and the University of Florida, to offer virtual school field experiences. Kennedy (2010) examined three pre-service teachers in the University of Florida experience. Each of these teachers was matched with an online instructor for a four-week-long, voluntary field experience. Unlike in the ISU model, these students did not take a course at the University of Florida that was directly aligned with the virtual school field experience. Kennedy, Cavanaugh, and Dawson (under review) found that a voluntary, four-week field experience not tied to a course lacked the opportunity for the students to be able to become active teachers in an online environment.

As an extension of the above studies, Kennedy and Archambault (2012) collaborated to find out the extent to which other teacher education programs and virtual schools were offering or planning to offer field experiences in virtual school settings. To do this, they conducted a national survey and found that only 1.3% of teacher education programs were offering or planning to offer virtual school field experiences. Those who reported that they would like to offer this type of field experience mentioned that they did not know how to design them. The purpose of this article is to offer research-based guidance for the design and development of field experiences in K-12 online learning programs.

Virtual School Field Experiences

Theory

One of the theories used to contextualize virtual school field experiences is situated cognition, which requires an authentic learning environment where the learner can make connections within a given context (Brown, Collins & Duguid, 1989). Learners interact directly with the learning environment via practical, hands-on experiences and reflect on their learning (Brown, Collins & Duguid, 1989). In a typical virtual school field experience, novice online teachers are matched with K-12 online cooperating teachers who serve as their mentors throughout the experience. This relationship can be likened to that of a cognitive apprenticeship, where the novice online teachers observe the online learning environment while the cooperating teachers model their effective online teaching strategies, provide scaffolded support, offer specific feedback for improvement, and make their expert tacit knowledge explicit; in conjunction with this learning, novice online teachers have the opportunity to identify and reflect on the ideas they learn (Collins, Brown & Newman, 1989).

Standards

Standards have been created to assess effective online teaching and can be used to inform the design and development of quality virtual school field experiences. Originating from professional organizations, these standards do not solely concentrate on preparing teachers for online learning; they also cater to meaningful technology integration in general and can be applied to the vast spectrum of K-12 online learning programs. The organizations and their respective standards include the following:

- Southern Regional Education Board's (SREB) *Essential Principles for High-quality Online Teaching* (SREB, 2006)
- National Education Association's (NEA) *Guide to Teaching Online Courses* (NEA, 2006)
- International Association for K12 Online Learning's (iNACOL) *National Standards for Quality Online Teaching* (iNACOL, 2011; 2008)

A cross reference of expected knowledge and skills for effective online teaching is shown in Table 1.

Table 1. Cross Reference of Online Teaching Standards

General Topic	Professional Organization	Standards
Qualifications, professional development, & credentials	iNACOL	• Knows and understands the professional responsibility to contribute to the effectiveness, vitality, and self renewal of the teaching profession, as well as to their online school and community; • Knows and understands the need to coordinate learning experiences with other adults involved in providing support to the student (e.g., parents, local school contacts, mentors) to support student learning; • Knows and understands the need for continuing to update academic knowledge, pedagogy, and skills; • Knows and understands the need for professional activity and collaboration beyond school (e.g., professional learning communities) to update academic skills and knowledge and collaborate with other educators; • Interacts in a professional, effective manner with colleagues, parents, and other members of the community to support students' success; • Knows and understands the participation in an online course from a student-centered approach; and • Knows and understands the subject area and age group they are teaching.
	SREB	• Meets the professional teaching standards established by a state licensing agency or the teacher has academic credentials in the field in which he or she is teaching; meets the state's professional teaching standards or has academic credentials in the field in which he or she is teaching; provides evidence that he or she has credentials in the field of study to be taught; knows the content of the subject to be taught and understands how to teach the content to students; facilitates the construction of knowledge through an understanding of how students learn in specific subject areas; and continues to update academic knowledge and skills; and • Has experienced online learning from the perspective of a student; applies experiences as an online student to develop and implement successful strategies for online teaching; demonstrates the ability to anticipate challenges and problems in the online classroom; and demonstrates an understanding of the perspective of the online student through appropriate responsiveness and a supportive attitude toward students.

Table 1. Cross Reference of Online Teaching Standards (continued)

General Topic	Professional Organization	Standards
Curriculum, instruction, and student achievement	iNACOL	• Knows and understands the process for aligning teacher and student expectations for the course, in general; • Knows and understands the need to create and explain objectives, concepts, and learning outcomes in a clearly written, concise format and to explain the course organization to students; • Develops and delivers assessments, projects, and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of the learning goals; • Knows and understands the relationships between the assignments, assessments, and standards-based learning goals; • Demonstrates competency in using data from assessments and other data sources to modify content and to guide student learning; knows and understands techniques to plan individualized instruction incorporating student data; knows and understands how data is used to modify the content, instruction, and assessment to meet student needs; knows and understands how instruction is based on assessment data; • Knows and understands options to expand student thinking, address styles of learning, and provide avenues for enrichment or intervention; • Knows and understands a variety of methods and tools to reach and engage students who are struggling; • Knows and understands the importance of self-reflection or assessment of teaching effectiveness; and • Knows and understands the role of student empowerment in online learning.
	NEA	• Online teachers should have the facility to track student participation in the course, viewing course logs, student postings in the discussion area, and student assignments.
	SREB	• Differentiates instruction based on students' learning styles and needs and assists students in assimilating information to gain understanding and knowledge; • Exhibits the ability to assess student knowledge and instruction in a variety of ways; • Provides student-centered lessons and activities that are based on concepts of active learning and that are connected to real-world applications; and • Demonstrates growth in teaching strategies in order to benefit from current research and practice.
Online Pedagogy	iNACOL	• Knows the primary concepts and structures of effective online instruction and is able to create learning experiences to enable student success; • Knows and understands the current best practices and strategies for online teaching and learning and their implementation in online education; • Knows and understands the role of online learning in preparing students for the global community they live in, both now and in the future; • Knows and understands the instructional delivery continuum (e.g., fully online to blended to face-to-face); • Plans, designs, and incorporates strategies to encourage active learning, application, interaction, participation, and collaboration in the online environment; • Knows and understands the techniques and applications of online instructional strategies, based on current research and practice (e.g., discussion, student-directed learning, collaborative learning, lecture, project-based learning, forum, small group work); and • Knows and understands differentiated instruction based on students' learning styles.
	SREB	• Plans, designs and incorporates strategies to encourage active learning, interaction, participation and collaboration in the online environment; • Demonstrates effective strategies and techniques that actively engage students in the learning process (e.g., team problem-solving, in-class writing, analysis, synthesis and evaluation instead of passive lectures); and • Leads online instruction groups that are goal-oriented, focused, project-based and inquiry-oriented.

Table 1. Cross Reference of Online Teaching Standards (continued)

General Topic	Professional Organization	Standards
Ethics of Online Teaching	iNACOL	• Models, guides, and encourages legal, ethical, and safe behavior related to technology use; • Knows and understands the responsibilities of digital citizenship and techniques to facilitate student investigations of the legal and ethical issues related to technology and society; • Knows and understands how the use of technology may lead to instances of academic dishonesty; • Knows and understands resources and techniques for implementing Acceptable Use Policies (AUP); • Knows and understands techniques for recognizing and addressing the inappropriate use of electronically accessed data or information; and • Knows and understands privacy standards about other students and their posting and performance that are outlined in FERPA or other similar guidelines.
	SREB	• Models, guides and encourages legal, ethical, safe and healthy behavior related to technology use; • Facilitates student investigations of the legal and ethical issues related to technology and society; • Establishes standards for student behavior that are designed to ensure academic integrity and appropriate uses of the Internet and written communication; • Identifies the risks of academic dishonesty for students; • Demonstrates an awareness of how the use of technology may impact student testing performance; • Uses course content that complies with intellectual property rights policies and fair use standards; • Provides students with an understanding of the importance of Acceptable Use Policies (AUP); and • Demonstrates knowledge of resources and techniques for dealing with issues arising from inappropriate use of electronically accessed data or information; and informs students of their right to privacy and the conditions under which their names or online submissions may be shared with others.
Communications and Interaction	iNACOL	• Knows and understands techniques to create an environment that will engage, welcome, and reach each individual learner; • Knows and understands the need to establish and maintain ongoing and frequent teacher-student interaction, student-student interaction, teacher-parent interaction, and teacher-mentor interaction; • Knows and understands techniques to maintain strong and regular communication with students, using a variety of tools; • Knows and understands the need to define the terms of class interaction for both teacher and students; • Knows and understands the process for maintaining records of relevant communications; • Knows and understands the importance of interaction in an online course and the role of varied communication tools in supporting interaction; • Knows and understands the process for facilitating, monitoring, and establishing expectations for appropriate interaction among students; • Knows and understands the techniques for developing a community among the participants; and • Knows and understands the process for facilitating and monitoring online instruction groups that are goal-oriented, focused, project-based, and inquiry-oriented to promote learning through group interaction.
	SREB	• Facilitates and monitors appropriate interaction among students; builds and maintains a community of learners by creating a relationship of trust, demonstrating effective facilitation skills, establishing consistent and reliable expectations, and supporting and encouraging independence and creativity; • Encourages collaboration and interaction among all students; and • Promotes learning through group interaction.

Table 1. Cross Reference of Online Teaching Standards (continued)

General Topic	Professional Organization	Standards
Communications and Interaction (continued)	NEA	• Be sensitive to problems of misinterpretation, and use an appropriate online tone in course design and course delivery; • Model an appropriate tone, and guide students toward an appropriate tone when they stray; • Foster appropriate online student behavior, model an effective and respectful online tone, guide discussions' tone and substance, and address problems with inappropriate online behaviors such as "flaming"; • Communicate with a number of other stakeholders through a variety of methods, some online, some not; • Foster student-to-student discussion during course design and deliver; • Build in course discussion as a feature of student assessment; • Provide instructions regarding when, where, and how students participate in online discussions; • Facilitate course discussions by intervening appropriately when discussions are either not occurring or are inappropriate; • Foster student-to-student collaboration through the use of online discussions, group projects, team activities, and instructional style; • Demonstrate skill at facilitating discussions, and be reliable guides to student learning; and • Demonstrate the appropriate use of both synchronous and asynchronous communications with students, using one-on-one communications when needed, and fostering and guiding group discussions.
Assessment and Evaluation	iNACOL	• Demonstrates competencies in creating and implementing assessments in online learning environments in ways that ensure validity and reliability of the instruments and procedures; • Knows and understands the need to define the assessment criteria for the course; • Knows and understands adequate and appropriate assessment instruments to measure online learning that reflect sufficient content validity (i.e., that adequately cover the content they are designed to measure), reliability, and consistency over time; • Knows and understands the implementation of online assessment measures and materials in ways that ensure instrument validity and reliability; • Knows and understands multiple strategies for ensuring the security of online student assessments, academic integrity, and assessment data; • Knows and understands the reach of authentic assessments (i.e., the opportunity to demonstrate understanding of acquired knowledge and skills, as opposed to testing isolated skills or retained facts) are part of the evaluation process; • Knows and understands varied assessment strategies that address levels of ability through a variety of alternative interventions; • Knows and understands the process of continuous evaluation of students to include formative and summative assessments and student feedback, including polls and surveys that reflect student learning progress throughout the course; • Knows and understands the use of effective learning strategies data for an individual student to formulate detail-specific changes in future instruction, based on assessment results and research study (data-driven and research-based); • Knows and understands ways for teacher and students to assess student readiness for course content and method of delivery; • Knows and understands that student success (e.g., grade, level of participation, mastery of content, completion percentage) is an important measure of teaching and course success; and • Knows and understands the importance of student self-assessment.
	SREB	• Demonstrates competencies in creating and implementing assessments in online learning environments in ways that assure validity and reliability of instruments and procedures; • Creates or selects fair, adequate and appropriate assessment instruments to measure online learning that reflect sufficient content validity (i.e., that adequately cover the content they are designed to measure), reliability and consistency over time; • Implements online assessment measures and materials in ways that ensure instrument validity and reliability;

Table 1. Cross Reference of Online Teaching Standards (continued)

General Topic	Professional Organization	Standards
Assessment and Evaluation (continued)	SREB (continued)	• Develops and delivers assessments, projects and assignments that meet standards-based learning goals and assesses learning progress by measuring student achievement of learning goals; • Continually reviews all materials and Web resources for their alignment with course objectives and state and local standards and for their appropriateness; • Creates assignments, projects and assessments that are aligned with students' different visual, auditory and hands-on ways of learning; • Includes authentic assessment (i.e., the opportunity to demonstrate understanding of acquired knowledge and skills as opposed to testing isolated skills or retained facts) as part of the evaluation process; • Provides continuous evaluation of students to include pre- and post-testing and student input throughout the course; and demonstrates an understanding of the relationships between and among the assignments, assessments and standards-based learning goals; • Demonstrates competencies in using data and findings from assessments and other data sources to modify instructional methods and content and to guide student learning; • Assesses each student's background and content knowledge and uses these data to plan instruction; • Reviews student responses to test items to identify issues related to test validity or instructional effectiveness; • Uses observational data (e.g., tracking data in electronic courses, Web logs, e-mail) to monitor course progress and effectiveness; • Creates opportunities for self-reflection or assessment of teaching effectiveness within the online environment (e.g., classroom assessment techniques, teacher evaluations, teacher peer reviews); • Demonstrates frequent and effective strategies that enable both teacher and students to complete self- and pre-assessments; • Employs ways to assess student readiness for course content and method of delivery; • Employs ways for students to effectively evaluate and assess their own readiness for course content and method of delivery; and • Understands that student success (e.g., grade, level of participation, mastery of content, completion percentage) is an important measure of teaching and course success; and provides opportunities for student self-assessment within courses.
Feedback	iNACOL	• Promotes student success through clear expectations, prompt responses, and regular feedback; • Knows and understands techniques for using appropriate communications in support of student engagement through prompt and regular feedback, and setting and communicating high expectations; • Knows and understands the need to provide clear expectations for teacher response time to student queries; and • Knows and understands the need for timely, constructive, personalized feedback to students about assignments and questions.
	NEA	• Monitor student learning, and provide students with feedback on their performance; • Review submitted work in a timely fashion (usually within one week of submission), and should provide students with feedback; • Be active and regular participants in their classes; • Take part in class discussions, review submitted work promptly, respond to student questions on a regular and consistent basis, and schedule online meeting times, as needed; and • Attend their online class on a daily basis, and respond to student questions expeditiously.
	SREB	• Provides online leadership in a manner that promotes student success through regular feedback, prompt response and clear expectations; • Models effective communication skills and maintains records of applicable communications with students; • Encourages interaction and cooperation among students, encourages active learning, provides prompt feedback, communicates high expectations, and respects diverse talents and learning styles; • Persists, in a consistent and reasonable manner, until students are successful; • Establishes and maintains ongoing and frequent teacher-student interaction, student-student interaction and teacher-parent interaction; • Provides timely, constructive feedback to students about assignments and questions; and • Gives students clear expectations about teacher response time.

Table 1. Cross Reference of Online Teaching Standards (continued)

General Topic	Professional Organization	Standards
Accommoda-tions and Diversity awareness	iNACOL	• Is cognizant of the diversity of student academic needs and incorporates accommodations into the online environment; • Knows and understands the diversity of student learning needs, languages, and backgrounds; • Knows and understands how adaptive/assistive technologies are used to help people who have disabilities gain access to information that might otherwise be inaccessible; • Knows and understands the process for connecting with local support personnel to verify student's IEP requirements or 504 accommodations needed for student success; • Knows and understands legal mandates stipulated by the Americans with Disabilities Act (ADA), the Individuals with Disabilities Education Act (IDEA), the Assistive Technology Act, and Section 508 or other similar guidelines/requirements for accessibility; and • Knows and understands that students have varied talents and skills and make appropriate accommodations designed to include all students.
	SREB	• Understands and is responsive to students with special needs in the online classroom; • Understands that students have varied talents and skills and uses appropriate strategies designed to include all students; • Demonstrates knowledge and responds appropriately to the cultural background and learning needs of non-native English speakers; • Provides activities, modified as necessary, that are relevant to the needs of all students; and • Adapts and adjusts instruction to create multiple paths to learning objectives.
	NEA	• Demonstrate an ability to use multimedia, as appropriate, in course materials, in ways that comply with Section 508 requirements.
Management	• iNACOL	• Knows and understands the need to establish criteria for appropriate online behavior for both teacher and students; • Knows and understands effective time management strategies; • Knows and understands online course management tasks; • Provide course materials to students in a timely manner, so that students have all course materials when needed. These include physical materials that may be mailed to students at school or at home, or electronic materials in the form of reference works or Internet links.
	• SREB	• Provides an online syllabus that details the terms of class interaction for both teacher and students, defines clear expectations for both teacher and students, defines the grading criteria, establishes inappropriate behavior criteria for both teacher and students, and explains the course organization to students; and • Provides a syllabus with objectives, concepts and learning outcomes in a clearly written, concise format; uses student data to inform instruction, guides and monitors students' management of their time, monitors learner progress with available tools and develops an intervention plan for unsuccessful learners.
Design	iNACOL	• Arranges media and content to help students and teachers transfer knowledge most effectively in the online environment.
	NEA	• Make appropriate use of the CMS platform's features, producing documents that are well organized for use by students, and that are kept up-to-date during course delivery; • Be familiar with the full range of CMS elements, and be able to select the appropriate elements while designing and teaching online courses; • Be familiar with online design and content standards, have the ability to determine which standards are appropriate for their course design and delivery needs, and be able to demonstrate use of design and content standards in course-document creation and course delivery; and • Revise course documents to keep them up-to-date and accurate.

Table 1. Cross Reference of Online Teaching Standards (continued)

General Topic	Professional Organization	Standards
Technological Knowledge	iNACOL	• Understands and is able to use a range of technologies, both existing and emerging, that effectively support student learning and engagement in the online environment; • Knows and understands the use of an array of grade-appropriate online tools for communication, productivity, collaboration, analysis, presentation, research, and content delivery; • Knows and understands the use of emerging technologies in a variety of mediums for teaching and learning, based on student needs • Knows and understands basic troubleshooting skills and the responsibility to address basic technical issues online students may have; • Knows and understands the need to continuously update their knowledge and skills for using the evolving technology tools that support online learning; • Knows and understands appropriate tools and technologies to make accommodations to meet student needs • Knows and understands critical digital literacies and 21st century skills; and • Knows and understands appropriate use of technologies to enhance learning.
	SREB	• The teacher has the prerequisite technology skills to teach online; • Demonstrates the ability to effectively use word-processing, spreadsheet and presentation software; • Demonstrates effective use of Internet browsers, e-mail applications and appropriate online etiquette; • Demonstrates the ability to modify and add content and assessment, using an online Learning Management System (LMS); • Incorporates multimedia and visual resources into an online module; • Utilizes synchronous and asynchronous tools (e.g., discussion boards, chat tools, electronic whiteboards) effectively; • Troubleshoots typical software and hardware problems; • Demonstrates the ability to effectively use and incorporate subject-specific and developmentally appropriate software in an online learning module; and • Demonstrates growth in technology knowledge and skills in order to stay current with emerging technologies.
	NEA	• Be familiar with online tools and online infrastructure, including Learning Management Systems (LMS) and Content Management Systems (CMS), and they should understand the appropriate uses of each system to support online course design and delivery; • Answer student questions on certain technical issues, including posting to discussions, submitting assignments, using the Internet, and viewing online grades; • Pay particular attention to the course enrollment process, be able to determine which students are enrolled in the online course, and know how to add and drop students from the course; • Be adept with the various platform features so that they can provide students the opportunity to submit their work online; • Demonstrate an ability to search and use Internet sites so that links to them can be incorporated into course documents; and • Employ CMS features to use and appropriately reference web sites, and have the Information Literacy skills to determine which sites are legitimate and of sufficient merit for inclusion.

Standards have also been created by iNACOL to guide the design of quality online courses (2011), and these can be used in the design of a field experience in online teaching as well.

Laying the Groundwork

Collaboration between teacher-education programs and virtual schools. The first and foremost step in planning for a virtual school field experience is for the teacher-education program to partner with one or more virtual schools based on the needs of preservice and inservice teachers. Once this relationship is established, personnel from the virtual school and the teacher-education program can start structuring the experience. Beyond constructing the virtual school field experience, the benefits of this collaboration also include a recruiting venue for the virtual school, providing them with a pool of teacher education program graduates who could potentially work at the virtual school as online teachers. It also provides practice-based connections, which can help create additional professional development cooperatives in which virtual schools can host professional development opportunities for the teacher education program while the teacher education program can host similar continuing education venues for virtual school teachers. Via this collaboration, a wealth of theoretical and practical knowledge can be shared for both preservice and inservice teachers.

Assessing User Needs. As is true in any instructional design process, users' needs must be assessed to determine what goals need to be met, the backgrounds of those taking the course, and how curriculum will be designed to meet all users' needs. The design of a virtual school field experience should be general but needs to be contextual as well. For example, the course should take into account whether novice online teachers want to be placed in a virtual school where teachers do not create their own content or one in which teachers create their own online instructional materials. It is also crucial to take into account the grade level and content of interest for each novice online teacher and do the best to match teachers as closely to their placement request as possible, so as to place them in an authentic and relevant setting. In most cases, multiple virtual schools might need to be contacted and partnered with, especially if the teacher-education programs are placing teachers in kindergarten through 12th grade, since not all virtual schools offer online learning opportunities at every grade level.

Taking Policy and Certification into Account. In these experiences, it is also necessary to understand the state- and district-level education policy when it comes to K-12 online learning. For instance, some states are more progressive and require K-12 students to take an online learning course in order to graduate. These states will likely be more willing, if they are not already, to allow field experiences in virtual schools to count towards the teacher-certification process. However, most often, virtual school field experiences are voluntary and occur in addition to traditional face-to-face field experiences (Kennedy, 2010). Because of this, the experience turns into a balancing act, forcing novice online teachers to negotiate how much time and effort they are willing to dedicate to the experience.

Cooperating teacher training. Great teachers are not always the best mentors (Rowley, 1999). Because of this, it is crucial for the virtual school and/or teacher-education program to provide training for cooperating teachers, instilling in them the crucial role they play in the professional development of novice online teachers (McKenna, 1998). Providing training for cooperating teachers is an investment for the teacher education program and the virtual school because they will be building the base of teacher leaders needed to sustain their organizations (Zimpher, 1988) and the teaching profession as a whole. Training should be focused on taking mentoring of teachers to the "educative" level (Wang & Odell, 2002). At this level, cooperating teachers need to facilitate the teachers' path to develop a "commitment to inquiry," where cooperating teachers consistently ask "difficult questions" to their novice online teachers and encourage them to continue to pose difficult questions to themselves throughout their entire teaching career (Dana & Yendol-Hoppey, 2007, p. 25). In addition, a cooperating teacher must encourage the novice teacher's commitment to equity (Achinstein & Barrett, 2004) and ensure that he/she will continue to advocate for all students. Cooperating teachers need to also engage in their practice and study it in order to better the future teachers with whom they work (Feiman-Nemser, 2001).

Practically speaking, a cooperating teacher-training program for virtual school field experiences would have four main goals. First, cooperating teachers need to have a solid knowledge of their organization and its mission, goals, and objectives, so as to instill those into teacher training. Second, cooperating teachers should gain a solid understanding of their roles as mentors by reading and dialoguing about key mentoring literature from experts in the field including Feiman-Nemser, Achinstein, Wang, Odell, Dana, and Yendol-Hoppey. Third, they should interact with one another and reflect on their teaching experiences thus far, understanding their own background and what they can offer a prospective novice online teacher. And fourth, they should engage in the development of the virtual school field experiences and help with the matching process of novice and expert online teachers.

Another issue that must be considered when thinking about cooperating teachers in virtual school settings is making sure they receive credit for their efforts (Futrell, 1988). They could be given this in a number of ways including monetary compensation, release time from other teaching duties, or continuing education units toward their recertification process. This would allow them to be more invested in the experience because they are being recognized and rewarded for their participation.

Design and Development

Overall structure. The virtual school field experience should span the length of an average semester, or 16 weeks, and be tied to a credit-bearing course if possible (Kennedy, 2010). This will not only allow for ample time to immerse novice online teachers in the online learning environment, but it will also offer a greater amount of time for them to engage in meaningful mentor-mentee activities. The relationship between expert online teacher and the beginning teacher should start with a meet and greet prior to, or at the start of the field experience. Included in this meeting should be an anticipatory reflective process, where both the cooperating teacher and novice online teacher write down and share with each other a list of what they need/want from the experience. This might be helpful in ensuring a positive experience for all involved (Kennedy, 2010; Kennedy, Cavanaugh, & Dawson , under review).

During the first few weeks of the virtual school field experience, the university/college instructor should concentrate on helping those learning to teach online reflect on their past online learning experiences. Often times, this helps teachers shed any preconceptions or misconceptions about online learning (Davis, Mackey, & Compton, 2009; Kennedy, 2010; Kennedy, Cavanaugh, & Dawson , under review). This process will allow them to look at the virtual school with fresh eyes. Teacher educators need to give preservice and inservice teachers a chance to unpack their beliefs, deconstruct their experiences, and reflect on how their past relates to their new learning opportunities. Examples in the research literature in which preservice teachers were asked to reflect on their past experiences include the creation of autoethnographies/ autobiographies of their education (Coia & Taylor, 2005), writing of reflection journals with prompts on a given topic (Brownlee, Purdie, & Boulton-Lewis, 2001), and construction of portfolios documenting past experience (Antonek, McCormick, & Donato, 1997). By providing teachers a way to connect their past to their present learning, powerful experiences in teacher preparation can occur (Smith, 2006).

The virtual school field experience itself should be designed in a blended format. The blended format would be especially helpful for novice online teachers who have not taken an online course previously. Ideally, the course should start out with at least a four-week introduction to K-12 online learning. This introduction would need to include relevant literature and reports regarding K-12 online learning. Especially important to include would be *Keeping Pace* (Watson et al., 2011), an annual report, which provides a broad overview of the current state of K-12 online learning and also introduces the various models of virtual schools that exist.

During the first four weeks, learning for participants in the virtual school field experience should be designed in a similar fashion to how the K-12 virtual school classes are structured. This will allow the novice online teachers to encounter firsthand what K-12 students experience in the online environment. Essential in the design would be interactivity so the novice online teachers are active in their learning, allowing them to interact, reflect on, and gain a deeper understanding of new knowledge (Berge, 2002; Kennedy, 2010; Kennedy, Cavanaugh, & Dawson , under review). Teachers should experience the same instructional strategies in this field experience course that they would be expected to incorporate when teaching their own students in blended and/or fully online learning environments. If the university course instructors do not model the strategies they expect teachers to use with online students, novice online teachers would be less inclined and less likely to use interactive techniques in their future learning environments.

After the broad context of online teaching, online learning, and virtual schooling is presented during the first four weeks of the experience, the remaining 12 to 13 weeks should be devoted to the development of the relationship between the cooperating teacher and the novice online teacher and dedicated to his/her discovery of what it is like to be an online teacher. While this is going on, the university course itself should run parallel to the field experience so as to allow the novice online teachers an opportunity to regroup and reflect on their experiences with their fellow teachers and with the university course instructor (Kennedy, 2010;Kennedy, Cavanaugh, & Dawson , under review). The connection between teacher-education courses and teachers' field experiences has been documented as necessary (Darling-Hammond, 2009). This hybrid setting "where academic and practitioner knowledge" combine to provide "the service of teacher learning" is key to offering a rich and integrated curriculum (Zeichner, 2010, p. 89).

Several topics that need to be covered in the virtual school field experience or in additional courses that accompany the experience include, but are not limited to, instructional design for online learning environments, online pedagogy, introduction to K-12 online learning, communicating in online environments, interaction, motivation, engagement, assessment, feedback, academic honesty, access and equity, legal and ethical issues, diversity and special needs, and information systems. Possible activities for novice online teachers to engage in might include grading student work, facilitating discussions, practicing time-management skills in the online environment, creating course content and other learning resources, collaborating and co-teaching with a content team, and planning and hosting synchronous teaching sessions via online video conferencing software.

An additional important topic is introducing and actively using emerging technologies that are useful in K-12 online learning environments. In terms of the technology tools that are involved in virtual school field experiences, teachers should understand the importance of the adoption of innovation, and those who design the field experience should take into account the need to help build the confidence and efficacy of meaningful use of new technologies to enhance the K-12 online learning environment. Preservice and inservice teachers new to online learning also need to learn the information systems that are used at the virtual school, including what information is housed in the systems and how online teachers can access and use pertinent information to make changes to their communication and instructional strategies (Kennedy, 2010;Kennedy, Cavanaugh, & Dawson , under review). This can be discussed in the university course that is aligned with the field experience but can also be emphasized by the cooperating teacher during the field experience itself.

The role of the cooperating teacher. A crucial part of the virtual school field experience is the role that the cooperating teacher plays in the development of the novice online teacher. Cooperating online teachers should feel responsible for mentoring novice online teachers so that they can get a full understanding of what it would be like to be an online instructor. Cooperating teachers should not only provide information (Villani, 2002), offer support and encourage (Huling-Austin & Murphy, 1987), coach (Rhodes & Beneicke, 2002), give emotional support (Odell, 1990), encourage creativity (Yendol-Hoppey & Dana, 2007), model effective behavior (Williams, 1993), and provide guidance in instruction and professional development (Rowley, 1999). They should more importantly provide mentoring that is "educative" (Wang & Odell, 2002). Mentorship is important to the development of novice online teachers, giving them an opportunity to work with an experienced online teacher as an apprentice (Glazer & Hannafin, 2006). Enough time and structure needs to be built into the experience to encourage mentoring relationships. Cooperating teachers need to actively guide new teachers in helping students with new online learning environments, provide school-specific information, give feedback, and engage in consistent communication.

Cooperating teachers should be urged to form strong relationships with their partnered novice teachers by understanding the prior knowledge that the teacher brings to the experience (Dana & Yendol-Hoppey, 2007). Cooperating teachers need to guide the teacher's "professional knowledge development" to include curriculum, pedagogical, content, context, pedagogical content, student learner, and classroom-management knowledge (Dana & Yendol-Hoppey, 2007, p. 28). Novice online teachers should be able to count on their cooperating teachers to encourage them to engage in ethical work, collaboration, inquiry, and equity (Dana & Yendol-Hoppey, 2007). The cooperating teacher should establish an active learning environment for the teacher that includes managing the online classroom, interacting with students and encouraging interaction between students, motivating students in their assignments, translating teaching from face-to-face to the online format, navigating the course-management system and student information systems, learning to build relationships with students, creating online content, differentiating lessons and providing one-on-one assistance to students (iNACOL, 2008).

Discussion

Because field experiences in virtual school settings are a very new development within select teacher education programs, the literature base surrounding these placements and their development continues to grow. Currently, only a very small minority (1.3%) of responding teacher-education programs offer virtual school field experiences (Kennedy & Archambault, 2012). Due to the growth in K-12 online and blended learning, this percentage is bound to continue to increase, albeit slowly, in coming years.

In addition to offering these virtual school field experiences, teacher-education programs need to provide coursework that includes online pedagogy curriculum as well as instructional design work in online learning environments. Programs also need to develop consistency in models in terms of length and structure. All too often, these experiences do not allow for enough time for quality mentoring. Even if sufficient time is provided, sometimes cooperating teachers are lacking the proper training to be effective mentors. Consequently, it is crucial for teacher-education programs and/or K-12 online learning programs to provide training for cooperating online teachers, instilling in them the critical role they play in the professional development of the novice teacher (McKenna, 1998). Additionally, it is important to consider providing incentives to the cooperating teachers so that they feel invested in and valued.

By connecting teacher-education programs with virtual schools (Kennedy & Archambault, 2011) and offering models to follow (Kennedy & Archambault, 2012), it is hoped that these experiences will continue to become more consistent from one teacher-education program to another. Ultimately, future teachers need to be able to acquire an understanding of the complexity of relationships among students, teachers, methods, content, and emerging technologies, and then be able to apply this both in face-to-face as well as in online settings. Because the growth of K-12 online learning is exponential, teacher-education programs need to start thinking about offering field experiences in K-12 online learning programs, as well as courses in online pedagogy and instructional design in online learning environments. This preparation may initially be developed as stand-alone courses and offered as something that teachers can choose to take part in, such as that which is included in online teaching endorsements or graduate certifications. Eventually, however, teacher -ducation programs may need to be restructured to include within their traditional coursework and field experiences, training that provides the necessary knowledge, skills, and dispositions to ensure that all teacher candidates are prepared for online learning environments which are increasingly becoming part of the educational landscape of the 21st century.

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SUCCESS for Teaching Assistant Professional Development

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Abstract: This paper reflectively applies the Motivating Opportunity Model (SUCCESS Model) to a successful redesign of a university teaching-assistant professional development program. It illustrates how the principles of motivation for perceptions, engagement and learning drawn from motivational theories inform the work of design. Both the SUCCESS Model and the redesign of the TA development have been previously detailed in separate scholarly publications. The goal of this integration is to illustrate application of the SUCCESS model in a demonstrably effective instructional redesign. This paper introduces the project and the motivational model briefly, then reflectively details how the SUCCESS components are implemented in the TA design project.

Keywords: motivation, instructional design, teaching assistants, professional development

Success is neither magical nor mysterious. Success is the natural consequence of consistently applying the basic fundamentals.
~Jim Rohm

The quality of foundational undergraduate instruction in American universities depends to a large degree on the skill and investment of graduate teaching assistants (TAs) (Marincovich, 1998). TAs need effective, appropriate professional development that offers both meaningful foundations and strategically useful tools for application (Hardré & Burris, 2012). Many TAs receive very limited preparation and mentoring before they begin teaching, so the design of what they do receive is crucial (Hardré & Chen, 2006). In addition, many TAs have little motivation to invest in learning to teach, given their commonly-held perceptions that teaching has little importance for their current and future professional aspirations (Ronkowski, 1998).

TA Professional Development Redesign

A team of designers was challenged to redesign the general professional development workshop for all new teaching assistants (TAs) in a research-extensive university (Hardré & Burris, 2012). The design goal was to transform the existing series of discrete one-hour sessions by guest faculty and trainers into a more coherent approach to TA professional development, using strategies grounded in current learning and motivational theory.

Contexts and timing. The context-of-instruction was a face-to-face, three-day training and development event, sponsored by the university's Center for Teaching and Learning Development. It occurred the week before classes began, after all of the new TAs had arrived on campus. As to contexts-of-use, they would transfer to classrooms and labs across campus, some teaching independently and others facilitating lab and discussion sections linked to faculty-taught courses. Some would have ongoing departmental support, coaching and mentoring for teaching, while others would not. All new TAs were required by their hiring departments to attend the training event.

Learners. The learners were 210 new university teaching assistants, hired to teach foundational courses across disciplines, in hard sciences, social sciences, arts and humanities. They were diverse in age, race, gender, background, teaching knowledge, degree program, career trajectory and professional experience. About half knew exactly what course(s) they would begin teaching the following week, and three-quarters knew what format of class (lecture, lab or discussion section). Some had taught elsewhere, but all were new TAs in this institution. As a whole, this was a diverse group of busy, educated adult learners.

Task. At minimum the learners had to be equipped with relevant knowledge and useful strategies to survive their initial venture into university teaching, including basic learning theory, general information about teaching in higher education and basic institutional information. Secondary objectives included an introduction to course/lesson design, and instilling value for teaching as part of their current and future professional roles.

Design strategy. Critical constraints included the short time (3 days) and limited facilities (one large lecture hall and three regular classrooms set up for lectures), as well as the number of TAs and the diversity of their transfer needs and contexts. The administrative clients chose presentation-with-discussion as the primary design strategy. The design team worked with the administrative clients, identifying essential content and organizing it into general sessions (attended by all) and breakouts (chosen by learners). General sessions were: course design, first-day strategies, instructional strategies and communication, and assessment. Breakout sessions included: motivating learners, creating positive classroom learning environments, three types of format-focused sessions (lectures, labs and discussions), inquiry-based teaching, and teaching through writing. On the last day, all TAs gave a short lesson, which was videotaped. They received a copy of the video and participated in a group critique of their videos. Materials and media included PowerPoint slides and handouts, a manual in which learners could record notes and applications, and assessment and feedback forms.

Evaluation. TAs found the event as a whole well designed to meet their needs, and felt that the activities and content made a notable contribution to their learning and development (Hardré & Burris, 2012). Learners were able to identify both specific knowledge they had gained, and some positive shifts in their values and beliefs about teaching (Hardré & Burris, 2012). Based on these outcomes, the redesigned ATA event was judged to be successful.

The SUCCESS Model of Motivation for Design

The Motivating Opportunities Model for Performance SUCCESS (Hardré, 2009) was developed in response to the identified need for a new, more robust and up-to-date motivational model for instructional designers (Hardré, 2003). It was designed both as a conceptual model to support designers' understanding of motivation theories and strategies, and as a procedural framework for translating that understanding into designing effective learning and performance environments (Hardré, 2009). It exists to promote engagement through integrating comprehensive motivational strategies throughout instruction, and is designed to be useful in practice, through flexibility in process and application (Hardré & Miller, 2006).

SUCCESS is transtheoretical, as it integrates constructs and strategies from multiple motivational theories and schools of thought, to achieve currency and comprehensiveness into a usable model for today's designers (Hardré, 2003). It does not constrain designers structurally into prescriptive or formulaic design approaches, nor assume a particular epistemological stance. Instead, it can be adaptively implemented across design environments and contexts, and with any global ID model or strategic approach (Hardré, 2009). It bridges the gap between theory and practice for ID professionals by:

1. Reframing complex theories of motivation in practical ways
2. Translating theoretical components of psychology into relevant principles for design practice
3. Providing a structural and procedural framework for integrating them fluidly
4. Including social, contextual and assessment components of motivation
5. Supporting integration of motivation from initial analysis through implementation, evaluation and transfer.

The heart of the model is the SUCCESS mnemonic, presenting seven key components of motivational considerations:

- **S: Situational** (contextual and access issues)
- **U: Utilization** (and transfer issues)
- **C: Competence** (focus on the development of skills & expertise)
- **C: Content** (knowledge and information components)
- **E: Emotional** (affective and personal response issues)
- **S: Social** (group, interpersonal interactions, collaborative & relational issues)
- **S: Systemic** (organizational and systems considerations with potential to facilitate performance improvement)

The Motivating Opportunities Model is design-focused, centered on the design elements and interactions in learning and performance environments, rather than on learner characteristics alone. It takes into account motivationally-relevant components of the task, learning and performance contexts, social setting and performance standards, as well as needs and characteristics of learners.

SUCCESS Applied in the All-TA Redesign

The following section illustrates how the redesign of the All-TA professional development (ATA) exemplified motivational strategies informed by motivational theory and illustrated by the SUCCESS framework. Across all of the components, motivationally-sensitive design includes goals, expectations, confidence and uncertainty, and various levels of communication—when, where, how and by what/whom. The importance and effects of these motivational components are supported by the systematic evidence (Hardré & Burris, 2012).

S: Situational (contextual and access issues)

This component focuses on the nature of the learning and performance contexts, their support for autonomy, authenticity, access and control (both actual and perceived by learners). Learners provided with motivationally-positive situational features, such as choice about how they do tasks, and with access to materials and support resources tend to more readily engage and fit instruction to their needs (Brookfield, 1986; Pasqual-Leone & Johnson, 2004).

Much of the context design had been predetermined by the administrative client, based on learner availability and resource limitations. Within these confines, the designers infused as much interaction and introspection as was feasible, to promote personal meaningfulness and motivation.

The sessions invited TAs to consider what they knew about their own assignments and develop individualized applications of the key principles. This strategy supported personal ownership and choice, to offset the potentially demotivating pervasive awareness that this was a mandated event.

The positive messages and thematics linking the various sessions supported autonomous transfer and personal success expectations that leveraged the TAs' situational perspective. For example, to enhance perceived value for the teaching sessions, one trainer invited TAs to look around and realize that while nearly everyone in the room *aspired* to be a faculty member in a research university, (based on job availability) only one in eight of them was likely to get that job immediately on graduation, while the others would more likely begin their academic careers in professional roles that depended largely on teaching effectiveness.

Information access was ensured both at instruction (by handing TAs hard copy of materials packets) and ongoing (by uploading the materials in digital format to the online LMS).

U: **Utilization** (and transfer issues)

The utilization component focuses on facilitating transfer by bridging perceptual gaps from instruction to application, from the task and skills as learned, to the task and skills in authentic use. Learners need to recognize how, when and why they will need particular skills after instruction, and that recognition is most powerful when linked to their own personal goals and aspirations (Dweck, Mangels & Good, 2004; Beck, 2004).

1. Strategies to support utilization for a TA included a focus on practical methods and immediate needs (e.g., "First-Day Strategies") so learners perceived them as appropriate for immediate/proximal use. This supported overall relevance and linked to their short-term (proximal) needs and goals.
2. All of the sessions included rich examples of real instances when the information being taught was necessary, to promote clear percep-

tions of how and when they were recommended for use.

3. The trainers encouraged the TAs to select a few key strategies/ideas from each session that they expected to use and focus on those. This invitation to focus and customize their learning supported feasible goal setting in what was for many a new area of learning. Given the range of needs and scope of information to cover those needs, this strategy also supported both individual autonomy (control and choice in their learning) and self-efficacy, as it gave them freedom/permission not to try to remember everything and instead to identify and select what would meet their perceived needs.

C: Competence (focus on the development of skills & expertise)

The competence component focuses on current and developing skills, task performance and feedback relative to learning targets and stated objectives. To develop toward professional competence, learners need to understand what standards exist, what knowledge and skills are important to learn, and how they are developing toward those goals as they progress (Alexander, 2004). Both actual and perceived competence (or self-efficacy) are important, and they are often different (Hardré, Ge & Thomas, 2007).

1. Trainers encouraged the TAs to share ideas and examples, and supported their ideas with positive feedback and elaborations. The support of their existing knowledge promoted perceived competence, and framing strategy suggestions as elaborations of what they had shared promoted the development of new knowledge linked to their prior knowledge.
2. The feedback documents asked TAs to identify what they had learned and expected to use along with *how* they could use it, supporting perceived self-efficacy for transfer and their metacognitive identification of key strategies from the broader content scope.
3. Instruction underscored the nature of competence in teaching as adaptive and situated in the class and discipline. Trainers explicitly strove to bridge from learners' prior knowledge and experience to their perceived needs and expectations, and linked skill learning to the institutional performance assessments.

C: Content (knowledge and information components)

The competence component focuses on motivational elements of how information is provided and developed through instruction, to support making knowledge accessible when it is needed for performance. Content should address the range of learners' needs, on degrees of novelty, challenge, relevance, and meaningfulness (Wlodkowski, 1999). The organization of information is also critical to sustaining interest and creating effective cognitive schema for later recall and transfer (Bransford, Brown & Cocking, 2000).

1. The TAs needed a foundational standard of information (to address minimum information requirements) balanced by some degree of choice and control (to support individual relevance and autonomy). This balance was achieved with the structure of general and breakout sessions.
2. The designers built multiple types of information presentation and access into the content, with text and graphics, and provided both PowerPoint slides as handouts and a manual with further elaborations of the concepts. This strategy provided new information for learners at various levels of prior knowledge, including the simpler version for more novice learners to follow along with trainers, and more detailed information elaborated for more advanced learners. Motivationally, this strategy supported an appropriate level of challenge and novel information across a range of learners' prior knowledge and experience.
3. Past learners had perceived the old workshop sequence to be "disconnected", lacking coherence, which reduced its meaningfulness and threatened learners' ability to make linkages between sessions that could bolster their overall learning and engagement. To support perceived coherence (as well as cognitive schema-building), the redesigned sessions were systematically linked, with the breakouts detailing and illustrating key principles and ideas introduced in the general sessions. Trainers intentionally linked strategies introduced in the breakouts to more general ideas presented in general sessions, to integrate the content and support TAs' valuing and schema development for teaching.

E: Emotional (affective and personal response issues)

The emotional component focuses on personal, affective and perceptual factors with motivational effects on instructional effectiveness. Learners' affect and emotions come from past and present experiences, role models and relationships, self-perceptions and sources of anxiety, and they powerfully effect learning and development, with impacts on recall and transfer to performance (Dweck, Mangels & Good, 2004).

1. Trainers modeled productive learning goals with openness to new ideas, along with value for teaching as a skill to be learned well.
2. Trainers shared success and error or failure stories including their effects on students, to demonstrate the importance of attention to effective teaching and promote TAs' awareness of their potential to impact their students' futures.
3. Sessions included opportunities to acknowledge and share any negative affect and emotions regarding teaching and seek to remediate them with new strategies for success in similar circumstances.

S: Social (group, interpersonal interactions, collaborative & relational issues)

The social component focuses on interpersonal elements of instruction, how people learn and work together, communicate and interact with each other and with the teacher-trainer or system. Social aspects of physical or virtual learning spaces, opportunity to contribute ideas, perceived safety and respect, teacher-learner-peer social relationships, and anxiety about assessment and performance all influence how people learn and what they take away from instruction (Bransford, Brown & Cocking, 2000).

1. Trainers shared their histories as TAs to build rapport and perceived understanding among TA learners.
2. In breakouts, the TAs were encouraged to share their concerns and engage in collaborative and cooperative problem-solving, with the trainers and with their peers.
3. Modeling by the trainers was a key here also, as was the degree of discussion and interactive contributions encouraged from TAs in the breakouts, to support peer community and demonstrate the interdisciplinary applications of the principles being presented.

S: Systemic (organizational and systems considerations with potential to facilitate performance improvement)

The systemic component focuses on elements that relate to the institution and organization in which the instruction and performance occur, and those to which they connect. Learners need to recognize how what they are learning fits into the larger context of their lives and needs. Beyond immediate context and utility, it is beneficial to frame instruction and its goals within the learner's organization and career (addressing both short term and long term goals) (Beck, 2004).

1. The separate breakouts were developed to meet needs for whichever type or format of course/section TAs were assigned.
2. In all sessions, trainers included examples from multiple disciplines and course types, to support perceived feasibility and relevance for broad transfer of the learned principles and strategies across teaching roles and contexts within the organization.
3. Sessions included systemic and organizational components of teaching processes (such as grading, enrollment, technology tools and facilities), to support perceived familiarity for systemic transfer and perceived compatibility with global features of the institution.

Summary Implications for Design

Using a tool like the Motivating Opportunities Model (with its SUCCESS mnenomic) as a systematic framework to scaffold design thinking can support the designer in integrating motivation into all levels of instruction. It supports all phases of design and prompts consideration of motivation into the design of materials, activities and environments, and into contexts-of-instruction as well as contexts-of-use, to facilitate learning and transfer.

Given the integrative relationships among motivational factors, and between motivation and learning (Dai & Sternberg, 2004), there will often be overlap among motivational considerations, influences and strategies for the seven SUCCESS components. However, using all seven enables designers to examine motivational issues and influences from multiple perspectives and supports more effective integration of motivation into all facets of instructional design.

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Design, Implementation and Evaluation of a Nursing Simulation: A Design and Development Research Study

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Abstract: The purpose of this study was to investigate the use of the Jeffries/National League for Nursing Framework for Designing, Implementing and Evaluating Simulations. The model was used to develop a simulation-based course to teach interprofessional communication to new graduate nurses in an acute care setting. Design and development research was employed to examine the phases of design, implementation, and evaluation. Findings revealed that the model generally functioned well in this context. Particular strengths were its emphasis on problem solving and recommendations for attending to fidelity. Identified weaknesses were inadequate guidance for designing and implementing student support and debriefing. Recommendations for strengthening the model include providing scaffolds to students during problem solving and a focus on the interrelationships of the design components in the model. Overall, designers would benefit from using the framework, supplementing it in areas where the model does not currently provide adequate guidance.

Keywords: instructional simulation, clinical simulation, instructional design, simulation, instructional development

Clinical simulations have been used in recent years to provide instruction on interprofessional communication skills to nursing students. Simulations have been effective in assisting undergraduate nursing students construct more organized communication and develop increased confidence (Guhde, 2010; Thomas, Bertram, & Johnson, 2009). They have also been effective to instruct new graduate nurses recognize when help from other medical professionals is required and to improve their communication with physicians (Mulligan, 2010). These findings provide evidence that clinical simulation is a viable option for teaching interprofessional communication skills to nurses.

The most common structure for a simulation-based course in nursing consists of an initial briefing followed by participation in the experience and then a debriefing (Cant & Cooper, 2009). This structure is similar to the recommendations provided by Lindsey and Berger (2009) who suggest three universal principles for experiential instruction – framing, activating, and reflecting on the experience. These principles are evident in the Jeffries/National League for Nursing Framework for Designing, Implementing and Evaluating Simulations (Jeffries, 2005, 2006; Jeffries & Rizzolo, 2006; Jeffries & Rogers, 2007).

Simulation Design Framework

This framework consists of three major components – outcomes, contextual elements, and design elements (Jeffries & Rogers, 2007). The outcomes of a nursing simulation include knowledge acquisition, skill performance, learner satisfaction, critical thinking, and self-confidence. Contextual elements are the students and teachers, their backgrounds and experiences, as well as educational practices embedded in a particular setting. Design elements include objectives, fidelity, problem solving, student support, and debriefing. These design elements are discussed below.

Objectives. Within the Jeffries framework, objectives must be clearly written to allow students to participate effectively in the simulation (Jeffries & Rogers, 2007). Other important features include matching objectives to a learner's knowledge and experience and including intended outcomes and expected behaviors (Jeffries, 2005; Jeffries & Rogers, 2007). The number of objectives should be reflective of the complexity of the simulation but ideally no more than three to four objectives should be included in a 20 -minute simulation (Jeffries, 2006).

Fidelity. Fidelity is defined as the level of realism found within a simulation both in the technology used and in the environment within which the simulation occurs (Jeffries, 2005). The level of fidelity in a simulation is a design decision based on learner characteristics and the learning objectives (Hertel & Mills, 2002). Simulations should be as realistic as possible to increase the likelihood of transferring learned skills to the real world (Lindsey & Berger, 2009). However, creating simulations that are too realistic and complex may overwhelm learners and overshadow the learning objectives (Hertel & Mills, 2002; Lampotang, 2008).

Problem solving. Another important simulation design feature is the opportunity for problem solving (Jeffries, 2006). Within the framework, problem solving is viewed as decision points that learners create for themselves (Jeffries, 2006). Jeffries (2005) discussed problem complexity in terms of the level of uncertainty found within the scenario; complexity increases with the number of problems presented, the number and stability of the relationships between the problems and the presence of irrelevant data. Complexity of a problem is also judged by the number of cognitive operations and degree of cognitive burden that is placed on the problem solver (Jonassen, 2004). In terms of complexity, the goal of the designer is to create simulations that are challenging while still allowing learners to be successful (Jeffries, 2007; Lindsey & Berger, 2009).

Student support. Student support includes the cues provided during the simulation (Jeffries & Rogers, 2007) as well as facilitation of guided reflection on decision-making during debriefing (Jeffries, 2006). The provision of cues during the simulation should "offer enough information for the learner to continue with the simulation, but do not interfere with his/her independent problem solving" (Jeffries & Rogers, 2007, p. 29). The decision to provide support during a scenario is based on balancing learner needs so that the learner uncovers their own strengths and weaknesses but does not become so overwhelmed as to have their self-concept threatened (Glavin, 2008). These decisions may be made by the designer prior to implementation and by faculty during implementation (Glavin, 2008).

Debriefing. Debriefing allows students and faculty to review what happened during the simulation and reflect on the meaning of events (Jeffries & Rogers, 2007). The goals of debriefing are to provide emotional support to learners (Flanagan, 2008) and help them achieve learning objectives (Glavin, 2008). Although debriefing is considered an essential element of simulation-based learning, it remains a poorly understood learning strategy (Dreifuerst, 2009).

The model described above was developed to guide nursing faculty design high fidelity clinical simulations. It was employed as part of an extensive, multi-site study (Jeffries & Rizzolo, 2006). The study was carried out in four phases, with model and instrument development included in the initial phase. Eight project directors (with the assistance of nursing faculty) utilized the framework to design, implement and evaluate a simulation experience at their site during the second phase. The results from this phase of the study are not included in the report, so little is known about how the model was actually used to design and implement the simulations. During the third phase, 395 students were randomly assigned to one of three conditions – paper/pencil case study, simulation with a moderate fidelity simulator, and simulation with high fidelity. There were no significant differences in knowledge based on posttest score comparisons. However, learners using the high fidelity simulation scored higher than those in the other groups on satisfaction and self-confidence measures. Additionally, student perceptions of the incorporation of active learning, feedback and diverse learning styles were significantly increased with high fidelity simulation.

Purpose of the Study

The purpose of the current study was to investigate the use of the Jeffries/National League for Nursing Framework for Designing, Implementing and Evaluating Simulations. The model was employed to develop a simulation-based course to teach interprofessional communication to new graduate nurses. The study focused on the processes used to design the simulation, its implementation by faculty, and its impact on students.

Method

Research Design

Design and development research (Richey & Klein, 2007) was used in this study to address the validity of the Jeffries framework. According to Richey and Klein (2007) "model validation is an empirical process that demonstrates the effectiveness of a model's use in the workplace or provides support for the various components of the model itself" (p. 12). The study of a design model can be accomplished through "validation of the impact of the products of model use" (Richey, 2005, p. 174). The current study focused on documenting the Jeffries model during simulation design, implementation, and evaluation.

Data Sources

Establishing model validity in a design and development study requires collecting data from a variety of sources. Triangulation of data from designers, instructors and learners improves a researcher's ability to make inferences about the data as it relates to the validation of the model (Richey, 2005).

Designer Data. Demographic data including gender, ethnicity, education, and design experience in both general and simulation-based courses were collected from the designer. A log was kept by the designer to provide data regarding model use during the design phase, as well as any problems encountered and impressions of the model. The designer log was analyzed for evidence of decisions made during the design phase and designer reflections on the model.

Faculty Data. Demographic data including gender, ethnicity, teaching experience in traditional and simulation-based courses, highest degree, and education in facilitating simulation-based education were collected from the faculty. A log was kept by the faculty to capture their impressions of the design components. Furthermore, course implementation was observed and videotaped to collect data on how student support was provided and how objectives and application to practice were addressed during debriefing. After each implementation of the course, faculty participated in a semi-structured interview regarding perceptions of course effectiveness, the level of fidelity and complexity in the scenarios, the experience of providing learner support, and perceptions regarding debriefing.

Student data. Demographic data including gender, ethnicity, educational background, prior experience with simulations, and overall perception of simulation-based education was collected via questionnaire. Student participants completed a pretest and posttest on the day of the course requiring construction of a report in the situation, background, assessment and recommendation (SBAR) format in response to a videotaped patient assessment. A different patient assessment videotape was used for the pretest and posttest. The critical patient assessment data was the same in both videotapes, but surface features, such as age and gender, were different. The organization and accuracy of the responses were scored using a researcher-designed rubric. The responses for the pretest and posttest were scored for inclusion of important elements of (1) patient identity and current problem (situation); (2) diagnosis, pertinent history and current treatment (background); (3) reporting of salient assessment data; and (4) recommendations reflective of the severity of the patient's condition that do not include harmful recommendations. Participants received a score of 0-3 for each component of the report with a total possible score of 12.

Student participants also completed two surveys. The first was a 12-item questionnaire designed to measure satisfaction with the simulation activity and self-confidence in learning. The second was a 20-item questionnaire to measure their perception of the presence and importance of design features in the simulation. Both of these instruments were developed by Jeffries (2005). To further explore student perceptions, participants were asked to list activities that supported or hindered their learning during the simulation.

Participants

Participants in the study were a course designer, three graduate nursing faculty members, and 27 registered nurses who had been in practice for less than six months and were enrolled in an in-service education course on interprofessional communication. The course designer was a female with 29 years of experience as a registered nurse. She holds a Master of Science in Nursing and a Doctor of Philosophy in Educational Technology. She has 10 years of experience in designing, developing, implementing, and evaluating classroom, online, and simulation-based courses for physicians, nurses, and other allied health professionals in a hospital setting. Additionally, there were three nursing faculty members who implemented the course. All were Caucasian females ranging in age from 32 to 47 years and each possesses a license to practice as a registered nurse. Their average number of years experience in nursing education was 6.8 (range 3.5 – 11) and all had experience implementing simulation-based courses. Student participants were mostly female (22 of 26, with one non-report) and all were white, non-Hispanic. All had recently graduated from an entry-level program in nursing. The mean age of the group was 30 years (SD 9.5, range 22 -57) with 23 participants having some clinical experience beyond nursing school. The majority of participants (N = 23) had experienced simulations in their undergraduate nursing programs. The average was 3.5 simulation experiences per semester. Of those who had experience with simulation, their overall attitude towards the use of simulation in clinical learning was favorable [M=4.08, SD=0.78] on a 1-5 scale, with five being very useful.

Setting

The setting for the study was a medium sized tertiary care hospital located in the southwestern United States. The course was implemented within the care facility's Simulation Center, a 3300 square foot facility with a 20-seat classroom and four simulation environments – an operating room, an intensive care/ emergency department room, a medical-surgical hospital room, and an outpatient room. The simulation rooms are built around a core control room used by the staff to run and record simulation activities. All clinical scenarios for this study were scheduled in the medical-surgical environment which is designed to be similar to a standard hospital room. The Simulation Center provided a SimMan 3G® human patient simulator for the clinical scenarios as well as the necessary clinical equipment. All simulations are recorded using a web-based system for capturing, annotating and archiving videos obtained during scenarios and debriefing. This system also allows students who are not direct participants the scenario an opportunity to observe the scenario in real time. This capability permits observers to consider their own approaches to the situation and participate in the debriefing.

Results

Data were collected throughout the design, implementation and evaluation phases of the simulation-based course. Results are reported below for each of these phases.

Design

Following the tenets of design and development research (Richey & Klein, 2007), the simulation-based course was designed by the principal investigator in collaboration with nursing faculty who served as subject-matter experts, provided input on objectives, reviewed and suggested revisions to the case scenarios prior to course implementation. The designer kept a log as a method of reflecting upon the use of the model. Coding of these data uncovered three primary themes – decisions about design characteristics, interrelationships between these characteristics, and challenges encountered in designing the course.

Fidelity. Reflection on this design characteristic related to ensuring fidelity and barriers to it. For example, the designer noted that she referred to a variety of sources to create realistic patient cases including nursing textbooks, online opioid calculators, and contacting a physician who specializes in pain management. Environmental fidelity was promoted by using moulage to create body fluids such as urine and liquid stool. Barriers to fidelity noted in the designer log related to the known capabilities of the human patient simulator. For example, one log entry read, "To adequately portray delirium, the limitations of the mannequin have to be taken into account. Agitation is not an option with the mannequin – it just isn't real."

Student support. The designer made several references to student support focusing on the adequacy of cues and how to make those cues available. Student support was written into the patient case scenario by providing sufficient and appropriate cues for the student to use in problem solving. An example of the use of cues as student support are found in this log entry regarding the gastrointestinal bleeding case scenario: "Cues available are patient script regarding symptoms, a stool that has the appearance of an upper GI bleed, vital signs . . . and recent physiologic stress." The designer wrote that decisions on how to make cues available to students are not always obvious:

You don't want to just give it away – you want learners to work for it, but how concealed is too concealed? I decided to tightly script the patient and provider roles so that information is only given on request to decrease the potential of faculty leading too much and lessening the problem solving aspects of the scenario. The lack of predictability of learner actions in the scenario makes tight scripting difficult.

Problem solving. Problem solving includes the events that trigger decision-making and considerations of the level of complexity of the scenario in terms of the learner's level of knowledge and skill. The designer documented decisions and concerns related to how to trigger problem solving, physician communication within the case scenarios, and how to alter complexity to fit the learner. The designer documented an approach to problem solving that required listing the questions that would need to be answered within the case scenario: "What is needed to do a thorough patient assessment? What do we think is going on here? What merit does the antibiotic argument have? What information should I share with the physician? What orders should I request or anticipate?" In this same case scenario, the designer recorded reflections on aspects of complexity, giving "careful consideration of complexity; how available are the cues in the scenario, how many conflicting cues to distract learners away from the real problem?"

Objectives and Debriefing. The designer reflected on the challenge of writing objectives to meet the model criteria of providing enough information to allow students to participate in the simulation effectively. This was an area in which the designer noted that faculty input would be important. In planning debriefing, the designer noted that an observation sheet based on expected student actions was developed to assist faculty in note taking during the scenario so that they would not need to "trust their memory." The designer also recorded the development of reflective questions based on objectives and application to practice for use by faculty during debriefing to meet model recommendations that debriefing be focused on the objectives.

Interrelationships. Interrelationships between the above mentioned design characteristics were also noted in the designer log. Decisions made about one characteristic often impacted others. For example, the designer wrote, "Building problem solving into the scenario flows naturally from the objectives." The interplay between problem solving, student support, and fidelity were documented as "Fidelity and student support are intimately tied to complexity" and "Fidelity is tightly tied – because if the cues aren't plausible, they won't support the learner."

Challenges. Several log entries discussed challenges in the design of the simulation-based course. While several of these challenges fell under the various design characteristics, a variety of other challenges also arose such as selecting the best types of patient cases, designing for an interactive learning session where there is lack of predictability of what students will do within a scenario, limitations of equipment, and the level of detail required. An example of a challenge faced is documented as part of the tryout session discussion, "timing of family interaction is a subject of debate among faculty – it is difficult to know what the best timing would be, as the family is there to distract the nurse from the real problem."

Model Utility. Analyses of the designer log also uncovered themes directly related to the utility of the model. These were adequate guidance, lack of guidance, and use of outside resources. In terms of providing adequate guidance, the designer noted that the "model makes you think about what the problem solving aspects are going to be relative to the objectives. It is flexible enough to encompass almost any problem designed into the scenario." However, areas in which the model did not provide adequate guidance were also noted in the log, particularly in designing learner preparation and debriefing. In learner preparation, the designer wrote that "it is difficult to determine how much detail learners need in the objectives to be able to participate in the simulation." This theme of preparation arose again during the tryout – "The model doesn't give good information about designing the prebrief; the scenario tryout experience suggests that objectives alone are not enough to allow learners to fully participate". Lack of guidance in preparing for debriefing was also evident in this statement written in the design log:

Other than making sure the objectives are re-stated and used for debriefing, little guidance is provided for how this is done. The model is not very robust for the part that most experts agree is the most important aspect of simulation-based learning.

Closely tied to lack of guidance is the theme of use of outside simulation resources. This was noted when designing pre-briefing and debriefing activities, where other models and literature were used for guidance.

Implementation

The simulation-based course was implemented twice during a single week, with content being repeated for two different groups of students. Typical of simulation use in nursing education, each group of students was randomly divided into three teams and then assigned to a patient case. Each case had five roles – two primary registered nurses, a team lead who could be called as an extra resource, a family member who served as a source of patient information via a written script, and an allied health staff member who could perform a range of activities such as obtaining laboratory specimens from the human patient simulator. During the case, the primary registered nurses were expected to identify the patient's primary medical problem by interacting with the human patient simulator and other persons or materials in the room. Each student directly participated in one case scenario; those who were not directly participating in the case observed the simulation via live video feed. At the conclusion of each patient case, two faculty members conducted a debriefing session. A video of the case was available for review during debriefing. Direct participants and observers took part in the debriefing session. This pattern was repeated for subsequent patient cases, allowing all students an opportunity to directly participate in a patient case.

Data collected during implementation included logs kept by faculty who carried out the simulation-based course, observations of each case scenario and debriefing sessions captured via videotape, and interviews of faculty conducted after each day of implementation. Findings from these data sources are provided below.

Faculty Logs. Analyses of these logs revealed themes related to faculty roles and fidelity. The faculty noted some initial confusion regarding their roles during implementation, as demonstrated by the entry, "… defining [our] roles in this simulated environment, such as; who would be keeping time, how would the groups be divided, who would be giving the participants the report on the patient prior to beginning the simulated scenario." Faculty noted that their discussions provided needed clarity, "Today it was clear as to what our roles were going to be in the simulation." The faculty also reflected on the importance of fidelity in the simulation. For example, one documented that it would be important for "orders [to be] given the way new grads would see them ordered on the computer." Concern for environmental fidelity was evident in the discussion of "what materials and equipment would be needed to allow the new grads to implement the first intervention to carry through with orders received."

Observation. Analyses of the videotapes captured during implementation of the simulation-based course revealed themes related to student support and debriefing activities. During each case, one faculty member provided the voice of the patient while the other provided the voice of the physician. These roles allowed faculty to provide students with support as they progressed through the case. Differences in student support were observed during implementation. For example, patient prompts related to pain were given earlier and more frequently on the second day of implementation. These were geared to focus students on symptoms missed on the first day. There were also more physician prompts supplied by faculty on the second day. For example, students were asked if the patient was on pain medication at home, which was the primary issue for the case. This question was not asked by faculty on the first day, and students did not discover this issue during the case. Furthermore, there were more instances of environmental support related to changes in vital signs during the second day of implementation. Additionally, the faculty were required to provide verbal answers to neurologic physical assessment questions that could not be produced by the human patient simulator.

The videotapes from debriefing sessions were analyzed for time spent on discussion related to course objectives and the application of learning to practice. The greatest percentage of time was spent discussing application to nursing practice (24%), appropriate nursing interventions (23.1%), and diagnostic assessment (21.2%). Much less debriefing time was spent discussing the objectives of selecting and organizing information and selecting recommendations (8.4% and 3.8%, respectively).

Faculty interviews. Analysis of these data revealed themes related to fidelity, student support and debriefing. Faculty found both positive and negative aspects to fidelity during implementation. For example, one commented, "It was good to have a faculty person as the voice of the patient . . . students needed responses in the moment to have dialogue . . . mannequin-canned phrases would not have worked as well." Environmental fidelity was seen as the biggest challenge; faculty noted that not having real-life resources such as an automated drug dispensing machine presented a challenge to students.

Faculty indicated that they chose to give additional support when students were "struggling" and "not getting to the heart of the matter." One stated that they provided support when the "information given was not adequate" for problem solving. Faculty mentioned that determining how much support to provide was not a simple decision. For example, one commented "I didn't want to give too much information [so] I was slow to respond . . . it was difficult to balance because I couldn't do [patient] movements to show I was still awake." Similarly, enacting the role of provider came with difficult decisions regarding student support. One faculty stated, "How far do you go and let them not be successful? You don't want to hold their hand and lead them down a path, but it would be natural for a provider to ask these questions."

Faculty interviews also revealed that debriefing was different after each day of implementation. One shared that the "first group was tough; the primary nurse beat herself up that she didn't recognize the issue." Faculty managed this situation by first discussing what went well then she was able to "come around to what the scenario was about." Despite these challenges, faculty shared that "nobody felt unsafe." Debriefing during the second day was less challenging; one faculty observed that "students declared topics that we had determined we wanted to talk about; only a few times did we need to ask questions to redirect." In terms of addressing objectives during debriefing, faculty stated that they "did achieve communication" but one acknowledged that "[we] talked about communication less than intended."

Evaluation

Following approved institutional review board procedures, student participants were recruited by the researcher prior to the beginning of instruction. Subsequent to obtaining permission, students took the pretest, participated in the simulation-based course, and then completed the posttest, the satisfaction and self-confidence questionnaire, and the simulation design scale.

Results are reported below for student achievement, attitudes, and perceptions of design characteristics.

Student achievement. The mean score on the pretest was 3.11 (SD = 1.40) out of a possible 12 points and was 4.89 (SD = 1.93) on the posttest. A paired-samples t-test indicated a significant difference between pre- and posttest scores, $t(26) = 4.44$, $p < .01$. An examination of each of the four components of the SBAR report revealed that scores improved significantly for the first component, $t(26) = 2.60$, $p < .05$. Small, but non-significant increases were shown for the second and third component. There were no differences on the fourth component.

Student satisfaction & confidence. Means and standard deviations for items on the Student Satisfaction and Self Confidence questionnaire (Jeffries, 2007) are shown in Table 1. In general, participants expressed positive attitudes toward the simulation-based course. They agreed that the simulation was motivating (M = 4.50, SD = 0.58) and effective (M = 4.41, SD = 0.64). Participants also expressed satisfaction toward the resources used during the simulation (M = 4.00, SD = 0.69). They were confident in their mastery of skills and knowledge covered in the simulation (M = 4.31, SD = 0.79) and in their ability to apply this content to clinical settings (M = 4.15, SD = 0.54). They also felt it was their own responsibility to determine what was to be learned from the simulation (M = 4.46, SD = 0.58).

Table 1: Student Satisfaction and Self-Confidence in Learning

Item	Mean	SD
The teaching methods used in this simulation were helpful and effective.	4.42	0.64
The simulation provided me with a variety of learning materials and activities to promote my learning the medical surgical curriculum.	4.15	0.88
The teaching materials used in this simulation were motivating and helped me to learn.	4.50	0.58
The way my instructor(s) taught the simulation was suitable to the way I learn.	4.15	0.67
I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	4.31	0.79
I am confident that this simulation covered critical content necessary for the mastery of medical surgical curriculum.	3.85	0.67
I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting.	4.15	0.54
My instructors used helpful resources to teach the simulation.	4.00	0.69
It is my responsibility as the student to learn what I need to know from this simulation activity.	4.46	0.58
I know how to get help when I do not understand the concepts covered in the simulation.	4.54	0.51
I know how to use simulation activities to learn critical aspects of these skills.	4.38	0.64
It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time	3.19	1.13

Note: 5 = Strongly Agree; 1 = Strongly Disagree

To further explore student attitudes, participants were asked to list activities that supported or hindered their learning during the simulation. They identified debriefing (N = 10), practicing physician communication (N = 8), and receiving feedback (N = 8) as the most helpful activities. Some participants specifically mentioned that feedback received during peer discussions was helpful (N = 4). The activity that was identified as least helpful related to being watched or videotaped during the simulation (n = 4).

Student perceptions of design characteristics. Means and standard deviations for items on the Simulation Design Scale (Jeffries, 2005) are shown in Table 2. These data reveal that most participants either agreed or strongly agreed that objectives, student support, problem solving, feedback, and fidelity are important in simulation-based courses. They rated being supported in the learning process (M = 4.81, SD = 0.49) and the opportunity to obtain guidance/feedback (M = 4.81, SD = 0.57) as the most important design characteristics. Furthermore, most participants agreed or strongly agreed that each of these design characteristics were present in the simulation used in this study. The highest scores were on items related to feedback and guided reflection. Specifically, students thought feedback was provided in a timely fashion (M = 4.56, SD = 0.87) and that there was an opportunity after the simulation to obtain guidance/feedback to build knowledge to another level (M = 4.60, SD = 0.91).

Discussion

The purpose of this study was to investigate the Jeffries/National League for Nursing Framework for Designing, Implementing and Evaluating Simulations. The model was used to develop a simulation-based course to teach structured communication to new graduate nurses in an acute care setting. Overall, results confirm the usefulness of the model. The simulation contributed to student learning and satisfaction with the course. Faculty were also satisfied with the course overall in terms of enacting their roles and with student learning. The strengths and weaknesses of the model are highlighted below followed by suggestions for how to improve it.

Model strengths

Particular strengths of the design characteristics are the guidance provided in designing and implementing problem solving and fidelity. The model focuses designers on creating problem solving situations as the basis for clinical simulation; this direction was important in developing the clinical scenario narrative that would trigger the decision points called for in the objectives. The model is also explicit in describing the factors that alter the level of complexity, such as adjusting the amount of information available, how information is made available, and how much conflicting information is included. The designer may use this to guide decisions regarding the types of information to provide to adjust the complexity of the clinical scenario.

Achieving the highest level of fidelity possible within a clinical scenario is also advocated by the model; a recommendation that contributed to student success in the current study. The perception that there was a possibility of encountering similar patient situations in actual nursing practice was motivating to students. Conversely, areas where fidelity was lacking presented a barrier to students when participating in the clinical scenarios.

Model weaknesses

Finding from the current study suggest that the model provided minimal guidance in designing instruction to prepare students for using simulation-based instruction and for structuring guided reflection. Although the model recommends writing objectives that provide sufficient detail for students to be able to participate in a simulation, this was shown to be insufficient preparation in this context. Similarly, other than recommending reflecting on the scenario in terms of the objectives and application to practice, little guidance for structuring debriefing is provided by the model. This is a particularly important concern given that students in this study indicated that guided reflection was the activity that most supported their learning. For both preparation and guided reflection, the designer referred to resources beyond the current model.

Within the design characteristic of student support, the model suggests pre-determining the content and timing of cues to be provided to students during a clinical scenario. Based on the findings of this study, this guideline may not be the best approach in every situation. Overall, the balance of providing student support in the form of cues during the clinical scenario was an area of uncertainty for both the designer and faculty. Additionally, the model indicates that student support also occurs within guided reflection but does not provide any further information regarding how to design or implement student support in that phase of the simulation.

Table 2: Presence and Importance of Design Characteristics

Objectives and Information	Presence		Importance	
	M	SD	M	SD
There was enough information provided at the beginning of the simulation to provide direction and encouragement	4.23	0.95	4.65	0.56
I clearly understood the purpose and objectives of the simulation.	4.42	0.99	4.54	0.71
The simulation provided enough information in a clear manner for me to problem-solve the situation.	3.81	0.94	4.54	0.58
There was enough information provided to me during the simulation.	4.08	0.98	4.54	0.58
The cues were appropriate and geared to promote my understanding.	4.15	0.83	4.38	0.64
Student Support	**Presence**		**Importance**	
Support was offered in a timely manner.	4.40	1.00	4.69	0.55
My need for help was recognized.	4.30	1.02	4.60	0.58
I felt supported by the teacher's assistance during the simulation.	4.20	1.04	4.65	0.63
I was supported in the learning process.	4.38	0.98	4.81	0.49
Problem Solving	**Presence**		**Importance**	
Independent problem solving was facilitated.	4.28	0.94	4.62	0.57
I was encouraged to explore all possibilities of the simulation.	4.19	0.94	4.69	0.47
The simulation was designed for my specific level of knowledge and skills.	4.31	1.12	4.73	0.45
The simulation allowed me the opportunity to prioritize nursing assessments and care.	4.00	1.20	4.77	0.43
The simulation provided me an opportunity to goal set for my patient.	3.46	1.17	4.35	0.75
Feedback/Guided Reflection	**Presence**		**Importance**	
Feedback provided was constructive.	4.42	1.10	4.77	0.59
Feedback was provided in a timely manner.	4.56	0.87	4.65	0.63
The simulation allowed me to analyze my own behavior and actions.	4.38	0.97	4.73	0.60
There was an opportunity after the simulation to obtain guidance/feedback from the teacher in order	4.60	0.91	4.81	0.57

Table 2: Presence and Importance of Design Characteristics (continued)

Fidelity (Realism)	Presence		Importance	
	M	SD	M	SD
The scenario resembled a real-life situation.	4.36	0.86	4.65	0.56
Real-life factors, situations, and variables were built into the simulation scenario.	4.36	0.86	4.69	0.47

Presence scale 5=strongly agree; 1=strongly disagree. Importance scale 5=very important; 1=not at all important

The model depicts the five design characteristics as separate and equal entities within the realm of design. Findings indicate that the characteristics interact in ways that impact the students' ability to problem-solve the scenario. The current iteration of the model does not clarify these interactions (Jeffries and Rogers, 2007).

Another weakness of the model is that it focuses only on designing activities for the participant who will assume the role of primary nurse in the clinical scenario. Due the number of students enrolled in nursing courses, it is typical that observers will be present when simulations are implemented. The model does not address engagement of observers or participants assuming non-nurse roles in clinical scenarios.

Strengthening the model

Based on findings of the current study, there are four areas where the model could be strengthened: (1) provide greater clarity and flexibility when designing and implementing student support, (2) increase guidance in student preparation and guided reflection, (3) expand the model to consider all students who may be present, and (4) define the interrelationships of the design characteristics.

Guidance in providing student support in designing and implementing the clinical scenario and guided reflection could be informed by the research on scaffolding in education. Scaffolding is defined by Merrill (2002) as "performing parts of the task that the student cannot perform and gradually reducing the amount of guidance and shifting control to the student" (p. 50). Evidence related to both cognitive scaffolds to assist students during the process of problem solving and metacognitive scaffolds which promote reflection on action (Lajoie, 2005) could provide an expanded conceptualization of student support. For example, Merrill (2002) states that learning from errors made in the problem solving process requires instruction on error recognition, error recovery and error avoidance. Using this principle of instruction during guided reflection may enhance learning from the clinical scenario.

Providing enhanced guidance to designers and faculty regarding learner preparation and guided reflection and feedback may be accomplished by referring to other currently available models. The approach to debriefing proposed by Rudolph, Simon, Dufresne, and Raemer (2006) includes both student preparation and debriefing. Dreifuerst (2009) has also proposed a comprehensive framework for debriefing that includes reflection, emotion, reception, integration, and assimilation/accommodation. The designer and faculty could overlay one of these models of debriefing while maintaining a focus on the course objectives.

Expanding the model to consider others present would assist designers develop roles in addition to the primary nurse and would help faculty implement learning activities for students who may be required to observe the simulation. There is little literature on the topic of observer engagement. However a case report by Kalmakis, Cunningham, Lamoureux and Elshaymaa (2010) demonstrated that student observers who were provided with a case-specific observation sheet demonstrated engagement in a clinical scenario enacted by peers in a simulation laboratory. Further exploration of techniques to assure engagement of observers would be beneficial to faculty who manage larger groups in simulation environment.

The Jeffries model would also be strengthened by clarifying the interrelationships between the design characteristics. Based on the results of this study, a direct relationship between objectives, problem solving, and debriefing was found; objectives directly influenced the design of the problem solving situation and both objectives and student problem solving behaviors informed the structure of debriefing. The design characteristics of fidelity and student support directly impacted complexity in problem solving. Thinking of the design characteristics as an interrelated systems approach could provide added guidance when using the model.

Conclusions

The findings from the current study support the validity of the Jeffries/National League for Nursing Framework for Designing, Implementing and Evaluating Simulations. The combined results of student achievement and satisfaction, coupled with faculty satisfaction with the course and designer data provide evidence that using this model is feasible and beneficial for designing simulations. Although there are areas that could be strengthened, supplementing the model with evidence-based recommendations is a practical approach. Further examination of the interrelationships among the design characteristics will benefit designers using the model in their setting.

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