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An Interaction Framework for Open and Distance Learning: Learning Outcomes, Motivation, Satisfaction, and Perception

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ÖZET

Etkileşim terimi, yüzyüze eğitim ortamlarının yanı sıra günümüzde çevrimiçi öğrenme ortamlarının tasarımında sıklıkla duyulmaktadır. Çevrimiçi araçlar farklı etkileşim türlerini barındırmaktadır. Etkileşim üzerine kuramsal çerçeveyi özetlemek, öğrenme ortamları tasarlanırken hangi etkileşim türü için hangi çevrimiçi araçların kullanılması gerektiği bu makalenin amaçlarından biridir. Ayrıca çalışmada, etkileşim ile öğrenme çıktıların ilişkisi, etkileşim ile öğrenen güdülenmesi, memnuniyet ve algı ilişkileri üzerine durulmaktadır. Kuramsal anlamda yeterince bilinen etkileşimin uygulama boyutu, uzaktan eğitim bağlamında tartışılmıştır.

Anahtar kelimeler: etkileşim, e-öğrenme, açık ve uzaktan öğrenme, öğrenme çıktıları

ABSTRACT

Interaction is often heard in the design of online learning environments as well as centuries of educational environments. Online tools have different types of interaction. It is one of the aims of this article to summarize the theoretical framework for interaction, which online tools should be used for which type of interaction while designing learning environments. In addition, the study focuses on the relationship between interaction and learning outcomes, interaction and learning motivation, satisfaction and perception. The practical dimension of the well-known interaction in the theoretical sense is discussed in the context of distance education.

Keywords : interaction, e-learning, open and distance learning, learning outcomes

Introduction

There has been a long history of interaction in any educational settings (e.g., Dewey, 1938; Vygotsky, 1978), yet a relatively new one in distance education (e.g., Anderson & Garrison, 1998; Holmberg, 1983; Moore, 1989; Wagner, 1994). In its earlier times, interaction in distance education was defined by adopting two different approaches; a merely humanistic one as “in a restrictive manner to cover only those activities where the students is in two-way contact with another person (or persons)” (Daniel & Marquis, 1988, p.339), and a more mechanic one as “reciprocal events that require at least two objects and two actions” (Wagner, 1994, p. 8). In an attempt to provide more precise and agreed upon sub meanings for interaction, Moore (1989) drew attention on three types of interaction (learner-learner, learner-content, and learner-instructor). Anderson and Garrison (1998) extended the discussions in distance education literature on these three major types of interaction to the other three types of interaction (instructor-instructor, instructor-content, and content-content). However, nowadays the relatively limited understanding of interaction once accepted in distance education have been replaced with more dynamic and active forms of interaction enhanced with a wide scope of strategies and the latest implications in learning environments including simulations, games, hyperlinks, virtual worlds, discussion boards (Fuller, Kuhne, & Frey, 2011), semantic web, social media, and massive open online courses (MOOCs).

Interaction serves many important purposes in distance education transactions. Mason (1994) has listed benefits of interaction at the affective level as increasing learner motivation and interest in the content; fostering learning in deep; and encouraging critical thinking. Moreover, some studies have shown that high levels of interaction have an effect on increased learner and teacher satisfaction (Keeler, 2006; Kuo, 2014; Su, Bonk, Magjuka, Liu, & Lee, 2005), and motivation (Mahle, 2007). Last, learner-content interaction has been suggested as a critical component specifically in distance education settings (Anderson, 2003). Zimmerman (2012) has supported this by pointing out the importance of the interaction with the course content, that is learner-content interaction, as a contributing factor for the achievement of learning outcomes and course completion.

Interaction, in its all forms, can be perceived as an effective way to promote distance education (Su et al., 2005). Therefore, this paper attempts to provide an insight into the theoretical frameworks, definitions, types as well as classifications of interaction in distance education contexts, on which there has been a continuous debate for years, yet no compromise at all.

Interaction in Education

Shale and Garrison (1990) state "in its most fundamental form education is an interaction among teacher, learner and subject content." Sewart (1982) proposes that all educational transactions lie somewhere on an interaction continuum, with learner-instructor interaction at

one end and learner-content interaction at the other. Interactions between instructor and learners and interactions among learners provide opportunities for an educational transaction. Without interaction, teaching becomes simply "passing on content as if it were dogmatic truth," and the cycle of knowledge acquisition-critical evaluation-knowledge validation is nonexistent (Shale & Garrison, 1990, p. 29). It is possible to see the different dimensions of interactions according to extents of the studies and perspectives (Yüzer, 2013).

Interaction in Traditional Face-to-face Educational Setting

As the key role that communication plays in traditional classroom settings has been noted since the emergence of communicative approaches in the 1980s (Richards & Rodgers, 2001), the key role of learning situations that are likely to promote communication have been emphasized to enhance a fruitful interaction. As previously explained, interaction, in the most general sense, is the collaborative exchange of information, opinions, or feelings between two or more people, and it creates an effect on all the parties engaged in (Brown, 2001). Therefore, it would be sensible to say that interaction is an indispensable part of classroom pedagogy because learners are always involved in the exchange of information, feelings, and opinions among themselves, or with the teacher. Actually, if no interaction takes place in the classroom at all, a teacher cannot claim that a lesson has been carried out.

Interaction brings along negotiation, which refers to coming to an agreement in order to make decisions. In a classroom, it is normal to witness occasions in which meaning is obscure or ambiguous between the teacher and learners or between learners and other learners. In these occasions, the teacher or the learner change what they say to be understandable to the others in the classroom (Hedge, 2000). In other words, negotiation takes place to comprehend, clarify or confirm the meaning. This way, disputes or misunderstandings are dismissed, opportunities that allow for achieving the outcomes of the lesson are created and learners are enabled to advance more smoothly in their learning paths.

Endowing learners with various benefits, interaction is a major concern of teachers who try to find ways to generate and maintain an interactive atmosphere in their classrooms for a more effective learning process. However, it can be a big challenge to create this interactive atmosphere, thus it is important to employ the right methods, tasks, practices or activities to fulfill the goals set for the lesson. When a teacher aims at giving instructions and explanations, he may prefer whole-class teaching technique, which employs teacher-learner interaction. It is timesaving, and easy to conduct in terms of organization and material production (Harmer, 2004). On the other hand, when the teacher wants to act as a facilitator or guide in an activity or task, he may go for pair work or group work, which are full of learner-learner interaction. Examples of activities that are held as pair work or group work include role-play, drama, project work, discussion, debate, and information gap activity. These activities are learner-centered, learners have more opportunities to be actively involved in their own learning, and their levels of autonomy increases while their anxiety decreases, creating a positive classroom

atmosphere (Brown, 2001).

Interaction in Distance Education Setting

With the advent of Internet, and people becoming more and more reliant on technology, it has been natural to integrate technology in teaching and learning, thus leading to the emergence of distance education settings. One very important thing to note here is that online learning has its own unique properties though it shares some common features with traditional face-to-face learning when it comes to interaction.

To start with, learners mainly study the course content on their own in distance education settings in contrast to traditional classrooms where there is always a teacher to guide learners through the content. Therefore, it is essential to focus on the clarity of course design in distance education settings to enrich learner-content interaction (Swan, 2001). When course content is well-structured taking the needs and interests of learners, the learners can be more interactive with the content, which, in turn, contributes to achievement of learners. Bernard and colleagues (2009) also claims that student-content interaction is more related with achievement in asynchronous distance education courses than asynchronous or face-to-face interaction.

Another feature of distance education settings is that learners miss out physically interacting with other learners in an online course, and this may negatively affect the learning process (Beard & Harper, 2002). To compensate for lack of face-to-face interaction among learners, platforms such as discussion boards or forums that enable learners to interact with each other must be included in online courses. Through these platforms, learners can discuss a subject and comment on each other's ideas, thus get the benefits of learner-learner interaction.

Besides learner-content and learner-learner interaction, learner-instructor interaction is also different in distance education settings. Instructors are available in person to explain, discuss, clarify, and give feedback to learners in a regular classroom while instructors interact with learners through giving written feedback to assignments, e-mail communication, or participating in discussions in an online course. Instructors' presence in a web-based course gains utmost importance since learner-instructor interaction plays a key role on comprehension of the course content and contributes to course performance (Thurmond, & Wambach, 2004b).

Up to now, three main interaction types in distance education settings have been addressed in comparison with traditional face-to-face educational settings. There is, however, another interaction type, which is more frequently observed in online learning: learner-interface interaction. This interaction type, which refers to the interaction between the learner and the technologies employed to deliver instruction, is closely linked to the learners' computer

experience, perceptions about technology, and access to technology (Thurmond, & Wambach, 2004b). Good command of computer skills, familiarity with the technology used, and adequate access to computers and Internet can increase learning in online environments whereas the opposite scenario can serve as a barrier to learning for learners.

To conclude, interaction in traditional face-to-face educational settings is unquestionably different from the interaction, which occurs in distance education settings. Even though some research findings (e.g., Smith, 1996) show learners may prefer traditional face-to-face courses than the distance education courses, for they believe more interaction is present in face-to-face courses, distance education courses actually can foster more interaction than traditional courses, providing more personal and timely feedback to learners (Hirumi & Bermudez, 1996; Horn, 1994).

Definitions and Foundations of Interaction

It's important to understand the concept of interaction before dealing with its roles and functions in education in general. To date, there have been an abundance of studies in literature attempting to provide a well-accepted definition for interaction. Wagner (1984), in its broadest sense, has defined interaction as “reciprocal events that require at least two objects and two actions” (p. 8). Wagner’s definition has been the focus of many related studies (Anderson, 2003; Bernard et al., 2009; Mishra, and Juwah, 2006; Vrasidas, 2000; Yüzer, 2012) as she argues that interaction occurs only when these objects and events mutually influence one another. In another definition, Parker (1999) has focused on the actors of interaction, “the level of involvement by participants in an instructional experience”, as well as the situational factors it depends, and later she described interaction as “an active learning which can be as simple as pushing the play button on the VCR” (p.14).

Rose (1999), on the other hand, has pointed out to the complex nature of interaction by introducing it as “a fragmented, inconsistent, and rather messy notion” (p. 48) particularly in the area of instructional technology, and attributed the reason to the fact that it is generally used interchangeably with the term interactivity by many researchers (e.g.; Chou, 2003; Sims, 1997, 2000; Wagner, 1997). In her study conducted in 1997, Wagner stated that there are several distinctions between interaction and interactivity—interaction focuses on behaviors among individuals and groups, but interactivity rather focuses on technology systems employed in educational practices. However, she has also stated that these distinctions don’t matter at all, so there is no harm to use the terms interaction and interactivity interchangeably. Anderson (2003) has supported her claim by introducing interactivity as a derivative term of interaction. In general, technological developments have shown that interactivity is a required element for interaction.

Interaction has also been valuable in distance education settings, which involves highly interactive environments. Moore (1989) has stated that interaction is very important in the

design of distance education and introduced three types of interaction, which are learner-learner, learner-content, and learner-instructor. Like Moore, many other leading researchers in the field of distance education have referred interaction in their studies. For example, Wagner (1994) has drawn attention to real-time interaction in distance education and the importance of learning and teaching theory in design of interaction. Furthermore, Moore and Anderson (2003) have pointed out the importance of interaction in distance education by arguing that all kinds of research studies investigating interaction are critical for and welcomed in distance education because most of the distance education practices are not *evidence-based*, and actions and instructional designs in distance education are generally based on presumptions on the value of modes of interaction. Garrison and Cleveland-Innes (2005, p.135), similarly, stated, “to appreciate interaction and the quality of learning outcomes, one must understand how cognitive, social, and teaching presence come together to create a purposeful community of inquiry.” On the other hand, Thurmond and Wombach (2004a) considered this issue from a different perspective and provided an insight into the content-driven goal of interaction in distance education offering a definition as “the learner’s engagement with the course content, other learners, the instructor, and the technological medium used in the course” (p. 4). Furthermore, they argue that “the goal of interaction is to increase understanding of the course content or mastery of the defined goals” (p. 4). Behind the classical view, it is possible to see different types of interaction for elearning. For example, Hirumi (2006) describes a framework that contains interaction between learner-instruction and learner-self. According to the Hirumi, learner-self interactions contains cognitive operations about metacognitive process and learner-instruction interactions are about the defining elearning strategy (p. 48). Wanstreet (2006) also examined literature related with construction of interaction in distance education and educational technology. She discussed framework under three heading: interaction as an instructional exchange, interaction as communication facilitated by networks of computers and, interaction as a social and psychological connection that fosters learning as problem solving (p. 403). Thereby, it seems that in the future, interaction will be a necessity not only for the theory but also for the design of distance education practices.

Considering the available discussions on the definitions of interaction, it can be seen that the core of interaction is the learner. Markwood and Johnstone (1994, p.94) have stated, “interaction is the silent, critical, creative conversation within the learner's mind that is spurred and supported by the learning environment.” For this reason, interaction, which is critical to distance education, ought to be dependent on the needs of the learner. As a result, we can define interaction as a way that leads knowledge to the touch of learner or a way that helps learner to reach knowledge via the content by himself.

Types of Interaction

In an editorial released in 1989, Moore suggested three types of interaction, as he believed without revealing sub-meanings of interaction, its description would be insufficient. These interactions are classified as *learner - instructor*, *learner - content*, and *learner - learner*. However, departing from the remarkable developments on and the fast proliferation of the technology, Hillman, Willis, and Gunawardena (1994) added a fourth type of interaction- *learner-interface*- to the distance education literature and described this as the interaction that occurs between a learner and a technological medium.

Learner – Instructor Interaction: According to Moore (1989), in learner- instructor interaction the instructor aims "to stimulate or at least maintain the student's interest in what is to be taught, to motivate the student to learn to enhance and maintain the learner's interest, including self-direction and self-motivation" (p. 2). Booher and Seiler (1982) put forward the importance of learner – instructor interaction by saying that avoiding the learning-instructor interaction could harm the learner's academic achievement. Although the notion of learner - instructor interaction is mostly associated with traditional face-to-face education contexts, learners of distance education have also the opportunity of learner-instructor interaction synchronously and/or asynchronously. Prior to the Internet, this type of interaction used to occur through the postal service and the telephone. Today, it is possible to maintain it via various communication technologies such as email, bulletin boards, message boards, discussion forums, Listservs, and videoconferences, though (Shearer, 2013).

Learner – Content Interaction: Learner - content is the type of interaction, specifically implemented in distance education, since distant learners are mostly supposed to study on their own. Moore (1989) defines learner - content interaction as "the process of intellectually interacting with content that results in changes in the learner's understanding, the learner's perspective, or the cognitive structures of the learner's mind" (p. 2). Learner - content interaction involves the components that enable learners to study independently. Bernard et al. (2009) has exemplified these components like below (p. 1248):

- Reading informational texts,
- Using study guides,
- Watching videos,
- Interacting with computer-based multimedia,
- Using simulations or using cognitive support software (e.g., statistical software),
- Searching for information,
- Completing assignments,
- Working on projects

Learner – Learner Interaction: Learners interact not only with the instructor or the content, but also with the other learners. For most instructors teaching online, learner – learner interaction stimulates deep learning by enabling learners to build online learning communities, analyze course content, share ideas, as well as develop critical thinking skills (Fuller, 2011). In this respect, Moore (1989) describes learner - learner interaction as an “inter-learner interaction between one learner and other learners, alone or in group settings, with or without the real-time presence of an instructor” (p. 4). As in learner-instructor interaction, whereas it was difficult to maintain learner-learner interaction in distance education practices prior to the Internet, now within the web-based courses asynchronous and synchronous online learning components have been commonly utilized (Bernard et al., 2009).

Learner – Interface Interaction: The learners interact not only with the source of content, but also with the medium through which they reach the content. The first three types of interaction, which are learner- instructor, learner- content, and learner- learner, are also seen in traditional face-to-face educational settings. Although Hillman, Willis, and Gunawardena (1994) argued that the fourth type of interaction, that is learner- interface interaction has been peculiar to online courses in the 1990s, it has growingly been observed in face-to-face learning environments as well. Learner-interface interaction is the manipulation process of various tools to achieve a task which eventually enables the learners to reach knowledge by using their senses in order to save information in sensory systems (Martin, Parker, & Deale, 2012).

From these aforementioned types of interactions, learner- instructor, learner- content, and learner- learner interactions are present both in traditional face-to-face education and distance education settings. Anderson claims with his theory *interaction equivalency* that in distance education context, it is possible to maintain only one of interaction type at high level rather than keeping all types of interaction at the same high level (Anderson, 2003). So one of these interaction types can be developed particularly for different situations and educational needs. Murray, Pérez, Geist, and Hedrick (2013) have studied these three types of interactions within the context of face-to-face, blended, and online practices (See Figure 1).

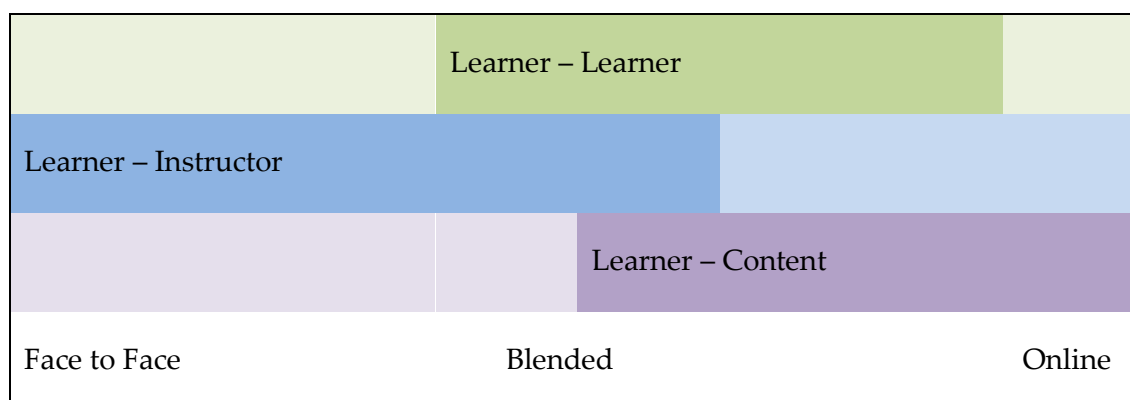


Figure 1. Delivery mode and interaction type. Adapted from “Murray, M., Pérez, J. Geist, D. and Hedrick, A. (2013). Student interaction with content in online and hybrid courses: Leading horses to the proverbial water. *Informing Science*, 16(1), 99–115”.

As it can be seen in Figure 1, all these three types of interactions play a role in delivery methods ranging from face-to-face to online. However, each type of interaction seems appropriate for a particular delivery mode. To illustrate; learner- instructor interaction serves better in traditional face to face settings while learner- content interaction is more dominant in distance education settings. On the other hand, learner-learner interaction doesn't fit to any particular delivery mode; instead, it serves well in every delivery mode. Similarly, in blended learning each type of interaction plays an equally important role.

Fostering interaction with the course content can be regarded as a valuable strategy and an effective method to meet the demands of distance education. According to the interaction-based online learning model put forward by Anderson (2003), distant learners may prefer learning either by the help of instructors or by web-based components including search & retrieval, tutorials, simulations & games, virtual labs, and e-books, each of which enable them to reach the content directly and study independently (See Figure 2).

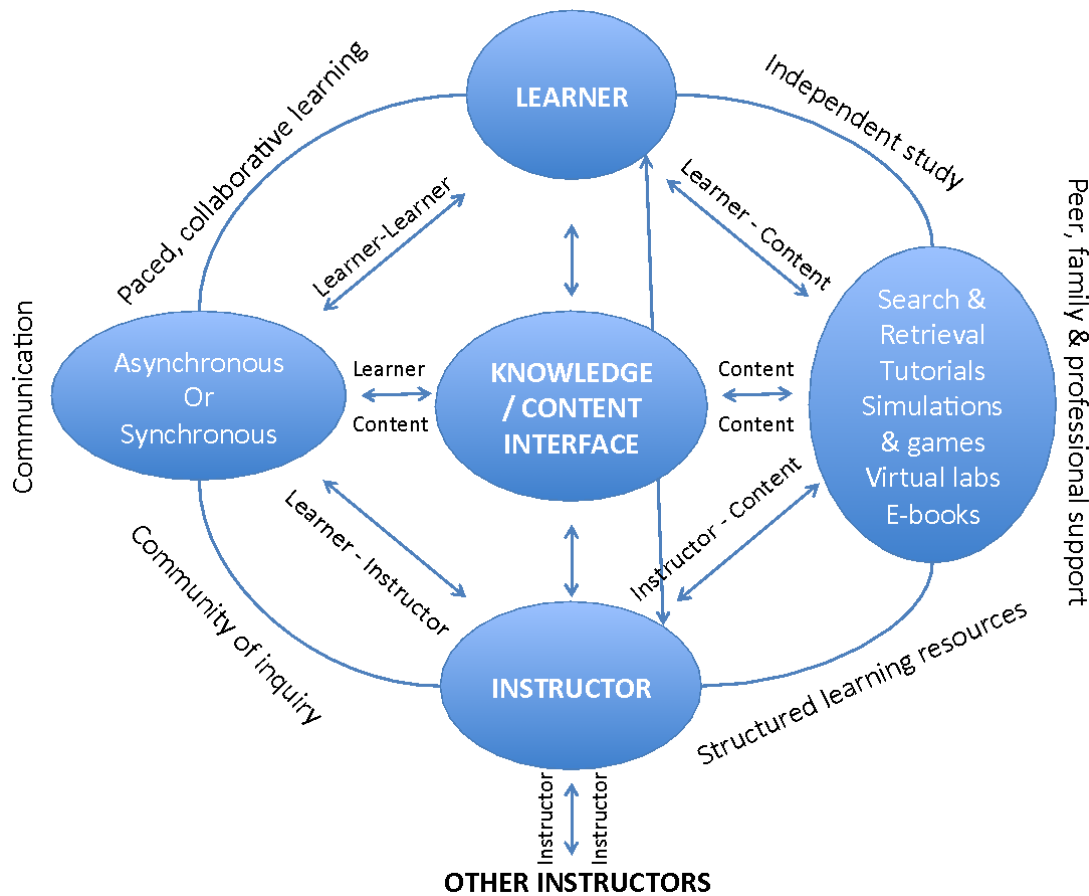


Figure 2. A model of online learning, showing types of interaction. Adapted from "Toward a Theory of Online Learning," by T. Anderson, 2004, in T. Anderson and F. Elloumi (Eds.), *The Theory and Practice of Online Learning* (p. 49), Athabasca, Canada: Athabasca University. Reproduced under a Creative Commons license.

Figure 2 refers to learners and instructors' interaction with each other and with the content. According to Anderson and Garrison (1998), networked world requires new roles, so interaction has six modes, which are learner-learner, content-content, instructor-instructor, learner-instructor, instructor-content and learner-content. Parallel to this model, Anderson (2003) asserts, in most future distance education scenarios, learner- instructor interaction will be decreasing in amount while learner-learner and learner-content interaction will be gaining more importance and substituting it. Additionally, Hirumi (2006) adds three interaction types named learner-others, learner-tool, and learner-environment. Learners can interact outside of other learners and instructors such as technicians, subject matter experts, and librarians. In learner-tool interaction type, learners may use other tools (for example microphone) to complete tasks about learning. Planning of instruction should consider the use of these tools. Learner-environment interactions are related about the location of learner. Learners may travel different locations to complete the activities (p. 52).

In the last decade it can be seen that these types of interactions develop with the sensory systems of mobile devices. For example, light, pressure, angle, temperature and location data can be accessible with these devices. Special applications and educational software can use these data and interact with environment. This situation adds new interaction types as “environment-tool and environment-content” that can affect learner and/or software (Erdogdu, 2016).

Classifications of Interaction in Distance Education Context

Implementing a variety of interaction activities, most distance education institutions try to engage learners in deep understanding by involving them in meaningful learning practices during their teaching processes. It is a fact that in the medium of distance education, activities, dimensions, functions, and the other components of online learning including the concept of interaction must be used distinctively from traditional face-to-face education. Especially, during the online learning material design and production processes, identifying appropriate activities within the context of interaction types holds a big importance. As can be seen in Table 1, Chou (2003) builds a framework by classifying interactive functions in online learning with respect to different interaction types.

Table 1. *The Framework for Interaction Types and Interactive Functions in Online Learning.*

Types of Interaction	Interactive Functions in Online Learning
Learner – Interface	Fixed-frame (menu) design Online registration Grade status tracking Assignment completion tracking Keyword search Software downloading Site map Database search Online problem diagnostics
Learner – Content	Frequently-asked-questions (FAQ) Links to related educational sites Links to related learning materials Multimedia presentation (text, graphics, animation, audio etc) User guidance on system On-line quiz for self-evaluation Push media On-line help on content Learner contributing to learning materials Individualized learning database Individualized instruction Difficult Individualized test/quiz Study guidance Jokes Sweepstakes Educational games
Learner – Instructor	Email to instructors Email to Web master Bulletin board systems (BBSs) Chatrooms Comments on the sites, course, instructor, etc. Online survey Online voting
Learner – Learner	Email to other learners Bulletin board systems (BBSs) Chatrooms Class roster

Table 1. The Framework for Interaction Types and Interactive Functions in Online Learning. Adapted from Chou, C. (2003). Interactivity and interactive functions in web-based learning systems: A technical framework for designers. *British Journal of Educational Technology*, 34(3), 265–279.

From these interaction types shown in Table 1, learner-content interaction without doubt can be identified as the most fundamental one on which all online learning is based (Vrasidas, 2000; Anderson, 2003). In other words, efficacy, efficiency and attraction of distance education systems can be achieved by the practice of efficient learner-content interaction through appropriate activities.

Apart from interaction types, there are also some other classifications of interaction such as interaction taxonomy (Schwier & Misanchuk, 1993), interaction levels (Sims, 1997), categories of interaction (Stouppe, 1998), and types of content interaction (Shank, 2003) (See Table 2).

Table 2. *Classifications of Interaction*

Taxonomy of Interactivity (Schwier & Misanchuk, 1993)	Levels of Interactivity (Sims, 1997)	Categories of Learner-Content Interaction (Stouppe, 1998)	Types of Content Interaction (Shank, 2003)
Levels • Reactive • Proactive • Mutual Functions • Confirmation • Pacing • Navigation • Inquiry • Elaboration Transactions • Keyboard • Touch Panel • Pointing Device • Voice	Levels • Object • Linear • Hierarchical • Support • Update • Construct • Reflective • Simulation • Hyperlinked • Non-Immersive Contextual • Immersive Virtual	Enriching interactions • pop-ups • hot-words • links • forward and back buttons Supportive interactions • zoom functions • moveable ruler bars • calculators • orientation/perspective controls • search and query functions Conveyance interactions • questions • simulations • games • what-if activities • process decision points Constructive interactions	• Multiple choice quizzes • True/false quizzes • Click on object or text to reveal more information (glossary — explanations) • Hypertext links to other pages inside the course or program • Hypertext links to resources outside the course or program • Tutorials (step-by-step) • Drag and drop • Navigational choices (choice of path and sequence of information) • Application simulations (software demos or try-it simulation) • Process simulations (realistic case studies — immersion exercises) • Fill in the blank • Self-reflection questions (Why do you think that...? Have you considered...?) • Games • Offline/field work (i.e. watch task, try program, offline labs) • Note taking/journals • Simulated people (ask the expert)

		• building mental maps • knowledge trees • organization charts	
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All in all, it is essential to decide which interaction type/s to use on the basis of learning environments, objectives, and learners' needs and interests. In an online learning setting in which the intended learning group is composed of independent learners, it would be wise to foster more learner-content interaction on behalf of supporting and enriching content specific interaction.

The Relationship Between Interaction and Learning Outcomes

Instructional design has a great impact on student achievement (Hirumi, 2002), and "the best way to design instruction is to work backwards from its expected outcomes" (Gagné, Briggs & Wager 1988, p. 39). In this respect, it will provide a more systematic approach to an online course design to construct learner-content interaction in regard to learning outcomes, since implementing various types of learner-content interaction activities will eventually play an important role in the achievement of predetermined learning outcomes.

Learning outcomes have been classified by educational psychologists such as Bloom (1956) and Gagne (1984). Bloom's taxonomy of educational objectives consists of six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. On the other hand, Gagne defines five varieties of learning outcomes. These categories are: intellectual skills (procedural knowledge), verbal information (declarative knowledge), cognitive strategies (executive control processes), motor skills, and attitudes. When it comes to the instructional design, these both classifications can be given as an established framework (Moore & Kearsley, 2005) that helps teachers and course designers to determine how to use different learner-content interaction activities to support distance education courses (Dunlap, Sobel, & Sands, 2007).

To illustrate, in his study, Govindasamy (2002) identifies pedagogical principles underlying online teaching and learning activities referring to Bloom's taxonomy. At the end of his study, from five different teaching and learning activities including multiple-choice questions, text entry, matching, case studies, and simulation, he proposes multiple-choice questions as the only type of activity that meets all the six levels of the Bloom's taxonomy.

Similarly, departing from the gap in the literature on learner-content interaction, Dunlap, Sobel and Sands (2007) have developed their own taxonomy of strategies for online courses by designing appropriate learner-content interaction and using Bloom's taxonomy. Ertmer, Sadaf, and Ertmer (2011) have dug a bit into deeper and examined the relationship among question types and levels as well as learner-content interactions in distance education settings

by using learning activities at every level of Bloom's taxonomy. At the end, they have pointed out the importance of using different question types to target different learning outcomes.

Gagne's works have also been a source of research in distance education course designs. In their study, Fuller, Kuhne, and Frey (2011) have stated that some of Gagne's guidelines can be applied as metacognitive strategies. Specifically, Gagne's Nine Event of Instruction helps instructors and instructional designers to develop the course content. Similarly, Uden and Campion (2000) have suggested Gagne's Nine Event of Instruction as a framework for the development of educational multimedia applications in online environments. What is more, Dooley, Linder, & Dooley (2002) have focused on the relationship between interaction and Gagne's nine events of instruction, and associated each of these events with different types of interactions.

While various research studies have been conducted to reveal the connection between interaction in online environments and Bloom's taxonomy as well as Gagne's nine events of instruction, to our knowledge, so far no research has been done to identify the role of learner-content interaction activities on achieving Gagne's learning outcomes. So more empirical study is needed to optimize the design online interactions parallel with expected learning outcomes (Hirumi, 2002; Thurmond & Wambach, 2004b).

The Relationship Between Interaction and Learner Motivation, Satisfaction, and Perception

The role and importance of learner motivation, satisfaction and perception have been a great interest for many researchers from different disciplines such as educational psychology and cognitive psychology in which human behavior and learning are of primary concern (Gabillon, 2005). To Hirumi (2002), these three constructs also play an important role in online instructional design, so as an integral part of distance education key interaction activities that influence learner perceptions must be carefully designed and delivered.

Besides, learner motivation, satisfaction and perception are seen as important constructs to be researched since they all have an immediate impact on learning behavior. Gilbert and Moore (1998) distinguish between instructional interactivity and social interactivity, and from these two; social aspects register on measures of attitude and course satisfaction. In line with this, Yacci (2000) has drawn attention on the importance of interaction in distance education to promote social presence and satisfaction. Kuo (2014), has supported this claim by suggesting learner-content interaction as the primary predictor of student satisfaction departing from the positive correlation she found between satisfaction and learner-content interaction at the end of her research that investigated student interaction, satisfaction, and performance in online learning environments by using a questionnaire titled Interaction and Learning Effectiveness. Mahle (2007), in a quasi-experimental study, examined the effects of 3 levels of interactivity (low, medium, and high) on achievement and motivation of college students in a Web-based

course and reported that there were increased levels of motivation and achievement in the medium-interaction and high-interaction groups, but there were no significant differences on level of motivation of the reactive and proactive groups. Furthermore, in a mixed method study, Ke and Kwak (2013) investigated online interaction participation, perception, and satisfaction across learners from varied ages and ethnicity groups, by using structural equation modeling, stated that it is crucial to consider these three constructs while designing multicultural online courses.

As it can be seen, while evaluating any activity, learners refer to their own perceptions and satisfactions. Therefore, while implementing online interactions in distance education, especially learner-content interaction activities, it is a good idea to consider learner motivation, satisfaction, and perception, for these three subsequently may contribute to the academic performance- that is achievement of the expected learning outcomes.

Conclusion

Interaction has recently been a source of inquiry as well as a focal point in discussions in the field of distance education. These ongoing discussions have brought a number of research studies along. Notwithstanding, most of these studies have been refined to the mere discussions of the definitions and types of interaction, which have resulted in a pile of definitions and classifications at the end. We argue that it will be wise to have a compromise on the conceptual understandings of interaction including its definitions and classifications to be able to provide a solid ground for the future research, which will intend to focus on more practical issues of interaction in distance education settings. Furthermore, it is observed that most of distance education practices have revolved around specifically two types of interaction in the past decade, which are learner-content and learner-interface interaction. Departing from the dearth of current research on these types of interaction, more research studies should be conducted about their impact on learner performance and satisfaction. Consequently, if the medium of the action is the teacher (Dewey, 1938) or the student the medium of the message is the interaction, so this makes interaction a worthwhile topic to investigate in any educational settings, including the distance education setting.

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