



Improving the Design of Learning Interaction

A Designerly Theoretical Approach

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Human-computer Interaction

Learning Design

Interactions

Interaction Design

Learning design and technology (LTD) researchers can use the Window of Interactions framework to provide context, explanation, and critique to the field. This framework provides the opportunity to analyze the technological characteristics of different types of interactive objects, including learning objects and learning environments, while keeping in mind pedagogical affordances. Using the framework enables LTD researchers to establish a link between interactive features of learning objects and learning goals and find better ways to design interactive learning experiences.

Improving the Design of Learning Interaction:

A Designerly Theoretical Approach

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Introduction and Description of the Theory

Learning interactions are an evolving aspect in the Learning Design and Technology (LDT) field due to the constant evolution of technological means. How learners interact with learning objects nowadays is different from a few decades ago, and it is safe to say it will be different in the future. As we live in a world surrounded by interactions and things that keep us busy (Janlert & Stolterman, 2017), change in the design and experiences of interaction is constant. Based on this premise, the *Window of Interaction* is both a theoretical and analytical framework proposed by Janlert & Stolterman (2017). This framework includes eight dimensions, which allows for analysis (and potentially an evaluation) of how different technology artifacts facilitate: (a) user's agency; (b) independence; (c) receptivity; (d) predictability; (e) freedom of action; (f) pace/time; (g) attention demand; and (h) awareness level. Each of these dimensions of interaction can be used as a descriptive lens to rate designed interaction from low to high.

This framework is designerly (Stolterman et al., 2009) and originates from the area of broader design theory. It does not strictly prescribe how to design interactions, as it describes qualities that can be used to analyze and evaluate interactions in diverse contexts. Janlert and Stolterman (2017) argue that the ways we interact with new technologies have also changed because we do not need to give certain commands to get a particular artifact or system to work. Instead, we can now manipulate or operate artifacts in an expressive-impressive way (e.g., using our voice or body movement to interact with technologies). The expressive-impressive style of interactions is what distinguishes new and emerging types of interactions. As such, technological advances are likely to affect and change every field, including education and online learning. Therefore, it is important to consider how new technologies and interactions can benefit learning, specifically in online courses.

How to Use This Theory to Describe and Analyze Interactions in Learning Contexts?

As specified earlier, this framework is designerly and originates from the area of broader design theory. Prior to utilizing this framework in the context of learning design and technologies, it was important that I operationalized each

dimension of interaction. An important part of this scholarly effort was a consultation with one of the authors of the framework. The purpose of this consultation was to ensure consistency with the meaning of the original definitions when operationalizing dimensions of interaction included in the framework. The author again stressed that the framework was designed to be in service of the designer; thus, it is flexible. I utilized this framework to study design intent and purpose of interactive elements and objects that designers created to support authentic learning in fully online courses. As Janlert and Stolterman (2017) emphasized, the framework is meant to provide flexibility for interaction analysis. Therefore, I should not force it to fit into my study but rather apply those dimensions that made sense to me for the purpose of my study. As such, my goal was to apply the framework when it was applicable and augment the existing framework by adding more insights and descriptions about interactions, if any, in the context of online learning. That is, I operated with dimensions of interaction that were clearly suitable for analyzing interactions at hand. I excluded dimensions of interaction that seemed to be close in meaning and were difficult to differentiate, such as independence (i.e., overlaps in meaning with agency) and predictability (i.e., overlaps in meaning with receptivity). Additionally, because my study focused on the designer's perspective and their interpretation of interactions, I removed the "Awareness Level" dimension, as it could only be analyzed from a user's perspective and could vary from user to user. Table 1 provides operational definitions of dimensions of interaction based on the framework and questions that I formulated based on the operational definitions.

Table 1

Operationalized Windows of Interaction Framework

| Dimension of Interaction | Theoretical Definition | Operational Definition | Possible Questions to Designers |
|--------------------------|---|---|---|
| Agency | "Actions of both parties (human and artifact or system) are guided by some internal design to achieve certain goals." (p. 49) | The designed learning interaction is guided by a certain intent that affords the learner to accomplish a specific goal. The agency window varies from low, medium to high. | Generally speaking, what do you hope learners will do or accomplish with this learning interaction? |
| Receptivity | "[...] discernible connection between what the user does and what it [artifact or system] does." (p. 52) | The designed learning interaction is responsive to the learner's input in a logical manner. The receptivity window varies from low, medium to high. | What designed learning interaction will communicate to the learner if they did X or Y? |
| Freedom of Action | "The freedom with respect to actions that have an impact on the artifact or system in a way that the designer intends." (p. 53) | The designed learning interaction has a range of options for learners to choose from, as the designer intended. The freedom of action window varies from low, medium to high. | What options did you include for learners to choose from in this designed learning interaction? |
| Pace/Time | "Interaction with a bounded interval within | The designed learning interaction is intended to be | How much time did you intend for the learner to dedicate to this designed |

| Dimension of Interaction | Theoretical Definition | Operational Definition | Possible Questions to Designers |
|--------------------------|--|---|---|
| | which interaction must be located to remain feasible." (p. 55) | completed by the learner slowly or quickly. The pace/time window varies from low, medium to high. | learning interaction? |
| Attention Demand | "The minimum level of attention objectively required by the artifact or system." (p. 56) | The designed learning interaction mandates a certain degree of focus. The attention demand window varies from low, medium to high. | What level of attention did you think learners should use for this designed learning interaction? OR Do you think learners can engage with this learning interaction while being engaged in another task? |

Example of How the Theory Has Been Applied

I applied this theory in my dissertation study research at Indiana University Bloomington (Abramenka, 2022). I worked closely with scholars from both the Instructional Systems and Technology as well as Human-Computer Interaction and Design disciplines. The focus of the study was to provide detailed and interpretative accounts of what interactions were designed, how interactions were designed from the instructional designer's perspective, and what the design intent was behind interactions to support authentic learning in higher education online courses. Further, my study investigated how instructional designers interpreted their experiences and how those interpretations and the meanings that they attributed to authentic learning and interactions manifested in their design work. I interviewed 15 instructional designers working in higher education. These instructional designers presented different learning objects/design artifacts that included various types of technology-level interactions. The artifacts demonstrated how the designers' overall design philosophy and perspectives about authentic learning and interactions were manifested in concrete design examples. I used the Window of interactions framework to analyze the characteristics of the demonstrated design artifacts and find the links between their characteristics and the learning goals that instructional designers had while designing their artifacts.

Based on the analysis of interactions using the Window of Interaction framework, the purpose behind designing certain interactions in online courses was determined as: (1) to sustain learner's attention and content comprehension, (2) to engage in the learning process, and (3) to encourage student-student (human level) interactions. For full description of the analysis of interactions within the demonstrated learning objects and examples, please refer to the full text of the dissertation study (Abramenka, 2022).

Interaction Intent 1: Sustain Learner's Attention and Content Comprehension

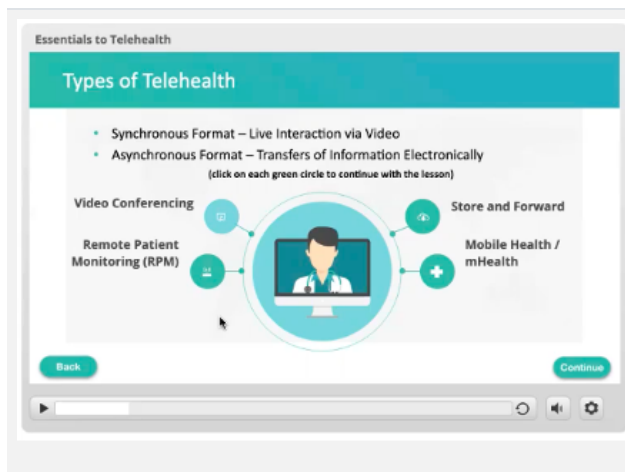
Eleven participants explained that the intent and purpose behind including technology-level interactions was to draw students' attention to important content that they needed to comprehend prior to going on to complete authentic learning tasks. In addition, the participants reported designing interactions within their objects that would allow students to practice and revise key theoretical concepts to ensure their understanding of required background knowledge.

The key insight that the designers shared was that their designer's role was to make sure that, as a result of their design, students looked at the required resources, read them, watched them, and comprehended them. Authentic learning projects required students to have certain background knowledge and skills prior to completing real-life simulations, working with a real client, or designing their own product, like a game for learning. Figure 1 shows types of interactions the designer created to sustain learners' attention and content comprehension.

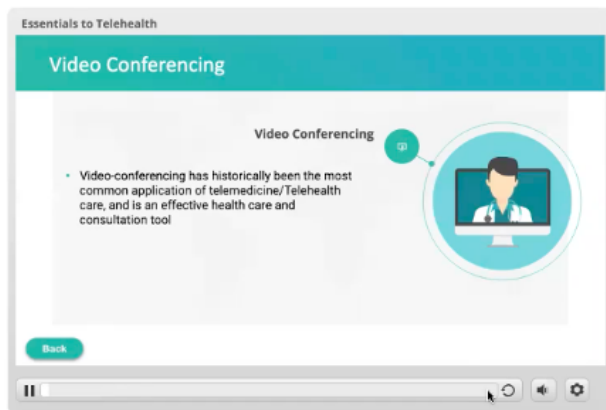
Figure 1

Example of a Video Presentation Designed with the Use of an Authoring Tool Characterized by High Agency, Low Attention Demand, and Middle Receptivity

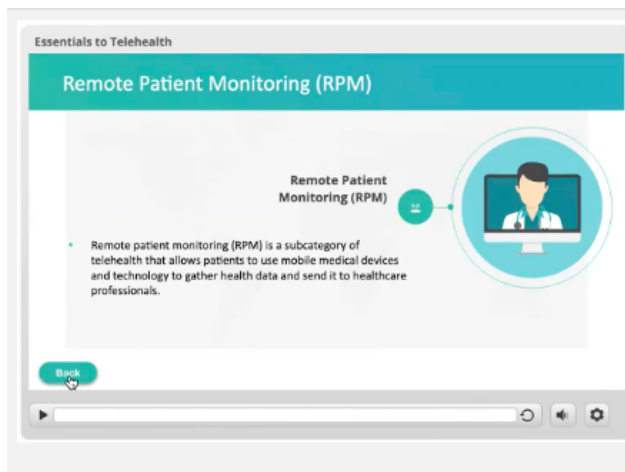
| Images of the object and interactions | Brief description |
|---|--|
|  | <p>Students cannot move forward without listening to the narration until the end.</p> |
|  | <p>Students cannot click "Continue" without listening to the end (difference between Telehealth and Telemedicine).</p> |
|  | <p>Students cannot click the "Continue" button without listening to each type of telehealth.</p> |



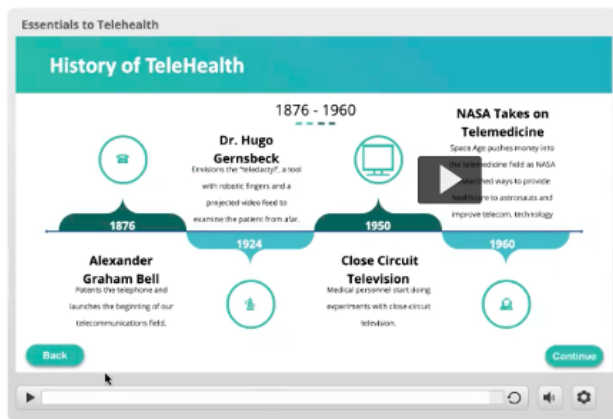
To signal that a student has already listened to a particular type of telehealth (e.g. “Video Conferencing”, “Remote Patient (Monitoring RPM)” etc.) an icon turns gray. For instance, in the image to the left, the “Video Conferencing” icon is graying out to show that a student has listened to this part.



This is how a slide looks like when a student clicks the “Video Conferencing” icon.



This is how a slide looks like when a student clicks the “Remote Patient Monitoring (RPM)” icon. Students have the option to go back to the menu with four different types of telehealth.

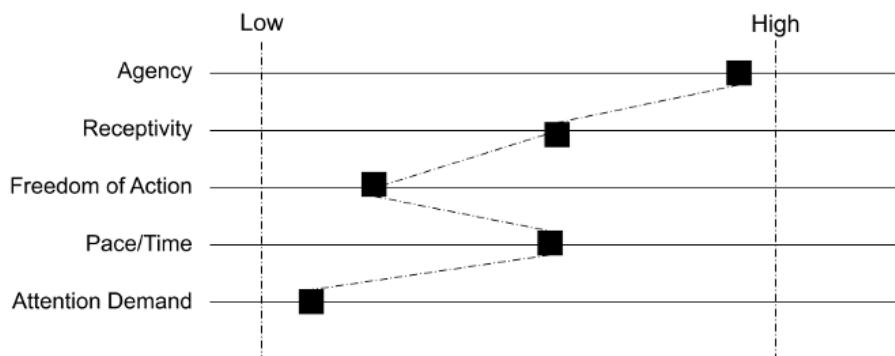


The History of Telehealth timeline where text next to each year appears when the narration about a particular year starts. When students just get to this slide, they see only the timeline with years without text.

Applying the Window of Interaction framework (Figure 2) allowed uncovering key characteristics of this category of interactions. For instance, it is worth noting that, while it was important to have a high-level attention demand for the presented content and authentic learning activities, the demonstrated objects had a low-level attention demand from a technical point of view. Therefore, low attention demand was noted to help sustain students' attention on key information. That is, as the designer's intent was to make sure students comprehended important content related to authentic learning tasks, they designed their objects in such a way that students could easily accomplish this goal. Therefore, in designing their objects, they intended them to be as simple and efficient as possible to use. Further, high agency and low attention demand were noted, but receptivity was close to the middle of the spectrum. Based on the demonstrated examples, this was because some of the designed interactions would not allow students to choose what content to start with or skip content.

Figure 2

Analysis of the Above Object using the Window of Interaction Framework



Interaction Intent 2: To engage in the learning process

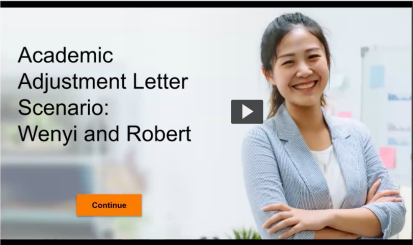
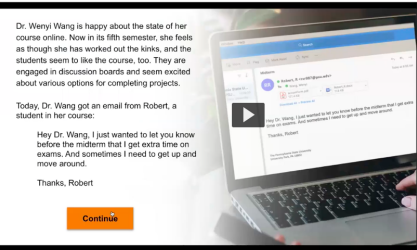
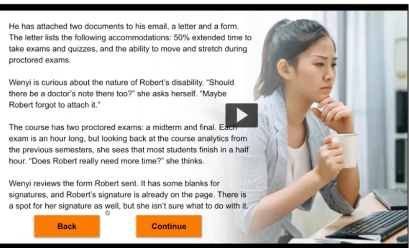
Ten designers specifically discussed engagement as the purpose of making learning content and activities dynamic and interactive. Here is an example from one designer who talked about how the design of interactions in the form of a branching real-life scenario with the use of a web-based tool (Figure 3) makes learning more authentic and more engaging.

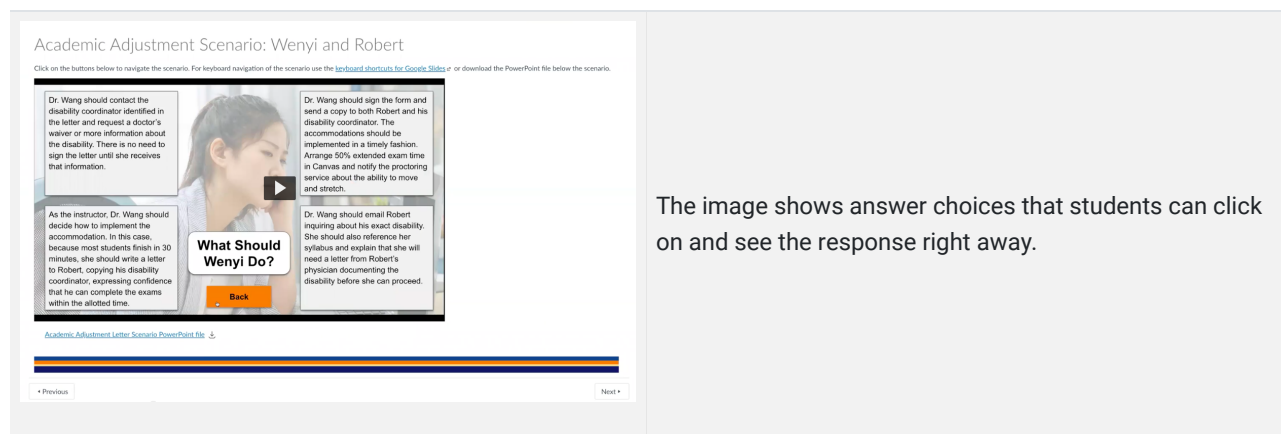
This course has to do with how instructors can best support students through providing necessary accommodations to their students. Instead of providing a list of policies and rules, my goal was to put it in a real-world situation with a series of choices of typical reactions that instructors might have in a given

situation. One of the choices is the recommended course of action. I really wanted to make it relevant to our instructors and interactive through providing choices and consequences of each choice. It's a short scenario, it's simple, it's concise, and it's easy to interact with.

Figure 3

Example of a Simulation as a Branching Scenario with Choices Set Up with the Use of Web-Based Presentation Tool

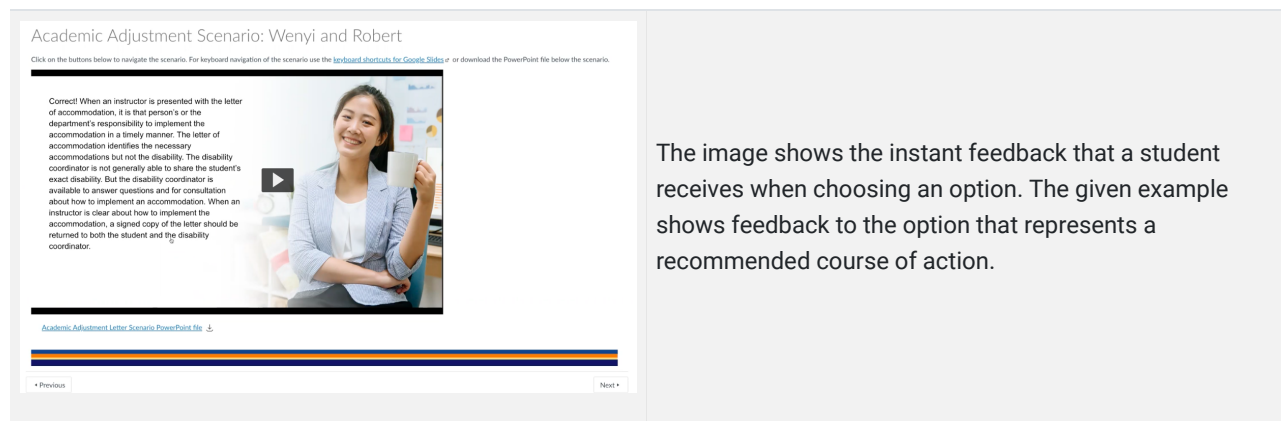
| Images of the object and interactions | Brief description |
|---|--|
| <p>Academic Adjustment Scenario: Wenyi and Robert</p> <p>Click on the buttons below to navigate the scenario. For keyboard navigation of the scenario use the keyboard shortcuts for Google Slides or download the PowerPoint file below the scenario.</p>  <p>Academic Adjustment Letter Scenario PowerPoint file ↓</p> <p>• Previous Next •</p> | <p>The image shows how an embedded presentation with a branching scenario looks like on a course site/an LMS page.</p> |
| <p>Academic Adjustment Scenario: Wenyi and Robert</p> <p>Click on the buttons below to navigate the scenario. For keyboard navigation of the scenario use the keyboard shortcuts for Google Slides or download the PowerPoint file below the scenario.</p>  <p>Academic Adjustment Letter Scenario PowerPoint file ↓</p> <p>• Previous Next •</p> | <p>The image shows how the scenario looks and the “Continue” button to go to the page of answer choices.</p> |
| <p>Academic Adjustment Scenario: Wenyi and Robert</p> <p>Click on the buttons below to navigate the scenario. For keyboard navigation of the scenario use the keyboard shortcuts for Google Slides or download the PowerPoint file below the scenario.</p>  <p>Academic Adjustment Letter Scenario PowerPoint file ↓</p> <p>• Previous Next •</p> | <p>The image shows the continuation of the scenario and navigation option to continue through the scenario.</p> |



The image shows answer choices that students can click on and see the response right away.



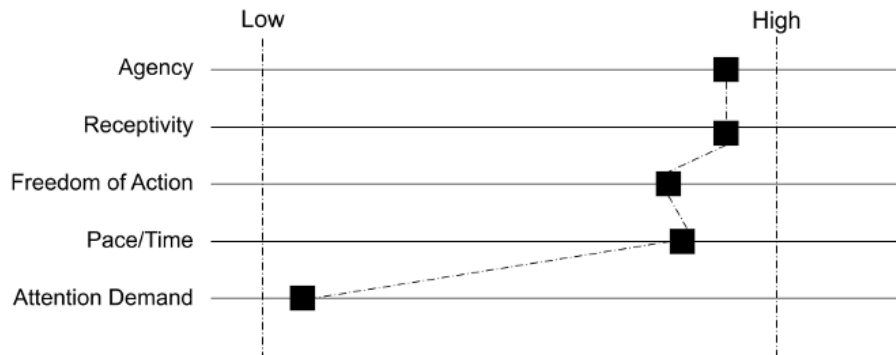
The image to the left is a specific choice that a student can make from the above listed choices of scenario.



The image shows the instant feedback that a student receives when choosing an option. The given example shows feedback to the option that represents a recommended course of action.

Through applying the Window of Interaction framework (see figure 4 for analysis), it was possible to conclude that interactions in this category were characterized by high agency, receptivity, freedom of action, and low attention demand. Such characteristics are understandable because these help students to get engaged in the learning process. Additionally, objects with interactive elements should be intuitive, responsive to one's input, and provide choices within that experience. High freedom of action specifically makes sense when it comes to authentic learning, as scholars have discussed the importance of helping students find their path and have/find voice in their learning (Kreber et al., 2007; Shaffer & Resnick, 1999; Stein et al., 2004; Wald & Harland, 2017). As mentioned above, low attention demand within an object referred to the low demand for human-level interaction so that students can focus on the authentic tasks themselves versus the features of the object. Therefore, from a pedagogical perspective, students need to invest effort and time to complete a specific learning task. However, from a perspective of technology-level interaction, the designers intended to make learning objects as easy as possible to navigate so that students could focus on the content and course-related tasks.

Figure 4



Interaction intent 3: To encourage student-student (human level) interactions

Along with fostering engagement with authentic learning content and tasks, five participants referred to the importance of fostering human-level interactions through computer-level interactions. Essentially, interactions that were embedded into objects, such as the “Comment” option in the discussion board tool, were meant to foster and maintain human-level interaction, such as student-student and student-instructor interactions. The participants specifically referred to the tools that they embedded into authentic learning tasks to stimulate human-level interactions. They referred to specific tools that allowed students to share feedback with each other through video or audio. For instance, in one object, students were asked to record feedback using a voice recording tool on other students’ presentations related to authentic simulation. For this category, the designers demonstrated the tools provided by a learning management system. The study focused on the analysis of interactive elements that the designers created, rather on the default features of technology resources that designers used. Although it was still important to state that the purpose of using default features of technology resources was to encourage human-human level of interactions, the Window of Interaction framework was not applied for analysis of such interactions.

Therefore, this theory afforded a deep analysis of the characteristics of technology artifacts/learning objects and related them to the learning goals that instructional designers had. Further application of this theory in designing artifacts/learning objects could help investigate the intentionality of technology characteristics and their value for the learners, granted the ever-evolving nature of technologies and the realities we live in. Therefore, discovering and applying new tools, such as the use of the Window of Interaction framework, could help instructional design practitioners be more intentional and purposeful with their design.

Why Should Researchers in LDT Consider Using the Theory?

LDT research ought to answer the basic question of the design success or failure of the designed learning objects in establishing interaction. The Window of Interaction framework could be used in LDT research to see how interactive characteristics of specific technology resources are related to learning goals in diverse learning environments. That is, analyzing technology resources and their interactive characteristics, and then relating them to learners’ characteristics and learning goals could make the design process more purposeful, ergo, improving the learning experience.

LDT discipline has recently started to be more accepting of approaches that could expand the repertoire of knowledge and skills related to designing learning experiences, after relying mainly on cognitive/psychological sciences. While knowledge of learning theories and instructional theories is helpful, it is also helpful to be reflective and considerate of a

learning context and the learners themselves. Therefore, discovering and applying new tools, such as the use of the Window of Interaction framework, could help learning/instructional design practitioners be more intentional and purposeful with their design work, toward more rigor and ethically driven processes/outcomes.

Connection Between the Theory and the AECT Mission/Values

The collective quest for designers, scholars, and educators at AECT is to promote scholarship and best practices in the *creation, use, and management of technologies for effective teaching and learning*. In this quest, LDT researchers should rely on all possible and rigorous theories that allow the field to understand better how learning interactions are evolving with technological means, how best to design learning interactions, and in what ways learning experiences in diverse contexts could be improved.

Using the Window of Interaction framework allows LDT researchers to arrive at an appreciation or evaluation of learning objects and determine their interactive qualities. As such, the scholarly efforts deepen our commitment to *excellence, high-quality artifacts, ethical conduct, and social consciousness*.

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