Fostering Interaction In Distance Learning through Purposeful Technology Integration in Support of Learning Goals

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Abstract

Facilitating effective distance learning interaction depends on the use of current technologies. Substantiated technology integration strategies are needed for distance educators to make informed choices about technologies as well as learning goals. Technology attributes and pedagogical factors that contribute to distance learning interaction are discussed. The purpose of this work is to provide guidance for technology integration in order to enhance effective interaction in distance learning. An interaction framework prototype, arising out of a design and development research effort, is also presented.

Keywords: interaction, distance learning, technology integration, design and development research

Distance learning is an important and growing part of educational practice (McIsaac & Gunawardena, 2000). With the rapid development of emerging technologies, distance learning involves more options in course resources, diversity of learning activities, and types of communication tools for supporting teaching and learning (Beldarrain, 2006). More and more studies have placed increasing emphasis on distance learning.

Based on transactional distance theory, the distance of importance in distance learning is not the geographical separation of learners and instructor, but rather the intellectual, social, and cultural distance (Kearsley & Moore, 1996; Moore, 1989). Adopting appropriate technologies and instructional strategies to foster interaction can minimize such psychological distance (Beldarrain, 2006). The rapid growth of more advanced technologies has created opportunities for more sophisticated interactions in the technology-mediated environment (Anderson, 2003) that can accelerate learning, our AECT conference theme.

A challenge facing many educators is how to integrate technologies for the design of distant interactions that support learning goals. Pressed by a lack of time, resources, and instructional design expertise, many distance educators often go it alone in trying to make choices for interaction. Current distance learning practices may not maximize the interactive learning possibilities of today’s technologies. Technologies are often reduced to repositories for content (Richards, 2006), raising several, largely unanswered, questions for consideration by distance learning researchers and practitioners: How can distance educators integrate technology to foster interaction from a distance that supports learning goals? What pedagogies for integrating technologies encourage meaningful interaction? This paper provides guidance for technology integration to enhance effective distance learning interaction by providing a framework prototype that educators can use to make informed instructional design decisions.

Review of Literature

Historically, interaction mainly focused on learner-instructor interaction in the face-to-face classroom (Anderson, 2003). With technological developments, there is wide recognition that interaction can be supported by the use of technologies. Interaction can take diverse forms such as synchronous interaction and asynchronous interaction (Kearsley, 1995). The concept of interaction has evolved from the dialogue between students and instructors in a traditional classroom-based setting and has been broadened to include technology-mediated interaction in distance learning (Anderson, 2003) among learners in addition to with an instructor.

Considerations of Purposes of Interaction

Wagner (1997) advocated that the concept of interaction should shift from learning agents to learning outcomes, especially in the information age, since such a shift could aid in employing instructional methods to improve learning performance. Therefore, instead of focusing on learning entities involved in the interaction process, some researchers define interaction in terms of purposes and functions.

Different technologies support different modes of online interaction. Real-time technology and delayed-time technology afford differences in the interaction experience. Research indicates that delayed-time technology is more effective in facilitating task-oriented communication and reflective activities, whereas real-
time technology promotes more social interaction (Chou, 2002; Meyer, 2003). Social interaction may not
directly contribute to the learning goals of instruction, but may foster a more positive learning atmosphere.
Wagner (1997) suggested twelve types of interaction focused on learning outcomes: interaction for
participation, communication, feedback, elaboration and retention, self-regulation, motivation, negotiation of
understanding, team building, discovery, exploration, clarification of understanding and closure. Choosing
technology according to specific interaction purposes is essential.

Consideration of Technology Attributes

Focusing on technology attributes rather than technologies themselves is a more productive way to
consider instructional technology (Clark, 1983; Kozma, 1991). The attributes of a technology refer to its
capabilities, such as the provision for active responding or the capability to provide auditory and visual channels
functions as the property of learning events, whereas interactivity refers to technological attributes (Anderson,
2003). Roblyer and Wiencke (2003) indicated that the distinction between interaction and interactivity is
important for researchers who investigate technological attributes to increase instructional interaction. Two-way
communication, user control, real-time interactivity, and delayed-time interactivity are four key technological
attributes that can foster interaction (McMillan & Hwang, 2002).

Two-way communication is a key technological attribute to foster interaction (Northrup, 2002; Roblyer
interpersonal interaction and the capability for providing feedback. Videoconferencing, teleconferencing and
computer-mediated communication are two-way interactive technologies.

Control is an important attribute concerning interaction between the learner and the content. With
advanced technologies, more learner control opportunities are available including: the depth of study, sequence
of instruction, pacing, and style of presentation (Gilbert, 1998; Wagner, 1994). The more a distance learner is
offered options for meaningful control of the technological learning environment, the more likely that learner-
content interaction will support positive learner experiences.

Wagner (1994) concluded that real-time interactivity is “one significant attribute of the technologies
used in current educational enterprises that sets them apart from previous technology” (p. 6). Real-time
interactivity technology supports high social presence and immediate feedback (Chou, 2003). Research by Tu
and McIsaac (2002) indicates that social presence and immediate feedback positively influenced interaction.
More social interaction can be supported by real-time interaction (Chou, 2002; Jonassen, 2001; Meyer, 2003).
Real-time interaction is also effective in developing a sense of community among learners since it supports
more cohesive interaction (Duemer, 2002; Jonassen, 2001).

Research demonstrates that delayed-time technology, with its flexibility in terms of time and place,
also fosters interaction (Chou, 2002; Kiousis, 2002; Vrasidas, & Zembylas, 2003). With delayed-time
technology, more interaction opportunities are provided because learners can access and process interaction over
longer periods of time and space. With more time for learners to compose responses in discussions, there is
greater opportunity for reflection, a primary advantage of delayed-time technology. More time for interaction
and the nature of written communication itself support interaction effectiveness in regards to reflection, critical
thinking, and group problem solving (Chou, 2002; Jonassen, 2001).

Methods

This research project used a design and development research methodology, a pragmatic type of
research, which is particularly relevant to the field of instructional design and technology (Richey & Klein,
2007). This study was classified as Type 2, now known as model research, in that it addresses the design and
development of a new framework with a generic focus (Richey & Klein, 2007). The following three phases were
employed to develop a framework for designing interaction in distance learning: analysis, development and
evaluation, and revision (Richey & Klein, 2007).

Research Participants

In this study, the framework was validated by a purposefully selected group of expert reviewers (Patton,
2001). Three experts were selected based on their expertise and contributions related to distance education,
learning theory, and instructional design. Prior to identifying participants, the researchers obtained approval for
the study from the Institutional Review Board (IRB) at Virginia Tech.

Data Sources and Data Analysis

Phase one: Analysis. The first study phase was an analysis phase during which data from a systematic
literature review were used to identify relevant elements of a distance learning interaction framework. The main
sources of literature included academic journals, academic databases, online journals, books, and doctoral

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dissertations published from 1995 to 2015. The selected literature met three inclusion criteria, content is: (1) peer-reviewed, (2) theoretical work or empirical research, and (3) situated within the context of education. During Phase I of this study, inductive content analysis was used to analyze the data (Erickson, 1986).

Phase two: Development and evaluation. In the second phase, development and evaluation, the findings from the analysis phase were used to develop the framework. The resulting framework was reviewed by three experts for feedback. The online rubric for the expert review was custom design and administered through Qualtrics survey software. The rubric requested usability feedback on a number of framework elements including: relevance, guidance, detail, clarity, organization, structure, and format.

Phase three: Revision. Revision was the third phase of the study. The three experts were contacted and their feedback was used to make improvements to the framework. Data collected from the three experts were coded and analyzed through a constant comparative analytic method (Rossman & Rallis, 2003).

Developing a Framework

Based on the findings from a systematic literature review of interaction research in distance learning, the framework regarding technology integration for purposeful interaction in distance learning was created (see Appendix A). The framework considers technology attributes, focusing on the level of interactivity offered by technologies. Technologies differ greatly in their potential to foster interaction in terms of level and functions (Barker, Frisbie, & Patrick, 1989; Bates, 1990; Heeter, 2000; Roblyer & Wiencke, 2003; Wagner, 1994). The framework identifies key questions and components to be considered for educators to foster interaction through technology integration. Guidelines, along with supporting research, for each component are also provided.

The framework outlines four key questions for designers to follow as they utilize technologies to enhance interaction in distance learning. These questions are:

1. Do available technologies support identified interaction purposes?
2. Do available technologies support different types of interaction?
3. Has temporality of technologies been considered?
4. Is the form of communication supported by the technologies considered?

Expert Review

Generally, the results of expert review indicated that the framework could be helpful for improving the quality of interaction design in distance learning experiences. Reviewers also pointed out that a systematic literature review served as a solid foundation to develop this theoretically- and empirically-grounded framework for guiding interaction design in distance learning. The third reviewer stated that, “I so appreciate that you build your case for your design on top of research, perspectives, opinion and evidence that already exist in the research literature to ensure that your design is predicated on reliable information.” This reviewer also stated that, “this is a nice enough overview of design considerations from the educational technology literature.” While the proposed framework was generally viewed to meet its intended use, experts offered several suggestions for improvement. Opportunities for improvement to the framework are discussed below.

Reviewer one suggested that social presence can be addressed more in the framework. Therefore, a short explanation about the relationship between social presence and interaction and an explanation of the term social presence were added.

This reviewer suggested that a related framework statement be reworded as, “When possible, supplement LMS with additional technologies that do support interaction purposes.” To address this suggestion, the text “when possible” was added in the first key question of the framework.
Reviewer three suggested including some contemporary technologies such as interactive web design, app design, mobile design, and games in example technologies in the guidelines. To address this suggestion, a statement was added after the table indicating that, since technologies will continue to change, the technology integration guidelines were limited intentionally to address only affordances and not specific technologies (that may or may not be current) and that the examples in the framework are not exhaustive but only representative. Appendix B presents the revised interaction framework.

Discussion

Interaction is an essential component contributing to the effectiveness of distance learning. Facilitating interaction in distance learning depends heavily on the use of technology. A valid challenge facing many educators and administrators in distance learning today is how to successfully incorporate technology into instruction to enhance and support interaction. Researchers have asserted that the current lack of guidance hinders improvement in the quality of interaction in distance learning (Roblyer, 2003; Wagner, 1994). In order to take advantages of interaction possibilities enabled by technologies, the investigation of technological attributes as well as the relationship between these capabilities and learning is necessary. However, research regarding technology integration for purposeful interaction in distance learning is still sparse. Studies in distance learning must call on a full range of learning and design theories to identify strategies that make the best use of technology to support interaction.

Considering the findings, seeking additional insights into various contemporary or emerging interactive technologies and offering specific and detailed guidelines for different types of commonly used interactive technologies would strengthen the application of the framework. Currently, the framework provides technology integration guidance for fostering interaction in relatively general terms.

Our next step is to invite more theoretical experts and distance learning practitioners to review this framework further. One reason to include distance learning practitioners, the target user audience, is to judge the real-world applicability of the framework. Further review can make the framework more robust for use in distance learning instructional design.

References


Erickson, F. D. (1986). Qualitative methods in research on teaching. In M. C. Wittrock (Ed.), Handbook of research on teaching (pp. 119–161). New York: MacMillan.


## Appendix A

### A Framework for Fostering Interaction In Distance Learning through Purposeful Technology Integration

<table>
<thead>
<tr>
<th>Key Question</th>
<th>Guidance</th>
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<tbody>
<tr>
<td>Do available technologies support identified interaction purposes?</td>
<td>Eliminate technological options from the LMS that do not support identified interaction purposes. Supplement LMS with additional technologies that do support interaction purposes.</td>
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</table>
| Do available technologies support different types of interaction? | • Learner-content interaction occurs when learner interact with content (Dunlap, Sobel, & Sands, 2007; Moore, 1989):  
  o Enriching interaction: Supports learner access to information.  
    • e.g., links, forward and back buttons  
  o Supportive interaction: Helps learners understand and work with the material.  
    • e.g., search function, zoom function  
  o Conveyance interaction: Provides ways to apply knowledge.  
    • e.g., simulations, games  
  o Constructive interactions: Organizing and mapping knowledge and understanding.  
    • e.g., concept map, organization charts  
  • Learner-instructor interaction refers to dialogue between learners and instructor. The purpose is to motivate, stimulate and facilitate activities and strategies (Moore, 1989).  
    • Provides for identified feedback opportunities.  
  • Learner-learner interaction refers to interaction between one learner and other learner (Moore, 1989).  
    • Provides for learner information exchanges, shared work, collaboration. |
| Has temporality of technologies been considered? | Synchronous interactivity:  
  • Supports high social presence and immediate feedback (Chou, 2003; Tu, 2001).  
  • Supports more social interaction (Chou, 2002; Jonassen, 2001; Meyer, 2003; Pena-Shaff, Martin & Gay, 2001).  
  • Effective in developing a sense of community among learners since it supports more cohesive interaction (Duemer, 2002; Jonassen, 2001).  
  • Provides a higher level of immediacy than asynchronous technology (Horn, 1994).  
  Asynchronous interactivity:  
  • Provides flexibility in terms of time and place, which can support learner control (Chou, 2002; Kiousis, 2002; Vrasidas & Zembys, 2003).  
  • Can provide an extended time period for interaction and more opportunity for reflection, critical thinking, and group problem solving (Angeli, 2003; Chou, 2002; Gilbert & Moore, 1998; Jonassen, 2001; Markus, 1994; McIsaac & Gunawardena, 2000). |

### Directionality:

...
supported by the technologies considered?

<table>
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<td>Supports interpersonal interaction and feedback capabilities (McMillan &amp; Hwang, 2002; Oliver, McLoughlin, 1997).</td>
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Flow:

- One-to-one communication
  - e.g., instant message, email
- One-to-many communication
  - e.g., blog, listerv, bulletin board
- Many-to-many communication
  - e.g., wiki, discussion forum
## Appendix B
A Revised Framework for Fostering Interaction in Distance Learning through Purposeful Technology Integration

### Key Question
Do available technologies support identified interaction purposes?

#### Guidance
Analyze the need of interaction in terms of serving specific purposes in support of learning:
- Social interaction and instructional interaction (Berge, 1999; Gilbert & Moore, 1998).
  - Social interaction: social exchanges between students and the teacher, or among students. e.g. body language, exchanging personal information, greetings.
  - Instructional interaction: both teacher control of content delivery and learner control of processes that related to the presentation of and response to instructional content. e.g. questioning, answering, pacing, sequencing, branching, etc.
- Interaction for participation, communication, feedback, elaboration and retention (enhance information provision, confirmation and correction), self-regulation, motivation, negotiation of understanding, team building, discovery, exploration, clarification of understanding and closure (Wagner, 1997).
- Triggering interactions (e.g. communicates expectations), exploration interactions, integration interactions (constructing meaning) and resolution interactions (e.g. application to real world) (Garrison, Anderson, & Archer, 2001).

Eliminate technological options from the LMS that do not support identified interaction purposes. When possible, supplement LMS with additional technologies that do support interaction purposes.

### Key Question
Do available technologies support different types of interaction?

#### Guidance
- Learner-content interaction occurs when learner interact with content (Dunlap, Sobel, & Sands, 2007; Moore, 1989):
  - Enriching interaction: Supports learner access to information.
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- Learner-learner interaction refers to interaction between one learner and other learner (Moore, 1989).
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<td>o Social presence primarily contributes to learners’ social emotion.</td>
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<td>o High social presence is more likely to result in more social interaction in distance learning (Swan, 2002).</td>
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<tr>
<td>• e.g. video conferencing, webcasts, live presentation tools.</td>
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<td>Asynchronous interactivity:</td>
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<td>• Can provide an extended time period for interaction and more opportunity for reflection, critical thinking, and group problem solving (Angeli, 2003; Chou, 2002; Gilbert &amp; Moore, 1998; Jonassen, 2001; Markus, 1994; McIsaac &amp; Gunawardena, 2000).</td>
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