AN INSTRUMENTAL CASE STUDY IN INSTRUCTIONAL DESIGN: INTEGRATING DIGITAL MEDIA OBJECTS IN ALIGNMENT WITH CURRICULUM CONTENT IN THE ONLINE HIGHER EDUCATION COURSE

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Abstract

Research has shown that there is an upsurge in the demand for online courses and programs in higher education. The literature indicates that a growing trend in online education is the need for more interactive, accessible, and engaging content – hence, these are important precepts in course design. The literature also reveals that public higher education institutions offer the most online courses in the United States. The purpose of this study was to explore how instructional designers integrate digital media objects (DMOs) in alignment with curriculum content in the online higher education course. The method of instrumental case study was used to guide the researcher in qualitative inquiry, data collection, and analysis. Five senior instructional designer participants working in public higher education sites in different regions of Massachusetts were interviewed about their instructional design process for online courses. The main findings emphasize the importance of using current course design standards in the course design process to include Quality Matters Course Design Standards and Universal Design for Learning. Specifically, the case findings depict how all participants used course design standards to aid in the integration and alignment of digital media objects (DMOs) with curriculum content. These findings illustrate how participants consider the use of QM and UDL effective in producing more accessible, quality content expected by today's digital learners and adopted by stakeholders. Another finding indicates that the use of modern technology and software tools provide a means for upholding the digital currency and compatibility of digital content. The participants regard collaborative course design and related development efforts among SME/faculty, digital media developers, and instructional designers, an important component of purposeful and creative course design strategy in addition to utilizing standards from the course design strategy. All participants agree current and future trends draw on learner-centered design solutions, such as Design Thinking and UDL. An Interactive eLearning (IeL) model is offered as a possible guide

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for course design. An online design form for collaborative course design and development efforts is an adaptable sample. Future research topics could explore how learner-centered UX (user experience) or UI (user interaction) web design methods may support online course design, DMO/OERs as instructional tools for their efficacy by QM standards for online course design, or instructional designer staff budgeting issues and related plans for under-resourced institutions of higher education.

Keywords: instructional design, online course, integration, alignment, digital media objects (DMOs), Open Ed Resources (OERs), interaction, accessibility, Quality Matters (QM), Universal Design for Learning (UDL), Design Thinking, learner-centered.

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Dedication

This work is dedicated to my incredible family for their constant faith and support. I am thankful to my oldest, my son Chris, and daughter L. Nicole, for being yourselves. You have always known that I am proud of you for the very smart, nice adults you are. I am also extremely proud of you for staying true to yourselves by persevering for what you strive for in your lives while remaining your happy and kind selves. Perfection would be if an empty nest were not inevitable. Since friends are like family to us, I traveled this journey with a lot of cheering on from the best long-term friendships I know with Nadia, Margo, and Carolyn. I admire them for their strength and grace, and I am thankful for their loyalty. A thankful nod also goes to the cats sharing my home, Lenny and Belle, who have been enduring many nights of my computer use, monitoring my efforts intently, and for the convenience they afforded by being reliably nocturnal.

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Chapter 1: Introduction

The purpose of this study was to explore how instructional designers integrate digital media objects (DMOs) in alignment with curriculum content in online higher education courses. The study addressed a timely issue in online course design, spurred by the unrelenting demand for more online courses in higher education, as well as to heed the call from leaders and scholars in academe for the integration of digital media objects and interaction within online courses. Instructional Designers make use of electronic (digital) media objects (DMOs) and information technology tools in the design of instructional content for online higher education courses. Developments in Internet and multimedia technologies are the basic enablers of online learning, and one of the required skills in our current era of technological literacy (Pavel et al, 2015, p 707). The term 'ID' is to mean Instructional Design and Technology (Reiser, 2007). In the field of instructional design there are two domains: scholars and practitioners.

Instructional design and technology professionals implement systematic instructional design procedures, integrating instructional media to accomplish their goals (Reiser, 2007, p 5). Toward this end, the point of issue and the aim of the main inquiry guiding this instrumental case study in ID was to explore how instructional designers are integrating digital media objects in alignment with curriculum content in the online higher education course. This phenomenon was best explored through an instrumental case study centered on the instructional design of the online course. Merriam (2001) recognized case study as being particularistic, descriptive, and heuristic. Stake (2003) implied that the instrumental case uses a study of one case to gain insights into a particular phenomenon where there is also an expectation that learning can be used to generalize or develop (or extend) theory. There is likely to be a specified question, or a set of predetermined criteria, or a theory which is being explored and tested through the case

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study, per Stake (2003). Research for this instrumental case study was explored primarily through interview questions. As Yin (2003) emphasized for the sake of clarity, the purpose of the single case study is to expand and generate theory as analytical generalization, as opposed to proving theory or statistical generalization, and that case study is an exploratory tool.

This chapter begins with an overview of the context and background of the problem of practice in instructional design (ID), as context is central to a case study. A discussion of the rationale and significance of this study follows. The research problem, statement of purpose, and the central research question of this case study are followed by definitions of important terms. The chapter concludes by discussing Merrill's instructional transaction theory (ITT) framework, the theoretical lens that guided this study.

Context and Background

Online courses have been in persistent demand in higher education over the last 16 years in the United States. Enrollment in online courses has grown considerably, and academic directors and officers have realized that the number of students taking online courses will continue to rise steadily (Allen & Seaman, 2018). The number of students who enrolled in at least one online course rose by 5.6% between fall 2015 and fall 2016, a faster rate than in the previous three years, revealing the proportion of higher education students taking one or more online courses is at a record high of 33.5 percent (p. 4). According to the Center for Online Education, 33% of college students are taking at least one online course, revealing a 2% increase from 2016 (Baule, 2018). In fact, 90 percent of higher education administrators expect that most college students will be taking at least one online course within the next five years as the number of institutions reporting online education is not critical to their long-term strategy has dropped to a new low of 9.7 percent (Allen & Seaman, p. 3). Also, higher education courses or programs are

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offered solely online, even by larger, public universities (Baule, p. 18). Also, key report findings for the 13th annual report of the state of online learning in U.S. Higher education state that public institutions command the largest portion of distance education students, with 72.7 percent of all undergraduate and 38.7 percent of all graduate-level distance students (Chmura, M., 2016). This multi-year trend shows growth in online enrollments continues to outpace overall higher-ed enrollments, according to these survey findings conducted by the Babson Survey Research Group in partnership with the Online Learning Consortium (OLC), Pearson, StudyPortals, WCET and Tyton Partners (2016, p. 1).

U.S. leaders in academe consider online education critical to the long-term growth of higher education institutions as they identified that the upsurge in demand for online course offerings surpasses face-to-face course delivery, according to Kuo et al. (2013, p. 16). Moreover, two-thirds of academic leaders in the U.S. believe future online courses will 'likely' or 'very likely' include ample interactive components, also known as *digital objects*, to make substantial use of multimedia-rich elements and include digital media objects in self-directed or self-paced applications (Allen & Seaman, 2018). The same study by Kuo, Walker, Bell, and Schroder (2013) established that student-content interaction was the major distinction in student satisfaction out of any kind of interaction in online courses. Specifically, the greatest marker among significant predictors of student satisfaction with online higher education courses was student-content interaction (Kuo et al, 2013, p. 39).

In view of the appeal for integrating DMOs as interactive instructional content, Yue et al, (2013), referred to Betrancourt (2005), who held that with self-paced instructional content, learners may cognitively process text, compare it with a narration, view an animation, and amply assimilate all of these information sources (p. 274). It was expected that the use of such

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multimedia materials (DMOs) as a means of instruction in online courses was expected to increase. It was also deemed critical that the design of instructional materials be integrated in a way that blends text, narration, as well as on-screen animations in a maximally effective way (Yue et al, 2013, p. 275).

Although the wave of online course offerings continues to rise, design issues often thwart the goals of students and instructors alike (Crews et al, 2017). Consequently, instructional designers are charged with meeting the substantial demand for online course content with interactive DMOs. Instructional designers and instructional technologists are in high demand as institutions are turning to them to provide media-rich learning solutions (Jordan, 2019).

Instructional designers may strive to use a course design process to integrate media-rich digital objects aligned with online course content to support interactivity. Interactivity facilitates connections students make from the collection of digital media as instructional components integrated with curriculum content in online courses, which aids in attaining course goals. Moreover, multimedia objects are integrated into course current when some instructional methods do not effectively attain the learning objectives (Frey & Sutton, 2010). Hence, digital media objects and the content interactions they provide must be integrated in alignment with the course objectives that institutions set for their students.

Nevertheless, a common problem has been that ID practices may not include directly connecting media objects to course curriculum, and instead merely inserts the DMOs into online course content. This is important because transactional content should be connected with what is being learned and courses need to be designed from sound design strategy. This alignment has yet to be ascertained by ID trends or by the literature of research for instructional design.

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One such ID trend is instituting and implementing the Quality Matters (QM) standards in the ID process. QM course activities and learner interaction seek to confirm whether activities and interactions further the attainment of the learning objectives based upon the interactions with online course content through digital objects (Crews, 2017). The demand for integrating digital media objects with online course content via an instructional design process also drove this study. While the current literature has been insufficient, this study explored improved ID efficacy in the design process as a means of improving instructional alignment in the design of the online course.

Morrison and Anglin (2009) noted the rapid propagation of online courses and of shareable digital objects in course content, but instructional designers need a way to determine whether existing online courses and sharable content objects are well designed, otherwise these online courses will be merely a collection of posted information, or *shovelware* (Morrison & Anglin, 2009). Such courses often include a vast array of information, yet they are not instructionally sound.

Faculty do not know how to integrate digital media objects in the design of their online course themselves as the literature indicates. Rackaway (2012) noted that faculty tend simply to add multimedia haphazardly, which causes content design issues because the multimedia used is not integrated into assessment. As a consequence, some faculty have considered multimedia as a convenient entertainment or a distraction, rather than as a legitimate instructional tool, even though it is very much in demand (2012, p. 9).

Friedman (2017) reported that in addition to overall online enrollment growth, continuing trends include the use of more technology and multimedia to augment curriculum in online courses; interactivity; and a greater push for instruction that uses technology to facilitate specific

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skills, such as interactive, digital media simulations, and digital multimedia. Shank (2014) recognized that the digital innovations of the information age and digital formats drove an emerging class of digital educational resources comprised of interactive, digital multimedia materials interrelated to interactive learning materials (ILMs) (p. 11). These trends denote an imperative for selecting and integrating DMOs that depends on advances in technology and an evolving ID process. This instrumental case study furnishes research in instructional design centered on integrating digital media aligned with curriculum content for interactive online higher education courses.

Rationale

Instructional designers refer to ID models as they design online instruction. This study was focused on interactive multimodal DMOs and their alignment with curriculum content. Such objects are built on a flexible and iterative ID models so that designers can modify them to a course instructional design. Instructional strategies can combine more than one model or approach. ID models are normally implemented in combination with instructional systems design (ISD) models (van Merriënboer et al, 1997, pp 2-3). ID is the design of instruction by a practice of "creating instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing," (Merrill, 1995, pp 5-7). Instructional Systems Design is a type of ID model that involves a systematic process for designing instruction with technology. An ISD uses a comprehensive system approach as a means for gathering and analyzing learning requirements, while adopting a wide view of the learning process that responds to identified learning needs, which may be considered an imperative for fulfilling course requirements. The systems design approach entails continuous development where learning programs and the required support materials can be matched to a variety of needs in a rapidly changing educational

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environment to become efficient and effective (Branson, 1975). Any issues for improved ID methods may be in the implementation of an ISD, not by the systematic approach itself (Merrill, 2015).

Many approaches, models, and frameworks are available when designing quality online learning environments. These approaches assist and guide instructional designers through the process of analysis, design, development, and implementation. Some approaches are useful for the design of later iterations, after summative course evaluations are analyzed. Instructional design professionals employ ID models and theories to guide their practice. A specific model is chosen, applied to an instructional situation and used to guide the design process by a collaborative team of designers and digital technicians (All Answers Ltd., 2017). The literature for ID practices in the online environment centers on a blend of usability, access to content, and alignment with pedagogical theories (Levene & Seabury, 2015).

Many leaders and scholars in academe believe that learners must be engaged to achieve the objectives and goals set out in online courses. Learner-content interaction is therefore developed and effected by instructional designers during the design process, as they work to integrate interactive digital media objects in alignment with curriculum content. ID tasks are growing due to the high demand for online courses. An ID model that supports the design process is a vital and overriding consideration as instructional designers integrate digital content to meet this demand. Merrill (1996) asserted that design and efficiency must be significantly increased if we are to realize efficiencies in the development of large amounts of computer-based interactive multimedia instruction (p. 3).

In addition, media selection should be consistent with the type of learning that is occurring, and all learning should be based around whatever content is being learned (van

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Merriënboer et al, 2002). This important issue in current ID practices has been verified by recent studies. Sugar and Luterbach (2016) analyzed ineffective and extraordinary ID and multimedia production (MP) activities among 36 ID professionals over a six-month period. Their most useful insight for this study was identifying four themes of effective ID matching methods and media to curriculum content, providing organized content, managing a complex ID project, and using theory to inform practice. In contrast, themes for ineffective ID included: not matching methods and media to content and learners, not supporting student interaction, selecting inadequate instructional strategies, not using ID processes, not collaborating with stakeholders such as administrators and other professionals in higher education, and coping with inadequate technical infrastructure. They suggested that future research may involve analyzing rarely-known phenomena in ID-related activities and further exploring negative or ineffective instructional design practices (Sugar & Luterbach, 2016, p. 1).

It is clear that effective ID of instructional content requires employing design practices that match methods and media to content. The integration of media objects that provide interactions connected to instructional content is one of the benefits of the online learning environment. Therefore, the alignment of digital media to other instructional content elements is important in the design of online higher education courses.

Like other instructional design professionals in the ID industry and in academe, Martin (2011) emphasized that ensuring the quality of educational experience becomes more important as technology advances (p. 955). Martin (2011) also pointed out that faculty are subject matter experts (SMEs), but they are not necessarily instructional designers (or media designers) (pp. 956-957). Some frameworks are concerned with learner participation, interaction, and engagement, while others are concerned with motivation or student success. These variables

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affect active participation and student engagement to some degree, but the main concern is how to design online instruction so that the content design is conducive to a high level of engagement (Czerkawski & Lyman, 2016).

Many scholars in the ID field, such as Raisinghani (2016), have observed that multimedia content is only produced by instructors in some online courses, including massive open online courses (MOOCs). These online courses are considered traditional teacher-centered instruction enriched by technology, rather than being learner or user centered. They have been known to have high attrition rates (Lindsay, 2014). They have also been criticized as lacking interactivity and engagement (p. 190). Likewise, Raisinghani (2016) considered it the instructional designers' job to work with a SME to learn the ideal multimedia form for the online instructional content being conveyed to the learner (p. 81). A course design for an online learning environment conducive to a higher level of engagement or interaction may not only alleviate learning challenges for online learners but also may lead to lower attrition rates.

Merrill (1996) suggested that instructional designers consider technology as an instructional strategy because the representation and organization of media as knowledge objects is important in ID. These tasks are integral to ID best practices for online courses and they are effective approaches for aligning various media with online content. As Merrill advised, a major concern of instructional design is representing and organizing subject matter content in a way that facilitates learning. Careful analysis of subject matter content, or knowledge, can facilitate representation of that knowledge for purposes of instruction as knowledge objects (Merrill, 1996). Merrill's ITT is explained later in this chapter.

Instructional designers may create a document for a course as a design guide for course design tasks and for integrating and organizing content, and identify instructional media while

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integrating these interactive DMOs with instructional strategy (Martin, 2011). Martin defined instructional alignment as the process by which different instructional elements are connected to each other; in the end, this makes the instructional material effective. The instructional media and strategies must be aligned with all the different elements (pp. 961-962).

Florence Martin (2011) also emphasized that it is important to align the lesson objectives and goals. The instructional objectives must be aligned with the information, examples, practice, feedback, and review. Martin explained that selecting appropriate media and technology for this use is of utmost importance, since media should be selected based on criteria such as learning outcome, instructional strategy, learner characteristics, and instructional setting (Martin, 2011, p. 961-962). Martin maintained that the purpose of media technology selection should not be to show the mastery of the technology itself, but to select media that best magnify learning (p. 962). Citing others in the field of ID, Martin clarified that the purpose of the media selection process is to determine the best medium; therefore, choosing the right medium should result in an efficient and effective learning process (Bevell, Martin, Ozogul, Su, & Zhang, 2003). Thus, aligning the media used based on other instructional elements is important (Martin, 2011, p. 962).

The "other instructional elements" Martin refers to is course content – some of which in her study was faculty-created instructional content, using a Matrix model to create instruction aligned to course goals and learning objectives. In her study, Martin advised aiding faculty in creating more effective instruction and that "instructional alignment" is of utmost importance for the online course environment and to the learner, affecting the facilitation of instruction as well as supporting learners to reach course objectives successfully. To that end, this instrumental case study in instructional design explored the integration of digital multimedia in alignment with curriculum content in the online course from ID design processes and perspectives that are

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important for ID best practices. An ID approach for alignment from both macro and micro level design thereby builds upon fundamental ID best practices.

Significance

This instrumental case study investigated how instructional designers may integrate DMOs in alignment with other instructional elements in the curriculum content of online higher education courses. Digital multimedia elements, or objects, like all other instructional elements, should be based on the goals of the curriculum. It is hoped that this paper expands upon current literature in ID practices by exploring how instructional designers integrate DMOs into online higher education courses in alignment with curriculum content to yield more effective instructional design.

Martin (2011) added that although alignment within the instructional elements is commonly mistaken with curriculum alignment itself to align curriculum with standards, the quality of instruction is higher when instructional elements are aligned with curriculum (p. 963). Yap Wei Lei (2016) argued that multimedia technology can be utilized in designing the learning module as it can attract better attention from students, increase learner motivation, and improve retention (p. 1). While students value online courses, not all are successful in online learning environments, and it appears that low engagement is due to a lack of interactive content as the literature suggests. Course designers must use media pragmatically to encourage deeper learning from engagement with online instructional content (Gormley, 2009, p. 34).

This trend is expected to continue at public higher education sites as educational technologies evolve for learning management systems. The ID staff at higher education sites for this study have responded to the increasing demand for integrating digital multimedia with course content, and implementated DMOs with technologies for responsive, online learning

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platforms across multiple devices, and as ID for online course development expands its reach in higher education.

Instructional design models can help instructional designers synthesize these instructional components to design content for online courses. Design models are useful even before the development of online courses – in subsequent iterations of the design process for a course after summative evaluation, for instance. Research conducted about ID models meet real-world demands by helping those in the higher education and ID fields to understand design issues better as well as the need for advancing instructional design processes. Research must account for how designs function in a realistic setting and rely on methods that can document and connect design processes to outcomes (Collins et al, 2003).

This study proposed to discover how instructional design practices can be used to integrate digital multimedia in alignment with curriculum content in online higher education. Yusuf, et al (2017) declared that the integration of multimedia and multimedia technologies has become a core part of the design, development, and delivery of e-learning, online learning, and blended learning courses. Two multimedia types are anticipated to have significant growth in terms of scale, volume, and application to learning and teaching in particular: videos and interactive multimedia (p. 36). According to data from surveys cited in Riedel (2014), demand for integrating multimedia technologies is largely due to emerging trends in educational media technology, including: (a) an increasing number of learners having access to mobile devices with 3G or 4G enabled internet connectivity, using media to transform their own learning processes; (b) the rise in the use of video as a learning and teaching tool by both instructors and learners; and (c) an increase in learner expectations of using social media; such as, Facebook, Twitter, Instagram, and others as a pervasive learning tool (Yusuf et al., p. 34).

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Research Problem and Research Questions

The purpose of this study was to explore how instructional designers integrate digital media objects (DMOs) in alignment with curriculum content in online higher education courses. The central research question for instructional designers was:

- How are you integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses?

The answers to the central research question informed the study's secondary research question, which was:

- How can a course design effectively integrate DMOs (knowledge objects) in alignment with curriculum content?

Definitions of Key Terminology

Active learning. Learner exploration of the learning environment is often recognized today as active learning. In the online environment, active learning is user-centered. Barnes (1989) described active learning as when students are engaged with tasks that are reflected in the activities conducted for learning (p. 19). Active learning requires an appropriate learning environment and the implementation of correct instructional design strategy, and that characteristics of learning environments are aligned with constructivist strategies derived from traditional philosophies (p. 19).

ADDIE. A model of instructional design with 5 iterative steps, which include, Analyze, Design, Develop, Implement, Evaluate (Shank, 2014, p. 5).

Digital Object. The term in this paper defines digital object as "any digital resource used as a reusable object to support learning", as derived from Wiley's definition of the term, 'learning object' (Wiley, 2000).

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Digital Media Object (DMO). A digital media object is any kind of media resource, including multimedia (examples: video with sound, animation with sound, etc.) that can be reused to support learning. DMOs can be video, graphics, photos, drawings, film, and even text rendered to create a certain structure and recognition of media content in the online environment. Some DMOs can provide interactivity meaning they can be used as interactive content by the online user. DMOs can also be used to produce other kinds of interactive digital objects for online course content; such as, simulations, digital storytelling, or documentaries, WBTs, video games, and eLearning with Web technologies.

eLearning (short for electronic learning) is an umbrella term that refers to all types of training, education and instruction that occurs on a digital medium, like a computer or mobile phone (http://theelearningcoach.com). Learning conducted via electronic media, typically on the Internet (http://lexicon.com). The acquisition of competencies, knowledge, and skills through electronic media, such as the Internet or a company Intranet (Oxford University Press, 2019). It has also been defined as Internet-enabled learning that encompasses training, education, just-in-time information, and communication (eLearning Glossary, 2011).

Instructional Design (ID) or **Instructional Systems Design (ISD).** The Association for Educational Communications and Technology (AECT) defines **instructional design** as "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" Reiser, R.A and Dempsey, J.V. (Eds.) (2002, p. 1). Instructional Design is defined as "a systematic process that is employed to develop education and training programs in a consistent and reliable fashion" (Reiser & Dempsey, 2007). In addition, it may be thought of as a framework for developing modules or lessons that (Merrill, Drake, Lacy, Pratt, 1996). Instructional design (ID), or instructional systems design (ISD), is the practice of creating

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instructional events to make the acquisition of knowledge and skill more efficient, effective, and appealing (Merrill et al, 1996, pp. 5-7).

Instructional Designer. An instructional designer is a person who applies a systematic methodology based on instructional theory to create content for learning events (www.eng.wayne.edu in Jordan, 2019). Instructional designers create and deliver content for online course delivery. An instructional designer is an individual who develops the methodology and delivery systems for presenting course content (www.syberworks.com in Jordan, 2019).

Instructional Transaction Theory (ITT). Instructional design based on knowledge objects (Merrill et al., 1996).

Interactive Learning Material (ILM). An interactive learning module (ILM) is defined as any discrete online, interactive, instructional resource used to teach a specific learning objective, or a set of related objectives. ILMs have multiple modalities. Shank, 2014, p. 14).

Interactive Learning Materials (ILMs). OERs that provide instruction. (Shank, 2014, pp. 12-13).

Interactive multimedia. The combination of text, pictures, audio, video and animation organized a cohesive system which empowers the learner to interact and control the learning environment, which can include simulations, games, and virtual and augmented reality. (Phillips, 2014). The interactive multimedia in instructional content allows learners to provide input to an online course and receive feedback as a result of the input. The input might consist of a mouse click or drag, gestures, voice commands, touching an input screen, text entry and live interactions with connected participants (Malamed, 2016).

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Knowledge Object. A knowledge object is a representation of subject matter content (knowledge) for purposes of instruction (knowledge objects), per Merrill (2000, p. 1). A term also used by the ITT ID Model that represents the content to be learned.

Learning Management Systems (LMS). A software application or Web-based educational tools in a software system that allow educational institutions to easily deliver, track, and manage student learning content and experiences (Jordan, 2019).

Multimedia. Multimedia is defined by the Oxford English Dictionary as "more than one medium of communication, artistic expression, etc." to include computing either designated or related to applications mixing a number of digital media, such as text, audio, video, and animation, "esp. interactively" (Oxford English Dictionary Online). One kind of media within another (as a combination) is multimedia as in web technologies or computer applications.

Online learning or eLearning is defined as the delivery of interactive training and educational material via an organization's internal computer network (Intranet) or the World Wide Web (Internet) (Oxford University Press, 2019). Learning conducted via electronic media, typically on the Internet (https://www.lexico.com). The term online learning is often used synonymously with eLearning. It is an umbrella term that includes any type of learning accomplished on a computer and usually over the Internet (Malamed, 2016).

Open Educational Resources (OERs). Open Educational Resources are educational materials and resources that are publicly accessible, meaning that they are openly available for anyone to use and under some licenses to re-mix, improve and redistribute (Bell, 2018). OERs are freely accessible, openly licensed text, media, and other digital assets that are useful for teaching, learning, and assessing as well as for research purposes. All definitions of OERs cover both use and reuse, repurposing, and modification of resources; include free use of these

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resources for educational purposes and encompass all types of digital media (Camilleri et al, 2014).

Theoretical Framework

This section describes and discusses the theoretical framework that served as the theoretical lens for this instrumental case study. The Instructional Transaction Theory (ITT) framework suggests that the use of digital multimedia objects allows instructional online course content to be more learner-centered as well as directly applicable to what is being learned. The ITT framework offers an approach to integrate online instructional objects that may be more effective and less ambiguous than other approaches. Per Merrill (1996), instructional design theory is a set of prescriptions for determining which instructional strategies are appropriate for enabling learners to meet instructional goals (p. 1). The "prescriptions" Merrill refers to are "prescriptive" principles or rules for implementing the practice of ID. Instructional design practices may be improved and more efficient if interactive media objects in online course content are aligned more effectively with curriculum. Merrill (1999) asserted a concern with emphasizing information rather than appropriate instructional strategies. He described instructional strategies as algorithms for manipulating data structures and provided a precise description of the different kinds of transactions required for different kinds of instructional outcomes, goals, or objectives. Merrill added that this formulation or design helps instructional designers design more effective and appealing products. Building these transactions into instructional development tools increases the likelihood that the resulting instructional interactions will be based on sound principles of instructional design (pp. 2-3).

Merrill identified another benefit from integrating digital multimedia in the online learning environment, suggesting that the goal of a learning environment is to allow learners to

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explore a device or setting. Objects in the learning environment should behave in a way similar to their behavior in the real world. Students can then act on objects in the learning environment and see the consequences of their actions. An open-ended learning environment allows free exploration within its constraints. Simulations that only permit a single action and limit the path the student can take are merely demonstrations, not learning environments (Merrill, 1999, p. 10).

Rationale for ITT

Merrill's instructional transaction theory (ITT) was used as a theoretical lens in this study to explore how instructional designers align multimedia objects with curriculum content in online courses. The study focused on the ID process for aligning DMOs with curriculum content. This instrumental case study explains how media objects can be more connected to or aligned with curriculum content as online courses need to be designed for digital learners with this goal in mind. Digital objects provide learner-content interactions in the online course, engaging learners with curriculum content and helping them reach course objectives. The researcher believes the ITT lens may help identify best practices instructional designers can use to align multimedia with curriculum content in the online environment.

ITT is intended to foster almost any kind of learning in the cognitive domain (Merrill, 1996, p. 398). Both the cognitive theory of multimedia learning (CTML) and ITT suggest that we improve learning environments through ID practices that allow for cognitive and interactive learning transactions with digital multimedia. Thus, a chosen instructional design model/theory in its course design phase must accommodate aligning digital multimedia to course content.

This instrumental case study focused on how instructional designers are aligning DMOs with online curriculum content as they design public online higher education courses. Therefore, this case study involves academic departments at public higher education campuses offering a

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wide array of online courses. The focus on aligning digital multimedia with curriculum may identify objects that are not aligned with curriculum or may reveal some design best practices to resolve integration. This study ultimately seeks to observe how ID practices are used at the study sites to align multimedia objects with online course curriculum. Merrill (1996) suggested that the instructional designer may apply a *formulation* (a design that the instructional designer created), or prescribe a design strategy, as a method to bridge this divide.

This researcher submits that with the lens of ITT, the ID individual could create an instructional design they assemble, then apply that design process for integrating media objects aligned with content. Writing four volumes of his book since the 1990s about instructional design theory and models, Reigeluth (1999) indicated that instructional design theory is separate and distinct from learning theory. He reasoned that while a learning theory is ordinarily a descriptive theory, instructional design theory is prescriptive to aid in the design of instruction. He suggested that ID can have two components methods of instruction and conditions of learning, so that ID theory may offer instructional methods, which can be aimed at creating conditions for optimal learning (Reigeluth, 1999).

As an ID theory, ITT was chosen as the lens for this study for reasons similar to those explained by Wojtecki (2012, p. 15). ITT focuses on knowledge objects. It has value for the instructional designer in that it offers a more precise way to describe knowledge representation, instructional strategies, and ID prescriptions (Merrill, 1999). As designers of instructional content, they have knowledge objects available to integrate using the ID theory/model of ITT.

The architecture of ITT has been explored and analyzed as an instructional design theory and as an effective ID strategy to automate the design process to meet growing demand for more online course development. Other scholars consider Merrill's ITT to be a significant contribution

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to ID practices because it meaningfully reduces the time it takes to design and develop instruction (Reigeluth, 1999, p. 399). Reduced time in the design of online courses helps instructional designers to be more disposed to react to an organization's needs. An ID model such as ITT is *synthesis* oriented (Merrill, 1999, p. 1). Merrill (1999) clarified that instructional transactions include all interactions necessary for a student to acquire a kind of knowledge or skill (p. 1).

Need for Interactivity in Online Courses

Integral to this study was the premise that active learning occurs when learners engage with interactive digital media objects in online courses. Interactive activities provide forms of active learning and a means for learners to gain knowledge in the online environment. Many educators have inferred that active learning surpasses passive learning (Brame, 2016).

Theories or models such as CTML and ITT have reinforced that knowledge is better retained by learners when they are interacting with content they are learning. More recently, in their report for the Online Education Policy Initiative at MIT, *Online Education: A Catalyst for Higher Education Reforms*, Wilcox, Sarma & Lapell claimed that active learning is now one of the most influential directives of online education, and that online environments are increasingly being designed with a conscious effort to integrate active learning and interactive elements, (Wilcox et al, 2016, p. 6).

The goal of the instructional designer is to prepare the curriculum for the online course format and design the instruction accordingly. Instructional content is the combination of all multimedia integrated objects that instructional designers integrate with curriculum content in a distance education course. Like many scholars, Vrasidas (2000) observed that course content is the fundamental form of interaction that education is based upon. He assumed that learners

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manage their own learning tasks as well as interact with content (p. 13). Learning occurs when learners interact with content found in books, objects from the environment, abstract ideas, videos, computer programs, websites, and other sources (p. 2). Moreover, Kuo et al. (2013) found learner-content interaction to be the strongest predictor of satisfaction and performance in online courses; they confirmed the importance of interaction in online learning (p. 39). Another study by Kuo et al. (2014) found student–content interaction to be the strongest predictor of student satisfaction in fully online learning. Their results indicate that instructional designers should pay attention to content design and select appropriate delivery technologies in the fully online course environment (pp. 44-45). Online content should be first presented in an organized way, and then be easily accessible to online learners. As inferred by Anderson (2003), the use of various media in instructional content expands opportunities for learner–content interactions.

It is an observable fact that instructional content in online higher education courses includes these digital objects. In this study, the term *interactivity* signifies the use of interactive, digital multimedia content for online course design. The integration of multimedia objects in distance education courses gave rise to widespread recognition in higher education of the importance of providing the interaction with online course content that enables active learning in distance education. Figure 1 shows the relationship of learner/student-content interaction with content amongst the inter-related position of interaction modes situated in online distance education.

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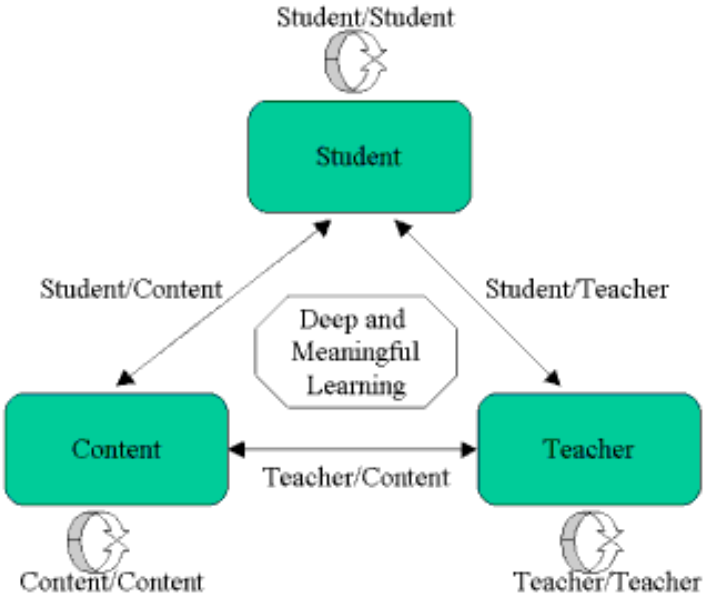

Figure 1. Modes of interaction in distance education (Garrison, T., 2003). Note. Reprinted from "Getting the Mix Right Again: An updated and theoretical rationale for interaction", by Anderson, T. (2003, October). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/149/230

DMOs are categorized by Merrill (1999), and by other experts in the instructional design field, as *knowledge objects*. These objects are integrated with the curriculum in online courses. This study sought those ID best practices that yield more accessible and inclusive online higher education course design. Although current literature does not use it, the ITT model gives the learner the power of exploration and offers a means for clearly defining learning objectives and goals (Merrill, 1999).

ITT allows instructional designers to use digital objects when designing curriculum content, making this framework ideal for this instrumental case study involving ID practices that align DMOs with curriculum in online courses. Wojtecki (2012) pointed out that ITT continues to focus on knowledge objects. The value of the ITT framework for the instructional designer is

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that it offers a more precise way to describe knowledge representation, instructional strategies, and instructional design prescriptions (p. 15). This precision means the instructional designer has a mechanism for working with these tasks in the course design process.

The researcher has concluded that these traits in the ITT model are useful and adaptable in achieving the objective of aligning ID practice with the intended curriculum. Instrumental case studies, Zainal (2007) maintained, may allow the generalization of useful findings to a larger population (p. 4).

Critics of Theory

Critics of ITT theory prefer other frameworks, but those are framed solely from the learning theory point of view, how learners perceive their online learning environment, rather than from instructional design theory. Other frameworks do not support the ID process for online content. For example, Anderson (2003) observed distance educators' use of media and technology to support interactions (p. 1) through the lens of Moore's transaction distance theory, which is centered on learning with technology and learning performance. Moore's learning theory arrived on the ID landscape around the same time as Merrill's ITT. Because an important task of instructional designers is supporting SMEs by integrating DMOs to provide interaction in online courses, the researcher employed ITT, a more useful theoretical lens, to explore how instructional designers align digital objects with online course curriculum content.

Some critics seemingly have missed the point with respect to alignment of learning objects with content altogether, and thus overlooked the value of ITT for digital media integration in course design. Wiley's (2000) dissertation on the design and sequencing of learning objects criticized Merrill's (1996) work on ITT. Wiley's main critique of ITT centered on what he saw as a paradox: ITT requires reusable educational resources to come in very

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specific formats, so an instructional approach would require all existing online resources to be specifically tailored to ITT prior to reuse. Wiley then assumed that this requirement destroyed the reusability of digital objects and assumed that Merrill wanted the objects themselves to be designed with specifications so that they could fit together perfectly. Wiley believed that his approach of building content with mortar to hold together blocks of a variety of shapes and sizes was in closer harmony with the idea of reusable educational resources, such as open educational resources (OERs). This same theme recurs in his later collection of chapters on instructional design. Without some sense of context binding together reusable educational resources, a course structure so designed becomes nothing more than a grab-bag of apparently unrelated things (Wiley, 2003). However, there is nothing in ITT that says designers must or cannot use OERs, or other produced DMOs, as an approach, strategy, or guide for ID practice. As intended by Merrill (1996) ITT as a model remains a flexible instructional design approach.

The ITT theoretical lens serves the aim of this instrumental case study because it is an instructional design theory. This theoretical framework was therefore well suited to a study exploring how instructional designers use digital media to support instructional content in the online course environment in contrast with educators using DMOs without collaboration of instructional designer input or reference to ID practices. In any online environment, managing complex tasks for both instruction and learning requires a succinct theoretical approach for design and an ID model that can handle the tasks. Merrill's ITT views learning tasks that are based on real-life tasks as the driving force for education; such tasks are therefore the first component in a well-designed environment for complex learning. This view was shared with several other instructional theories, as discussed in Merrill (2012). The three remaining

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components in ID models are supportive information, procedural information, and part-task practice (van Merriënboer et al., 2002).

Merrill's ITT is not only efficient and flexible enough for the duties of the instructional designer, but it also leaves ample opportunity for feedback, scaffolding, and facilitation so the course facilitator can engage with the learner and the learner can interact with the content as well as the facilitator. This researcher identified ITT as a particularly useful theoretical lens for exploring how those who practice ID align digital multimedia curriculum content for the online course because ITT is a flexible ID tool for course design in any subject. Additionally, Mayer (2003) substantiated the positive effects of a blended multimedia ID method. In similar fashion, Merrill (2012) asserted that the instructor will scaffold the information with ITT to guide and encourage students to learn on their own with transactional methods, and that DMOs are available as adaptable course tools.

All research to date has involved digital multimedia and the value of interactions with those DMOs in online courses. This researcher seeks improvements of course design is undertaken by directing the study around how instructional designers integrate digital media objects in online higher education courses and identifying better and more useful ID practices. Because of the ID theory used in this study, it focuses on the alignment of interactive digital media with curriculum, providing active learning that affords richer learning transactions with instruction. Review of the literature for this purpose had drawn this researcher to Merrill's ITT as the primary model for an instrumental case study involving aligning DMOs with curriculum content in online higher education courses.

Research and theories are always being refined in the ID field and in higher education. Supported by the ITT framework, the researcher intends to seek ways instructional designers are

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refining ID best practices in higher education by finding more effective and significant ways of aligning digital multimedia with curriculum in online course content. The study was important because if transactional learning objects are not effectively integrated then a significant misalignment can occur between the DMOs and the online course content. If the integration isn't implemented well or aligned with curriculum, the online instruction or learning activity will not be beneficial. ID practices and collaborations between ID staff and faculty can help improve and develop user-centered interactive instruction with digital media as part of online course content.

Designing user-centered instruction is part of an ID process. Designing that content in the online environment is not a new concept or dissimilar to Web development where user experience (UX) and user interaction (UI) are similarly intrinsic to user design. Likewise, for ID staff, designing learner-content interactions in the online course is just as significant. It is not surprising then that another term emerged as learning experience design (LX), which rose from other fields – experiential learning, cognitive psychology, interaction design (UI), user experience (UX) design, instructional design and Design Thinking (Jordan, T. 2019).

Creating instructional content intended to attain the goal(s) of the online course can be a challenging aspect of online course design but providing interaction via digital objects in learner-content is useful to assess student success in the online course, according to expert Instructional Designer Kim Shivler (2016). Tracking learner-content interactions from the LMS or collecting other data from assessments and course evaluations, can also affect future design iterations of an online course. During the design process of ID, the arrangement of video, visual components like diagrams and pictures, text documentation and other multi-media connected to the instructional content can help learners apply the concepts and tasks by interacting with the online course content (Shivler, 2016). This can be achieved in various ways, such as asynchronous

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demonstrations, simulations, or virtual reality because multimedia resources and software tools to create them have become abundant.

During the 1990s, multimedia objects appeared in online courses throughout higher education. Merrill's (1996) ITT supports the premise that people retain more when they are interacting or engaged in active learning via instructional transactions with learning objects, including DMOs (Merrill, 1999). ITT is an attempt to identify the patterns of the transactions and thus develop instructional algorithms to promote appropriate instructional transactions. The instructional algorithms operate on a set of *knowledge objects* incorporating three major types of instructional strategies: presentations, practices, and learner guidance. ITT recognizes which knowledge components are required for a given type of instruction and develops instructional strategies to facilitate ID by integrating these knowledge components (Merrill, 1999).

In Merrill's book, *First Principles of Instruction: Identifying and Designing Effective, Efficient, and Engaging Instruction*, he proposes that the instructor is the guide and students are encouraged to learn on their own. ITT is intended to foster almost any kind of learning in the cognitive domain (Merrill, 2012).

Theories that are indirectly associated with ITT include behavior, cognitive, and social learning theory. These theories address how active learning occurs when digital multimedia is integrated into instruction also. Mayer's (2001) cognitive theory of multimedia learning (CTML) represents a culmination of these other theories, but surprisingly, although it is a learning theory, it does not emphasize transactions with multimedia learning objects. The researcher had identified that ITT, as an ID model, was a more flexible and succinct theoretical approach to utilize for the purpose of this instrumental case study.

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Merrill prescribed five instructional principles to enhance the quality of instruction across all situations (Merrill, 2007, 2009): task-centeredness, activation, demonstration, application, and integration (p. 2). Reigeluth's (2016) findings upheld the principle that retrieval practice enhances learning through retrieval-specific mechanisms rather than by elaborative study processes. According to Reigeluth (1999), there is an interrelation between curriculum theory and instructional design theory. Thus, instructional designers refer to many theories and use various models to design instruction.

Today, more instructional design approaches can be created using the expertise, established practice, knowledge set, and skills of instructional designers. ID staff know how to design web and technology-mediated content for instruction, and apply up-to-date instructional technologies and emerging instructional design principles, that work in online higher education. Luck (2001) expressed that instructional designers can offer expertise in course design and development for adult and distance education (p. 2).

As every institution has different curriculum goals, development needs, and institutional standards, each employs its preferred instructional design practice(s) to make use of models and may or may not utilize ID theory. ID standards are also increasing in use, such as Quality Matters and Universal Design. Invariably, ID practices change along with advancing technology. ID staff can keep faculty abreast of updates in technology to utilize for designing their courses and developing content, faculty can collaborate with ID staff, as well as rely on ID staff for their expertise in instructional design.

Luck (2001) provided a narrative of the approach to instructional design affecting the course development process at the Penn State World Campus. Luck (2001) wrote that the course development process utilized all of the resources available to Penn State faculty, which included

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instructional design, technology, and media production staff and graphic designers. Most university faculty were not familiar with producing work in teams with ID staff although the results met with high approval from faculty. The Penn State faculty were focused on course content and knew about designing learning activities from assessment. They also know they could rely upon course design and development professionals to contribute their expertise beyond the knowledge of faculty (p. 1). The study exemplified that ID staff are a key resource for faculty and non-technical staff.

ID professionals in higher education act as instructional design and technology leaders, advising and guiding online faculty in ID practices ascribed to by their institution. SMEs (faculty) meet with ID staff to make sure their courses are on track with ID practices. ID staff use online course design practices and tools to successfully design and develop online course modules, including specific digital multimedia learning objects, and to evaluate course effectiveness from course evaluations and content assessments of student-content interactions. These are all necessary to better align digital course objects with curriculum content in the online course. To improve efficacy of the online course a design process must be iterative and efficient.

Course evaluations are based on the prior group of learners' needs assessment, but the curriculum content must also adhere to updated curriculum (content currency) and course goals so that learners can meet course objectives successfully. Decision-makers in higher education collect informative feedback from student online course evaluations to apply an institutional strategy for designing courses. These summative course evaluations can provide helpful data about how effective online course elements are from all content (and DMOs) for learning and why. With this summative data ID staff can then pool their resources to work with faculty in

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support of course curriculum, and for improving course content to facilitate learners to meet course goals.

Several authors have written on the benefits of implementing digital multimedia technologies in the field of education and online course instruction as its technology advanced. Rackaway (2012) wrote in his abstract about multimedia maturing and how best practices have emerged to challenge opposing findings. The majority of best practices show student interest in interactive materials. Another advantage of multimedia use is the accommodation of multiple learning styles to better engage students in course materials overall (p. 1). Since numerous studies found that student success is directly correlated to time spent doing classwork, ILMs increase 'time on task' which greatly increases time learners spend engaged with content (Shank, 2014, p. 138). As interactive learning materials (ILMs), DMOs have also been found to be critical for remediating knowledge gaps (p. 134). Online learners will be more likely to spend more time focusing on and being engaged with interactive digital media objects if the online course is more immersive with interesting multimedia (Shank, 2014, p. 122).

The literature on instructional design claims that interaction(s) with multimedia objects support many types of educational activities relative to ID purposes. Klett (2004) pointed out the significance of using interactivity features to shape contents for online education, illuminating how interactivity improves online course design. Similarly, John Shank (2014) proposed that ILMs (interactive learning materials related to DMOs) are tools which can be effectively utilized for designing course content to address the learning challenges of digital natives. Shank also supported that interactive learning materials be aligned with and promote the Seven Principles of Good Practice for designing course content (p. 141). The Seven Principles for Undergraduate Education by (Chickering & Gamson, 1987), contains these principles: Encourage contact

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between students and faculty, develop reciprocity and cooperation among students, encourage active learning, give prompt feedback, emphasize time on task, communicate high expectations, and respect diverse talents and ways of learning. Modern design practices for effective online course(s) design can be aptly shown by exploring how instructional designers are presently integrating DMOs aligned with online course content, piquing the researcher's interest for this case study.

The literature has not yet concluded how to most effectively align DMOs with curriculum in online higher education courses. Mandernach (2009) pointed out evidence which showed that well-designed multimedia resources enhance learning outcomes; however, there has been little information on the role of multimedia in influencing essential motivational variables (p. 1). Mandernach (2009) suggested that educational institutions carefully study the cost-benefit ratio of including multimedia in online learning environments. That study further examined the effect of instructor-personalized multimedia supplements on student engagement in an introductory college-level online course. Mandernach's (2009) comparison of student engagement between courses featuring increasing numbers of multimedia components revealed conflicting evidence (p. 1).

This researcher was compelled to discover the cause of this disparity in research findings, not only to discover how instructional designers may bridge ID principles and their application, but also to discover why the inconsistency occurs. DMOs produced or selected for the curriculum in the design of an online course may simply be ill-matched to the curriculum content, or there may be another reason. It was apparent that more research is needed to determine better ID practices for aligning digital multimedia with online course content more effectively.

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Cost affects accessibility features in the design of online courses, as it takes time to create, produce, or even choose the DMOs that would be most meaningful during instructional transaction design. A group of instructional designers may simply not have the time to select appropriate multimedia to align with to curriculum, as they have other responsibilities, such as helping faculty get their courses online. Usually, there is a small in-house group of instructional designers who work each term with a much larger group of online faculty to provide ID support or guidance for any number of online courses and to keep the updated courses running suitably.

Yet, the cost of online course design may have a silver lining. Carr (2012) illustrated the declining cost of distance education and online courses by citing Google researcher and professor Peter Norvig, who has offered online courses about online education at many California institutions. Norvig held that online courses have improved dramatically in several ways. A copious amount of data can be stored and transmitted at very low cost through cloud computing. Lessons and quizzes are streamed free in abundance over YouTube and many popular media delivery services. Social networks act like digital campuses where students can form study groups and answer each other's questions, modeling digital campuses. Costs have dropped sharply for delivering interactive, multimedia-rich online courses, according to Carr.

These facts regarding access contradict those who point to distance education as historically expensive. Institutions are saving money with online courses as they afford more overall physical space on campus; rather than more expensive face to face courses on campus. The evidence for this in the study by Allen and Seaman (2018) suggested that evidence shows agreement across all sizes and types of institutions of higher education that improvements in modern digital technologies will make development costs, and the delivery, of online courses considerably less expensive than face-to-face courses. In fact, 44% of the largest public

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institutions of higher education – where cost per course is lowest in comparison to costs at private institutions – thought such improvements as likely, according to their study, (p. 22). These savings may help to offset some of the costs of ID staff and online course development. Research-intensive institutions should continue to work at innovations purposefully, and to provide quality content that online learning distributes so well (Lindsay, 2014). It was inferred then from the current literature that online courses containing integrated digital multimedia content aligned with curriculum can and should be designed at a lower cost than previously thought, and with higher quality. ID and ISD offer more utility than providing a systematic process for designing a course. For example, the use of reusable digital objects like DMOs and other OERs, and their integration in purposefully designed online courses, is one way to provide richer, quality content and interactivity in the online course – and for lower costs than it would incur by creating these digital objects for each instance. Also, according to Petrides & Dezmon (2017), DMOs as OERs can be used to build instructional content at scale (instead of recreating content in each instance).

This is no less true for the need for developing innovative instructional design strategies to overcome other issues. One of the biggest issues in education is that technology is not available due to the lack of support to help educators' access and use DMOs and other OERs, yet these digital objects can often be found online. OERs are produced by thousands of organizations and individuals from NASA and museums to schools, and by individual educators themselves (Petrides & Dezmon, 2017). State education agencies provide both technical support and training to empower schools to help educators work with the technology to access these materials as resources (2017). Accessibility to DMOs and other OERs is vital for all learners, those working in education, their institutions, and to advance the field of Instructional Design.

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Accessibility is regarded as a positive component of distance education courses. It can be difficult to provide consistent and quality access to any structured online course with integrated content. Although accessibility makes active learning transactions in distance education easier, there are recurring accessibility issues for learner-content online transactions. Access issues affect learning. Active learning requires retrieving interactive digital objects, which is itself an active learning task. The practice of retrieving and the act of reconstructing knowledge enhances learning (Karpicke et al., 2011, p. 774). Zhang et al. (2005) found that some multimedia-based e-learning systems do not support sufficient content interaction and flexible learning processes.

This researcher found the accessibility of content is important to her topic, even though most literature focused on cognitive theory regarding learner-content. Access to content is reliant upon technology as well. Anderson (2003) noted that newer cost-effective technologies are nearly ubiquitous in developed countries. Net-based telecommunications systems are evolving, with cost and access implications. While digital media files of DMOs can often be larger in size than other file types, faster data transfer rates enabled by today's telecommunications capacities equate to faster download of DMOs, followed by increased usage. Furthermore, developments in social cognitive based learning theories are providing increased evidence that activity is an important component of all forms of education, including those delivered at a distance.

The context in which distance education is developed and delivered is changing in response to the capacity of the semantic web to support interaction, not only among humans but also between and among autonomous agents and human beings (Berners-Lee, 1999). Both the landscape and challenges of achieving the best blend have not lessened in the past 25 years; in fact, they have become even more complicated (p. 1). Equal access affects the availability and accessibility of interactive, digital knowledge objects and content in the online environment as

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well as to modern technology. Instructional design practices in the higher education arena are vital to this problematic endeavor. If the cost of the technology tools for instructional design are going down, we could find ways to better utilize digital multimedia in educational technology and make content more accessible.

Application

Implementing effective ID practices can be challenging for ID staff as they develop learning content transactions using digital knowledge objects such as DMOs. As previously mentioned, these integrated digital learning objects are fundamental to designing curriculum for the online environment. These objects provide the self-paced, asynchronous or synchronous mode of learning that is expected by accessing online course content. Accordingly, this study explored aligning DMOs with course content in higher education courses. This researcher seeks to discover how innovative ID practices can integrate DMOs in alignment with curriculum content in online higher education courses.

Merrill (1999) suggested that, from a systems point of view, a transaction is a set of rules for displaying knowledge objects and elements to learners and for interpreting information submitted from the student. Merrill (2000) defines a *knowledge object* as a representation of knowledge for purposes of instruction, (p. 1). The processes identified for manipulating the knowledge objects in a knowledge structure provide the basis for computer algorithms or transactions that can emulate some of the processing done by a learner. One transaction can teach any kind of knowledge, and an appropriate knowledge structure may be used with a broad variety of subject areas (p. 7). Instructional designers may integrate knowledge structures represented as DMOs with subject matter content drawn from the stated goals of a curriculum. With the lens of the ITT (Merrill, 1996) theoretical framework as a guide, this study explored

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instructional design processes and approaches effecting the alignment of digital media objects with online course content, which provides interactive learning that is richly connected to the course curriculum.

Applying Findings to Theory from Research

This research sought to ascertain a more effective instructional design approach for the integration of digital multimedia in alignment with curriculum content in online higher education courses. It was anticipated that outcomes from this instrumental case study would inform better design processes for the practice of instructional design**.** The researcher conducted interviews with instructional designers to explore and observe the design process of integration of DMOs with related transactions. The study explored whether they are closely aligned to curriculum, thus producing an effective course design. This knowledge may augment findings for current ID practices. The ID topic, focus, and research methodology are referenced and sustained mainly by ITT, which includes cognitive precepts like CTML.

Because the case study used a case method it was expected that the course structure by instructional design and of instructional transactions can be affirmed in the university setting over a semester-length period. The instrumental case study discovered how instructional design was implemented by an ID staff group at a rural university in the course of conducting an interview process. Inductive reasoning supported the premise of improving the integrated multimedia approach to instructional design of course content for online education.

The research included interviews with participants, direct observations, and documents for standards and course rubrics, which were provided by the participants. The participants relayed how LMS tools measuring student engagement with curriculum through interactions with integrated digital multimedia informed the instructional design choices they make as ID

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professionals. The study and its findings offered ideas or suggestions for further research into design practices and the integration of DMOs in online course content. Participant's analysis of course evaluations established some findings to support the thesis. Data was collected and compiled from higher education professionals in the field of instructional design at two state universities and a public college in different regions in the same state. The instrumental case study conducted used an inductive approach to obtain conclusive findings that support the thesis.

Chapter Summary

Current research on the use of instructional transaction theory (ITT) to create efficient learning transactions with the use of DMOs aligned to curriculum content in online courses is limited. There is escalating demand for interactive digital media objects in instruction. Studies have shown that aligning media objects with content in the design of online courses provides a more effective learning process. The purpose of this study was to explore how instructional designers integrate DMOs in alignment with curriculum content in the online higher education course.

The literature review suggests that there was a need for further exploration to determine whether online courses are effectively designed to align DMOs with other online course content, thereby providing a higher level of interaction. This study explored effective ID approaches for aligning digital multimedia with curriculum in online courses. This study ascertained how interactive digital media objects are more beneficial in online higher education courses through an exploration of how instructional designers' use and integration of such objects in course content from their instructional design practices in public higher education. The researcher perused instructional designers' responses to interview questions. Analysis showed that the

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strategy phase of course design was effective for the alignment of interactive digital media with curriculum in online higher education courses.

A review of literature on available resources relevant for this purpose is provided in Chapter 2. This includes ID models and theories, instructional design relative to the interaction digital multimedia provide in online courses, and digital multimedia alignment with curriculum content in the online course. This provided the researcher with information about the application of ID models or theory as a design process and course development approach, interactivity provided by digital media objects in online courses, and the alignment of such digital instructional objects with curriculum in online courses.

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Chapter 2: Literature Review

This chapter reviews literature related to instructional design practices and how DMOs may be better aligned with curriculum in online higher education courses. The literature includes (a) theory and models related to instructional design that are commonly utilized for integration of multimedia in courses, (b) interactive use of digital multimedia in online higher education courses, and (c) aligning multimedia objects with curriculum in online higher education courses. The literature presented in this chapter includes background on ID theories and models that operate with DMOs, interactivity provided by DMOs, and the basis of ID practices that align DMOs with curriculum in online higher education courses.

The researcher searched for literature from journals and dissertations in the field of education. Some educational Wikis were referenced for figures of ID models. The background of ID theories and models was reviewed for their potential usefulness in online higher education course design because their derivatives can be applied to current theories, approaches, strategies, and methods that currently influence the design of online higher education courses.

In 1977, several leading institutions of higher education participated in a government funded project with the Advanced Research Projects Agency of the Department of Defense called the ARPANET to implement a computer network across four university campuses in the United States, including Massachusetts Institute of Technology and the University of California at Los Angeles, (ARPANET, 2018, Wikipedia). The network communications technology used in the ARPANET project became the backbone of the Internet, which today enables the inter-connected network system that supports higher education courses on the Wide World Web and learning management systems.

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Like the early research projects that evolved into the internet, ID models situated in technology took on a life of their own. ARPANET established the progression of interactive communications and accessibility standards for the World Wide Web, and as inventor Tim Berners Lee intended for the WWW, its purpose was sustained for online education. The U.S. Department of Defense (DOD) developed and defined four major levels of eLearning interactivity as in the *Department of Defense Handbook: Development of Interactive Multimedia Instruction (IMI).* They correspond to interactivity levels with various stages of learning as well as identified the resulting skills expected after the learning session, (Lange, A. 2006). Level 1 eLearning is passive eLearning where the learner acts simply as a receiver of information. Level 2 eLearning is defined as limited interactivity; with the learner offering simple responses to instructional cues. Level 3 eLearning has complex interactions that requests the learner to make multiple and varied responses to cues. Level 4 eLearning are real-time interactions create lifelike sets of complex cues and responses (Defelice, R., 2018). Levels of interactivity provided a basic set of standards to define the appropriate level for eLearning systems.

As online courses became accessible on the web, many digital tools and technologies used by higher education for interactive communications as well as ID standards have evolved. ID theories needed to keep up with advances in these technologies. The onset of ID models and standards for instructional systems design (ISDs) are shown in this research. Chapter 2 covers the literature relevant to ID issues, ID models and theories, ID practices for integrating DMOs, the interaction DMOs provide in online courses, and their alignment with course content.

ID Models and Theories of Multimedia in Online Higher Education

Gagne suggested that learning tasks for intellectual skills could be organized in a hierarchy according to complexity: stimulus recognition, response generation, procedure

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following, use of terminology, discriminations, concept formation, rule application, and problem solving. Prerequisites are identified by analysis of a learning or training task. Learning hierarchies provide a basis for sequencing instruction. These events should satisfy or provide the necessary conditions for learning and serve as the basis for designing instruction and selecting appropriate media (Gagne, Briggs, & Wager, 1992). Gagne's work has contributed greatly to the field of instructional technology, especially in the design of instruction (Querishi, 2001). Today, it is still common for instructional designers to make use of Gagne's ID model from cognitivism for the "nine events of instruction."

Similarly, Willis (2000) maintained that instructional design as a whole is centered on the three principles: recursion, reflection, and participation. Likewise, Akella (2015) held that the principle of *recursion* holds that instructional design is not linear, but is iterative, and the principle of *reflection* states keeps to a process of experiential development. It develops learning content by following a heuristic, rather than a procedural one. The principle of *participation* focuses on collaboration and articulation, wherein learning is not viewed as a passive activity but an active process (p. 41). Active learning may be achieved by integrating interactive multimedia with online course content in the course design. In addition to providing opportunities for active learning and improving accessibility, instructional transactions are effective using interactive DMOs in course design. Akella (2015) implied that the practice of instructional design concerns both the selection and arrangement of learning matter for effective instruction (p. 41). This study explored ID best practices for aligning digital media objects (DMOs) with curriculum content in online higher education courses, which can provide active learning with interactive multimedia instruction to engage learners in modern digital environments.

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Merrill (1996) developed ITT from an earlier highly-regarded theorist in the field of instructional design as he explicitly referenced Gagne's cognitivist theory work of the nine events of instruction. Merrill's ITT theory was grounded on Gagne's (1965, 1985) assumption that there are different kinds of instructional goals and that an instructional strategy is required for any design strategy in order for the learner to most effectively and efficiently acquire knowledge and skill(s), providing practice and learner guidance to achieve learning objective(s) (Seel et al, 2017, p. 84). Merrill believed that the ITT model accommodates flexible instructional strategies to meet these instructional design tasks. He categorized his ITT model as "second generation" instructional design. The three components of ITT theory are: The Descriptive theory of knowledge, Descriptive theory of strategy, and Prescriptive theory of instructional design (Merrill, 1996, p. 36).

All ID theories based on this inference consist of three components: a descriptive theory of the knowledge and skills to be learned, a descriptive theory of instructional strategies required to promote this learning, and a prescriptive theory that relates knowledge and strategies (Merrill, 1996, p. 1). The prescriptive approach, relating to knowledge and strategies, follows the line of reasoning used in this paper toward a more informed method of design, aligning DMOs with curriculum in online higher education courses. Figure 2 is a visual representation of Merrill's ITT, which profiles descriptive knowledge objects and interrelationships of those components, descriptive instructional strategy components, and prescriptive guidelines of Instructional Transaction Theory (Merrill, 1996).

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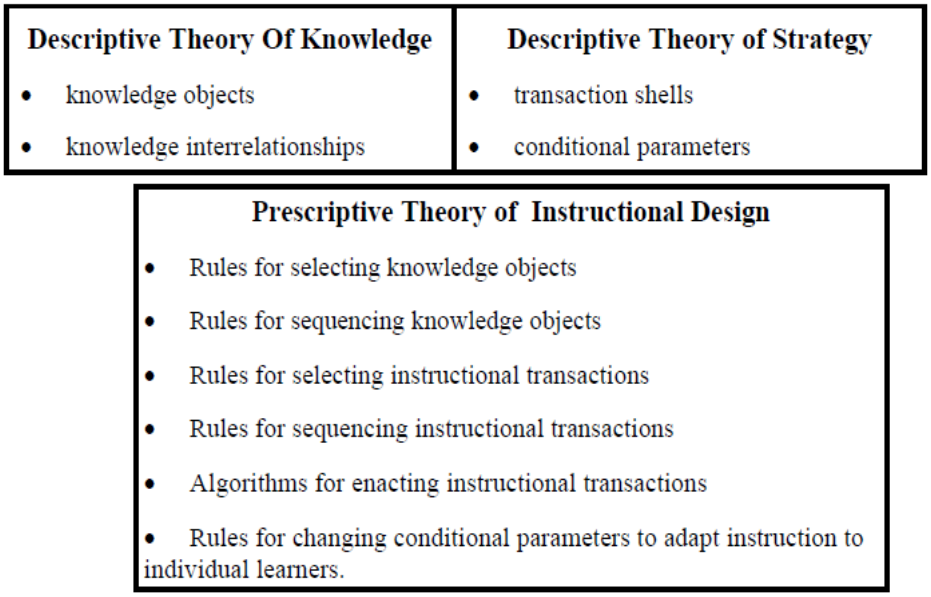

Figure 2. Principal components of instructional transaction theory (Merrill, 1996, p. 3). Reprinted from https://mdavidmerrill.files.wordpress.com, by M. D. Merrill, 1996. Instructional Transaction Theory: An Instructional Design Model based on Knowledge Objects, n.d. Retrieved from https://mdavidmerrill.files.wordpress.com/2019/04/txbased_ko-1.pdf . Copyright 1996 by ID2 Research Group, Department of Instructional Technology, Utah State University.

As integrating DMOs (knowledge objects) in alignment with curriculum content in online courses was the focus of this study in instructional design, which also relates to learner-content interactions, the researcher applied the lens of ITT for the descriptive theory of knowledge portion concerning digital knowledge objects and their interrelationships in content (1996, p. 3). ITT utilizes knowledge objects that are "a precise way to describe the subject matter content or knowledge to be taught" (Merrill, 1998, p. 1). His descriptive theory of knowledge consisted of a two-way classification based on performance level and content type (knowledge objects including digital multimedia) (p. 2). The descriptive theory of knowledge also identifies interrelationships among knowledge objects in course content (p. 3). Transactions are complex

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instructional algorithms of object-method interactions (Merrill, 1991). They represent a dynamic form of interactivity (online) between the learner and the instructional system (Seers et al, 2017). Seers pointed out there is a clear delineation between objects and instructional transactions in second generation ID (Seers, 2017, p. 83). Logically, the online environment is not merely where content is accessed – but where a "second generation" instructional design process can enable student-interactions to occur via instructional transactions intrinsic of knowledge objects.

Prior to developing ITT, Merrill created component display theory (CDT) in the 1980s. When the need to develop a theory to work with computer systems was recognized after technology growth in the 1980s, Merrill extended and renamed CDT as ITT. As Merrill (1996) noted,

> We have tagged both of these ID theories as first-generation ID theory. Neither Gagné's conditions of learning nor Merrill's component display theory provide a sufficiently complete set of prescriptions to drive a computer program. Instructional transaction theory is an attempt to extend the conditions of learning and component display theory so that the rules are sufficiently well specified to be able to drive automated instructional design and development. (pp. 1-2)

Merrill (2007, p. 8) later clarified from *First Principles of Instruction* that instruction needs to involve authentic real-world problems or tasks. He offered that body of work as an instructional strategy for task-centered instruction (Merrill, 2003). Merrill (2003) proposed a content-first approach assembled from whole problems or tasks describing a *Pebble in the Pond* as a modification in the ISD ADDIE model. He was also in agreement with Clark and Mayer that interactions should mirror the task (R. C. Clark & Mayer, 2003, p. 53). Merrill enumerated that a main "principal of instruction" relates to media objects and whether the media is relevant to the

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content and used to enhance learning (Merrill, 2007, p. 11). Giving credit to his colleagues Merrill (2007) concurred with Mayer (2003, p. 39) that humans learn better from multimedia instruction of a conversational style over a formal one, noting that Clark and Mayer (2003, p. 133) advised using multimedia in conversational style (Merrill, 2007, p. 14). The effectiveness of the instructional product(s) from interrelated "instructional principles" for learning is at the center of *First Principles of Instruction* (Merrill, 2007, p. 1).

In *Designing e³ (effective, efficient, engaging) instruction*, Merrill (2009), referred to steps for the Pebble in the Pond model based on his First Principle of Instruction, as well as using properties for the effective use of multimedia (Clark & Mayer 2003). In step 4 of this *Pebble in the Pond* model for instructional development, Merrill (2009) illustrated that developing media objects should occur after the design process as part of an "instructional strategy" and that media objects are only then simply incorporated into a final prototype, which is used later to convey the intent of the design to other content producers.

Thus far, integration of DMOs for instructional design is only incorporated separately and treated as a separate step so that integration of DMOs was shown as a disparate phase that was incorporated after the first iteration of the design process with prescribed transaction shells for online course content. If later changes and iterations of the design process are needed for digital objects and related content, shells may have had to be reprogrammed at times. This automated approach could be less useful or effective as was originally intended for the purposes of a design process in an ID Model and is likely to be just as time consuming as any other.

For its intended design principles, ITT was used as a theoretical lens by the researcher to guide this instrumental case study that explored how the ID process itself may be more directly applied for integration of digital multimedia in alignment with curriculum content in online

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courses. Interviews with senior instructional designers in the instrumental case study allowed the researcher to explore further how an ID process may be more directly applied for that purpose.

ITT was also effective as a theoretical lens for the analysis of themes by allowing the researcher to focus on the significance of integrating DMOs (knowledge objects) aligned with curriculum content in online courses. This focus helped the researcher to understand and identify related design processes from the ID participants in the study, which were central to its findings. It was then clear to the researcher that integration of DMOs could be incorporated another way – by using the ID strategy phase within the overall design process (as shown in Figure 3); instead of having that integration develop afterwards.

In their study, "The Essentials of Instructional Design Process in the Digital Age," Egbedokun et al. (2017) posited that the design processes and procedures prescribed by any instructional design model identify the essential roles that certain stages of the design process play. Goals and objectives, assessment analysis, instructional strategies and media, and evaluation are all part of successful instruction. These components of instructional design play a role in the instructional design process and the implementation of instruction in the digital age (pp. 28-29).

However, their study was based on learning theory alone (p. 36). It rested on a foundation of learning design instead of a strategy of an instructional design model(s). In the conclusion of their study, the authors affirmed that instructional strategies and media are a necessity so as to highlight their function in the design of instructional content. In addition, they determined that ID strategies are mainly used to resolve the course objectives and the needs of learners who are digital natives. Therefore, the utilization of multimedia is prescribed not only for interactivity and engagement, appealing to digital learners in the online environment, but are also prescribed

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to deliver course objectives (Egbedokun et al, 2017, p. 37). These "components" (ID strategy and multimedia) rather, can be better applied through a wholistic ID model for instructional design processes applied to all course content.

A strategy or standard is thought of as an agreed-upon way of doing something. A comprehensive ID model can be regarded as such a standard. In addition, a learning management system (LMS), as a technology tool, needs a common language or LMS standard so courses can communicate with the system and be compatible with digital objects and online course content. To ensure that communication across application software and other digital objects, including multimedia files, in the online environment function well technically and can be accessed by learners through the LMS, vendors need to comply with a hosted standard on the LMS. One of the most widely-held, current set of technical standards for eLearning software used in online course design and development is the Shareable Content Object Reference Model (SCORM) standard. After a course content is arranged and SCORM zip tool utilized, the modules can be uploaded into a SCORM compliant LMS to ensure all files are compatible with SCORM. The SCORM standard makes instructional content display as intended in a LMS as they are SCORM compliant. Also, ID models need to be flexible enough for the SCORM standard.

Among a sea of ID models applied in a dynamic technological landscape, the ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation. It is recognized as an established ID model and as an ISD framework of technology-based instruction in online higher education due to its continuous and adaptive course development characteristics. Therefore, it is well-known in the ID field that most current instructional design models are byproducts of ADDIE. As a flexible ID model it can be adopted as either a linear or cyclical application for designing instruction. ISD models have a broad scope and typically divide the

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instruction design process into roughly five phases (van Merriënboer, 1997, pp 2-3). As indicated by its acronym, ADDIE has five iterative steps: analysis, design, development, implementation and evaluation so that the outcomes from each ADDIE step support the subsequent step. Each step in the ADDIE model provides a chance for corrections before moving forward to the next step in the model. ADDIE's advantages as a macro ID model are that it is adaptable to user-centered learning because it has an iterative development process, and because it is also an automated ISD that utilizes computer system tools in online course development.

Carter (2015) viewed this ID Model as a visual representation of a systematic approach with which to design efficient and effectively developed instruction. It is important to note the differences between a traditional ID Model and an ISD. ID models focus on the design and analysis of content and on learning needs. ADDIE is used to guide the entire process of creating the learning platform, while various ID models are plugged into it to complete the vacant areas (van Merriënboer, 1997).

Therefore, ADDIE is a flexible ID model where the designer may decide in the design process which ID approach is best for learning in any given scenario, whether it is rooted in constructivism, cognitivism, or behaviorism (Ferriman, 2017). Additionally, not all ID models can adapt to as many LMS standards since ADDIE adapts to other LMS standards as it does with SCORM. Thus, ADDIE is widely known due to its adaptable development characteristics, providing instructional designers with a guideline that is quite flexible. Theories and models are generally guidelines to be tested in the field to see if they work and then applied, rather than being merely a void or static philosophical concept or idea.

ADDIE was first developed in 1975 for the U.S. Army by the Center for Educational Technology at Florida State University. As a broad instructional system design (ISD) model, it

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became a rapid development tool for instructional design that is also a LMS standard. ADDIE began as a linear model, but then it evolved into a non-linear model. ADDIE remains an endemic instructional systems design (ISD) model due to its compatibility with today's technological tools and software systems or LMSs that adhere to industry standards and curriculum development principles, such as SCORM, Quality Matters (QM), and Universal Design for Learning (UDL). ADDIE is also a well-known ID model that can incorporate multimedia, and it is still widely used in whole or in part by instructional designers today.

For example, ADDIE was employed in the study, *Designing for Engagement* (Nichols Hess et al, 2018) where the authors used the ADDIE framework to facilitate student engagement in a information literacy course. They found that the process can be scaled down to fit smaller or more discrete instructional needs of their study because a systematic design process that incorporates feedback is essential to designing meaningful learning opportunities. Applying a systems-focused design process such as the ADDIE model to create new learning interactions helps faculty and learners to address the course content (p. 278).

While ADDIE's waterfall model is an early ID model, the successive approximation model (SAM), created by Michael Allen (www.alleninteractions.com, 2019), is known as an iterative rapid development model for eLearning and an agile (software development) approach. Because SAM is situated in software development, it can be used with interactive multimedia objects and tools as an ID model. SAM has only three steps: evaluate, develop, and design. This is different than a one-step-at-a-time process such as ADDIE. SAM can be used to automate design in the large-scale development of instruction. SAM is an example of a specific agile project management method that builds instruction incrementally in shorter sections rather than all at once so that course modules are created by combining ID and software development.

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Content is built and tested by multidisciplinary developers as learners are included at the outset to pilot, evaluate, and potentially improve the modules. Although it began outside of ID practice, as an agile approach SAM has quickly become a popular ID model that is mainly based on SME collaboration, efficiency, and repetition. It is also a rapid prototyping utility that is attractive to instructional designers for meeting online course design deadlines.

Another flexible instructional design model, the 4C/ID-model, was created by Van Merriënboer, which is considered a flexible instructional design model that is geared more for training, such as using task-based simulation efforts, rather than for supporting conceptual knowledge and cognitive skills. 4C/ID has several components lacking in prior instructional design models: it centers on integration and organized performance of task-specific essential skills rather than on knowledge types, context or delivery media. The model also distinguishes between supportive information and required just-in-time (JIT) information where the latter specifies the performance required, not only the type of knowledge required. Although more traditional models use either part-task or whole-task practice, the 4C/ID-model suggests a mixture where part-task practice supports very complex, "whole-task" learning. However, the 4C/ID-model is suited more for developing training programs for complex skills and when learning transfer is the overarching learning outcome. Such training programs have a typical length of weeks, months or even years (van Merrriënboer, et al, 2002).

Yet, the model can be applied in combination with other models to address ID tenets not adequately addressed by 4C/ID-model alone and where shorter instructional events are integrated. Some researchers and practitioners prefer to combine or blend this model with others. For example, In *Ten Steps of Complex Learning* by van Merriënboer & Kirschner (2017), the authors present a systematic ID approach using ITT that also works with the 4C/ID-model.

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Current trends in the U.S. among researchers and practitioners of ID are in favor of merging the ID profession with learning sciences to make a better integration of the two. The line between them was always blurred at the international level where SMEs from many different disciplines meet each other in the ID realm (van Merriënboer & Kirschner, 2018).

Kemp also offered an instructional design model, combining technology-based instruction into an iterative and efficient model. The Kemp (1994) design model is known for its inclusive approach to instructional design. From its 1994 version, the Kemp model defines nine different components of an instructional design and at the same time adopts a continuous implementation or evaluation model. Kemp adopts a wide view; the concentric, oval shape of his model conveys that the design and development process is a continuous cycle that requires constant planning, design, development, and assessment to insure effective instruction. This is a creative, circular ID model as the designer can end the process wherever it is most useful to the design, but like the ADDIE Model it does not force the designer to choose between Cognitivist, Behaviorist or Constructivist approaches or any particular learning principles. As the model is systemic and nonlinear it seems to encourage designers to work in all areas as appropriate (McGriff, 2000).

The Kemp model is particularly useful for developing instructional programs that blend technology, pedagogy, and content to deliver effective, inclusive, and efficient learning ("Kemp Design Model", 2007). Its usefulness as a learner-centered model is its focus on learner needs and learning goals as it apportioned formative and summative assessment. It also has a focus on support and service, which is not present in other ID models (Qureshi, 2001). Although the process in the model is iterative and highly adaptable, the design has been subject to constant revision since its origin in 1985. Other models have half the steps of Kemp's, and this may not

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appeal to designers who are seeking a more simplified model or one that has a start and end to its organizational structure (linear). Kemp's model also emphasizes content analysis as would any modern-day ID approach.

Newer technologies offered in the 1990s went beyond simple simulations to include multimedia objects that introduced interactive multimedia instruction (IMI). In the 21st century both social media and variety of mobile devices have made collaboration and interactions even more powerful than initially visualized in the World Wide Web's online environment. These technologies have been widely implemented in online higher education courses to be "responsive" to operate on various technology platforms and devices. Today's digital learners expect on-demand and seamless access from any device, and without any access issues, (Kozinsky, 2017). Therefore, digital objects/DMOs need to be in accessible media file formats to provide access to learning anywhere on any platform, including mobile online access.

Models, frameworks, and standards are important to this instrumental case study because they allow for more accessible interactions with DMOs in the online environment, helping them operate more efficiently. In any profession, one of the hallmarks is a standard language, an agreed-upon framework for measures and common processes. Institutions of higher education today may choose their own LMS, model or framework, and standard.

Some present-day ID approaches also refer to prescribed learning principles and multimedia use, such as the Universal Design for Learning (UDL) framework defined by David H. Rose, Ed.D., of the Harvard Graduate School of Education and the Center for Applied Special Technology (CAST). The premise for UDL as a curriculum designed approach stemmed from earliest roots of civil rights legislation that emphasized the right of all students to a free, appropriate public education in the least restrictive environment (Hitchcock, Meyer, Rose, &

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Jackson, 2005). Out of the need for equal access to information and learning, UDL was intended to remove barriers to access, not to challenges. UDL grew to be inclusive of additional barriers since the passage of other types of legislation like the Americans with Disabilities Act of the 1990s. Thus, UDL was also influenced by architectural universal design movement as well, making environments more accessible. The principles of the UDL framework considers diversity through proactive design of an inclusive curriculum, so that barriers to academic success may be reduced or eliminated. UDL as a framework and lens for education stems from neuroscience and cognitivism. UDL has three principles: multiple forms of representation for recognition, multiple means of action and expression for cognitive strategy, and multiple means of engagement (Rose et al, 2014). Using UDL as a lens can create flexible learning environments and accommodates learning styles and variances. In addition, the UDL educational framework for curriculum has four interrelated parts: goals, methods, materials (media), and assessment to evaluate any barriers that may exist in the curriculum. The purpose of UDL is to produce learners who can assess their own learning needs (learner-centered), monitor their own progress, and regulate and sustain their interest, effort, and persistence during a learning task (Ralabate, 2011). Sustaining learning tasks through interaction with content in the online learning environment is important to course design, which has been a central focus in this study.

The ID approaches mentioned in this paper are for the purpose of applying any useful design aspects with digital multimedia integration, which are flexible enough for use with effective instructional principles for learning and teaching. Although this list is not absolutely comprehensive for all ID models, and as use of ID models can vary at each institution of higher education, this instrumental case study investigates ID model(s), ISDs, ID guidelines and standards currently used for the purpose of the study as stated. Merriam (2001) cautions

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researchers using the instrumental case study not to confuse the process of case study with the object of the case or its research project. Similarly, this instrumental case study applied ITT as a theoretical lens to see whether or how Instructional Designers are aligning digital multimedia objects with curriculum content in online higher education courses regardless of the ID Model and design strategies they employ. Instrumental case study can provide insights into larger question(s), which come from conducting the study, as classified by Stake (1995).

Interactive Digital Media in Online Higher Education Courses

In the 1980s, Garrison wrote about the three generations of distance education: correspondence, telecommunications involving telephone teleconferencing, and computers. At that time the latter form of technology-enabled distance education was called computer-aided instruction (CAI). CAI involved a mix of media, which many considered to have positive instructional elements, including objects that provided interaction and promoted independence in learning. As Garrison (1985) explained, "A secondary outcome was an ordering of distance education media based upon the concepts of interaction and independence" (p. 240). Even given the rudimentary computer technology of the time, Garrison compared levels of interaction for multimedia in instruction insofar as to order various distance education multimedia within the context of interaction and independence (p. 241).

Garrison was among the early scholars of distance education in the age of online course delivery by computer network transmission. He had the foresight to say,

> It is a virtual tautology to say that media is essential in distance education. The essential nature of mediated communication to distance education emphasizes the need to understand the impact that new technologies have had on distance education delivery methods. (p. 235)

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However, these technologies were quite limited because computer aided instruction (CAI), the only computer technology in education available prior to the Internet, offered elementary graphic media simulations for mild interaction. Pre-Internet, computer-based training (CBT) were available which were specialized, self-contained and self-paced training computer programs.

CBT use led to web-based training (WBT), which made CBTs easily available on the Wide World Web via the Internet. As such a WBT is an internet browser-based technology which is also available on local intranet (Technopedia, 2015). As WBT is a program by itself it operates without a learning management system (LMS). Or, it can be placed within the LMS since it can be linked with other systems (COMMLab India, 2018). With colossal use of the Internet for delivering instruction on server-based networks, it is quite probable that CBT's as WBTs will flourish (COMMLab India, 2018). WBTs contain combinations of digital multimedia objects such as text and graphics, animation, audio and video, which need additional bandwidth and software to function well. Technologies of WBTs include streaming audio, video, webinars, forums and instant messaging. WBT is also referred to as "online courses" and "Web-based instruction". The Internet and multimedia serve as the main vehicles for the modern WBT (Technopedia, 2015). CBTs often include 3D simulations that can be integrated with other multimedia.

In the 1990s, technological advances allowed instructional designers to complete courses much more quickly and efficiently on the Web. Interactive activities could be included in online course content beyond the use of CBTs or email to deliver online courses. About half of the colleges and universities now offer online classes due to decreases in learning costs (Technopedia, 2015). By the late 1990s, course development was much more automated and instructional design could be produced swiftly and then refined through iterative versions. ID

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methods had evolved, with better learning management systems (LMS) products, such as Saba and Blackboard, competing against each other in the market.

Scholarly articles began to appear in the 1990s about integrating multimedia into online education and about the interactions they provided within the context of the curriculum. The phrase "content is king," coined by Bill Gates when he imagined what role content would be for the Wide World Web, is often used in the context of ID practices for designing and developing online courses. Metaphorically, the context of instrumental case study is likewise dominant (Stake, 1995).

Mayer (1997) aimed at ID methods to incorporate digital multimedia into instruction, motivated by the idea that the design of multimedia instructional materials should be based on a theory of meaningful learning. In his paper, "Multimedia Learning: Are We Asking the Right Questions?" Mayer emphasized that instructional design methods should include generated multimedia. Mayer had seen the main theme of a generative theory of multimedia learning: the design of multimedia instruction affects the degree to which learners engage in cognitive learning within the visual and verbal information processing systems.

Mayer was interested in promoting deep learning in future generations of highly interactive computer-based environments (2003, p. 3). He focused his research predominantly from the standpoint of the learner, addressing learning and engagement. His study yielded positive findings relating to interactivity through cognitive approaches. Mayer reported, "This result provides evidence for an instructional design principle that can be called the interactivity principle—people understand a multimedia explanation better when they are able to control the order and pace of presentation," (Mayer, 2003, p. 6). This is additional support for the limited capacity aspect of the cognitive theory of multimedia learning (Mayer, 2001), which is that

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interactivity reduces cognitive load by allowing learners to digest and integrate one segment of the explanation before moving on to the next. Instructional design principles are fed from other theories as well as from ID theories.

Mayer (1997) reviewed eight studies and found consistent evidence for a multimedia effect. For example, students who received a coordinated presentation of explanations in verbal and visual format generated a median of over 75 percent more creative solutions on problem-solving transfer tests than did students who received verbal explanations alone. A review of ten studies concerning when multimedia instruction is effective found consistent evidence for a related effect: Students generated a median of over 50 percent more creative solutions to transfer problems when verbal and visual explanations were coordinated than when they were not coordinated. A review of six studies concerning effective multimedia instruction showed that multimedia and related effects on learning were strongest for students with low prior knowledge and high spatial ability. These results were consistent with a generative theory of multimedia learning in which learners actively select, organize, and integrate verbal and visual information (Mayer, 1997, p. 1).

The field of instructional design was traditionally rooted in cognitivism, like Mayer's CTML, but more contemporary models are based on constructivist theories. Mayer tended to mix views from cognitivism with constructivism. Yet, Mayer also crossed over to the area of instructional design when emphasizing how integration of multimedia with content took place. As others have noted in recent years,

> Mayer underscores the importance of learning (based upon the testing of content and demonstrating the successful transfer of knowledge) when new information is integrated with prior knowledge. Design principles including providing coherent verbal, pictorial

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> information, guiding the learners to select relevant words and images, and reducing the load for a single processing channel etc. can be entailed from this theory. Mayer's theory has three main assumptions for learning with multimedia, which are that there are two separate channels (auditory and visual) for processing information (sometimes referred to as Dual-Coding theory); each channel has a limited (finite) capacity (similar to Sweller's notion of Cognitive Load); and learning is an active process of filtering, selecting, organizing, and integrating information based upon prior knowledge (David, 2015, p. 1).

This researcher gained her perspective from reviewing Mayer's recent literature on instructional methods, which argues that one's prior knowledge of content curriculum needs to be evaluated in terms of cognitive load. However, digital multimedia object technology does not stand alone as a disparate part of content. Mayer highlighted the importance of learning based upon the testing of content and the successful transfer of knowledge (David, 2015). Like Mayer, Merrill stressed the importance of content and instructional transactions (learner-content interactions), but with respect to the instructional design of content and learner-content interactions and the role of the design process. The design must align the digital knowledge objects (DMOs) with curriculum and intended course objectives for learners to attain in the online course environment. This integration must also be done well enough so that course objectives may be met successfully.

Digital technology is ever changing, and so are the demands of institutions of higher education, as noted by recent studies that suggest steady increases in online course demand. Growth in online course enrollments has been unrelenting (Allen & Seaman, 2018). The authors observed that online course demand has persistently increased over the last 14 years whether the economy was expanding or contracting, and whether total enrollments were growing or

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decreasing. Online growth represents almost three-quarters of all of U.S. higher education's enrollment increases. Public institutions of higher education command the largest portion of online students, hosting 67.8% of all distance education students (Allen & Seaman, 2018). In comparison, even in the small number of private, nonprofit institutions with large online campuses, the number of online students enrolled exclusively in online courses doubles that of students enrolled in part time online courses (Lederman, 2018).

Kolowich (2015) revealed that nearly two thirds of academic leaders refer to online education as critical to the long-term strategy of their institution. In 2014, this was 71%, the highest rate yet. Clearly, there is a lot at stake as online education has become mission-critical across the global online higher education landscape. In addition, the most drastic recent increase in the perceived importance of online education was at small colleges, those with fewer than 1,500 students. In 2012, 60% of academic leaders at small colleges said online education was strategically crucial. In 2015, that number reached a new high at 70% – nearly the same increase as at universities with more than 15,000 students (Best Colleges, 2016). According to the 13th annual survey of higher education by Babson Research Group, "Online Report Card: Tracking Online Education in the United States" the number of students taking online courses grew to 5.8 million nationally reflects a consistent growth trend continuing for over a decade as more than a quarter of higher education students (28 percent) are enrolled in least one online course (Smith, 2016). Additionally, Kathleen S. Ives, executive director of the Online Learning Consortium, confirms that the trend of online enrollments in higher education while overall enrollments decline suggests a meaningful shift in the landscape of higher education in America. This steady growth in online course enrollment is acknowledged by leaders in academe as they recognize that online course offerings are critical to the long-term strategy of their institution(s) (Smith,

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2016). Ives elucidated that since more than a quarter of students are enrolled in at least one online course, online higher education has become mainstream (Smith, 2016).

Babson also asked academic leaders if their faculty members acknowledge the value and authenticity of online education. In 2015, only 28% of academic leaders said their faculty thought online courses were legitimate. The Babson team noticed an inverse relationship between declining higher education enrollment and escalating online enrollments (Smith, 2016). This low percentage implies that most faculty did not ascribe to providing online instruction, and this statistic had been about the same since 2002.

One reason is that faculty do not always know how to design courses with technology in the online environment and likely do not readily adapt to the growing demand for online course development. They may or may not be required to collaborate with, or use support from, ID staff to design online course content when they are assigned to teach online courses – as institutions of higher education can differ in their requirements of faculty who want to teach online courses to collaborate for their online course development and/or use directed design processes from consulting sessions with their ID staff.

For whom are instructional designers designing online courses in higher education, besides the stakeholders in higher education? Per the data collected by U.S. News, the average age of online learners is 32 for bachelor's students, (Friedman, 2017). Due to its flexibility, graduate students' use of online education (36%) is higher than the average for bachelor's students (32%), as reported by the National Center for Education Statistics (2015). Friedman (2017) suggested that career goals continue to be the primary motivation for students pursuing an online degree, according to a 2016 market survey provided by The Learning House. This is because 95 percent of new students at ranked online schools took college courses previously, so

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it is rare for an online student to enroll full time in an online bachelor's program after high school, as they might for a program on campus (Friedman, 2017).

Nonetheless, given that the average online learner represents the largest group of online digital natives, millennials are currently overtaking baby boomers as the population representing the majority of online digital learners. According to the U.S. Chamber of Commerce Foundation, Millennials are born 1980-2000 (2012). The subsequent generation born after 2000 is following in their footsteps. The U.S. Dept. of Health and Human Services has termed this next generation as post-millennials. Post-millennials have also been referred to as "Digital Natives," having grown up with the Internet and its communication tools. Post-millennials have just entered college, and they too are anticipating an online environment that allows them to be engaged with digital objects for learning interactions, indicating that college education is still heading in the direction of a more learner-centric environment (Kozinsky, 2017). This successive generation represents future online learners, who like their counterpart digital natives of the millennial generation, also expect digital learning objects to be deeply embedded in their education, because technology has always been a fully-integrated experience connected to every facet of their lives (Kozinsky, 2017). In the industry of industrial design, providing expertise higher education around the globe, Sutherland (2016) acknowledged that digital natives were "born into an era of instant connectivity," exploring the world in an entirely new way. Therefore, digital natives have different expectations for education based on their relationship with technology. In discussing his work in the field, Shank (2014) drew from earlier research with Amaral (2010), which showed that higher levels of time involved with interactive digital course content lead to greater student course success (p 31). These exigencies for ID in online higher education are evident. However, for colleges and universities to be responsive and relevant, they must adapt

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their systems to meet the advancing needs of digital learners using digital technologies (Sutherland, 2016).

The foregoing developments are well-established, imposing trends as well as explicit inferences for instructional design in higher education for purposefully designed integration of digital media objects in online course content. Digital technologies and the current demands for online courses with integrated DMOs as digital instruction and learning applications are changing the face of higher education, spurred by the growth of the World Wide Web. Online learners expect nothing less adaptive of the design of digital content and online higher education course development. NALs, known as non-traditional learners have changed the demographic profile of the online learner so that this group is representative the majority population of learners in higher education today (Non-Traditional Students: The New Majority, 2017). Higher education staff in the ID profession know who their audience is in the online environment. Even so, as statistics brought forth by Chen (2017) point out, NALs are often neglected for their diversity,

> An important population of student diversity that is often neglected in postsecondary education, however, is nontraditional adult learners (NALs) even though they represent approximately 38.2% of the postsecondary population in the United States (National Center for Education Statistics, 2009). NALs, usually defined as aged 25 and over, also include those under 25 but who have characteristics indicative of adult responsibilities, such as working full-time, being financially dependent, has non-spousal dependents, is a single parent, as well as having a nontraditional educational trajectory, such as delayed enrollment into higher education or did not complete high school (Horn, 1996). Given these characteristics, most students in undergraduate programs can be classified as

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> nontraditional, suggesting that the traditional student, who enrolls full-time and lives on campus, is now actually the exception rather than the norm (Choy, 2002), even though they, the traditional student, arguably receive the vast majority of attention and resources from colleges and universities (p. 1).

With the exception of online learning for traditional learners, other learning environments have a traditional, youth-centric feel, which are often significant barriers to NALs for engagement in postsecondary education (Chen, 2017). As the diversity of undergraduate students has grown substantially in the last 15 years, this increase is influential for online course design at the macro and micro levels given that these learners want flexible course scheduling and more self-paced instruction (Hittepole, 2015). The United States is projected to become a "majority minority" (Colby & Ortman, 2015, p. 9) nation in 2044, as the total percentage of minorities will exceed the Caucasian population. With the total undergraduate population projected to increase by about 37% to just less than 24 million students by 2022 (Hussar & Bailey, 2014), the increasing racial/ethnic diversity in the United States will equivalently continue to impact the diversity at college and university campuses across the country (Chen, 2017, p. 1). How does this increase in diversity affect online course design? Chen (2017) addresses this:

> Colleges and universities have needed to reexamine curriculum and its delivery. Curricular changes include knowledge and skills for the modern era including environmental sustainability (Vincent & Focht, 2009), civic engagement (Adelman, Ewell, Gaston, & Schneider, 2014), information technology literacy (Jarson, 2010), and even multicultural and diversity training. Delivery changes include the growth in online courses and programs, electronic learning management systems, and more mobile and technologically focused solutions (Chen, 2017, p. 3).

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The characteristics of the majority of online learners are now diverse populations of learners who often have work and have family obligations (Non-Traditional Students: the New Majority, 2017). As recognized by Hittepole (2015), higher education is known to cater to traditional learners. Invariably, the needs of NALs and their age group (Millennials) include being able to take advantage of automated learning systems and technology.

To meet the demands of online higher education programming from the steady increase in diverse online populations, ID staff will not only have to keep automating the design process, but also will be diligent in integrating more self-paced (online) instructional content. It is important that this instructional content for such instructional/learning transactions in online course content be prepared to consist of integrated transactional objects/DMOs aligned with curriculum goals, and that IDs are applying this integration at the macro and micro level design for self-paced content and those transactions with digital objects in the online environment. The necessity for such content holds merit by the demand in higher education; from the steady influx of online learners and ID trends that are integrating digital multimedia and interactive content designed for learner-centered learning.

Globally, digital learners prefer a collaborative learning environment, interacting with digital object transactions that includes their involvement with instructional learning materials ILMs) such as DMOs. They are completely comfortable learning alongside other students, even outside of their own school, using digital application tools that offer learning with digital objects. Moreover, as digital natives are from a generation who grew up with digital objects and never lived in a world without them, today's learners prefer to be constantly connected with digital content that offers viewing, listening, reading, and continuous interaction with technologies in the online environment, (Shank, 2014, p. 3). By way of active learning afforded by DMO's and

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ILMs, students are more motivated, engaged, which supports their learning critical course content. As digital natives, both millennials and post-millennials are hands-on and directly involved in the learning process. In addition, those born in this latter generation thrive when they are given the opportunity to have a fully immersive educational experience and they even enjoy the challenges of being a part of it. For instance, while only 12% expressed that they learn through listening, 51% of surveyed students said they learn best by doing, and they enjoy all interactive classroom environments over the traditional dissemination teaching method (Kozinsky, 2017).

Such data as this concerning learner-content interactions with digital objects inform ID practices with what is being learned with integrated online course content. Therefore, instructional designers must prepare and integrate digital objects for interactive, digital learning environments based on this data-driven evidence to make design improvements. In a data-driven era a trend in higher education is using evidence-driven data to purpose it for instructional design processes.

As published in Forbes, advances in information technology now make it possible to offer significantly more rigorous courses that do not feel as difficult due to the design of the course and more precisely integrated features (Lindsay, 2014). Online courses can be of lower quality like free courses, called MOOCs (Massive Open Online Courses), and from text-only electronic correspondence courses, evidenced by the fact that MOOCs have a high, 90 percent attrition rate – due to an overall lack of attention to course learning outcomes in lieu of their low cost. In contrast, multimedia-rich offerings feature a high degree of interactivity via access to quality digital media objects, including video and simulations. Are online courses being designed for better engagement and the next generation of digital learners who have more advanced

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technical and Net skills and who are therefore, well prepared to interact with digital content, their professor, and their peers in the online course environment and related communities?

According to Lindsey (2014), however, the majority of what is offered of online courses, especially by public institutions, is not as developed. Colleges who can afford to produce better quality courses with interactivity, integrating media-rich digital objects and technology, are experiencing improved learning outcomes, better retention, or completion rates. Exelscior College, for example, has spent over $100,000 per course for supporting the online of its nursing program, resulted in completion rates of 96%, and demand for the program is growing (p. 8). Moreover, results of recent studies by Columbia's Teachers College show that online learning is well-suited to adult learners as they were designed, but not necessarily for the younger, traditional-aged college students (Lindsay, 2014). Online programs are yielding better results from their content compared to those of the traditional classroom, particularly for more self-motivated, older, and experienced adults, who are currently the majority of online learners. Inexperienced and less confident 18-24-year-olds had issues with persistence and completion, (Lindsay, 2014).

Overall, the results of these studies should signal to decision makers, policymakers, and college administrators that they must now endeavor to improve the quality of online learning integrated with digital media content. Instructional designers are tasked with creating designs that enable all digital learners to interact directly with online course content, improving engagement. Learning formats in this study focus solely on multimedia integrated online course content in higher education courses. Instructional designers must keep up with this demand from today's digital audiences, assist educators in the design of their online courses, and follow the tenets of institutions of higher education to provide quality content in online courses. Since

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attaining effective learning and use of instruction via digital media continues to be a major concern in education, educators have needed to find the best usage of digital media technology, providing students each advantage towards reaching an informed international perspective and to become active participants in their learning (Chien, 2012). Their need (educators and learners) is a considerable factor for the progress of course development, integrating DMOs and for advancing those ID practices.

Designers must not only provide enough accessible and timely digital content, but also provide integrated digital objects aligned with curriculum in higher education online courses throughout the design process. Instructional design can enable digital learning transactions that are directly connected to what is being learned. Using a strategy for design or ID model that provides a seamless, automated design process is warranted today more than ever. Strategies in the instructional design area affect how all the design components fall into place. These strategies are a means by which to implement an effective design for aligning DMOs with curriculum in online and distance higher education courses. In addition, instructional designers must include the three elements, learning, instruction, and assessment, that Sorden (2015) delineated for ID.

Sorden (2012) concluded that CTML as a theory has issues and inconclusive parts – but that his expectation is that the theory will evolve when more research develops for the study of how people learn and cognitive functioning. Sorden also acknowledged that instructional design is a field that is continuously developing very quickly due to advances in technology and neuroscience. This illuminates a need for researchers to contribute new scientific studies to the development of the theory and design principles (p. 22). Still, CTML also informed ITT theory, as Mayer and Merrill continued their collaborations in the ID field over decades.

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As an instructional design theory, the design methods for components of ITT illustrate a possible increase of accuracy to describe instructional strategies to represent knowledge objects and instructional are used methods for manipulating the elements of knowledge objects. They enable the specification of executable knowledge, as they enable both tutorial and experiential instruction from the same knowledge representation (Merrill, 2000). Merrill introduced ITT as a possible strategy to provide more accuracy to designing instruction for different kinds of instructional outcomes and to attempt to make automated instructional design feasible via instructional technology and Instructional Transaction Theory (ITT). These remain important possible strategies for the future of instructional wikidesign, as designers use technology to align media objects with curriculum content in the online course design process.

This researcher anticipates that although instructional designers are busy with these tasks Sorden described, that designers must look at the "big picture," which includes summative evaluation of courses, does not negate the fact that the instructional design process is iterative to improve instructional content continuously, and that all digital media objects must be integrated in alignment with curriculum. However, in the design of online higher education courses, the three elements are only part of integrating multimedia with content. Hence, DMOs are underestimated as important transactional objects that need to be better aligned with curriculum through instructional design practices. Mayer's approach saw the objective of online course content although from the learner perspective of course design it may seem like a "cart before the horse" approach; except where course outcomes can affect future iterations of the design process. This illuminates a gap in the design of online content.

Mayer and Dow (2003) expanded upon theory, moving on to the topic of interactive qualities of DMOs and inserting them into systems environments. Their findings reiterated

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CTML's benefits for memory and increasing transfer of what is learned through multimedia interactions. The focus then was on the systems rather than integrating curriculum. It would seem inconceivable that it took theorists three decades to arrive at this point. Moreover, the literature shows the gap in more purposefully designed interactive online content certainly still exists.

Yet, Butin (2010) made it very clear that exploratory dissertations can focus on the new, noting, "An exploratory dissertation design is best used when an issue is not well understood in the literature or previously unexamined in a particular fashion" (p. 80). Evans and Gibbons (2007) conducted a related study that pointed to the need to adopt an initial sequence of interactive design components as a better ID method,

> The aim of this study was to determine whether the addition of interactivity to a computer-based learning package enhances the learning process. A sample of 33 (22 male and 11 female) undergraduates on a Business and Management degree used a multimedia system to learn about the operation of a bicycle pump. The system consisted of a labelled diagram of the pump, followed by a description of twelve stages in its operation. The sample was randomly divided into two groups who used either an interactive (I) or a non-interactive (NI) version involving both images and text. The I system differed from the NI system by the incorporation of control of pace, self-assessment questions and an interactive simulation. Students then undertook two different types of tests to assess their learning: one designed to evaluate their memory by recalling facts from the lesson, and another designed to assess their understanding through solving novel diagnostic problems. Students using the I system outperformed those using the NI system in the problem-solving test and needed less time to complete both memory and problem-solving tests. This result is consistent with the hypothesis that interactive

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> systems facilitate deep learning by actively engaging the learner in the learning process. This suggests that educational designers who seek to foster deep learning (as opposed to mere factual recall) should adopt the incorporation of interactivity as a design principle. (p. 1)

Evans and Gibbons (2007) also stated, "It thus provides further evidence in support of the active learning hypothesis in the form of an interactivity effect for understanding and for memory." (p. 1158). Evans and Gibbons indicated that further research needed to be done around instructional design,

> The effect of interactivity in increasing learning has important implications for the design of the next generation of e-learning systems. As indicated in the introduction, until recently, most systematic studies of computer-based learning have used systems which were non-interactive. This study provides compelling reasons for courseware authors who wish to foster deep learning, to incorporate interactive features into the design of their systems at an early stage. (p. 1159)

Their view contrasts with Mayer's belief that new information in content is integrated with prior knowledge. Deubel (2003) observed,

> There is an abundance of theoretical frameworks to assist designers in decision making (Willis & Wright, 2000) regarding the development of the interface of a multimedia product. This article illustrated how designers might enhance motivation using strategies from Keller's ARCS model, apply Reigeluth's Elaboration Theory to layer information, create authentic simulations using Merrill's Instructional Transaction Theory, design instructional events in the interface using Gagne's learning hierarchy, and use scaffolding strategies to help individualize instruction. (p. 87)

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Deubel concluded that theories continually evolve or are revised as a result of research analysis and critiques by instructional designers and theorists (2003, p. 87).

This researcher used ITT theory as the theoretical framework for this instrumental case study. Merrill emphasized the importance of instructional design in online education. Merrill's earlier work also warrants attention because it supports an understanding of the importance of instructional design practices, particularly in the area of integrating digital multimedia in online learning. Merrill wrote about the efficiencies in the development of "large amounts of computer-based, interactive, multimedia instruction," purporting that, "we must significantly increase our design and development efficiency" (p. 3). Merrill (1996) defined instructional design theory as "a set of prescriptions for determining appropriate instructional strategies to enable learners to acquire instructional goals" (p. 1).

Merrill's affirmations concerning instructional design helped shape its importance in online higher education courses with digital multimedia knowledge objects. After creating ITT, Merrill (1999) emphasized effective instructional design that is "concerned with the current emphasis on information and the lack of emphasis on appropriate instructional strategies," (p. 5). Merrill (2015) explained,

> In the Pebble-in-the-Pond model the content to be learned is specified first. It is casting in the problem or whole task pebble and specifying a progression of such whole tasks that is the unique characteristic of this model. Pebble-in-the-Pond is primarily a design model; hence we have not shown other necessary phases of the ISD (Instructional Systems Design) process, such as front-end analysis, implementation and evaluation. (pp. 6-7)

The ISD model or design process commences at the curriculum level with content analysis, definition of objectives, outlining of sequences and subsequences of the curriculum, per Alessi &

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Trollip (2001, p. 18). ISD is often thought of as a "modern" approach, while a post-modern approach is more eclectic, borrowing from other professions, such as, software development because ID is still considered a linking science that looks to other disciplines (pp. 6-8). Along with this more scientific approach to ID, Brown and Green (2016) posited that a much greater awareness of the greater complexity of systems and progressively ubiquitous, computer-based media production tools, foster a situation in which instructional designers must adapt their views and practices (p. 18).

Content is the most indispensable component in instructional design of online courses. It was important to become more familiar with these current instructional methods before interviewing ID staff at the study sites because some study participants may prefer using more contemporary instructional design model(s) and practices. The instructional design for the integration of DMOs with content is even more important in online courses because they are a prevalent component of content, presentation, and delivery in that course format.

In the online learning environment instructional interactions create conditions of active learning. Active learning opportunities for online learners depend on interactions provided by digital multimedia learning objects. Education literature indicates that interactions are inherent and paramount to educational activities. Empirical studies have shown that students learn best when they actively participate in the learning process (McKeachie, 1999). There is substantial empirical research showing that learners retain more with active learning provided by learning transactions with digital multimedia. Nonetheless, areas of vulnerability show gaps that necessitate improvements in instructional design methods, integrating digital multimedia with curriculum for more effective or improved transaction experiences based on ITT.

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The case study established additional considerations than what have been employed in instructional design methods. During the interview and observation process, instructional designers were asked whether transactions that are more closely aligned to curriculum content yield a better and more effective course design, as suggested by the literature. An instructional design application requires a broad approach to improve the transaction efficiency and accessibility of digital multimedia curriculum content. "Since learning is not static, learning theories must change to suit the broader educational context in which they are found" and that learners "must be provided with a broad-based learning and with a repertoire of learning tools and sources" (Koslow & Pina, 2015).

Chiu and Churchill (2016) purported that more experiments were needed to extend their findings and "to determine the effectiveness of the instructional approach itself." (p. 24) What are these more current approaches and what is being done effectively in the field of ID in higher education to produce successful, interactive online courses? Chiu and Churchill (2016) suggested "Using multimedia learning principles simplify learning when faced with large amounts of learning content provided from an instructional approach" (p. 7). Visual representations of information, and data in relation to curriculum, are often used in digital format and integrated with the course content of many online higher education courses.

The emphasis across higher education on shared reusable DMOs as knowledge objects from accessible, digital sources means that online courses are now designed and developed with a vast amount of resources from many digital sources. These digital objects are sometimes stored in common educational resource libraries on college/university campuses for sharing amongst course/instructional designers as reusable objects used for ID purposes or are freely accessible OERs. Differentiated from learning objects, knowledge objects are defined by Merrill, (1996) in

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his work, “Instructional Transaction Theory: An Instructional Design Model based on Knowledge Objects.” For example, many colleges maintain digital libraries that include digital repositories for such digital knowledge objects, which are stored online by their own library and instructional design departments.

Faculty who depend on instructional design staff to help implement and integrate DMOs in their online courses wonder how to go about that task. Faculty are already laden with course textbooks, content, description, curriculum, and syllabi for courses they facilitate online. Instructional designers are tasked with collaborating with faculty to integrate course content and DMOs to provide learning transactions that support the curriculum.

This instrumental case study was intended to discern how instructional designers go about these tasks to assist in closing the gap, aligning digital multimedia objects with curriculum in online courses. This research was sustained by an understanding related instructional design models regarding interactive digital media object integration in online courses. Merrill’s ITT and Mayer’s (1990) CTML served as practical points of reference.

Merrill’s use of descriptive design strategies formed the basis of this researcher’s idea of aligning DMOs with curriculum in online courses. Merrill (1999) recommended that transactions with digital multimedia should be a mainstay in effective instructional products:

> [with] instructional strategies as algorithms (transactions) for manipulating data structures (knowledge objects) we have provided a much more precise description of the different kinds of instructional transactions required for different kinds of instructional outcomes (goals or objectives). Our hope is that this formulation will enable instructional designers to design more effective and appealing instructional products (p. 5).

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Merrill reinforced the idea of building transactions into instructional development tools and observed how the resulting instructional interactions would be based on sound principles of instructional design (pp. 2-3). This study explored how this is implemented toward that end.

Jonassen (1991) elaborated that external reality is thought of somewhat differently by everyone, depending on individual experiences of the world and our beliefs. Likewise, Bednar et al. (1991) believed learning is an active process where meaning is grows from experience, and that learning knowledge must be situated in a rich context and founded on real world contexts, for learning to take place and then transfer to the real world. It is clear that these constructivist scholars were of like mind regarding how active learning takes place. As mentioned in Chapter 1, Merrill stated,

> The goal of a learning environment is to enable the student to explore some device or setting. The objects in the environment behave in a way similar in their behavior in the real world. The student can act on objects in the environment and see the consequences of their actions. An open-ended learning environment allows free exploration within the constraints of the learning environment. So-called simulations that allow only a single action and are constrained as to the path that the student must take, are merely interactive demonstrations not learning environments. (Merrill, 1999, p. 10)

There are more ways to integrate transactions other than simulations, and that is what this study explored through case study about how ID integrates digital multimedia in alignment with curriculum content in online higher education courses.

Braxton (1999) refined Moore's (1997) theory of transactional distance. Braxton specified that the theoretical framework of an evaluation tool consists of learning theory and instructional design methodology. This includes Moore's theory of transactional distance, which

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is based on learner autonomy and two primary components: structure and dialogue (p. 1). Her study differentiated technical and nontechnical transactions, which are those learning transactions that include technology and those solely utilized with course instructors rather than technology. To validate her refinement of the existing theory, data relating to distance education instructional design methods and transactional distance were collected from practitioners in the field through surveys, interviews, and virtual focus groups. Braxton's data supported the refinement of transactional distance theory, examined the instructional design methods in use by distance education practitioners of the time, and examined the levels of transactional distance that result from the various instructional designs (Braxton, 1999). Braxton (1999) set out to produce an evaluation tool for educators who develop their own computer-based distance education courses. The evaluation tool uses a utilization-focused process to help educators select the most appropriate content, model, methods, theory, and uses for course design (p. 1).

Similar to how Braxton conducted her study through the lens of Moore's transactional distance theory, this study sought to refine instructional design practices through the lens of an instructional design theory of Instructional Transaction Theory (ITT), rather than a learning theory. ITT is a contemporary ID theory. ITT involves an inclusive, methodical design process for use with multimedia for learner-content interaction and online course development.

In the big picture, ID is comprised of macro design as well as micro design. Micro design is a component of macro design. Snelson and Elison-Bowers (2007) discerned each stating,

> The macro, meso, and micro perspectives correspond to decreasing levels of granularity for the design of educational products such as multimedia-enhanced online courses. At the macro level decisions about the design of an online course are situated within a larger program or institution. From this higher level of granularity course design

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> is geared toward alignment of curricular goals with programmatic and institutional needs. The mesolevel shifts to a narrower focus of design granularity as the overarching framework of a course is mapped out for a specific context. The microlevel of design assumes an even finer focus toward development of individual elements of instruction (p.384).

These design entities are not separate although they have separate functions (Morrison, 2017). Associated with this study's purpose of integrating DMOs in alignment with curriculum content, Reigeluth (1999) also highlighted interrelatedness in instructional design, taking a broader view (macro design) that includes the design of instruction, students, and content. Reigeluth affirmed correlations between instructional theory, learning theory, and ISD (design) process. Subject areas are interrelated within these independent domains, thematically and in other respects. The interrelationships between instruction and other areas, such as learner motivation, engagement, and assessments, are also powerful. Learning is related to and influenced by the climate or culture of the environment within which it occurs (pp. 2-3). Reigeluth's (1999) model of instructional design, Elaboration Theory, has two components for facilitating human learning and development: methods of instruction that relate to the context in which learning can take place and situations for learning that affect the methods of instruction (Qureshi, 2001). In this way Reigeluth (1999) showed that other systems also have a role in instructional design, including professional development and technology support systems (p. 3). Reigeluth believed that the bottom line of task-based instruction is that it is active, learner-centered, and largely self-directed (p. 5). Reigeluth appreciated ITT for its efficacy, time-saving design, development of instruction, and valid theoretical basis.

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Koslow and Pina (2015, p. 65) referenced Anderson (2003) while writing about the impact of interaction in distance education. They reviewed the three types of interaction proposed by Moore's (1989) Theory of Transactional Distance: student-teacher, student-content, and student-student interaction. As a predecessor to Merrill's ITT, Moore's innovative Transactional Distance Theory was first developed in 1977, but it was later honed the 1990s as technology advanced. The capacity of the Internet to store, catalog, and deliver such content, supplemented by the capacity of computers to support a rich variety of computer-assisted instruction, simulations, and presentation creation tools, is significantly altering the context of student-content interaction (p. 136).

Because ITT provides more exact ways to describe or represent knowledge objects in embedded in content, ID strategies, and design prescriptions, it can advance the application or integration of interactions with content more efficiently than other theories. Knowledge objects that more precisely represent the knowledge to be taught increase the precision with which instructional strategies can be described. Merrill (1999) indicated that instructional strategies can be described as methods for manipulating the elements of knowledge objects, and that this object-oriented architecture enables the specification of executable knowledge objects, making practical instruction possible using the same knowledge representation (p. 29).

ITT was intended to be used as an adaptable model that accommodates macro and micro levels of instructional design. It was based on an assumption that subject content knowledge can be isolated from instructional strategies for teaching that content knowledge inputted by an expert but then uses algorithms (in software programming) to manipulate and organizes the knowledge object content to create learning interactions between an instructional device and a

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learner. The device displays information, instructional activities to teach a specific skill or piece of information using technology as the medium.

According to course material offered by Utah State University (SMPL-007 Foundations of Educational Technology, n.d.), one of the primary goals of ITT is effective adaptable instruction. As Merrill (1999) alluded, this is largely made possible through the use of precise knowledge objects. Also, many forms of computer aided instruction (learning environment, gaming, etc.) seek to mimic this high level of re-usability. Though the instructional systems using ITT as comprehensively and complexly envisioned by Merrill may not be a large part of current educational practice, elements of ITT are present in current educational instructional design (https://resources.instructure.com, n.d.).

The need to work towards a better design process to align digital multimedia with curriculum in online higher education courses is evident. Research to explore combining modern tools and knowledge in current instructional design may develop more effective ID practices. Through instrumental case study, the researcher explored ID practices for integrating interactive media objects to be more effectively aligned with curriculum content for digital learning. To date, the research has been scarce in this area. By conducting an instrumental case study, this researcher sought to find another way for integrating digital media objects in alignment with curriculum content in online courses. The next section delves into what was found in the literature for digital content alignment in the online course.

Alignment

Koslow and Pina (2015) posited that content can be presented in a variety of ways using multimedia elements of text, images, video and audio. Mandernach (2009) proposed examining the effect of instructor-personalized multimedia supplements on student engagement in an

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introductory college-level online course (p. 1). Anderson (2003) observed distance educators' use of media and technology to support interactions (p. 1) through the lens of Moore's transaction distance theory, which is centered on learning with technology and learning performance. He concluded that transactional distance theory provides a rich base from which instructional designers and course developers can put theory into practice. By incorporating principles of course structure and learner autonomy into the design of online courses, the disadvantageous effects of distance between online learners and their instructors can be addressed and alleviated (Anderson, 2003, p. 70).

Rather than learner-teacher or learner-learner interaction, the focus of this instrumental case study was on learner-content interaction viewpoints of the participants. Functions of learner-content interactivity are more emphasized by the ITT framework. Chiu and Churchill (2016) indicated in their study that literature proposes using learning principles for multimedia in the instructional design of content – yet learning principles alone may not be sufficient for the design of learning objects for concept learning in some subjects. The lack of literature suggests that more studies are needed about integrating learning objects in context with specified online course curriculum content. The intent of this instrumental case study was to resolve such gaps in the literature.

The focus of this study was instructional design for learner-content interaction with digital multimedia that are aligned with curriculum in online higher education courses. Tiene (2002) confirmed that the most vital instructional technologies available to today's educators are multimedia-based learning and distance education. Tiene, who worked as an educator as well as a course developer, suggested that a variety of multimedia objects can be effectively integrated,

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so students are aided by digital multimedia to interact with structured curriculum. In his conclusion, Tiene related,

> These computerized lessons can include a variety of multimedia resources: pictures, sounds and video materials. The visual material can help clarify key points, video can bring real experiences into the classroom, and animation can help demonstrate how processes work. Audio can also be very helpful, especially for topics such as music and language instruction. The lessons developed for my course with the Toolbook authoring language were well received by the students. Particularly successful were some sequences for teaching Web-based computer skills that made effective use of screen captures from the Web. These screens were then marked with highlighting to indicate critical menu selections, displays, transformations, etc. Procedures could effectively be demonstrated on these simulated Web screens, showing students exactly what menu choices would appear and which commands they needed to select. (p. 18)

Patnaik (2018) pointed out that although words may be useful, multimedia elements play a critical role in the online learning environment in guiding and supporting learner engagement, and that multimedia can be utilized efficiently in the design of effective courses. This highlights an important benefit of multimedia objects integrated with online course content, which is that the interactions to support engagement can also guide learners to connect more directly with online curriculum content.

Key Theorists and Instructional Systems Design

Merrill et al. (1996) wrote, “Instructional design (ID), or instructional systems design (ISD), is the practice of creating instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing” (pp. 5-7). Merrill (1999) created

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(ITT), which is tied to multimedia objects. Earlier theorists did not combine transactions with multimedia, for learner-content interactivity with multimedia, and this type of interaction is more emphasized by the ITT framework.

Mayer's (2001) CTML, as well as Miller and Reigeluth, were mentioned earlier in this chapter. These theorists and scholars are all recognized as proponents of interactive digital media in online higher education. Their work prompted this study. Miller's (2001) abstract is as follows:

> This article argues for the extensive employment of multimedia in college courses and suggests that instructors jointly involve their students in the process of making such resources. To foster greater engagement, a way of thinking about multimedia within the context of a coherent online system is introduced. The article identifies the key components of this system (i.e., distribution, location, collection, conceptualization, and production), the precise ways in which various online services and tools fit into each element, and how facility can be developed in working with digital learning content across the system. (Miller, p. 1)

Instructional Design Practices for Content Alignment

Instructional designers who design and develop online higher education courses are responsible for ensuring they have the components that the university prescribes, and that SMEs follow for understanding their institution's instructional design processes. Instructional designers also participate periodically in professional training on course design and development systems and are aware of trends in current online instructional design methods. The instructional design staff also sometimes provides support to other online course facilitators, either technical or in collaboration with faculty. This instrumental case study was needed to understand the

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professional ID practices, design processes, and procedures that instructional designers must be cognizant of when producing effective instructional design and developing online courses for integrated multimedia objects that align with curriculum content and related course objectives.

Some progress to close the gap by producing more effective instructional content in online courses can be made through direct observations and participant knowledge of the outcomes of course surveys. However, such summative assessments often do not address integrated learning objects that can provide transactions designed for learning experiences that are germane to the course content. Rackaway (2012) affirmed,

> Faculty members tend to add multimedia haphazardly and do not integrate the multimedia used into assessment. As a result, multimedia becomes a convenient entertainment or distraction rather than a legitimate learning tool. The author's own frustration with multimedia's second-rate inclusion in instruction led to limited use until a multimedia component with full potential for integration emerged. (p. 6-7)

The *component* Rackaway referred to would be a system tool or mechanism that is used to integrate digital multimedia into course content. Tools may be within a learning management system (LMS) or course management system (CMS), or integrated by another digital application. Rackaway inferred,

> Multimedia content has not been as widely accepted as a classroom pedagogical tool for a variety of reasons. Faculty technology aversion is perhaps the most significant reason, but many others impede the integration of multimedia. Lack of assessment techniques has also been important, along with reasons such as sporadic faculty interest, unwillingness or inability to devote time to collecting materials, or dedication to traditional textbook pedagogy. (p. 13)

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As Miller perceived,

> The full integration of online multimedia into academic curriculum makes great practical sense. We have the technological capability to do so, and it is backed by substantial research showing that media-based learning materials can help students better relate to course concepts and principles in a variety of ways.

Miller (2001) added, "However, we are still a long way from significant integration, much less near the point of teaching our students how to work with multimedia, as even simple employment to date has not been widely embraced by U.S. college faculty." (p. 295). In the conclusion of his study, Miller acknowledged that faculty don't always have multimedia production skills, as he makes it known that multimedia integration with content is not as easy as that ID skill set appears (p. 307). Miller was also concerned with how faculty may select and integrate digital multimedia into their online courses by using various external resources, including OERS and online digital repositories that maintain sharable digital objects and DMOs. The lack of faculty familiarity with ID practices, skills for content development, and quality digital resources, can be problematic since there is a currency of digital content, which includes the use of DMOs, OERs, and ILMs. Sharable digital objects such as these must be valid, relevant, and have timeliness; usually indicated by a date, per Shank (2014, pp. 28, 100, 120).

In contrast, Bull put forward a theoretical approach for instructional design with digital multimedia that was based upon the cognitive-constructivist viewpoint rather than an ID theory that was the theoretical framework with ITT for this study. As creator of cognitive constructivist multimedia theory (CCMT), Bull (2013) offered that, "Using CCMT as a theoretical framework for designing interactive digital materials, educators can create functional teacher-made multimedia materials aligned with their curriculum, student learning outcomes and

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competencies. Materials created by teachers are more focused on addressing student learning outcomes" (2015, p. 616). His theory focused on teacher-designed objects, which differentiates it from Mayer's CTML. Bull contended that CCMT is aligned with the cognitive theory of multimedia learning (CTM) as one of its supporting theories (p. 615). However, rather than focusing on constructivist instructional design methodology for interactions with DMOs, Bull viewed the means to more effective instructional content from a cognitive-constructivist approach as his CCMT theory supported teacher-designed DMOs. Bull pointed out that interactions with these objects produce increased higher-order thinking, and that multimedia is not as complicated for teachers to create and integrate because of advances in user-friendly technology tools. Accordingly, Bull (2013) proposed that teachers can create functional interactive digital files using Camtasia software to develop video files and Audacity software to design audio podcasts (p. 614), constructed by his CCMT model.

The widespread focus on personalizing content has been customary for educators practicing instructional design without the benefit of collaboration with instructional designers. Routinely, there is a heavy emphasis on personalizing content to the learner in the initial design process, rather than to the overall design of the course, so learners can better reach course goals and objectives. Approaches to instructional design also need to ensure the content aligns with the curriculum intended for the online course by the institution of higher education. To purpose DMOs for both macro and micro level design is another consideration. DMOs are after all reusable knowledge objects and are adaptable for course design. Shouldn't digital multimedia objects be integrated toward this end at the macro level of ID, not only at the micro level? If seeing the "big picture" or "forest" in ID processes is an imperative in the setting of online higher education, the "trees" will grow in.

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Designing online courses has been openly overwhelming to some individuals in higher education. Educators are reluctant to use digital technologies and the appropriate instructional design models on their own, regardless of the ubiquitous availability of technology for instruction (Davidson-Shivers, Salazar, & Hamilton, 2005). This may partially because educators tend to use information and data gathered from various sources arbitrarily, shoveling it into an application or an internet platform and deeming it as educational (Morrison & Anglin, 2009). As long as selection of digital media objects or OERs are "shoveled" into content without an ID process to consider alignment with curriculum, there is more likelihood of some bias in the curriculum content. Digital objects integrated with other information in online content should be chosen with better design approaches than what has been referred to in the ID field as shovelware. Shovelware can be found anywhere and distributed on the web without any respect to design or usability, (Morrison & Anglin, 2009). For example, an instructor collects information and shovels it into an application or a learning management system to build an online course. They believed that online courses designed that way are web-based information but are not instructional because they have few or no instructional strategies embedded in the instructional materials (Morrison & Anglin, 2009). They purported that the creation of high-quality instructional content requires effective instructional strategies developed in context with a sound instructional design model (Morrison & Anglin, 2009).

This study intended to use a theoretical lens of an ID theory, ITT, which is an instructional design theory supported by CTML to design a better connection between interactive digital media objects and what is being learned – from well-integrated instructional content. It has been well established that DMOs integrated with curriculum are beneficial to learning. Vrasidas (2000) noted, "Context and content are crucial in a constructivist approach and they

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determine the method and strategies employed in a course" (p. 8). As Andrade, Mercado, and Reynoso (2008) related,

> The field of multimedia-interactive systems can be benefited with more experimental studies measuring achievement, students' attitudes and completion time to give instructors a clearer vision as to under which circumstances this kind of systems can be more effective to academic performance. For future studies we propose to develop and empirically test a multimedia-interactive system based on design principles with an emphasis on usability, and with an easy to use, fun and stimulating interface. (p. 29)

Similarly, recent ID approaches have prioritized learner engagement from entertainment rather than engaging students through interactions aligned with the intended curriculum content or course objectives. This activity in the name of inclusive or accessible education becomes more defendable if educators interpret what learners should be experiencing from instruction, rather than guiding or facilitating their active learning from instructional content that is already aligned to curriculum and course objectives and goals from a macro level ID approach.

Unfortunately, design principles are often left to the end rather than the outset of a study involving the integration of digital media objects in online courses, and without regard to their alignment with curriculum, leaving a gap between the two. That approach ostensibly develops a design first or using one that is based on a template to address both curriculum content and those course learning goals later – rather than considering the curriculum content to apply design principles to support the integration at the outset. Hence, the approach to the ID process is not direct or proactive enough to effectively design an online course connected with curriculum content. Whenever ILMs are presented in the online course environment in which active learning can take place, that integration design should offer them aligned with curriculum content.

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After reviewing the literature on instructional design methodology, this researcher contends that information design and content should be considered first, interactive design from digital objects may then be derived from the content, and finally presentation design is devised for course delivery. The qualitative findings and outcomes from successful ID practices, experiences, and knowledge of the participants involved have supported this study's purpose.

Chapter Summary

Instructional design can resolve gaps between content and curriculum in online courses. Parts of the design process can be undertaken with varied approaches. As scholar-practitioners turn back to design principles, instructional designers today are often charged with collaborating with faculty so DMOs are appropriately integrated in online course content.

The expertise of instructional designers may produce important institutional guidelines for staff and faculty as they approach online course development. Their expertise also ensures that the overall design of course content is aligned with the intended course curriculum. System integration tools in learning management systems, shared digital repositories, and external software sources are becoming a mainstay in the instructional designer's toolbox for helping faculty incorporate more DMOs and learning transactions into online courses.

The aim of this chapter was to consider what instructional designers at the research site may be doing to effectively integrate interactive media objects and produce instructional transactions that align with curriculum in online courses. There is evidence the approach may resolve gaps between what is being learned online and course curriculum. Therefore, when integrating DMOs in online courses, consideration could be given to the content, the constructed interactive build and arrangement of the course design, the presentation of the online instruction, and the alignment of digital objects with curriculum. This instrumental case study was needed because

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the literature does not provide sufficient direction or cogency about aligning digital multimedia object transactions with curriculum in online higher education courses. The literature supports integrating interactive multimedia learning objects using a more embedded instructional design approach for online courses.

Chapter 3 describes the qualitative research design for this instrumental case study. The study was conducted mainly from semi-structured interviews with questions informed by the stated research problem. In cases where participants could not meet in person, written responses to the interview questions were collected, and sometimes the written responses were sent ahead of any in-person meetings. The researcher conducted the interviews with five senior instructional designers working in inter-related IT/ID departments that included teaching and technology centers at three public higher education sites of different sizes in the state.

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Chapter 3: Instrumental Case Study Research Design

The purpose of the qualitative research study was to explore how instructional designers integrate digital media objects (DMOs) in alignment with curriculum content in online higher education courses. The research design was driven by the central research question: How are you integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses? This question was posed to participants to discover their ID approach or used an instructional design process to integrate digital media objects (DMOs) in alignment with curriculum content in online higher education courses. The answers to the central research question informed the study's secondary research question, which was: How can a course design effectively integrate DMOs (knowledge objects) in alignment with curriculum content? The organization of this chapter first describes the qualitative research design and the research methods that were used for this study. The selections of method include setting and participants, followed by the procedures, data analysis, the study's validity, reliability, and limitations of the study, are presented.

Qualitative Research and Approach

The research study was a qualitative case study. The researcher was seeking to understand the phenomenon of how instructional designers were integrating digital media objects in alignment with curriculum content in online courses in the context of instructional design. This study may also provide information about improved interactive instructional content. Stake (1995) discerned that instrumental case study provides insight into larger questions. He claimed the issue(s) in the case as dominant (1995). Similarly, this research was intended to discover any instances of successful alignment of interactive digital media with curriculum content in higher

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education online courses. Prevailing on this timely issue it was expected that the analysis of the data collected from the study contributed to the field of Instructional Design.

Method

This study used an instrumental case study methodology. Instrumental case studies provide insights into an issue, remake generalizations, or can be used to refine a theory through an extension of experience, and this was best conducted through a qualitative research approach with an emphasis on yielding productivity rather than generalizability. (Mills, A. J., Durepos, G. & Wiebe, E., 2010). In an instrumental case study, the *issue* is dominant (Stake, 1995). Therefore, this study uses the ITT framework to approach the issue of how ID practice could align DMOs with online course curriculum. Instrumental case study was an appropriate method for this topic. A professional group of senior level instructional designers in the public higher education field was studied as an exemplar of an issue in instructional design practice, and the study's findings may later be generalized for use in the ID field.

This study was significant because the literature does not provide either sufficient direction or cogency about the alignment of DMOs with curriculum in online higher education courses. Johnson and Christensen (2000) stated that in an instrumental case study, a researcher is usually interested in how and why a phenomenon occurs as it does (p. 329). This instrumental case study was used to understand a general case in a typical context, which is how an instrumental case study is characterized (p. 329). This case study used the ITT framework to approach the issue of how ID practice could better align DMOs with curriculum in online courses. Butin (2010) specified the role of exploratory questions in a dissertation, pointing out that an exploratory dissertation examines new or complex issues that have not yet been investigated in a particular way (p. 53).

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Yin (2013) held that empirical inquiry investigates contemporary phenomena within their real-life context (Yin, 2013, pp. 13-14). This method was best for this topic because the study was conducted at the chosen sites in order to understand more about the approach and evaluation methods used and so that ID development knowledge can be applied to other general ID practices. Thomas (2015) discerned that inquiry serves a specific purpose, so that the case study acts as an instrumental tool (p. 121).

In addition, this type of case study discovers general knowledge in an effort to better understand a phenomenon. As explained by Johnson and Christensen (2000), in an instrumental case study, a researcher is often interested in how and why a phenomenon occurs as it does (p. 329). This instrumental case study was used to understand a general case in a typical context, as they recommended.

An instrumental case study was used because the research was qualitative in nature. An instrumental case study was conducted to discover how instructional designers implement design processes with respect to the phenomenon of aligning digital multimedia with curriculum content in online courses at a state university. It was expected that the instrumental case study would examine a phenomenon in the context of instructional design, namely, instructional transactions aligning digital multimedia with content in higher education courses.

More specifically, the researcher inquired into what instructional designers do to align DMOs and their transactions in alignment with curriculum content in online courses. The researcher gathered contextual data to discover findings relevant to its purpose: whether or not the gap between integrating DMOs in online higher education courses and aligning them with the intended course curriculum can be resolved. Hyett et al. (2014) pointed out that Merriam (2009) affirmed that research in a case study is defined by analysis, the study itself, and its findings,

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which comprise the case. In addition, Stake considered that case study research was about the investigation and analysis of a single or collective case, and that it was meant to ascertain the whole matter of the study subject (Stake, 1995). Baxter and Jack (2008) concluded,

> Case study research is more than simply conducting research on a single individual or situation. This approach has the potential to deal with simple through complex situations. It enables the researcher to answer "how" and "what" type questions primarily, while taking into consideration how a phenomenon is influenced by the context within which it is situated and may help to clarify "why" this is so. For the novice researcher a case study is an excellent opportunity to gain tremendous insight into a case. It enables the researcher to gather data from a variety of sources and to converge the data to illuminate the case. (p. 566).

Yin (2013) offered that case studies are a preferred strategy when how or why questions are being posed, the researcher has little control over events, and the focus is on a contemporary phenomenon or issue within a real-life context. Yin also recommended using a single instrumental case study when a proposed case study is designed to "confirm, challenge, or extend the theory" (Yin, 2013, p. 40). A single case is best used when applying theory to context, or when a researcher wants to create a better-quality theory, as Gustafsson (2017) implied. A single case study also permits the researcher to have a fuller understanding of the subject explored and to be able to richly describe the existence of a phenomenon in-depth, collecting different types of information. A researcher's ability to understand and describe the context of the environment of the phenomenon in question so the audience can understand the context, and to produce theory in relationship to the context, is important. For example, a single case study is suitable when the researcher wants to study a person or a group of people, or the researcher may question old

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theoretical relationships and explore new ones using a single case study because a more cautious study is undertaken (Gustafsson, 2017, p. 11). A case study schematic is found in Appendix C for this instrumental case study.

Participants and Access

Participants come from a group of five senior instructional designers from instructional design areas of their IT divisions who engaged in instructional design of online courses at several public higher education sites. These ID participants from teaching and technology centers for online programs worked with media services staff. All sites had established areas in IT, ID, and a specialized digital multimedia staff group involved in digital multimedia development, including accessibility services; such as, captioning and producing transcripts of visual content. Participants also taught online courses. The senior ID participants were relegated to consulting, faculty workshop training, and administrative or technical duties using an LMS. Two of the five senior instructional designers, Bruce and Rene, were also directors of online learning at their respective sites. These five senior ID participants were involved in the study as part of the targeted ID population. Two public universities and a two-year public college in Massachusetts were chosen as study sites for appropriate participants who are senior-level instructional designers working in their public education sites. Each site served the largest student population in their own locale from different regions in the state of Massachusetts.

These five participants served as a relevant and useful group for the instrumental case study. The participants develop their own online courses but most of the time they design online courses after collaboration with faculty subject matter experts (SMEs) for the benefit of other educators and their students. Online instructors who do not hold any instructional design role did

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not participate directly in this study of ID staff who collaborate to assist faculty in preparing their online courses in the learning management systems as well as in integrating related DMOs.

The case study afforded the researcher access to ask ID staff participants how they are aligning interactive DMOs and their transactions with curriculum so that the course content is connected to what is being learned. This alignment with curriculum was a phenomenon of ID practice, which was the focus of the study. An instrumental case study asks questions such as those described by Yin (2013), Baxter and Jack (2008), and Johnson and Christensen (2000), as noted earlier in this paper. Therefore, the instrumental case study method was appropriate for this study, because it gave the researcher a way to gather information in natural conversation with a group of participants at their work place, providing insights into how learner-content transactions work when supported by the lens of ITT. This instrumental case study's findings may then be applied by others as an instructional design method. It was anticipated that the study could improve ID practices by using ITT as a method for aligning interactive digital media content with curriculum. This type of study was also supported by Wojtecki (2012), as he noted ITT has consistent focus on knowledge objects, believing that ITT's value is a more precise way to describe knowledge representation, instructional design strategies, and prescriptions. He also agreed with Reigeluth that a major contribution of the theory is that it significantly reduces the time it takes to design and develop instruction (Reigeluth, 1999, p. 399). The reduced time for developing coursework helps instructional designers be more responsive to an organization's curriculum needs (Wojtecki, 2012).

Creswell (1998) described the inductive analysis of qualitative data as a "data analysis spiral" (p.143). Inductive reasoning, inherent in an instrumental case study, supports the premise of this study by the researcher providing interview questions for senior ID participants aimed at

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improving the approach to instructional design of integrated interactive multimedia content aligned to curriculum in online adult education courses. Butin (2010) noted that questions must be intertwined with the research purpose (p. 53). Butin also advised that in linking research purpose to research method the practitioner must realize that all are integrally connected, including the type of data (p. 77). In an exploratory instrumental case study, all types of qualitative questions are used to obtain data to analyze. Butin (2010) said that with this line of questioning, "Exploratory research can ask a multitude of questions about the issues under study (pp. 79-80). This researcher chose the exploratory line of questioning as an appropriate information-gathering tool for her case study. This study explored the ID practices at several study sites in order to identify and resolve any gap(s) shown in analysis of findings of the study involving ID participants who are integrating DMOs into curriculum and designing effective instruction for online higher education courses.

The public university campus sites serve a wide area in the middle of the state, accessible by highways in every direction. This case study was conducted at several public institutions of higher education in different regions of the state offering online courses because they host a relevant number of instructional design staff, some of which are media specialists, as well as online course developers in their own division of continuing education. A group representative of each campus site was used to gather results of the ID approach used in order to have a varied population as well as to avoid bias. The instructional design and multimedia staff groups are all interdepartmental with the IT department, which is the largest group of technologists for the public higher education sites. The study population includes individuals at the study sites in instructional design to include those working in the teaching and technology center and media services within the Information Technology Department; the College of Continuing Studies,

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which directs online course offerings. One site had just launched an Online Development Program Center for instructional design and online development efforts for collaboration with SMEs/faculty. All of the ID staff perform instructional design tasks for online courses and work intermittently with subject matter experts and faculty to develop online curriculum content.

The case study research was conducted by interviewing a broad and diverse population using semi-structured questions to investigate its thesis, exploring how instructional design can integrate DMOs in alignment with curriculum content in online higher education courses. Accordingly, the case study amassed qualitative information from among instructional design staff, as well as other course and multimedia developers who actively implemented digital multimedia in online course content. Sound and effective instructional design is a science linking theory and practice (Willis, 2009).

Consequently, the study consisted of findings drawn from the data sets of these ID/IT departmental groups. In trying to close the gap defined in the problem statement, the purpose of this instrumental case study was to explore how instructional designers are integrating DMOs in alignment with curriculum content, using the ID practices implemented at the public institutions of higher education. This alignment was significant for producing instructional/learning transactions that are more connected to curriculum content (what is being learned) to reach course objectives. Key improvements toward this end were sought through exploration and potential findings from the completed case study. This researcher utilized an instrumental case study method because, as Hyett et al. (2014) indicated, "An instrumental case study provides insight on an issue or is used to refine theory."

The instrumental case study was appropriate for the topic of this study because it was expected that the information and data gathered from the instructional design staff would

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uncover the ID practices that align digital multimedia with curriculum in online higher education courses. Integral to this study was the premise that instructional design practices should include aligning digital multimedia as interactive knowledge objects with curriculum. By conducting interviews with instructional designers and their knowledge of online course design and making observations, this study pursued design practices that may close the gap between what is made for interactions through multimedia objects in online course content and their alignment with curriculum.

Due to the possible variety of participants, and for the sake of using diverse study groups, the research in each instance derived information through the lens of the ITT theoretical framework, which enabled the researcher to focus on the integration of digital multimedia within instructional design practices and to understand how they are applied and used in higher education courses. Observing responses to interview questions and gathering documents from different groups of participants provided significant information.

The research included data from public higher education institutions whose diverse staff, faculty, and student population has grown considerably and offers culturally rich academic programs and opportunities. The sites were chosen following the Babson Research Group's (2016) observation that public institutions of higher education account for the majority of the online learner population. Most of what is currently offered for online courses, especially by public institutions, is found to be at the less-sophisticated end of the spectrum in terms of multimedia-rich online course content. ID staff at the research sites make continuous efforts to promote and encourage awareness of their instructional design practices for online courses, which integrate digital multimedia into curriculum to provide functional and accessible online course content.

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Qualitative research for this case study was initially limited to three higher education sites; however, this effort included different participating groups across three different sites cross-check findings. Participants were limited to those in instructional designer roles because faculty may not have the instructional design background needed for this study. However, some of the instructional design participants taught online courses, and the participants working in both areas were identified. Sampling were taken from these groups because there are many courses to design each semester. As sampling is an ongoing and emerging process, opportunistic sampling may transpire (Johnson and Christensen, 2003, p. 182).

The groups within the ID and teaching and technology centers of the public college and university IT departments were also involved in employing instructional methods. They evaluate technology tools for innovative teaching and learning. For instance, one university in the study adapted a rubric that was originally developed by the Rochester Institute of Technology. Various course rubrics for standards or specific to a LMS were used by ID staff and to encourage ID practices among faculty. Some information from the online divisions relating to the application of rubrics for online course design address integrating and aligning DMOs in online courses, as they involved instructional design practices at the site to include utility, creativity, and efficacy.

Among these categories, utility must solve a defined problem, and have the potential to benefit many courses or educators and others involved in education; creativity must represent a new paradigm or a novel approach or application; and efficacy must use an evidence-based approach, and demonstrate improvements to student experience. A 2015 study of more than 16,000 college and university students across the country found that students performed as well or better when using open educational resources (OER) instead of traditional materials (Petrides & Dezmon, 2017, p. 20). Equalizing access to knowledge and educational opportunities rests on

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the use of OER according to that study. OER includes online repository of collections of digital media, such as libraries of images and videos that can be openly shared for academic purposes (Geith & Vignare, 2008, p. 106). Multimedia digital objects, whether found in OER or other college or digital library repositories, may then become purposefully integrated in the design of online higher education courses by instructional design staff.

Procedures

CID staff at the study site and their managers or directors supported the case study methods employed in this study. These consisted of in-person or virtual interviews, observations, and interview questions distributed by email. Information from interviews with ID staff was collected in addition to the data provided by institutional staff. For example, the participants referred to their own results from course evaluations and/or other such summative assessments from internal course surveys or student polls. Appendix A shows a table of Six Sources of Evidence with the main interview questions and sources collected for the study, Appendix B is an interview protocol informed by the theoretical framework, Appendix C is a case schematic, Appendix D is a letter of recruitment, Appendix E is a consent form, Appendix F is Table 3. Online Course Design Form, and Appendix G is the Higher Education Quality Matters Course Design Rubric, Sixth Edition (https://www.qualitymatters.org, 2019)

An email was sent to identified subjects asking them to participate in the instrumental case study. The researcher contacted the parties participating in the study by exercising these steps:

1. Composed and sent a recruitment letter (Appendix D) in an email to potential participants, notifying them that they have been identified as potential study participants to be interviewed for this study on instructional design for online courses in higher education. The

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purpose and scope of the study was briefly described in this initial email letter to potential participants. Participants recruited were departmental supervisors and managers, as well as other instructional designers working in the Information Technology, Teaching and Technology Center, Media Services, College of Continuing Studies, and the Online Program Development Center).

2. Once they expressed interest in becoming a participant in the study, the researcher invited the participants to contact her with any questions by their preference of: phone, email, and/or a software-enabled online meeting. The researcher only emailed an Informed Consent Form for signature once a participant agreed in writing to participate in the study, and provisions for confidentiality was shown in the attached Informed Consent form (Appendix E).

3. Once their response was returned by individuals to participate with their signed consent form, the researcher emailed the interview questions (Appendix B) as an attachment, along with the assurance of confidentiality, to each study participant.

4. As it became necessary to recruit other participants to increase the number of participants obtained initially, a subsequent emailing of the recruit letter was sent to additional potential participants for each site. The researcher planned to enlist as many participants who are part of ID groups from across the groups mentioned in step 1.

5. Semi-formal interviews conducted via software online or face-to-face interviews were held, recorded, and were then outsourced for transcription to a transcription service to avoid bias. An interview schedule was arranged with participants who chose to meet online and to either clarify or elaborate on their responses to the study questions.

6. The researcher also took field notes during the interview process to ensure the integrity of the information collected.

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7. Other information for the case study came from documented sources, including ID and institutional documents, and systems tools that instructional designers utilize to gather data from the online courses as part of IDs administrative or ID management duties.

8. Transcripts were checked with participants via email for cross-checking and accuracy and transcribed by a transcription service, Rev.com. A main feature of qualitative case studies is having multiple data sources, and this strategy also enhances data credibility, as explained by Yin (2013). Accordingly, some data for this study came from the participants' explanations of documentation generated through the LMS tool controls at the site that track learner activities in individual online courses. This reporting capability helped with cross-checking the data and participants' observations of interactive digital objects that connect active learning with course curriculum content, in addition to utilizing any assessments and summative evaluations utilized for instructional design processes. Participants' references to built-in LMS system-recorded tracking information provided some valuable information about student activity and feedback in the analysis phase and contributed to findings. According to the participants, combined with student interaction activities generated from course evaluations and results tracked from tools in the LMS, reflected whether the interactions through DMOs actually support the stated goals of curriculum. This data gathered from the participants, and information from the participants in workshops for online course design, provided an opportunity for the researcher for direct observation and notetaking – as well as evidence for comparison and analysis with regard to how ID staff integrated digital multimedia in alignment with curriculum content, which in turn contributed to analysis and findings.

Arising from the central research question mentioned in Chapter 1, and as found in Appendix B, the following semi structured interview questions for instructional designer

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participants guided the focus and direction of this instrumental case study in instructional design for online course development:

1. How are you integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses?
2. How can a course design effectively integrate DMOs (knowledge objects) in alignment with curriculum content?
3. How can course design effectively integrate DMOs that provide instructional transactions, or interactivity, in alignment with curriculum content in online higher education courses? (i.e. as some DMOs can be *interactive* multimedia objects)
4. What instructional design (ID) *models and strategies* are useful or are being employed to achieve alignment of DMOs with curriculum content in the design of online courses?
   Sub questions: How? Why?
5. The representation and organization of DMOs is important in ID. What *technologies* are being utilized to achieve alignment of DMOS with online content?
   Sub question: What ID methods are being implemented to achieve this?
6. What instructional design *practices* for the integration of DMOs in online course content could produce a more effective course design for interaction with online course curriculum content (e.g., Use of ID model(s), after collaboration with SMEs, media services, technology implementation, learning management systems/LMS, design methods, higher education ID standards, institutional design documents/templates, institutional mission statements for online courses/course development, new initiatives)?
   Sub question: How?
7. How can a course design *effectively* integrate digital multimedia objects that provide relevant instructional transactions in alignment with curriculum content related to course goals?
   Sub question: How is DMO alignment with online curriculum content necessary?

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8. What instructional *design process* for the integration of digital multimedia objects (DMOs) in online higher education course content could produce a more effective course design?

   Sub question: How do you develop instructional content transactions (interactivity) using DMOs as part of the course design? *Sub question:* What is used, if anything, to automate that ID process? *Sub question:* How can interaction with DMOs factor into the instructional design (ID) process of online courses?
9. If any open education resources (OERs) (digital online repository of collections of DMOs or library collections of images and videos that are openly shared for academic purposes for selecting DMOs) are being utilized, how are these DMOs integrated for alignment with curriculum content? *Sub question:* How are they being integrated for interaction? *Sub question:* Is the integration of interactive DMOs automating the ID process (in part, or overall)? How?
10. What other innovative techniques might support digital media alignment with online curriculum content? *Sub questions:* How? (what ways) Why?
11. What might be potential future trend(s) for Instructional Design of online higher education courses in the (digital) platform? (e.g. these can be for example, Human Computer Interaction or HCI, synchronous tools, UI/UX (UI Development, UX Design), Agile course development, etc.)
12. As a professional staff member in higher education who is involved in the development and design of online courses, how do you see Instructional Design evolving or changing for online higher education courses in the next five years?
13. If there were no limits for creativity how would you envision the future of Instructional Design? *Sub question:* what can be done?

Interview questions were drawn from the literature and the chosen theoretical ITT framework. The researcher categorized, analyzed, and clarified any phenomena discovered,

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resulting in definitive and critical findings. Study conclusions were amassed from the foregoing, and findings and comparisons were made to derive interpretations through the theoretical lens of ITT, as well as recommendations to resolve the problem of practice.

The study was comprised of the interview questions for instructional designers in higher education who integrate digital multimedia in the design of online course content. The researcher explored the instructional design perspective in online course design and development through site observations and recorded interviews conducted with instructional designers. These research activities elicited their responses to the interview questions and any relevant data they have from their work or that is provided by current institutional research. The research activities employed for the study resulted in the collection of data by conducting recorded interviews, attendance by the researcher at workshops for direct observations, note taking, participants observations, and information received in the form of ID documents as physical artifacts provided by the ID participants. Yin (2014) also identified six common sources of case study data, which include "documentation, archival records, interviews, direct observation, participant-observation, and physical artifacts," (p. 103).

The initial contact to participants was made by emailing the letter of recruitment. The researcher communicated with members of the instructional design staff in the information technology departments at each site to inform them of the proposed study, and to make an initial brief and general inquiry to request their possible participation in the study. This first contact to the participants was to explain that the study questions would be emailed prior to the interview. If they showed interest in participating, a letter was emailed to request their participation and to obtain their consent to be study participants and to return their signature to this researcher.

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This recruitment letter was emailed before the interviews to address how the participants would be involved in the instrumental case study and how it would be conducted. The letter explained how they were identified as potential participants and promised that pseudonyms would be used to provide anonymity so that their names were not revealed for any reason or under any circumstances. The recruitment letter also explained that the data would only be used confidentially for the intended case study to ascertain findings. An interview schedule box for was included in the letter for any participants who accepted. Upon their reply, an informed consent form was emailed to those who agreed to participate in the study and to begin the data collection phase.

The researcher met with individual participants from ID groups and in workshops to ensure that bias is not transferred and that all attempts are made to conduct objective research. Additionally, cross-case analysis and cross checking was conducted across groups of participants to support integrity, reliability, and validity. Some current institutional research and/or ID documents were gathered where permission was first obtained while protecting the identity of participants and their sites. Interviews with ID staff provided most of the qualitative information, as they often not only collaborate with faculty needing assistance to develop their online courses, but they also developed and taught their own online courses. The researcher conducted interviews and made direct observations, as these tools are commonly used in qualitative methodology. The study was conducted with campus ID staff participant groups from each institution's information technology (IT) department. Each individual from their ID group practiced instructional design methods somewhat differently than others in the way they integrated the various types of media-integrated transaction content depending on the technologies and staff resources they had available.

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Due to the possible variety of participants, and for the sake of using diverse study groups, the research in each instance derived information through the lens of the ITT theoretical framework. The study focused on the integration of digital multimedia within instructional design practices to understand how they are applied and used in higher education. By observing different groups significant information was based in ethnography, just as Merriam's purposeful approach denoted emphasis on the case as an object of study (Merriam, 2002).

One of the sites chosen for this study was the largest public university in the area. They had a sizable IT, ID, and Media Services staff group altogether. These participants also worked in the College of Continuing Studies as they were engaged in online course design and development, where each of their continuing education divisions offered online courses. The first type of participant is a purposeful (Merriam, 2001) selection of the organization. The research included data from all public sites whose diverse staff, faculty, and student population has grown considerably and offers culturally rich academic programs and opportunities. The name of the sites as well as its participants were protected with the use of respective pseudonym(s): Bruce, Marko, Ray, Irina, and Rene.

To begin the research, a pilot interview protocol entailed emailing a recruitment letter to department managers and ID staff involved in instructional design practices for the public campus sites. The letter, as described later in this chapter, explains the purpose, type, and scope of the study. It was sent to the identified study participants. Preliminary interviews took place to confirm criteria were met and that the participants' work roles were related to the instructional design practices at the study site. The case study protocol is a series of questions formed by the theoretical framework that will serve as a lens of the case and will direct the research during data

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collection (Yin, 2012). Accordingly, theoretical propositions drawn from the literature served to bind the study.

The study used semi structured interviews, with questions informed by the stated research problem. The instrumental case study questions are:

- How are you integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses?

The answers to the central research question informed the study's secondary research question, which is:

- How can a course design effectively integrate DMOs (knowledge objects) in alignment with curriculum content?

The aim of the semi-structured interviews was to understand how individual participants experience the problem of practice. The semi-structured interviews provided direct access to the participants (Holt-Jensen, 2013). The researcher conducted the interviews with instructional designers who worked in public higher education teaching and learning centers as part of their IT departments, and who also worked with multimedia specialists from their respective teaching and technology departments. The study was conducted through recorded interviews with ID staff, in-person when possible or virtual if needed and/or written responses to interview questions emailed to the participants prior to meeting to provide opportunities for deeper discussion during the in person or online interview meetings. Follow up conferences were not needed as the participants and the researcher had considered the information was complete after answers were provided by the participants to the interview questions in written form and discussed again in their interviews. The researcher invited the participants to follow up as needed if they had any other information to add after the interview questions were answered, as procedures can be

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iterative in the instrumental case study. The researcher kept interview notes and made direct observations that are inherent to this research method. Inductive reasoning in the course of interviews with ID staff was appropriate to gather data, direct observations, and participants' professional knowledge and observations, because the researcher was involved in conversation during the interviews throughout which deductive outcomes naturally occurred.

These research activities allowed information to be gathered about the ID practices for developing instructional transactions in online courses. The researcher consulted with ID teams to learn how they were improving instructional design approaches or methods for integrating DMOs into online courses. The researcher also asked interview questions to see how individual ID staff were aligning digital media with course curriculum content and how they were using effective ID practices to reveal any discrepancies among design and curriculum structure in online courses. The study upheld the ethical guidelines of the IRB process to protect participants and to protect research integrity. The researcher formally contacted all participants at each site. This section outlines the procedures used for data collection and analysis and trustworthiness.

Data Analysis

A double coding method, as described by Baxter and Jack (2008), was used to identify differences in data among effective interactions from multimedia aligned with curriculum. Coding is cyclical as labels are created out of which patterns arise. These patterns turn into categories of data. Data was collected and organized by word processing software "to facilitate the recording of source detail, the time and date of the data collection, storage, and search capabilities," (Baxter & Jack, 2008, p. 554). The data and connections were linked to support their analysis from the researcher's and participants' observations, note taking, and coding. Saldana (2015) described exploratory methods of coding and first phase or elemental coding.

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Process coding is an elemental coding method that worked with this study due to the gerunds involved in the topic of instructional design practices (i.e., integrating, interacting, aligning). This form of data coding correlates to findings resulting from this instrumental case study, which subsequently culminates in propositions for further research and to apply the findings to theory (Yin, 2013, p. 37). Saldana (2015) suggested that for qualitative study a code is usually a word or short phrase that symbolically allocates a summative, salient, essence capturing, or an evocative attribute for a portion of language-based or visual data, (p. 292).

The data analysis held in computer files was utilized to organize data. Baxter (2008) pointed out that both Yin and Stake acknowledged the importance of effectively organizing data, and the benefits of using software to organize raw data for independent inspection (p. 554). Using a software application improved the reliability of the case study because it allowed the researcher to track and organize data sources, including notes, key documents, tabular materials, narratives, video and audio files, for easy retrieval. The software provided unlimited areas into which data can be collected and then organized. In addition to the creation of files, the use of a word processing software program was used for storing the details of the source, the time and date of the data collection, storage, and offered adequate search capabilities. These are all important when developing a case study database (Wickham & Woods, 2005). The advantages and disadvantages of software have been described in the literature (Richards & Richards, 1994, 1998); one of the greatest drawbacks is the distancing of the researcher from the data." (p. 554). Information from the study was gathered, sorted into categories, hand coded, and organized for compilation. A transcribing service, Rev.com, was used to transcribe interviews. The Microsoft Word software application was selected for sorting, categorizing, coding, and compilation tasks into tables. Using the Taylor-Powel and Renner (2013) method of coding qualitative data for

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content analysis, the researcher analyzed data sets of this study for patterns that show effective alignment of DMOs with curriculum in online higher education courses.

As themes present in the data emerged, hand coding helped the researcher organize how the ID participants considered how digital media objects were aligned with curriculum content and why. This data was established as the basis for any resulting findings that arose from subsequent analysis. Any events from the data that form patterns, uphold consistent findings, and confirm the hypothesis, were noted to ensure validity. The researcher anticipated that assertions from both initial propositions and refined observations were sorted from the research in this study, which complemented the findings by providing accuracy and completeness for future comparison with other studies. As Baxter (2008) observed,

> Yin (2013) notes that one important practice during the analysis phase of any case study is the return to the propositions (if used); there are several reasons for this. First, this practice leads to a focused analysis when the temptation is to analyze data that are outside the scope of the research questions. Second, exploring rival propositions is an attempt to provide an alternate explanation of a phenomenon. Third, by engaging in this iterative process the confidence in the findings is increased as the number of propositions and rival propositions are addressed and accepted or rejected. (p. 555)

Ethical Considerations

The validity and reliability of the case stands on its own merits and sources of data, which have been described in the qualitative methodology. The reliability and validity of the data collected was paramount to the researcher. Checks on validity from note-taking during and after interviews enabled the researcher to maintain data integrity.

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All information remained anonymous with the use of pseudonyms for the participants and the site of the study during the interview process. All documents were maintained and accessible in a computer system only under the researcher's possession with a backup on a cloud system that is password protected. The researcher used a transcription service, Rev.com, to transcribe all interviews conducted. An audit trail safeguarded accuracy and reliability of the data, ensuring validity. Because this was an instrumental case study, the study itself became the focus of the research process. The researcher held all field notes of this study in a file cabinet and kept the only key.

Credibility

Stake (1995) cited three major characteristics of case study and qualitative research methods: The purpose of inquiry is understanding in case study research, the role of the researcher is personal in case study research, knowledge within a case study is constructed. (Stake, 1995, p. 37)

The participants worked in interrelated departments and depended on one another's professional integrity, their ID and technical systems expertise, and their own judgment. These participants' responses to interview questions were cross-checked and contributed information gathered prior to data analysis. Observations of any type of meetings with ID participants and the researcher yielded some field notes kept by the researcher.

Yin (2013) considered having multiple data sources a hallmark of many qualitative case studies since he believed that this strategy also enhanced data credibility. In similarity, some data was generated for this study by the participants use of their own LMS tools and system controls that track/record learner activities (or interaction with DMOs) in online courses. A robust LMS tool has a function to generate reports from granular data. The LMS reported information relayed

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by the study participants helped to confirm accuracy of observations of interactive digital objects that connect active learning with course curriculum content, in addition to any assessments and summative evaluations utilized for instructional design processes.

Triangulation occurred from using different sources for data and from staff from several different IT departments, including the Continuing Studies area that offer all online courses for the respective sites. Methodological triangulation was used because it involves employing a range of data collection methods to view the same question (Denzin, 1974). The interview questions were first emailed to the participants for their written responses, then an in person or digital meeting was conducted, and ID documents were also collected from online course workshops at the participant sites, and the researcher's notes of direct observation from workshops where the participants had also attended. A rich, thick description of the case along with triangulation of the data will ensure trustworthiness (Merriam, 2001).

Potential Research Bias and Positionality

The participants in the groups for this study range in age and cultural backgrounds, which helped to uncover bias and support internal validity. To avoid bias, the researcher fully disclosed her background knowledge that has been considered, and that her approach to this study was intended to discover what is being done in the current instructional design area for the stated purpose. The author has not, and will not, receive any funding or benefits from industry or elsewhere for conducting this study.

This researcher conducted interviews, recorded them, and made observations from the responses from the study participants, including their observations, in addition to initially collecting some participant's written feedback to interview questions through email. Discussions with participants were conversational in nature to limit bias. During the interviews the researcher

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was positioned as an observer. The researcher took notes during interviews to ensure all of the data was accurate. Neutral observations were possible insofar as the researcher can ensure that she was not in any way a proponent of particular outcomes (Butin, 2010, p. 103).

I recognize from my faculty work experiences that course content is often imported by faculty, instructional designers, or both, into the online course LMS shell as material from publishers' digital textbooks and related instructor ancillaries. The digital media objects selected must then be integrated to align with course curriculum in the overall course design. Each academic institution of higher education varies its approach to instructional design practices and design processes, much like the private sector varies its strategy for ID. Their choices often depend on their budget and the affordability of learning management systems, networked technologies, and personnel to support online education. Many turn to the use of OERs.

My interest in multimedia arose initially from viewing my father's industrial video business across from MIT in Boston, and in Needham, MA next to WCVB, which operated from the late 1960s through the 1980s. At the age of nine, I attended the 1967 Technological Expo as part of the World's Fair in Montreal, Canada. This event was a business trip with my father, who was an entrepreneur and business owner in the industrial video industry, working with video and audio pioneers like Kloss Video in Boston and members of the educational Channel 2, WGBH, in Cambridge.

My father inspired my earliest viewpoint of how important technology and its accessibility would become for our day-to-day lives and in business and academe. The University of Pennsylvania was the first campus to use video supplied by my family's video business in the 1960s, which caused me to wonder why media wasn't available to more people and institutions at the time, before video technology evolved and became more affordable in later

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generations. My personal viewpoint emerged as a belief that everyone should have equal access. This belief has fueled my positionality about technology, its widespread use, and how it was implemented or integrated.

Working in marketing and media industries early in my career fostered my interest with multimedia later on toward supporting digital objects in digital environments, including learning management systems. Subsequent work roles were in technology companies included internet service providers (ISPs), Web, and IT support services. The care taken to harness and support how we access and use technology transactions to improve access to educational content in daily living is still important to my work with online content, developing my own online courses as an instructor in higher education.

My bias comes from my experience working for several decades in the technology and education sectors. This has exposed me to viewpoints from mentors and subject matter experts in the technology field, colleagues in these market sectors, and students of later generations who access and experience over 60 percent of their education today with responsive technology – via mobile devices, software applications, learning management systems, and other tools consisting of computer-supported multimedia. My work experiences included working with ID teams at a state university in Boston when I was a full-time faculty member, creating online Management Information Systems courses I would facilitate, developing the first online course offered for a two-year municipal college, and working as a senior visiting lecturer teaching online technology courses for another public university in the state of Massachusetts.

Like many people, although I have been entrenched in how technology affects daily life, I strived to avoid allowing past influences from experiences to affect any outcomes of this study. I was aware of my emotions and made efforts to use my understanding to alleviate bias, as

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Merriam (2001) relayed how respondents, in a study by Healy (2000), learned they had an expanded self-awareness coinciding with increasing self-knowledge and mindfulness in the present (p. 18). I was aware of how my experiences can color expectations from the findings of this study, and through this awareness, I remained cognizant of how they could affect findings during analysis.

As an instructor teaching online courses for diverse college populations, I developed an innate understanding and a wide-ranging view of the importance of how we implement digital technologies. More efficient technology use and advancements can have a lifetime effect, and modern technology can be utilized as a means for more accessible online content in higher education. This impact mainly depends upon the reach or scope of how we make them accessible, and that how we are utilizing or integrating them matters or may make a difference to improve online content, particularly with accessibility and facilitating usability, as set out in common ID standards in higher education; such as, Quality Matters (QM) Standards for Course Design.

The semantic web (Berners-Lee, 1998) provides an environment in which content can be formalized, manipulated, stored, searched, and computed through autonomous technology agents. This allows for the development of much more useful teacher and learner agents, encouraging migration to content-based forms of interaction. This study was intended to validate how instructional design best practices may align interactive DMOs with curriculum content, which may expand upon or advance current design practices for online higher education.

Limitations

As a case study qualitative research is initially limited to one or more institutional sites depending on the recruiting process. This instrumental case study employed a cross-checking of

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findings among the participating groups and individuals. Critics of case study methodology have considered its research findings not generalizable more so in comparison with large samples obtained with quantitative methods (Tsang, 2014). Yin (2012) maintained that although case study does not furnish statistical data, it does allow generalizations from analysis of findings (p. 18). Findings of case study may be generalized when the case is shown to represent a more encompassing group or larger population (Gomm, Hammersley and Foster, 2009; Atkinson and Hammersley, 2007; Hammersley, 2012, Tsang, 2014). Like Tsang (2014) this researcher also believes that findings can be generalizable to another study outside of itself. This instrumental case study is to be conducted at regional public higher education institutions that vary in size in one region that represent typical sites of a group from a wider area. As such, public institutions of higher education, who are enrolling the majority of online students in the U.S., can vary in size themselves – and as the number of online course enrollments are soaring, according to the current literature.

ID groups typically range from instructional designers to their ID division manager directors who report to one or more directors across their institution and stakeholders. Even though the majority of faculty may not have had the instructional design background needed for this study, many of them end up designing their own online courses with or without ID support. Those participants who also design and develop their own courses are identified in the study to further aid in categorizing findings. As is characteristic of a data collection process in an instrumental case study, purposeful sampling was limited to ID groups due to their ID expertise. Because sampling is being done through ongoing and emerging qualitative research, opportunistic sampling may also transpire (Johnson & Christensen, 2003, p. 182).

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Every semester there are many courses for ID staff to design on deadline before courses begin. They are also tasked with supporting online faculty who facilitate them and a vast number of their students. Work changes from late decisions on textbook adoptions, or other course development delays, can affect work schedules to design content in addition to the general semester-based work schedule of instructional designers. Consequently, ID staff must manage and then automate their work, which is affected by these various constraints for designing instruction in the timeframe of each semester and related deadlines.

To gather information when an in-person meeting is not possible or cannot be arranged, other meeting formats, such as an online meeting and conversation, were used to ask the research questions. Although they are quite responsive to staff and faculty, instructional designers at the public campus sites were typically busy trying to meet their own work deadlines. Therefore, in some instances, a phone and/or online interview was conducted at a sufficient interviewing time more conducive to their schedules. The researcher met the participants at their convenience and choice of locale from their public campus site.

Conclusion

The proposed instrumental case study was conducted using an inductive qualitative research method to attain conclusive findings that support the thesis statement. “For instrumental case study, issue is dominant; we start and end with issues dominant” (Stake, 1995, p. 16). As such, the sampling for this case study consisted of conducting research via an email containing the interview questions as well as semi-formal online or in-person interview with participants for any additional information, clarification, and elaboration, as necessary. The research protocol emphasized observables from interviews with participants, workshops, notetaking, and various documents shared or referred by the participants, including design standard documents,

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templates from any LMS used, such as rubrics for course design or course evaluation for designing online courses, were collected.

As Yazan (2015) explained, "Merriam (1998) suggests that 'Purposive or purposeful sampling usually occurs before the data are gathered, whereas theoretical sampling is done in conjunction with data collection'" (p. 66). Sampling may also include information derived from institutional assessments that were included in the data collection of this case study, as they could also be used to help analyze findings to support the thesis. Data collection was obtained and compiled from at least three professional groups in the field of ID who make their online course design process available for study. Yin (2009) suggested a type of research inquiry a single case study helps to inform practice by revealing what works well, what is successful, and what are the core issues, and that it examines a real-life contemporary phenomenon. Therefore, it is naturally the norm for multiple sources of evidence to be used (Yin, 2009). Six Sources of Evidence include a variety of data that are itemized in a table in Appendix A.

Chapter Summary

As grounded in the current literature of scholars and professionals in the field, instructional design is a practice which continuously works toward improving the design of instructional content. Online course content needs to be relevant and engaging, otherwise students won't want to use it, which would equate to a waste of time and various resources (WBT, 2016). This tenet of relevant and engaging content underscores the prevalent demand on instructional designers in higher education to create content for online learners of any generation. An APA (American Psychological Association) article, *Engaging the Millennial Learner* (Novotney, 2010) advocates that in order to engage digital learners, instructional designers need to make online content, integrate online course multimedia, interactive, relevant, and connect

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content to real life, explore new instructional methods (exploratory/experiential) including active learning (2010). In the article "Portrait of the Modern Learner," Hogle (2017) also advises that the learning needs of millennials may not be generational after all, urging it is time to replace all stereotypes and to focus instead on responding to the eLearning needs of all modern online learners of any age or generational affiliation. Online content that is accessible and relevant is important as the designer's job comes in making content usable to all learners (Hogle, 2017). Essentially, instructional designers in higher education have many significant considerations for designing inclusive, accessible, and responsive content, due to the high demand for better design of online course content.

The instructional design process is a universal issue for designers using technology and related online/eLearning content creation tools to design online course content for meeting these current demands for creating quality instructional content. The goal of this instrumental case study was to find a more effective and purposeful instructional design process and/or strategy for the integration of DMOs aligned with (connected to) curriculum content in online higher education courses. Harling (2002) suggested that the instrumental case study was done to provide a better general understanding of a phenomenon using a particular case. The case chosen can be a typical case although an uncommon case may help illustrate matters passed over in a typical case because they are subtler in that environment (p. 2). Toward that end this instrumental case study was conducted at several public higher education institutions that serve an online population from a variety of locales so that its findings may be useful as tools or general guidelines for other institutions of higher education that design online courses aligning DMOs with intended curriculum. The data collected from the instrumental case study was utilized to attain direct analysis, resulting in the findings of the study.

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Theoretical Propositions

The researcher sought to discover how current instructional design practices integrate interactive digital media objects in alignment with curriculum in online higher education courses. This study correlated how participants conveyed how their online course modules to integrate with DMOs aligned with online curriculum content, and to see how an instructional design method for online higher education courses was more effective. The data and information gathered from the instructional design staff participants in this study uncovered useful ID practices that integrate digital multimedia objects aligned with curriculum in online higher education courses. The findings of this study expanded upon ID practice literature to resolve the divide that Merrill (1999) observed between instruction and the lack of emphasis on effective instructional design strategies that align knowledge objects (DMOs) with content.

The survey of the literature revealed that there is a need for a more simplified way of achieving DMO integration in course content from an instructional design method or strategy, as supported by Merrill (1999), and this is where a gap remains, which shows the current literature is missing or deficient. Hence, an Integration Design process for DMOs as an ID component would be a byproduct from the study and offer an ID design method and ID strategy. The way this design element surfaced emerged from the data collection and analysis phase of the instrumental case study. According to Yin (1994) case study analysis hinges on linking the data to the propositions and explicating the criteria by which findings are to be interpreted. Yin (1994) contended that theoretical generalization is to the domain of case study what statistical generalization is to the true experiment.

A review of the literature indicated that a divide existed between how digital multimedia objects are integrated into curriculum and an effective instructional design, and that ID practices

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to integrate digital multimedia can potentially be improved upon so that these learner-content interactions are more connected to the content to be learned and to reach course objectives. At issue is that implementing effective ID practices can be challenging to design learning content transactions with digital objects, which are integral to any aspect of working with curriculum in the online environment. Accordingly, this study identified the divide by exploring how ID practices are integrating digital multimedia in higher education courses to map these knowledge objects to curriculum content, thereby providing more purposeful learner-content interactions connected with learner use of those adaptable, digital learning objects.

Yin (2018), suggested that theoretical propositions can be signified by 'key issues from the research literature' (p. 35). The issues presented in this paper were derived from the literature of the Instructional Design field, ID theory, and current concerns among instructional designers of online courses in the evolving landscape of higher education, which serves a growing, diverse populace of learners characterized as digital natives. As mentioned in chapter one ID theories must continue to keep up with advances in ISD technologies and inform adaptive ID models and interrelated standards for instructional systems design (ISDs).

Integral to this study was the premise that instructional designers must seek a design process to effectively integrate digital multimedia as interactive knowledge objects in alignment with online curriculum content. As the field of ID is continuously seeking improvements in macro and inherent micro design processes, the focus of this study was on the integration of interactive multimedia objects in alignment with curriculum content in online courses. By this means a gap may be resolved that Merrill (1999) identified; between instruction and the lack of emphasis on effective instructional strategies that align DMOs (knowledge) with content.

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Prompted from research using ITT as a theoretical lens as it considers both macro and micro design processes in its ID Model, this study proposed a more simplified ID approach as the research is intended to discover how ID can effectively integrate interactive DMOs in alignment with the curriculum in online courses through a design phase. This design approach for integrated content is aimed at designing more effective instructional transactions with these objects and enabling enhanced learner-content interactions. This study endeavored to achieve this end by exploring an instructional design approach which adapts to integrating digital multimedia with the curriculum content of online higher education courses.

The findings from the study better discern where and when this integration takes place advantageously in the design process. The researcher intended that the study yielded data which may be useful to produce streamlined approach toward effective integration of digital media objects in alignment with curriculum content in online higher education courses, to benefit the instructional design field. The findings of the study can be useful as a guide for ID practices that are adaptable enough to use in a wide variety of online courses for improved instructional design. The instrumental case study presented findings and analysis in Chapter 4, which may produce a useful guide for instructional design that integrates digital multimedia in alignment with curriculum content in online courses, and to close the gap between instruction and the lack of emphasis on effective instructional design strategies that align DMOs (knowledge objects) with content. The findings presented may possibly extend theory for this context and revive current perspectives on how the design process can effectively integrate digital multimedia objects in alignment with curriculum content in the online course environment.

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Chapter 4: Findings and Analysis

The purpose of this study was to explore how instructional designers in public higher education are integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses. As part of the research design the qualitative research study used an instrumental case study methodology. A case study with alignment of the theoretical framework and design establishes logic that can also be applied in other contexts (Yin, 2012).

- Merrill's Instructional Transaction Theory (ITT) was used as the theoretical framework for applying concepts to this instrumental case study about how instructional designers may be finding ways to improve the instructional design process for integrating interactive digital media objects (DMOs) in alignment with curriculum content in higher education online courses. The theory allowed the researcher to recognize the importance of how instructional designers are integrating DMOs with curriculum content in the online higher education course. The theory also informed the researcher's understanding of the need for integration of digital media in the online course, which provided a basis with which to examine how a more current design approach may contribute to best practices in the fields of instructional design and online higher education.

Five senior instructional designer participants from three public higher education sites of several sizes in Massachusetts answered pertinent research questions for this instrumental case study. The researcher collected data from their written responses to interview questions. In some cases, either an in-person or an online follow-up interview was conducted for any clarification needed by the researcher, after an offer was extended to the participants to elaborate upon their responses for ensuring the validity and reliability of the data sets.

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Transcripts from interviews with participants were transcribed by Rev.com, an independent transcription service, to ensure consistent trustworthiness and validity. The researcher then hand coded all transcripts from interviews and participants' written responses to utilize as the main data sets in the study and she kept notes during the coding process. Other research documents included ID workshop documents where direct observations by the researcher and the senior ID staff participants occurred. Additional ID data and information gathered at the study sites from participants, including QM and UDL guidelines, their LMS course rubrics, emailed newsletters, personal communications via email with workshop announcements, workshop attendance by the researcher, and related information from interviewees, served as sources of evidence, was recorded in Appendix A. A copy of the *QM Higher Education Rubric Workbook Standards for Course Design, Sixth Edition for Online & Blended Courses*, was obtained by the researcher at one of the online course design workshops she attended at the campus where Bruce and Marko worked. The researcher kept notes from her observations in the workbook and highlighted where course content alignment and digital media appear in the workbook. This QM workbook listing the eight standards of Quality Matters in detail with annotations, points out the QM Rubric "specifically focuses on course design", (2018, p. 5). Keeping her own notes with this workbook enabled the researcher to follow participants' references to QM standards about integration and alignment of digital media with other online course content and a deeper understanding of how QM standards work in online course design.

This sub-section reflects the themes important to the ID participants revealed from the data sets collected by the researcher. The data sets indicated nine main subordinate themes and nine sub-themes. Table 1. Instructional Designer-Participant Responses displays a matrix of the study themes. Table 1 reflects the themes derived from the ID participants' responses to research

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questions after they indicated their course online design processes for the study. This chapter then provides explanations of how the themes related and how some had overlapped.

Table 1

Summary of Instructional Designer Participant Responses

	Bruce	Marko	Ray	Irina	Rene
Course Design for Integrating Digital Media	x	X	x	x	x
Quality Matters Standards for Course Design	x	X	x	x	x
Modern Technology Tools and Course Content	x	X	x	x	x
Digital Currency of DMOs as OERs	x	X	x	x	x
Future Trends of Online Course Design	x	X	x	x	x
Need for Learner-Content Interaction	x	X	x	x	x
ID Model for Design and Content Development			x	x	x
Accessibility and Digital Media	x	X	x	x	x
Need for Skilled Instructional Designers	x	X	x	x	x

Emergent Themes

This section discusses 9 themes and 9 sub-themes that were revealed from data sets collected from participants' responses to research questions for this study. These themes

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included: (1) *Course Design for Integrating Digital Media* with a sub-theme of *Alignment of Digital Media Objects and Content;* (2) *Quality Matters Standards for Course Design*; (3) *Modern Technology Tools and Course Content* with sub-theme(s) of, *Development Tools for Digital Media Objects* and *Interaction;* (4) *Digital Currency of Digital Media Objects as OERs* with a sub-theme of *Development of DMOs as OERs;* (5) *Future Trends of Online Course Design,* with sub-themes of *Responsive Course Design and Development* and *More Learner-Content Interaction;* (6) *Need for Learner-Content Interaction* with a sub-theme of *Learners as Co-Creators of Interactive Content;* (7) *ID Model for Design and Content Development;* 8) *Accessibility and Digital Media;* (9) *Need for Skilled Instructional Designers* with sub-themes of *Instructional Design Credentials* and *Course Design and Content Development: Time and Costs.*

On the following page, Table 2. Summary of Themes, shows in detail the superordinate themes accompanied by any sub-themes, relative to the interview questions concerning the design process of how instructional designers are integrating DMOs with curriculum content in online higher education courses. Various themes included a corresponding sub-theme(s) that the researcher noted from the data and context of its subordinate theme.

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Table 2

Summary of Themes

Themes	Sub-themes
Theme 1: Course Design for Integrating Digital Media The instructional designers participants' approach to course design with regard to integrating digital media objects (DMOs) in online courses. Integration mentioned 18 times overall (of all data sets). Integration appeared 7 times in this theme.	**Sub-theme: Alignment of Digital Media Objects and Content** Alignment mentioned 16x times overall; mentioned 6 times in this sub-theme.
Theme 2: Quality Matters Standards for Course Design The ID participants' use of Quality Matters (QM) standards useful in course design for content alignment. Quality Matters mentioned 18 times overall; Alignment mentioned 5 times in this theme.	
Theme 3: Modern Technology Tools and Course Content ID participants' experience of using modern technologies for integration and development of digital media objects and interaction. Modern Technology mentioned 17 times overall.	**Sub-theme: Development Tools for Digital Media Objects (DMOs)** Integration mentioned 5 times. **Sub-theme: Interaction.** Interaction mentioned 5 times.
Theme 4: Digital Currency of Digital Media Objects as OERs (reusable Open Ed Resources) Indicated the ID participants knowledge of the use and development of DMOs as OERs. OERs mentioned 17 times overall; 4 times in theme 6.	**Sub-Theme: Development of DMOs as OERs**
Theme 5: Future Trends of Online Course Design The future trends of online course design that ID participants identified from their perspective. Future Trends mentioned 14 times overall.	**Sub-theme: Responsive Course Design and Development with Technology** **Sub-theme: More Learner-Content Interaction**
Theme 6: Need for Learner-Content Interaction The ID Participants' viewpoints on the need for learner-content interaction and the development of interactive content. Interaction mentioned 15 times overall.	**Sub-Theme: Learners as Co-Creators of Interactive Content** Mentioned 6 times overall.
Theme 7: ID Model for Design and Content Development Determined whether the ID participants used a specific ID model for course design and content development. ID Model mentioned 7 times overall.	
Theme 8: Accessibility and Digital Media How the ID participants regarded digital media for supporting accessibility. Accessibility mentioned 6 times overall; 4 times in this theme.	
Theme 9: Need for Skilled Instructional Designers The ID participants' perspective on the need for instructional designers and content development. Need for skilled ID staff mentioned 6 times from all 5 participants.	**Sub-Theme: Instructional Design Credentials** **Sub-Theme: Instructional Design and Content Development: Time and Costs** Time and costs mentioned 3 times by 3 out of 5 participants.

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Course Design for Integrating Digital Media

The data confirmed that all of the participants affirmed the course design process for integrating DMOs has more emphasis on the quality of content and content integration over the automation of the course design itself. All participants felt that the course design is intended to support the course curriculum content and goals. This accord among participants' responses was also true where integrating digital media objects in alignment with online course content was concerned.

From the concensus of the participants' responses for course design and integrating DMOs in alignment with online course content, a remarkable outcome was drawn from their unanimous reference to Quality Matters Course Design Standards for both integration and alignment of content. Moreover, the sub-theme, *Alignment of Digital Media Objects and Content*, from the primary theme of *Course Design for Integrating Digital Media,* and the subordinate theme of *Course Design and Quality Matters (QM)*, had a common thread between them of DMO alignment with content in the study. This interrelationship was formed by each of the ID participants' confirming they applied QM Course Design Standards for incorporating alignment of all course content. The eight general course standards from the QM Higher Education Rubric are: Course Overview and Introduction, Learning Objectives (Competencies), Assessment and Measurement, Instructional Materials, Course Activities and Learner Interaction, Course Technology, Learner and Instructor Support, and Accessibility and Usability. The QM Rubric is listed as one of the Six Sources of Evidence found in Appendix A.

At one public university site interviewed for the study, Bruce and Marko elaborated on course design and integration of digital media objects relative to Quality Matters Rubric. Bruce stated, "The Quality Matters Rubric is used as a guide for technology integration in online

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courses." He elaborated that DMOs are integrated with technology in the online course – where all alignment with Quality Matters is aligning their assignments assessment, course content, and the technology used with the course goals and learning outcomes. He added, "Student engagement with DMO content must be purposeful – once again, we need to ensure alignment with learning outcomes."

Similarly, Marko explained how the alignment of online course content is tied to using the Quality Matters Rubric, which his site uses to evaluate their online courses as well. He stated,

> Several of the standards in the rubric must align with each other for the course to be deemed to have met the standards. In particular, the online course should use a variety of different technology tools to present the curriculum content; such as video, graphics, or audio files. When we review the courses based on this QM Rubric, we take into consideration that technology is used to enhance the content and not superfluously. DMOs should be used when they can offer an enhancement over a plain piece of text. If the content will benefit from having a voiceover, or being animated, or a video/screencast of the instructor writing out a problem, then I believe that is an effective use of DMOs.

At another public university site, Ray and Irina expressed similar views about course design integrating DMOs. Ray relayed, "The use of DMOs in the course design is encouraged in our online courses as it is perceived to make learning more interactive and more effective." Ray explained that in her team, "ID staff will think of ways to incorporate the transactions that take place with the DMOs, then integrate them in alignment with the course content. Ray added that they will advise SMEs on course design for DMO integration, so that the knowledge gained is measured and weighs toward a grade or credential; as it is accounted for in the course design.

Irina provided an example of how instructional designers at her site, including herself,

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embedded questions for student in videos with Kaltura software, rendering video content aligned with the course content all the more interactive. Irina stated,

> ID staff will help SMEs make their own video lectures. I think that will continue. We found that a number of different tools that will assist them in doing that like Kaltura that we use, but I'm finding that a lot more professors are looking for existing resources first before they create them.

Rene, as the sole senior instructional design and director from the least staffed site, echoed the response of the ID participants at the other sites, by rationalizing that in any course design DMOs must have a purpose as a requirement – that they be aligned to content for learner-content interaction and meeting course goals. She further elucidated that the integration of "DMOs used in our online course design makes learning more interactive and more effective." This consensus exemplifies that purposeful DMO integration with curriculum content makes a more effective course design, which validates this finding from the study among three unaffiliated public higher education sites. In a later theme, *Digital Currency of Digital Media Objects as OERs,* DMOs are discussed as resusable, open education resources (OERs) and as knowledge objects inherent in course content.

Ray also exlpained that the ID team staff of her state university site are involved in all course design matters, including instructional technology, content development, implementation, working with their institution's curriculum to intregrate DMOs for the SMEs, as well as to advise them on all course design matters. At Ray and Irina's campus all SMEs who teach online are required to consult with an instructional design staff before they teach online for each course. However, at both of the public higher ed institutions where Bruce, Marko and Rene work as ID staff, there are no design requirements of SMEs in this regard in order for them to develop and/or

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teach online courses.

To become familiar with the course design tool and/or Learning Management System (LMS), all participants expressed that workshops are always offered for familiarizing SMEs with the LMS, and workshops professional development in instructional design and multimedia development are strongly encouraged. Emails are distributed for upcoming online course design workshops (as listed in Appendix A), which include campus and/or regional workshops for development of DMOs and OERs, design standards like Quality Matters, Universal Design for Learning (UDL), and technology tools for creating a variety of online course content. Online course design workshops help familarize SMEs on various content development tools, multimedia development, locating Open Ed Resources (OERs), provide group ID consultations, and host other course technology and ID related events. As director of the online education division at her public higher education site, Rene sponsors workshops on instructional design, ID standards and practices (Quality Matters and Universal Design), and has two mutlimedia developer specialists on staff in her department to help faculty create DMOs or to locate quality OERs for their online courses. She indicated that all of the online courses at her site are reviewed by following Quality Matters Course Design Standards.

Ray suggested that clear instructions and templates for quality design of online content are also helpful for faculty (SMEs) teaching online courses with their curriculum content for use with their online courses after consulting with the instructional designer staff. She also relayed that in cases where automation of content is actually needed, detailed ID checklists, clear guides, and templates are all useful. Ray explained the ID process at her site references, “Either a design template or the ADDIE model helps to automate the ID process, because you do the same steps – start to finish.” Irina also confirmed that their site makes their own course design checklists that

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include Quality Matters Course Design Standards and Universal Design for Learning. Rene also suggested that the LMS provides automation and templates for course design, adding that the creation of templates in the LMS has made a difference in how courses are designed structurally and visually. Templates are utilized as LMS tools, which aid in streamlining the course design process and related tasks.

Alignment of Digital Media Objects and Content in Course Design

All ID participants use Quality Matters Course Design Standards to align DMOs with curriculum content in online courses. Bruce relayed that Quality Matters is used as a course design guideline at their site. "Quality Matters Course Design Standards are being employed to achieve alignment of DMOs with curriculum content in the design of online courses," Bruce said. He elaborated, "Quality Matters has eight different standards and I would say most of them deal with the issue of alignment. Yeah, making sure that just everything within your course is aligned with every other thing in your course somehow so that once again your assignments, your assessments, you know everything is somehow tied into your learning outcomes." He also shared that all ID staff obtained QM Course Reviewer certification.

According to Marko, course design using QM standards is the way to achieve alignment. In additon, he submitted, "Our Continuing Studies division also uses QM to evaluate courses, and we ID staff assist them in applying standards to online course design." Marko also explained that for purposeful course design his team integrates DMOs for instructional transactions aligned with content and course goals using QM. Ray and Irina both claimed that for online course design her ID team instructional design staff have been "a subscriber for many years of Quality Matters as a framework for online course design," referencing their use of QM for alignment of all content. Rene explained that DMOs must have a purpose as a requirement that they be

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aligned to content, so that they are (also) supporting student-content interaction, according to QM course design standards.

Conclusion

From a concensus of the participants' transcript data sets, the researcher found that their course design process for integrating DMOs in alignment with online course content, were significant themes drawn from this study of the ID participants' all-inclusive reference to how they utilized Quality Matters Course Design Standards in their design process for both DMO integration and alignment with content of online courses. This theme of integration was mentioned seven times in this main theme alone. Integration was also mentioned six and five times respectively in the next two main themes of *Quality Matters for Course Design* as well as in *Modern Technology Tools and Course Content*.

In addition, alignment was mentioned seven times in this main theme, which generated the sub-theme of *Course Design: Alignment of Digital Media Objects and Content* from the primary themes of *Course Design for Integrating Digital Media* and *Quality Matters (QM) Standards for Course Design* had a common thread between them in the study related to alignment of all course content by applying the Quality Matters Course Design Standards in their course design process and/or online course reviews.

Quality Matters Standards for Course Design

Alignment is mentioned most within this primary theme by all instructional designer participants in the study. Bruce mentioned, **"**Quality Matters has a standard dealing with DMOs (standard eight, which states that), 'Course multimedia facilitate ease of use.'" Standard eight is centered on accessibility and usability per the QM standards, which states that multimedia is used for content and feedback. Marko offered, "Quality Matters Course Design Standards are

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followed to achieve alignment between course content in course design." He also added, "QM is how we align content with course goals."

Both Bruce and Marko pointed out how QM standard 6 refers to how digital media should be produced with current technology, and that the standard recommends using LMS technology for integrating digital media (DMOs). Bruce referred to QM standard 4.4, which states that instructional materials (including digital media) represent up-to-date theory and practice in the discipline, that instructional materials are current, and how another standard all digital media must be used for the same purpose as stated in learning outcomes. Marko referred to standard 6.2 which promotes active learning, as QM Standard 6.2 states that course tools promote learner engagement and active learning. Bruce also considered this standard addressed active learning needs. Rene referred to her site conducting QM workshops to provide that guidance to online SMEs/faculty before launching a new online course.

Where DMO alignment with content was concerned once again Quality Matters Course Design Standards were applied to achieve alignment of all content, according to Bruce. He declared that "QM is incorporated to achieve alignment of DMOs with curriculum content." He explained that DMOs are aligned with content according to QM standards. Marko stated, "We use the Quality Matters course standards to inform our course design, which has standards specifically requiring alignment between course content and course design." Like Bruce, Marko also referred to QM for DMO Alignment with content, and that they "align all content" within the course design. He added, "We incorporate QM standards into course reviews, workshops, and online training for SMEs," suggesting that alignment is thereby extended by incorporating QM standards into course reviews, workshops, online training of SME faculty.

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Irina stated, “We do use Quality Matters, but we have modified the (course design) checklist to meet our own needs since we just didn't have enough time to go through everything that we needed to do (overall). She continued by providing an example of one of the standards of Quality Matters, which overlaps with the later theme of *Accessibility and Digital Media*:

> We have an accessibility department that handles the whole accessibility section (in QM). We talk about basic universal design processes, but we don't really go in there or worry about the video captioning, for example; we have a captioning team that does that. We do tag most of our images, so we do tag images for that stuff. I would say that is probably the basis for most of our design issues.

Conclusion

All participants in this study are senior instructional designer staff whose ID area is a sub department of Information Technology departments at their site. A consensus among the participants in this study confirms that Quality Matters is a strong component of course design practices, including QM course reviews of all content for all of their online courses. In addition, the researcher observed that all participants knew that integrating digital media can be more intricate work, and therefore more time consuming, than integrating other content. The next section, *Modern Technology Tools and Course Content,* continues to look at how technology tools are affecting course design in relation to course content development.

Modern Technology Tools and Course Content

All participants felt that modern technology tools were essential for integrating and developing interactive digital content. Bruce stressed the importance that, “a DMO must be developed with current technology first.” The researcher observed during this interview exchange that this notion also has to do with ensuring ID staff are working with compatible file

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formats since modern technologies are always being updated, which Bruce had confirmed during a recorded interview and documented in the interview transcript, as reflected in Appendix A.

Four out of five participants' (Bruce, Marko, Ray, and Irina) used the Blackboard LMS extensively for integration of course content at their campus site. Bruce affirmed that modern technology are used for integration of DMOs aligned with online content. Marko also stated that modern technology tools integrate DMOs – such as the learning management system (LMS); namely, Blackboard, and its built in design tools. Like Bruce, Ray also referred to modern technology tools and file formats that are used for integration of DMOs within their LMS, Blackboard, and that third-party tools give seamless integration with Blackboard, "We use tools and file formats that integrate with Blackboard, our learning management system. Most third-party tools provide LTI (learning tools interoperability) technology for seamless integration with the LMS." Just as Bruce and Marko pointed out how how QM standard 6 recommends using LMS technology for integrating DMOs in subordinate Theme 1, it also refers to how course tools promote learner engagement and active learning from a variety of technology used in a course.

Development Tools for Digital Media

Bruce went on to mention some tools are for creating DMOs in the context of course content. "Student engagement with DMO content must be purposeful – once again, we need to ensure alignment with course outcomes." Bruce also suggested that modern technology tools used for creating content allow more interactivity with digital media objects, by ID staff or in collaboration with SMEs creating or adopting DMOs and/or OERs that provide interactivity.

Similar to Bruce's response Marko brought up that modern software tools are used to create interactive DMOs. Modern technology tools include development tools for digital media objects which also "creates and integrates platform agnostic content," said Marko. When the researcher made further inquiry into how his ID team develops instructional content transactions

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(interactivity) using DMOs, Marko stated, "Using some of the tools mentioned above, such as Poll Everywhere and EdPuzzle, is a good way to create interactivity with these DMOs."

Overall, using the EdPuzzle software tool is a way to make a video interactive and therefore, learner-centered. Learners can interact with self-paced learning content via interactive videos. The videos can be made from editing video content off the Internet or from scratch. Rather than a teacher playing a video, students are in control. They can rewatch, respond to written questions or quizzes, click on hyperlinks inserted by ID designers with SMEs, or review written comments or audio notes left by an instructor, for instance, so that students may engage with it individually. Similarly, the EdPuzzle tool can also enhance a Youtube video to render it more interactive as a DMO. In addition, this interactivity makes a DMO self-paced for all learners, improving accessibility, and creating more inclusive course content.

Interaction

Like the other ID participants in this study, Ray indicated that her site uses the tracking tool, a feature that is built into Blackboard to track learner interactions with all content for use with assessments and improvements during iterative course design processes. Irina also referred to the tracking tools of learner activities with digital objects for extracting data for summative course assessment and then to see what updates need to be done from there for iterative course design tasks.

Rene's site used modern LMS tools to track the amount of learner-content interaction and usage of content and the types of interactions or learning transactions that took place by each learner and how many learners are utilizing DMOs aligned to curriculum content in any given online course. Rene relayed that her staff also uses data analytics tools in their LMS to track users and monitor usage, so that they have a lot of user data to support and/or defend their use of

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technical support for their online course(s) to improve course design. She explained that the creation of templates in their LMS, Moodle, has made a difference in the way courses are designed structurally and visually. Rene added that some features in the LMS are unique, but that they try to explore and use activity-types that extend learning with other tools. She illustrated how her site uses screen-capture tools – for instance, Screencast-O-Matic or SnagIT, to create tutorials "on the fly" and Zoom to connect users (learners) in real-time and to record video/audio for future review(s) by learners accessing interactive content in the online course.

Conclusion

According to all participants in this study, modern technology tools are not only used for course integration of all content, but also all DMOs may be edited and/or updated with modern technology tools for sustaining their digital currency by using software application tools. In this way, this theme is related to the next theme of *Digital Currency of DMOs as OERs.* Participants had referred to this researcher to their use of data analytics tools in their LMS to track users and monitor usage within the LMS, providing data to support and/or defend their use of these technology tools for effecting design improvements for their online course(s).

As a participant in this case study explained to this researcher, some features in an LMS are unique, and ID staff explore and use activity types that extend learning with other tools. A plethora of modern technology tools, such as software programs, exist for creating interactive content, and this fact was confirmed not only by the literature, but also by all participants who had mentioned they were currently using such modern technology tools. The employment of interactive features for active learning in all participants' online courses coincided with this theme, *Modern Technology Tools and Course Content*, and it overlaps with a later theme, *Need for Learner-Content Interaction*.

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There was a common expectation among the participants that they plan to use more multimedia development tools for developing DMOs, and as they evolve in the future, as part of their instructional design practices. The researcher noted this common thread evidenced by their data sets, where all participants believed that the use of modern technologies will continue to be a trend in their future instructional design practices. This theme overlaps with another subordinate theme, *Future Trends of Online Course Design*.

Digital Currency of DMO as OERs

Four of the five participants spoke about ensuring that the digital currency of DMOs and OERs integrated with online course content was part of their job, integrating digital media objects in alignment with curriculum content in online courses. As Bruce explained, "Digital currency of digital media objects is important since content must also be accessible for use." He espoused, "digital currency of reusable content is critical for students." He then relayed, "Content should lead to related purposes that ties to a learning outcome for alignment or not be used." Bruce also referred to the use of Active Learning pedagogies like Jean Piaget.

Both Bruce and Marko expressed that DMO content from textbook publishers was their largest source of all content, which are then integrated via the Blackboard Learning Management System they use. "Other than that," said Bruce, "OER adoption we've seen so far has been very limited to things like the instructor maybe finding a free online textbook." Their university library commons web site had a very limited amount of OERs available for their institution, but it does have links to outside OER sources, such as OER Commons, which is one of the largest repositories with open educational resources.

As director of the Teaching and Learning Center at their site, Bruce has been distributing information in monthly emails to SMEs/faculty about OER resources, OER events in the region

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for locating or developing them, including DMOs/OERs as Interactive Learning Materials (ILMs), as well as related ID workshops on campus or in the state. SMEs/faculty and developers can then be more informed and involved in the development and use of DMOs/OERs for use in online courses. Other disseminated information comes in the form of emailed newsletters through the year. Through these communications ID staff keep their campus posted about any professional development opportunities for SMEs for designing their online courses or for developing OERS for online course content.

Other participants in this study also disseminated information through email for OER development events, including the regional 2019 Northeast OER Summit. These emailed development events were distributed to all faculty and staff for professional workshops. They were shown as opportunities for developing DMOs/OERs with ID staff, multimedia developers of online courses, as well as other SMEs, so that everyone could be collaborating to create them, and possibly share these reusable knowledge objects in collections of common repositories for reuse among campuses of involved institutions.

Ray also expressed earlier that her ID team collects DMOs as OERs and saves the location of their better sources for future use. Similarly, Ray discussed the adoption of DMOs/OERs at her site this way,

> OERs are collected and sometimes general repositories of OER content are used. We access general repositories of OER content and try to collect sources for them. SMEs may comb through the OER resources to find some that meet their needs for course objectives. We're not seeing a big switch toward textbook replacement with OER, primarily because it's difficult to find complete OER materials. Most instructors will use OER in the form of reading materials and maybe video clips from YouTube or similar

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free sources. We try to guide SMEs throughout the ID process. After advising SMEs in a design consultation, we try to steer them in the right direction for (content) resources.

Irina illustrated, “I work with SMEs to help them understand that when they determine that they want a piece of digital media, why they're using it, and how the alignment works in terms of content.” She added, “We can import anything.” Irina shared that she uses the LMS to technically integrate digital media into the course, confirming that IDs can “use the LMS to drive that process.”

At Rene’s site, the campus library similar to other sites in the study had information about OER Commons and ‘Films on Demand’ database access through the CLAMS library network. Emails were distributed about the 2019 Regional OER Summit event in Massachusetts, and OER development events of that nature. None of the participants mentioned that they had their own OER collections actually based at their sites, but that they had made attempts to collect quality OER sources and their location information from other institutions on the Internet or from the links via their campus library’s web pages.

Development of DMOs as OERs

Both Bruce and Marko pointed to the lack of time, staff, and cost for development as the reasons more DMOs and OERs are not developed in house, and why they are searched for elsewhere – online, textbook publishers – for content. Bruce relayed, “So that is as updated as that content gets.” He explained,

> We do have one professor who is creating his own video lectures and then posting those as open content that other institutions and other professors here at Bridgewater are welcome to use. Now, unfortunately, we don't have like an institutional repository, so right now the professor has basically created a website of his own where he's sharing the content. I’ve got to do a video interview with him next week so we can share what he's

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doing with the campus.

Marko said that the problem for development is that OERs are still created in small amounts for their site, which was in agreement with what Bruce had conveyed about this sub theme. Marko emphasized how the lack of time to develop DMOs and OERs is at issue, as is the frustration they experienced based on the lack of time and staff as vital resources for online course design efforts. Even so, these senior ID staff endeavored to remain mindful of how to keep both time and costs of the development of DMOs as OERs down, such as offering OER and/or similar ID events.

Rene had multimedia developer specialists to assist instructional design tasks, so the amount of harvesting and development of DMOs as OERs was not as extensive a concern at her site as it was for the other two sites, except with regard to conducting workshops to demonstrate the usefulness of DMOs as OERs to SMEs teaching online courses. Likewise, Rene's online learning department distributed news about these course design events as had the other sites of the ID participants in the study.

Currently the larger participant sites host statewide OER training events for team-based approach for developing OERs, including DMOs. Since legacy publishing models have restricted the use of OERs with the intent of selling their educational digital resources instead. As a result, OERs are starting to be produced collaboratively, which offers direct access to DMOs as OERs to the benefit of ID staff, faculty, and students at the 28 public higher education institutions in the Commonwealth. Massachusetts Open Education: Achieving Access for All is a collaborative project focused on building capacity for open educational resources (OER) across the state. The project offers regional training events. Leaders of the project include open education advocates from public universities and colleges, including community colleges. Open educational resources

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(OER) are freely accessible, openly licensed text, digital media (DMOs), and other digital assets for online education.

Bruce underscored the importance of DMO/OER development with improved digital currency of DMOs as OERs and the need to always keep the content fresh and updated to meet the needs of students. Another way to do this is to make sure these objects are adapted for different platforms. “We've seen it, even in my own teaching our students are doing a tremendous amount of course work on their smartphones. So, if we go by the Design Thinking methodology, we were talking about being more empathetic towards our students’ needs and really meet them on the platforms they are using.”

Design Thinking does not have a singular established definition but originated from a more scientific approach to course design, finding solutions to human problems and needs in a collaborative approach. It is a way for design concepts to be developed for cognitive, strategic and practical processes by instructional designers. Bruce also brought up Universal Design for Learning (UDL) as an approach to address online learner needs. “With UDL we try to design things that meet accessibility standards. For example, if we're designing video content, we want to make sure that it has the appropriate captioning, you know, and that we're also providing multiple modes of learning.”

Conclusion

DMO/OER development is quite limited overall at the participant sites, as revealed by all of the instructional designer participant data sets used in this study. All participants referred to hosting workshops for their faculty to share where to find interactive DMOs/OERs or finding workshops elsewhere. Still, as this paper is being written, OER development is being sought by

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all participants sites from specific workshops in the region, for example, the Massachusetts Open Education: Achieving Access for All collaborative project funded by the Massachusetts Department of Higher Education, which is working to build Open Ed Resources (OER) across the state. All participants indicated there had been steady interest reflected by higher attendance at ID workshops. Also, all of the participants had expressed the desire to have their departments hold workshops for demonstrating licensed software tools to SMEs so that they are also able to develop DMOs and OERs for their own online courses. Whether these sharable, reusable objects were created in house or found outside of their sites, all ID participants were interested in more development tools for DMOs and OERs for making their online courses more interactive.

Future Trends of Online Course Design

All participants believed that there will be improvements in the instructional design process for online courses in the future. As a future trend, Bruce promoted the idea of employing "Design Thinking methodologies for more empathy for the online student and their needs." Design Thinking is an iterative, five-step interaction content design process that is user-centric as it is based on human need: Empathize (with your users/learners), Define (learner needs, their problem, your insights), Ideate (challenge assumptions and brainstorm ideas for innovative solution), Prototype (to create solution), Test (test solution(s)). The process of the Design Thinking methodology is not necessarily sequential so that it can be flexible and adaptable to any ID model or ID strategy (Dam, R. & Siang, T., 2019). In comparison, in the ADDIE model, Design Thinking may look more like seven steps: Define, Research, Ideate, Prototype, Implement, Learn; where the last phase is evaluating learning outcomes, where the last step of ADDIE is 'Evaluate' (en.wikipedia.org/wiki/ADDIE_Model.s).

As it is user-centric and adaptable to ID iterative models, the use of Design Thinking is becoming more commonly practiced in the field of ID, and was identified as a future trend, as

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echoed by the participants in this study, for content development in ID strategy. The researcher noted that "interaction" was frequently mentioned as a learner need by most participants in the study, which had not only overlapped into this theme, but also from prior subordinate themes, *Modern Technology Tools and Course Content,* including the sub-theme of *Responsive Course* Design, and again in the theme *Need for Learner-Content Interaction*. Bruce suggested that a future trend for the course design process might be "more of a cyclical review and improvement so that content and technology is always fresh and best meeting the needs of students." Similarly, the sub-theme, *Responsive Course Design,* in this subordinate theme section, *Future Trends of Online Course Design*, has to do with responding to learners needs in that context.

Responsive Course Design

The interviews revealed that all participants thought that modern technology tools will greatly affect future trends in instructional design. As Bruce shared,

> I can see ID staff working one-on-one with faculty to develop learning apps for use on smartphones and tablets – to better meet our students on the platforms they are using. I can also see early adoption and development of mixed reality tools and content, which provides further engagement of students in their learning.

Marko contended that course design has not yet been designed for future students needs, and that platform formats are already outdated. This need for responsive design is evidenced by observable fact as the increase of students' use of portable devices were noted by the participants. The participants relayed to the researcher that they know from SMEs, and from courses that ID staff teach themselves, that many learners bring their own devices into classrooms that have applications loaded on them – and, that mobile applications are designed

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specifically for that device screen size. Marko emphasized, “Mobile will be a main computer platform since the desktop is just about outdated.”

This trend would not be difficult to envision given the rapid advance in techology and increasing use of portable devices. The Quality Matters standard 8.5 states that, multimedia used as a vehicle for content or feedback (e.g., images, audio, animation, video, and interactive components) are easy to use, intelligible, and interoperable across devices (Higher Education Rubric Workbook Standards for Course Design, 2018). From responsive course design IDs can adapt online courses to multiple platforms as well as multiple screen sizes if their course strategy and development included them.

Similar to the way Bruce and Marko perceived the future of learner-centered design, Ray expressed a similar viewpoint from her university site. Ray affirmed, “Rapidly evolving technologies for creating quality content, freeing the instructional designer to be able to focus more time on the design of more immersive and student-centered (learner-centered) content and learning experiences." Ray projected that there will be “more demand of online courses and turnaround of quality online courses, which will only increase the need for some automation.” Accordingly, she believes, "The ID processes will adapt to produce faster results with regard to training faculty and develpment of courses". She added, “I also expect that there will be more interest in teaching online therefore (again) more demand for a quicker turnaround of quality online courses.” Attributing yet another factor for the increase in the number of online courses being developed and offered, Ray expected academic courses to go to online formats more often as administrators push for even more online degree programs in addition to meeting demand for students’ needs.

Irina had worked previously for a private higher education institution, and she offered her

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observations that there is not much ownership of the content or the materials in a private institution, as they have in a public institution. “Whereas in the public institutions, we're still talking about the same students but we're trying to make additional, alternative access available to them.” This illustrated that public institutions are trying to have more responsive online course design for a variety of portable devices to access online courses, since the average online learner (digital learner generation) is still either of a millenial age or younger.

More Learner-Content Interaction

Bruce suggested that game development would be a strong future trend due to that fact that it offers a higher level of interaction with content. He also expected there will be even more development of content for interaction and learner engagement like videos and video gaming – as well as using modern technologies for increased immersive experiences; such as 360 VR, augmented reality.

Ray stated similar beliefs stating, “Now that technology is more reliable, I expect there will be more synchronous and asynchronous video interaction for students, as well as for student projects.” Ray shared that at her site they have been using a synchronous tool, Wimba, for meeting with students online, and BB Collaborate. She stated, “We are pushing [the use of] Voice Thread too.” She added that it is likely that there will be more interactive and “immersive experiences with 360 VR and augmented reality” as well as “more assessment of student work that is more practical and applicable to the field.”

Rene discussed that more technology tools for content development are always being developed. Her projections for future trends mirrored the projections of design staff from the other two sites. She believed that a future trend is more student-content interaction through online course development, using modern technologies like video, 360 Virtual Reality, and

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augmented reality.

Conclusion

All participants emphasized quality of content over automation now and in the future. There was some overlap with this theme of *Future Trend of Online Course Design* with the preceding theme of *DMO and Other OER Development*. They all believed there will be advances in development tools for content.

Moreover, all participants believed that modern technology tools will improve the course design process overall. Although Ray suggested automation might be increased in the future, it was from a belief that demand for online courses will rise, and lack of ID staff and time for course design and development tasks would spur the need for some type of methods in online course design for further automation besides current technology. Like Bruce and Marko, Ray and Irina thought this would take place in the future. Ray expected that advances in future modern technology tools may "have better features for *automating* instructional design tasks." Rene also believed that future trends in the LMS will continue to help with course design, by using them for incorporating interactive objects into the online course. The next section *Need for learner-content interaction,* blended content development and learner-content interaction.

Need for Learner-Content Interaction

All of the participants knew that interactive content is not only anticipated by stakeholders, educators, and instrutional designers of online courses as proponents of active learning, but also is expected to be present in digital environments by online learners. Bruce noted, "We've seen numerous studies demonstrating that the more students are engaged with the learning process, the better their opportunity for building knowledge and developing understanding." He added,

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> If instructors are adopting DMOs that provide interactivity; such as EdPuzzles, which integrate video content with periodic built-in assessments, then students may feel more engaged. Better yet, though – have students develop DMO content themselves to demonstrate knowledge and understanding. They can create digital artifacts such as infographics, collaborative slideshows, and video content. Rather than be passive recipients of knowledge, have them be active creators.

Bruce brought up that Quality Matters has a requirement in standard five, which specifies including interaction in the course design. He confirmed their online courses are reviewed to meet all QM standards. The QM general standard five is labeled *Learning Activities and Learner Interaction*. QM standard 5 states specifically that the design of online courses should have learning activities that promote the achievmeent of the stated learning objetives or competencies, that learning activities promote opportunities for interaction that support active learning, that the instructor's plan for interaction is clearly stated, and that the requirements for learner interaction are clearly stated. Bruce noted that Universal Design is focused on the concept of "ensuring that you're meeting learning needs of all of your students, not just some of your students."

Bruce elaborated that his team is finding ways to incorporate interaction in their course design process,

> We are looking at how Design Thinking methodologies could apply to online teaching, advocating for the online student, what their needs are – and there's a cyclical-like review improvement process built into Design Thinking. That is one of the things we've been looking into.

Marko described options for providing interactivity, saying, "When designing DMO content, there are choices for including interactivity." He expounded this idea, providing examples,

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> Low-stakes quizzing inside a video lecture in a PowerPoint. Tools such as Poll Everywhere allow you to embed polls within slides as well. They also provide a more visual experience that may help engage students more. Adding in peer review for assignments also helps create more opportunities for learning in different ways. Using some of the tools mentioned above (Poll Everywhere, EdPuzzle, etc.) is a good way to create interactivity with DMOs.

Ray also expressed that her site integrates DMOs for interactivity, declaring, "A course design process that is focused on learner needs [learner-centered] will have interactive DMO components." Ray clarified, "the use of DMOs is encouraged in our online courses as it is perceived to make learning more interactive and more effective." She explained that fifty percent of the time the designers at her site "are integrating a good amount of interactive digital media objects in the design of online courses."

Rene expanded on the idea that technology tools can also provide a way to add interactive elements to an online course for learner-content interactivity. For instance, by using video that students control, that DMO integration can provide limitless learner-content interactions. Rene's site uses a form they created, Distance Education Course Interaction Plan, for SMEs to fill out before an online course is checked for adherence to Quality Matters course design standards as well as additional accessibility standards.

Learners as Co-Creators of Interactive Content

Several of the participants proposed the idea of learners as co-creators of digital media objects and as contributors of interactive content. As Bruce suggested, "Why not let students be co-creators of DMOs to provide interactivity in the online course. Students could create video game together from audio recording transcript." Marko suggested an advanced level of interactivity as well, including live polls, where learners enter the data into the course and create

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interactive content such as peer reviews and graphics. For example, ID staff sending an email to instructors inviting them to learn a digital media development tool for online course content was emailed as this chapter was being written. The email explained how FlipGrid is an easy-to-use video discussion platform that works like the Blackboard discussion board, but with videos. Instructors pose a prompt to students – i.e. read a journal article, watch a video, answer a question. Students can then respond to this prompt with short video responses created through their smartphones, tablets, and computer webcams. The instructor and classmates can respond with their own video feedback. This was an example of a wide range of application tools that make online learning more responsive, more engaging, and where learners are co-creators of online course content.

Conclusion

All participants were favorable towards increasing levels of interactivity in online courses by finding interactive DMOs/OERs to integrate with online course content from multiple sources – as well as ways of developing them. The data in this study confirmed that interactive DMOs as OERs are increasing in the design of online courses. It also points to an increase for interactive content in the design of online courses and for online learners. The use of interactive DMOs as OERs in course design of online courses is seeing an upsurge as more of these digital objects are integrated into online courses. Therefore, data sets from all ID participants in the study revealed that all had mentioned how interactivity can be tracked on DMOs/OERs in online courses, using the tools in the learning management system they use for working with their online courses. This provides much granular control over course assessments of learner-content interactions as well as over the whole course in an iterative design process.

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Two of the participants, Bruce and Marko, essentially referred to varying levels of interactivity, which are higher depending on the type of DMOs/OERs used. Generally, levels of interactivity in multimedia development for interactive online courses, which help guide its design, are described as follows: Level 1 is passive, level 2 is limited, level 3 is moderate to complex, and level 4 is full, real-time interactivity (example: simulations), according to standards on interactivity for eLearning. These were originally based on the "levels of interactivity" by the United States DOD for learning (201. By integrating interactive DMOs/OERs with online course content, user experience design (UX) principles are being either directly or indirectly referenced for course design among ID staff in higher education, when user interaction is being tracked through the LMS in online higher education courses by instructional designers and SMEs alike. In a data driven era these assessments of the use of interactivity in online courses are invaluable to instructional design processes for online higher education.

ID Model for Design and Content Development

Instructional design models are intended to be guides to refer to for course design based on the purpose of the course design. An ID model can be used to define the activities that will guide content development within online course design tasks. Three of the five participants conveyed that they refer to ADDIE (Analysis, Design, Development, Implementation, and Evaluation) to guide them as an instructional design model, while two participants from the same public higher ed site stated that they did not refer to any single and specific ID model. Even the participants who did refer to ADDIE which included Ray, Irina, and Rene, thought of it as optional to using a design template and their own checklists, including the use of Quality Matters Course Design Standards and Universal Design for Learning as guides.

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Even so, as Ray disclosed, “The instructional design model adhered to mostly is ADDIE for course design and development as we are involved in that implementation.” It was noted in her interview that ADDIE can be a flexible and useful model where design and development of content needs to be done or rapid, iterative cycles to ensure that content generated can be used in each iteration. A flexible ID model is a useful guide to employ where instructional content, including DMOs, is being updated and refreshed to maintain their digital currency. Rene referred to ADDIE as the ID Model of choice at her site. Rene described that as the ADDIE Model is iterative, it is referred to as a guide for course design at her site, and as part of that design process, for integrating DMOs in alignment with curriculum content. She explained that “ADDIE structures the phases of course design and development.”

Ray concurred: “ADDIE provides the framework for rapid development of content in course design.” It was noted during the study that an ID model is useful insofar as its flexibility for overall course design operation that allows for changes to elements of the course design, for example, updates to courses to keep in compliance with important current ID standards. As an iterative, adaptable ID model, ADDIE has been useful in data-driven course design approaches, where changes to the course design need to be carried out after summative course assessments are completed from course evaluations. Both Ray and Irina referred to ADDIE, as an iterative design model that is an important practice to refer to for course design, for example, for making changes after student feedback. Changes to the course design could happen easily when their designers follow an iterative and flexible ID model as a guide.

Surprisingly, an instructional design model was not specified in the ID area at the campus site where Bruce and Marko work as they did not feel limited to any course model for course design tasks. They felt that a specific ID model limited them. Where they did not require SMEs

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to meet with their ID staff, and since they did not have that course design requirement for their online courses at their site, this optional condition determined their choice not to specify an ID model or be limited to any one as a design guide. They relied on Quality Matters for course design and development than using any given ID model.

To simplify the actual course build process, all sites utilized templates in their LMS judiciously. At two sites using Blackboard LMS in the study, four out of five participants employed the Blackboard Exemplary Course Rubric for innovative course design techniques and course delivery in the most current version of the Blackboard LMS, Learn 9. Blackboard's rubric is less detailed than the QM Rubric, and therefore, both were adhered to for course design and for creating adaptable course templates, as documented in Appendix A. Rene utilized QM for the same purpose. Rene commented that she also used templates at her site at times, but that they were used more for organizing course content. She clarified that the templates were modified in the smaller-sized LMS (Moodle) at her site, and that these templates were useful, built-in LMS tools for structuring the online course visually.

All ID participants working within their respective ID departments were also involved in employing instructional methods. Documents indicated all the participants evaluate technology tools for innovative teaching and learning were in the form of course rubrics for design standards (QM Course Design Standards), or were specific to a LMS (Blackboard Exemplary Course Rubric), were used as evaluating tools for innovative teaching and learning; criteria include utility, creativity, and efficacy at Bruce and Marko's site. The rubric document used by the other university site where Ray and Irina worked was originally developed by the Rochester Institute of Technology and adapted to suit their course design preferences. All rubrics had been adapted

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by that university to encourage ID practices among faculty. Rene relayed that built-in LMS templates also sufficed for this purpose.

Conclusion

Changes in course design to be more learner-centered included application of the Quality Matters Design Standards (QM) and the Universal Design Learning Standards (UDL), and did not necessarily depend on the use of an ID model, according to the ID participants in this study. Universal Design for Learning was also mentioned by the majority (four out of five) of the participants. In addition, two of the five participants referred to Design Thinking's practical processes explicitly for learner-centered design.

However, a flexible ID model was mentioned by all ID participants as being useful at least in part. Three of the five participants referred to the ADDIE ID model regularly for its adaptability as a course design model and guide for content updates. The next section for the theme, *Accessibility of Digital Media,* discusses more on how the participants specifically addressed accessibility of digital media.

Accessibility and Digital Media

Bruce contended that digital media provides content in multiple modes for supporting accessibility, adding, "We want to ensure that the course content, from an overall perspective, is in alignment with Universal Design for Learning best practices." He explained that since all learners learn in various ways, they recommend to instructors that they provide multiple modes of content – text-based, podcasts, videos, games, simulations, and so on. Both Bruce and Marko referred to QM Course Design Standard 8 that relates to: course design faciliates accessibility and usability for navigation, facilitating readability, accessible text and images in files,

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documents, LMS pages, and web pages to meet the needs of diverse learners, the course provides altnerative means of access to multimedia content in (file) formats that meet the needs of diverse learners, course multimedia facilitate ease of use, and vendor accessibility statements are aprovided for all technologies required in the course – all of which makes a course more accessible.

Ray also pointed to her site's application of Universal Design, stating "UD principles are relied upon for DMO integration in alignment with content." Just as Bruce and Marko suggested, Ray told the researcher that UDL is applied for consideration of learning styles, cognifitve load, accessibility, and inclusion. She detailed, "We rely on Universal Design principles for most effective DMO integration, of technology, and inclusion of all learners with considerations about learning styles, cognitive load and accessibility." Ray also pointed out in an earlier theme the availability of DMOs and other OERs as a factor having an effect on accessibility, as it sometimes takes time to locate good quality digital media , for example, that is appropriate for the course content.

Rene also expressed that UDL is applied at her site as well through workshops for course design principles. In addition, staff at her site has been working towards 100% ADA (American Disabilities Act) compliance for improving accessibility, by utilizing multiple services to provide captioning, transcripts -- and as needed, a small box signer for signing (sign language), which is connected through Zoom conferencing. Rene indicated that her site is therefore working towards total ADA compliance, including accessibility of DMOs for improving course content accessiblity and student-content interaction. While student materials can be quickly and inexpensively distributed via the Internet, online content documents need to be designed and created to be ADA compliant for those who do not have equal access due to disabilities. The

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ADA encourages the use of the WCAG to help websites become accessible for people with disabilities for interactive accessibility. The W3C (World Wide Web Consortium) created WCAG (Web Content Accessibility Guidelines) to provide a standard for web content accessibility that can be shared globally. The WCAG was intended to afford organizations a schema on how to make their websites ADA compliant (Accessibility of State, 2008).

Conclusion

It was agreed among all ID participants that DMOs and other OERs provide multiple modes of learning, improving accessibility for learners in the design of online courses. Quality Matters, Universal Design for Learning were all utilized by the ID participants for improving accessibility in their course design process. Both ID standards were referenced for development of online course content as well. ADA compliance was mentioned by one of the ID participants for improving accessibility in addition to improving the quality of student-content interaction. DMOs and OERs are often interactive content; so that learners are interacting directly with what (curriculum content) they are learning.

The availability of DMOs and other OERs for ID staff and SMEs/educators affects access to these digital resources for learners as well. Hence, Instructional designers also think of ways how to incorporate DMOs and other OERS into online courses as a way to address digital equity affecting accessibility. Holding workshops and partnering with other institutions may help develop more DMOs and other OERs.

Need for Skilled Instructional Designers

The need for more instrutional designers with skill sets and appropriate credentials for academic institutions is clearly seen in the light of today's ID course design practices, such as the common usage of Quality Matters Course Design Standards (QM) and Universal Design for

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Learning (UDL). Bruce stated, “We have also incorporated guidance from the Online Learning Consortium, through which we have completed online teaching professional development series. All of our staff have completed the Instructional Technology certification.” The ID staff at both larger public higher education sites (Bruce, Marko, Ray, and Irina), who used the Blackboard LMS, stayed updated with the Blackboard Exemplary Course Rubric for innovation with technology tools in that LMS and for the features built into Blackboard that help to integrate content. The Blackboard Course Rubric covers best practices in four major areas: Course Design, Interaction & Collaboration, Assessment, and Learner Support. Appendix A lists this rubric.

Bruce and Marko indicated that all ID staff in the office of the teaching and learning center are certified Quality Matters reviewers for adhering to the course design standards from the QM Rubric, and they review online courses for SMEs upon request. Ray stated, “Quality Matters has been a credential of our ID staff for many years.” Rene also confirmed the utilization of Quality Matters in her online division as well, validating that their current practice includes Quality Matters workshops participation before launching a new online course. All participants shared that their ID staff had obtained Higher Education QM Reviewer certification as online course reviewers and all participants mentioned QM course reviews were conducted at their site as regular ID practice.

Digital Media and Content Development: Time and Costs

A lack of time for course design was another reason that participants cited the need for more skilled ID staff. In fact, all participants agreed that more skilled instructional designers are needed. Lack of ID staff time for course design and content development is the biggest constraint – so more time needed, or increase staff in ID groups for improving instructional design, according to Marko. As a possible solution to time and limited staff constraints, both Marko and

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Bruce suggested an increase in ID staff as well as more time for solving problems creatively and for entertaining ideas for content in collaboration with SMEs willing to take part in online course design workshops and workshops for digital media devleopment who have had such prior experience or ID consultation(s) for online course design and digital content development.

This common sentiment among all study participants recurrently implied the need for more time on design tasks. As Ray pointed out, “A course design process could be more effective if there were sufficient time and support allocated for creating new material.” Marko also pointed to the lack of ID staff as he felt that “time is the biggest constraint,” since more time is needed for design tasks overall. Marko suggested that increasing staff in ID groups would be helpful for improving instructional design activities. “An increase in ID staff and time for solving problems creatively, and/or entertaining ideas for content, in collaboration with SMEs who have had ID consultation already,” Marko added. Ray claimed that with the existence of "rapidly evolving technologies for creating quality content,” such technologies could be “freeing instructional designers to be able to focus more time on the design of more immersive, student-centered content and learning experiences."

General lack of staffing in the instructional design area that all ID participants pointed to was proportionate for their sites. For example, the largest site had more ID staff on their team, they were a larger university offering more online courses. Bruce and Marko at the next largest site seemed to feel the weight of the lack of staffing as there were only two ID staff at their site: themselves. Rene’s site was a two-year public college, and she had digital multimedia specialists available to her to assist her with DMO development and the technical implementation of DMOs and OERs in course design tasks.

Thus, all of the participants felt that their lack of ID staff meant that ID staff must carry

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the weight of providing guidance for all of the online course offerings and faculty. All ID staff participants in this study expressed that they spend a significant amount of their day providing faculty support for course design – either in consultations or workshops, or as a dedicated arm of IT support for all course design and content development matters, including the integration of DMOs with curriculum content in their online courses and for the development of DMOs. Insufficient instructional design staffing affects the quality and scope of design work, yet ID staff are expected to cover a broad area of responsibilities within that role and for many, many SME consultations for all online courses launched at their respective site(s).

Costs are substantial for affording ID staff, and DMO content development are additional costs, according to Bruce. As Marko stated, higher education top administration and stakeholders have to see proof of efficiencies (ROI) for justifying increasing ID staff. The researcher noted that none of the participants suggested the costs of instructional design would decrease in the future, and this point that Marko raised about top administrators and stakeholders being the decision makers appeared to be an important factor.

Where Ray and Irina work with an ID team that is considerably larger ID team than those of the other staff involved in this study, all ID teams which involve the participants in this study are situated within the Information Technology support departments of their instituitions. However, those IT individuals have dedicated IT support tasks assigned to their role so that they can only provide IT support for the LMS, faculty and students, and do not provide support for any course design tasks. Rene is the singular ID professional at her site, so she holds the only instructional design role there to handle design tasks and/or to oversee course design workshops for online learning, overseeing all course design tasks, including applying Quality Matters, and SME/faculty course design consultations along with her digital multimedia specialist staff to help

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develop in-houe DMOs and OERs.

Conclusion

A lack of staff and time for course design were prevalent themes among all ID participants in this study, regardless of the size of their ID team at their respective sites. Ray and Irina had the largest team, yet they also had the largest quantity of online courses as theirs was the largest public university site in the study. It was noted by the researcher that none of the participants suggested the costs of instructional design would decrease in the future, although the costs are significant for affording ID staff and time for course design and content development activities. Half of the participants expressed that more of their own time could be allocated to course design tasks rather than training faculty as part of an IT function, and the ID area was a sub department of the IT area in all participant sites for this study.

Summary

This study purported to explore best practices for the course design process relative to how DMOs are being integrated in alignment with curriculum content in online courses by instructional designers in online public higher education. The themes and subthemes presented related with the major research question of the study asking how instructional designers are integrating digital media objects in alignment with curriculum content in online courses. Through coding and an analysis of responses to the study questions for participants, 9 main themes and 9 sub-themes emerged as outlined above, which evoked findings regarding how ID staff at public higher education sites in Massachusetts are integrating digital media objects in alignment with online course content in online higher education courses. Their course design process included many considerations as reflected in the subordinate themes and sub-themes.

As delineated within their course design process, this study illuminated that the design of

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online courses, as well as the development of instructional course content within online course design, is of utmost concern to instructional designers in public higher education institutions. Each public institution of higher education may follow their own mission statement regarding online course goals. Therefore, a rigid adherence to an ID model especially for its own sake appears not to be as important as following a course design process which adheres to applying course design standards to content first and foremost, such as Quality Matters, Universal Design, accessibility, responsive course design, and learner-centered design, such as Design Thinking, which have all evolved into these present-day instructional design practices. Modern technology tools, such as learning management systems and other course development tools, help to integrate and align all online course content in addition to creating and developing DMOs and OERs for interactive content.

Purposeful DMO integration makes a more effective course design, which was validated by the consensus from among three public higher education sites in the study. Accordingly, any ID models in use must also be flexible and iterative for integrating digital media objects and other OERs have digital currency as online course content is being updated by instructional designers and SMEs. The literature described how digital content integration and alignment with curriculum is addressed following the application of specific ID models and theories.

Surprisingly, the data revealed that not all ID participants from public higher education sites in the study referred to specific models other than ADDIE, but three out of five maintained a reference to that adaptive ID model. However, with QM as the main instructional design guide, all instructional designers addressed integration of DMOs within the design process. They also suggested that content integration and alignment is the focus throughout the Quality Matters Course Design Standards, which can be applied throughout the course design process. QM

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toolset and practices are based on standards of best practice, research findings, and ID principles, design to promote learning, integral to continuous quality improvement, and part of inter-institutional, SME content, data-driven course assessment, and peer review process. A QM course review process for online courses by ID staff can ensure that the design standards are being practiced for online course content.

The researcher purports from the findings such ID practices as QM be applied prior to, and in accordance with, an adaptive and flexible ID model or course design process. This approach to course design is also important as Instructional Design theories must continue to keep up with advances in modern technology; such as, ISD technologies and inform adaptive ID models and interrelated standards for an adaptive instructional design process and instructional systems design (ISDs), as explained in chapters one and three. The findings showed that instructional design processes from all participants and their sites includes the application of instructional design standards, namely, Quality Matters, Universal Design, and two participants of the five mentioned using Design Thinking in their instructional design process.

Three out of five public higher education sites in the study retained a reference to ADDIE, an adaptive and iterative ID model. Surprisingly, not all public higher ed ID participants referred to an ID model, by itself, but rather drew from of ID models from their educational background in ID and professional knowledge as ID staff. However, with QM as the main ID guide, all instructional designers addressed integration of DMOs within the design process. All staff suggested that content integration and alignment is the focus throughout the QM standards, which can be applied iteratively throughout the course design process.

The data also revealed that a design process for integrating DMOs in alignment with curriculum content should be both purposeful and creative. Curriculum content helps designers

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to prescribe the nature of the interaction with DMOs. For instance, if an online course has some content in an instructional module, and say, there needs to be some interactive ways for learners to interact with sub content in the module, then a link, video or other DMO, can be integrated with the curriculum content there. DMOs are being integrated with other content must be purposeful, for needs of learners, and how that could happen in the future through alignment of DMOs/OERs with curriculum content using QM. As Bruce had conveyed, "Student engagement with DMO content must be purposeful – once again, we need to ensure alignment with learning outcomes." A double-edged sword is automation of the design and making well implemented, creative design solutions for supporting purposeful online course content.

As evidenced by the data sets from all participants in this study, using Quality Matters as part of the course design process offers a more refined and granulated approach to instructional design for integration of DMOs with curriculum content. It was found from the data that most ID participants believe that automation for integration of digital media objects is not entirely necessary throughout the design process, while other areas of ID could remain automated; such as, using modern technology tools to create DMOs to maintain their valid digital currency.

The data has supported that all participants felt there is a lack of time and staff for design processes and content development, and that therefore, more (skilled) ID staff is needed. Time for developing instructional content helps instructional designers be more responsive to an organization's curriculum needs (Wojtecki, 2012). This researcher sought to explore how instructional designers in public higher ed are integrating DMOs in alignment with curriculum content for online courses during the design process itself, which could enable a seamless or continuous and more unified design approach.

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Regarding development efforts for DMOs and other OERs, most participants suggested that collaborative development for digital educational resources could be inclusive of learner co-created DMOs/OERs. More support for widespread initiatives like the Massachusetts Open Education: Achieving Access for All project could make a substantial improvement in the availability of such resources browsable by curriculum area. The participants cited external websites for repositories of OER collections, which help to locate DMOs and other OERs for use for educators and instructional designers alike. They also expressed that there was still a need for more development of OERs, and that their quality or digital currency (for instance for relevancy, updated content, and copyright date), is something that must be checked often, or they shouldn't be used, emphasizing the need to keep all content fresh and updated.

Accessibility of digital resources in general is a broader concern, which also affects access to digital resources and related costs. Participants expressed that if more DMOs and OERs are available in the future, this would affect the time for development and related costs. Increased access to these resources without restrictions for institutions would make more quality content available to instructional designers of online courses, online educators, and to learners in online courses.

Merrill's Instructional Transaction Theory (ITT) was used as the theoretical lens for applying concepts to this instrumental case study about instructional designers' design process for the integration of interactive digital media in alignment with curriculum content in higher education online courses. The theory allowed the researcher to understand design processes related to integrating digital media aligned with curriculum content in the online higher education course, providing a basis with which to examine how design may improve and support interactive online course content in the broad instructional design process.

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The researcher confirmed through data analysis that the use of Merrill's Instructional Transaction Theory (ITT) to identify how instructional designers may integrate digital media objects in alignment with online course content through their own approach to the instructional design process for online course design. This connection between the theoretical framework and application to the data analysis is explored in Chapter 5, as it helped to document what instructional designers in public higher education believe are better approaches to integrating digital media objects with curriculum content in online higher education courses. For this instrumental case study data sets collected from five Senior Instructional Designers working in public higher education sites in Massachusetts were analyzed for themes and findings – as the literature had showed that public higher education offers the most online courses across the United States.

Chapter 5 summarizes the findings based on the themes by showing an analysis of how the results of this study either support or contrast with the studies presented in the literature review from Chapter 2. A conclusion is provided with a discussion of the implications of the findings for the field of practice – instructional design in online higher education. In addition, an examination of possible future directions for research on this topic is offered in Chapter 5.

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Chapter 5: Discussion and Implications for Practice

The purpose of this study was to explore how instructional designers in public higher education are integrating digital media objects (DMOs) in alignment with curriculum content in the online higher education course. The impetus for the researcher was to search effective ID strategies in an approach to online course design for integrating DMOs aligned with curriculum content as a way to provide apt learning transactions with relevant instructional content. Merrill's Instructional Transaction Theory (ITT) provided a theoretical framework to inform the researcher's understanding of the need for integration of digital media objects in the online course. By exploring the effect of the instructional design process for the integration of digital media aligned with instructional content in online higher education courses, the theory furnished the researcher with a sound basis to make relevant research questions and to analyze the data sets collected from instructional designer participants in the study. The researcher was then able to examine how a more current design approach can contribute to best practices in the field of instructional design and for online higher education. Methodology included qualitative research and an instrumental case study as tools to collect and analyze the data, which supported the researcher to document the senior instructional designers' familiarity of course design, concerning how they are integrating DMOs in alignment with curriculum content in online higher education courses.

Analysis of the data sets collected for this instrumental case study from five senior instructional designers in public higher education about their design practices for online courses, yielded nine subordinate themes as outlined in the preceding chapter: (1) *Course Design for Integrating Digital Media;* (2) *Quality Matters Standards for Course Design*; (3) *Modern Technology Tools and Course Content;* (4) *Digital Currency of Digital Media Objects as OERs;*

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(5) *Future Trends of Online Course Design;* (6) *Need for Learner-Content Interaction;* (7) *ID Model for Design and Content Development;* 8) *Accessibility and Digital Media;* (9) *Need for Skilled Instructional Designers.* These themes from discussions and data sets from the study participants offered an inclusive assessment for the researcher to derive significant findings.

This chapter presents findings that correlate to each subordinate theme, and reviews how the findings relate to previous research from the literature review as well as how the theoretical framework applies to this study's outcomes. The last sections of the chapter relate to implications of the findings by providing applications of the recommendations for practice, and possible directions for future research are suggested. The first section begins by linking the initial theme, *Course Design for Integrating Digital Media,* to its findings as well as to the literature and the framework.

Course Design for Integrating Digital Media

The primary finding related to the first theme, *Course Design for Integrating Digital Media,* showed that all ID participants referred to Quality Matters Course Design Standards (QM) in the design process of online courses at their public institutions of higher education. Discussions with the ID participants focused on their familiarity with course design, integrating digital media objects in online courses, and the alignment of digital media with content. The results of themes analysis yielded a significant finding about the course design process for integrating DMOs in alignment with online course content, which was remarkable for participants' all-inclusive and specific reference to the use of Quality Matters Course Design Standards (QM) for both integration and alignment of content in online courses. Therefore, QM in particular was vital and germane to the course design process, according to all five ID participants in this instrumental case study. Digital media objects (DMOs) are categorized by

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Merrill (1999), and by other experts in the instructional design field, as *knowledge objects*. These objects are integrated with the curriculum in online courses.

Course design for DMO integration was significant as it was aimed at this first finding alone and mentioned seven times by the study participants. Moreover, reference to this content integration in online courses was revealed often in the next two main themes of *Quality Matters for Course Design* as well as in *Modern Technology Tools and Course Content*. In addition, alignment of DMOs with online course content was mentioned six times in this theme. Likewise, a sub-theme of *Alignment of Digital Media Objects and Content,* from the primary theme of *Course Design for Integrating Digital Media*, and the next subordinate theme of *Quality Matters Standards for Course Design*, had this common thread between them in the study. This interrelationship was linked by alignment of overall course content by applying the Quality Matters Course Design Standards to the course design process for this reason; whereas, all ID participants in the study adopted and preferred QM for purposeful instructional design to ensure standards-based content that is aligned with curriculum. This would coincide with the literature review in Chapter 2 as Crews (2017) posited that QM course activities and learner interaction seek to confirm whether activities and interactions further the attainment of the learning objectives based upon the interactions with online course content through digital objects.

Additionally, all the ID participants cited QM as helpful for effecting online course reviews that support SMEs and for any improving course development activities. This is supported in the literature in this study where Morrison & Anglin (2009) explained, "Instructional designers need a way to determine whether existing online courses and sharable content objects are well designed, otherwise these online courses will be merely a collection of posted information, or *shovelware*. Such courses often include a vast array of information, yet

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they are not instructionally sound." QM has gained a foothold as an approved standard by institutions of higher education for integrating and aligning all content toward course goals.

Continuous improvement of course content quality through course reviews has been supported in the *QM Higher Edcuation Rubric Workbook Standards for Course Design, Sixth Edition for Online & Blended Courses* (MarylandOnline, 2018). This addresses the QM toolset and course review process based on national standards of best practices, their research findings, and instructional design principles, and is designed to promote student learning that is integral to continuous quality improvement, and part of an inter-institutional, faculty-driven, peer review process. The value of QM's course reviews are important for comprehensive course design practices, including DMO integration and alignment with curriculum content.

Quality Matters Standards for Course Design

This finding showed the ID participants' use of Quality Matters standards is useful in course design for content alignment. As suggested by Collins et al. (2003), research must account for how designs function in a realistic setting and rely on methods that can document and connect design processes to outcomes. A consensus from the study was Quality Matters was a strong component of course design practices including QM course reviews. Participants knew that integrating and developing DMOs can be more intricate and time-consuming work even with use of modern technologies. Another study, Kuo et al. (2014) found student–content interaction to be the strongest predictor of student satisfaction in fully online learning. Their results indicate that instructional designers should pay attention to content design and select appropriate delivery technologies in the fully online course environment (pp. 44-45). That literature reference supports the next section about the use of modern technology tools and course content in instructional design practices.

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Modern Technology Tools and Course Content

This finding involved ID participants' experience of using modern technologies for integration and development of digital media objects and interaction. It was revealed that all ID participants often used modern technologies for integrating DMOs in alignment with curriculum content. The participants considered their own Learning Management System (LMS) tool useful for implementing the environment of the online course. For instance, templates were utilized by the majority of participants to streamline the merging of course content into the course LMS shell, housed in internal website pages belonging to their institution where the course was located and accessed online.

The interoperability of the LMS to work with other application tools, importing all content and a variety of accessible file formats for ease of use, was also considered a convenience for designers and users of content (learners) by the ID participants. Like the first theme of *Course Design for Integrating Digital Media*, the use of the Quality Matters Rubric was a guide for integration of content using technology in online courses. For example, as the first participant explicated, DMOs are integrated with technology in the online course – where all alignment with Quality Matters is aligning their assignments, assessment, course content, and the technology used with the course goals and learning outcomes.

Development Tools for Digital Media Objects

All study participants had indicated they used technology tools for developing digital media objects as well. In an online course workshop that the researcher attended led by the two senior instructional designers at their public campus site, Bruce and Marko, and a faculty SME in the Communications academic department, had developed and showcased some DMOs they were using in their online courses to encourage those attending the workshop to try the same

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media development tools to create their own DMOs for their online course modules and for appropriate interaction in their course modules.

Interaction

Another finding from this subordinate theme of *Modern Technology Tools and Course Content* also included the use of development tools for learner-content interaction with digital media objects. This would agree with the literature by Anderson (2003), who deduced that the use of various media in instructional content expands opportunities for learner–content interactions. Similar to ITT (Merrill, 1996) that was used as a theoretical lens for this study, where knowledge objects (DMOs and OERs) include entities, activities, and processes, the interrelationships among them can provide interaction through the selection and sequencing of these knowledge objects in the online course environment.

As interaction was emphasized by the ITT framework, likewise, this paper was concerned with the integration and functionality of learner-content interactivity with multimedia objects in the online course. The effort of this paper is that transactions with digital media in alignment with curriculum should be inherent in the ID strategy for instructional design process for online courses. This instrumental case study sought effective ID practices that may be applied in that context on a wider scale in ID practices.

Digital Currency of Digital Media Objects as OERs

This finding indicated the ID participants' knowledge of the use and development of DMOs as OERs in course design. The finding that was most striking to the researcher was the necessity for keeping DMOs updated and current, which was acknowledged by all participants in this instrumental case study. As a result, the need for curating DMO and OER collections in general was signified and at issue.

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However, there were no official repositories of OERs curated at their respective public higher education sites with the exception of small collections these individuals had in their ID/IT departments and online learning divisions in the larger two public sites out of the three sites in the study. It was apparent that the absence of curated in-house repositories was largely due to the time and cost or budget constraints for developing and curating digital collections, as the participants cited lack of time for development for ID staff. Instead, there were links at their campus library pages for sharable OERs, which included DMOs made at other institutions and to OER Commons, a public digital library of OERs (OER Commons, 2019).

Quality Matters Course Design Standards, and another standard, Universal Design for Learning (UDL), were also amply referenced by all participants germane to this theme of using multimedia in course design, particularly to guide adherence to accessibility practices while integrating DMO and developing these digital knowledge objects for online course content. This concurs with the literature on the purpose of UDL, which is to produce learners who can assess their own learning needs (learner-centered), monitor their own progress, and regulate and sustain their interest, effort, and persistence during a learning task (Ralabate, 2011).

The literature supports that UDL was designed to remove barriers to accessing content, not challenges. The premise for UDL as a curriculum designed approach stemmed from earliest roots of civil rights legislation that emphasized the right of all students to a free, appropriate public education in the least restrictive environment (Hitchcock, Meyer, Rose, & Jackson, 2005). According to its creator, UDL has three principles: multiple forms of representation for recognition, multiple means of action and expression for cognitive strategy, and multiple means of engagement (Rose et al., 2014). UDL as a framework has four interrelated parts: goals, methods, materials (media), and assessment to evaluate any barriers that may exist in the

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curriculum. Assessment is an invaluable aspect for course design because ID staff must devise modes of formative and summative assessment to measure the effectiveness of online courses. Assessment can make a purposeful impact on the quality of content in the online course and in summative course evaluation, which can inform changes for improvements and updates in the content and in future iterations of the overall design process.

Respectively, Quality Matters (QM) has a whole standard for assessment and measurement to ensure assessments measure the achievement of the stated learning objectives as well as opportunities for learners to give feedback on their learning progress. Shivler (2016) noted that during the design process of ID, the arrangement of video, visual components like diagrams and pictures, text documentation and other multi-media connected to the instructional content can help learners apply the concepts and tasks by interacting with online course content.

The general agreement inferred by the participants was to include Quality Matters Course Design Standard, UDL, and Design Thinking for Learning in an ID strategy for learner-centered course design and content development. This finding also overlaps in the next two subordinate themes of *Future Trends of Online Course Design* and *Need for Learner-Content Interaction*. How instructional designers design learner-content interactions in the online course is just as significant. Learner-centered instruction was supported in the literature. Hence another discipline has emerged as learning experience design (LX), which rose from other fields – experiential learning, cognitive psychology, interaction design (UI), user experience (UX) design, instructional design and Design Thinking, as supported in the Litrature by Jordan (2019, p. 2). Usability is a main component of QM standard 8.5 which specifies multimedia (is) used for content and feedback in the course design. Usability relative to User Experience (UX) and User Interaction (UI) in content and feedback, then are important concepts in online course design –

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since all online courses are on websites whether or not any LMS (learning management system) is used, as a QM standard eight annotation details that interactive elements integral to content are cross-platform and cross-browser.

Future Trends of Online Course Design

The future trends of online course design that the ID participants identified from their perspectives were responsive course design and and continued increase in the development of interactive DMOs. Yusuf, et al. (2017) declared that the integration of multimedia and multimedia technologies has become a core part of the design, development, and delivery of eLearning, online learning, and blended learning courses. Two multimedia types are anticipated to have significant growth in terms of scale, volume and application to learning and teaching in particular, videos and interactive multimedia (p. 36).

The participants expressed the scarcity of responsive online course design and the need for responsive online course design to reach learners on the platform of their mobile devices. The literature informed the researcher how today's digital learners expect on-demand and seamless access from any device, and without any access issues (Kozinsky, 2017). This finding relates back to the literature, "Delivery changes include the growth in online courses and programs, electronic learning management systems, and more mobile and technologically focused solutions (Chen, 2017, p. 3).

The participants expected this future trend to be compounded as technologies advance and suggested that online higher education courses need to be "responsive" by operating on various technology platforms and devices. Therefore, digital objects/DMOs need to be in accessible media file formats to provide access to learning anywhere on any platform, including mobile online access. This finding was also supported by an explanation by Sutherland (March

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31, 2016), that colleges and universities need to be responsive and relevant, and they must adapt their systems to meet the advancing needs of digital learners using digital technologies.

Need for Learner-Content Interaction

This finding showed the ID participants' viewpoints on the need for learner-content interaction and the development of interactive content. Consistent with the way all the study participants in this instrumental case study upheld the need for learner-content interaction, the literature supported that there is a need for learner-content interaction with digital media (DMOs) in online courses. Shank fostered that online learners will be more likely to spend more time focusing on and being engaged with interactive digital media objects if the online course is more immersive with interesting multimedia (2014, p. 122).

Another datum related to this finding from several ID participants in this study indicated that learners could be productive co-creators of interactive online course content. This seems to coincide with the literature as Kozinsky (2017) alluded that digital natives born in this generation thrive when they are given the opportunity to have a fully immersive educational experience and that they even enjoy the challenges of being a part of it. For instance, while only 12% expressed that they learn through listening, 51% of formed students said they learn best by doing, and they enjoy all interactive classroom environments over the traditional dissemination teaching method (Kozinsky, 2017).

Two of the senior instructional designers in this study offered faculty assistance with the use of the FlipGrid tool, which is an application that can be used to make videos interactive for (and by) learners. Such tools can make online course content more engaging and immersive. As was shown in the example in the previous chapter, instructors can add to video content, as part of an online discussion module in the course, by asking questions during the video – and the learner

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can then respond to a prompt and add a response video themselves with the FlipGrid application tool. Hence, there is much possibility for growth for learners to be part of collaborative content development, since interactive classroom environments can already be partially or fully immersive, due to a bevy of modern technology tools for developing and integrating DMOs, and reusable objects (OERs), in alignment with online course content.

Similarly, Merrill (2012) supported that with Instructional Transaction Theory (ITT), the instructor will guide and encourage students to learn on their own with transactional methods, and that DMOs are available as adaptable course tools. Moreover, Brown and Green (2016) posited that a much greater awareness of the greater complexity of systems and progressively ubiquitous, computer-based media production tools, foster a situation in which instructional designers must adapt their views and practices (p. 18).

ID Model for Design and Content Development

Purposeful DMO integration makes a more effective course design, which was validated by the consensus of three public higher education sites in the study. Any ID models in use must also be flexible and iterative for integrating DMOs and other OERs to have digital currency and since online course content is often updated or changed by instructional designers and SMEs. This finding is supported by the literature as the ADDIE model is used by instructional designers to guide the entire process of creating the learning platform, while various ID models are plugged into it to complete the vacant areas (van Merriënboer, 1997). Riegeluth and Wojtecki, as cited on page 93 in this study, described how digital content integration and alignment with curriculum is addressed following the application of specific ID models and theories.

Likewise, Instructional Transaction Theory (ITT), which was used as the theoretical lens in this study, was deemed by its originator to have value for the instructional designer in that it

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offers a more precise way to describe knowledge object representation (DMOs as OERs), instructional strategies, and ID prescriptions (Merrill, 1999). Merrill's ITT was used as the theoretical lens for applying concepts to this instrumental case study about how instructional designers were integrating digital multimedia in alignment with curriculum content in higher education online courses and how that took place in their design process. This theory, which is also an ISD model, allowed the researcher to understand design processes related to integrating digital media aligned with curriculum content in the online higher education course, providing a basis with which to examine how design may improve and support interactive online course content in the broad instructional design process.

This finding determined whether the ID participants used specific ID model(s) for course design and content development. Surprisingly, the data in this study revealed that not all ID participants from public higher education sites referred to specific models other than ADDIE, although three out of five maintained a reference to that adaptive ID model that they sometimes used but that the actual use of a model was optional. However, with QM as the main instructional design guide, all instructional designers addressed integration of DMOs within the design process. They also suggested that content integration and alignment is the focus throughout the Quality Matters Course Design Standards, which can be applied throughout the course design process. QM toolset and practices are based on standards of best practice, research findings, and ID principles, design to promote learning, integral to continuous quality improvement, and part of inter-institutional, SME content, and data driven, peer review process.

The QM course review process for online courses by ID staff, with SMEs and media developers, can ensure that design standards are being met in an online or blended course and identify which are not. Standards such as QM are being practiced as a component of the design

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process for online course content. The researcher purports that from the findings such ID practices as QM be applied prior to, and in accordance with, an adaptive and flexible ID model. A flexible approach to course design is also important as Instructional Design theories must continue to keep up with advances in modern technology, such as ISD technologies. A flexible course design approach can inform adaptive ID models and interrelated standards for adaptive instructional design processes and instructional systems design (ISDs), as explained in chapters one and three. The findings show that the all participants embraced a flexible instructional design process from that incorporated the application of instructional design standards, namely Quality Matters (QM) and Universal Design for Learning (UDL).

Three out of five public higher ed sites in the study retained reference to using ADDIE occasionally, an adaptive and iterative ISD model, and none of the participants referred to an ID model as being necessary. Instead the study participants simply drew from their general knowledge of ID models from their educational background in ID and/or professional knowledge as ID staff. However, with QM as the main ID guide, all instructional designers addressed integration of DMOs within the design process. All these ID staff participants suggested that content integration and alignment is the focus throughout the QM standards, which can be applied iteratively throughout the course design process.

Accessibility of Digital Media

The finding related to this theme was that integration of digital media can support accessibility. All study participants referred to Universal Design for Learning in their course design process for integrating DMOs, as well as ADA for accessibility compliance. For example, implementing captions to videos or alternate text over graphics was handled by multimedia developers and/or ID staff themselves, or ensuring accessible file formats were being used was

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important to accessibility of digital content.

In the literature, Anderson (2003) noted that newer cost-effective technologies are nearly ubiquitous in developed countries, as net-based telecommunications systems are evolving, which can have an effect on cost and implications for access. Responsive course design and development of content to reach online learners in their online environment was another finding among ID participants' responses. The use of smartphones for academics in higher education increased to 70 percent in 2014 and to about 50 percent for tablets (Brown, 2015).

Some participants had relayed that instructional design for online courses hasn't caught up with the need for responsive course design yet, which coincides with the literature. Considering that most of the platforms used currently by digital learners in online higher education courses are various mobile, portable platforms, instructional design skills are at a premium. The next section, *Need for Skilled Instructional Designers*, adds more to the finding.

Need for Skilled Instructional Designers

This finding of a need for more instructional design staff with appropriate skill sets, such as knowledge of instructional design standards like QM, came from the ID participants' perspective that increasing ID staff would also increase time for instructional design and development activities. There were only so many ID staff at the sites involved in this study, ranging from one to ten ID staff. All participants believed that more time could be devoted to course design and content development, rather than time on training faculty/SME's if there were more skilled ID staff afforded to their department. This was supported by the literature after conclusion of a study by Miller (2011), who acknowledged that faculty don't always have multimedia production skills, as he makes it known that multimedia integration with content is not as easy as that ID skill set appears (p. 307). Miller was also concerned with how faculty may

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select and integrate digital multimedia into their online courses by using various external resources, including OERS and online digital repositories that maintain sharable digital objects and DMOs. Results of a Babson survey for the *Time for Class Toolkit*, stated that faculty who are experts in their respective disciplines are not necessarily experts in digital learning tools and techniques (T4C, 2019). The lack of faculty familiarity with ID practices, skills for content development, and quality digital resources can be problematic since there is a currency of digital content, which includes the use of DMOs, OERs, and ILMs. Sharable digital objects such as these must be valid, relevant, and have timeliness, usually indicated by a date, per Shank (2014, pp. 28, 100, 120).

The literature coincided with the finding that there is a need for skilled ID staff and more time on course design tasks, as described by the participants in this case study. The literature by Lindsey (2014) advised that research-intensive institutions should continue to work at innovations purposefully and to provide quality content that online learning distributes so well. Nagar and Hallam-Miller (2019) stated that the flexible nature of OER enables them to have more control over course content, and provide the opportunity to customize or create new OER that more acutely correspond with online courses. Since OERs are not beholden to rigid publisher copyright, educators have agency over their use of these resources (p. 1). More specifically, these open resources align with the 5Rs, which allow users to retain, reuse, revise, remix, and redistribute OER content (Wiley 2014).

It is inferred then from the literature and the results of this study that online courses containing integrated digital multimedia content aligned with curriculum can and should be designed at a lower cost than before and with higher quality (digital currency) curated digital DMO/OER content. Yet, it is apparent that the availability and development of DMOs and OERs

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needs to be advanced for this to come about. Digital equity is affected by accessibility to digital content and related resources.

Summary

This study purported to explore best practices for the design process relative to how DMOs are being integrated in alignment with curriculum content in online courses by instructional designers in public higher education. The findings of this study emphasized the use of design standards for integrating content in online courses, rather than the use of any specific or instructional design model, which was prevalent among the participants. As shown by the description of their course design processes by the participants in this instrumental case study, instructional design is both purposeful and creative.

The findings of this study emphasized the use of design standards for integrating DMO content in alignment with curriculum content in online courses, namely Quality Matters Course Design Standards. The findings also showed that QM also supported the development of digital media objects with current technologies and this was estimated to be a strong future trend by the ID participants, which was also supported by the literature review. Related to the digital currency of DMO and OER development was another important finding that DMOs as OERs be updated and relevant or they are not as useful as course content. The participants also recommended use of Universal Design for Learning or ADA Compliance, which underscored the importance of the accessibility of digital content.

Recommendations for Practice

Through inductive reasoning, this case study uncovered a reconsideration of a common belief heretofore in the field of ID: of having to use a particular ID model for the course design process. The researcher poses that this study provided insight into an issue by reexamining that

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common generality as the findings showed how implementation of ID standards, addressing content for quality, usability and accessibility, as well as a learner-centered approach to course design strategy, were considered by the participants as being as functional and effective in the design process as adhering to a specified ID model. Not all of the ID participants referred to an ID model by itself in this study, as they instead drew from ID models from their educational background in ID and professional knowledge as ID staff. With QM for online and blended courses as the main ID guide, all instructional designers addressed integration of DMOs within the design process. The instructional designers in the study thought that content integration and alignment is the focus throughout the QM standards, which can be applied iteratively through any flexible course design process.

According to the senior ID participants in this study, a design process should be purposeful and creative as is a design process for integrating DMOs in alignment with curriculum content is both purposeful and creative. Course curriculum helps designers to prescribe the nature of the interaction with DMOs in the online course per their ID strategy of integrating DMOs with design standards. In an online course that has curriculum content in an instructional module, some sequenced interactive means for learners to interact with the content may be integrated with the curriculum content in the module. Course content can have many components, some of which take the form a graphic link, animation, embedded video, link to a video, podcast, augmented/virtual reality, or other digital media objects.

An instructional design model provides guidelines to organize appropriate pedagogical scenarios to achieve instructional goals (Kurt, 2015). ID models are simply meant as guides that designers can refer to as such and/or as a way to keep organized working in the design process. Instructional design models describe how to conduct the various steps. The steps involve

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instructional design process collectively. The models help educators to guide and plan the overall design process (Kurt, 2016). Kurt pointed out that Driscoll & Carliner (2005) stated that "design is more than a process; that process, and resulting product, represent a framework of thinking" (p. 9). ID strategy can be inclusive of design standards and approaches like Design Thinking. A common ID strategy could be formed within an ID model to help guide the ID process as a flexible approach for designing online courses. Likewise, Figure 3 illustrates a flexible course design approach in a pragmatic ID model for interactive eLearning, where the user-centered ID strategy may be all-inclusive of instructional design standards; such as, QM and UDL and/or Design Thinking. Using standards aid accessibility and file compatibility is necessary with technology. For example, the SCORM standard is helpful for ensuring compatible and sharable file types as required.

Standards provide designers and developers of competency-based education courses and programs with a structure and framework that serve as a way to create quality learning environments that align objectives, instruction, and assessments. QM is important in online course design. Hastings and Rasmussen (2017) noted that "At the micro-level, standards facilitate direction of the structure, format, and content of a competency-based course that ensures a high-quality product. At the macro-level, standards help institutional administrators and faculty make good, informed decisions about program policies and procedures," (p. 1).

Furthermore, in *The Hidden Power of Quality Matters*, Parenteau (2017) contended how QM works with all course components,

> When operationalized, alignment is akin to a systems thinking entity that has the organizing power to create cohesion among different elements of the course. It is a bonding agent capable of fortifying the relevance of those course components. Through

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> building relationships, alignment ensures that paths for achieving learning outcomes are clearly marked, (p. 1).

Course design can be effective and purposeful by applying QM standards to course content, as supported by the literature and as evaluated in higher education. Associate Provost Joan Mikalson, a QM Certified Facilitator, QM Course Manager, and past QM Research Colleague at Excelsior College, stated, "We are very happy with our decision to adhere to QM's course quality Standards; this helps us view quality through a research-supported, learner-centered lens," (Excelsior College: A Community of Quality, 2015).

Thus, designing courses with DMOs in alignment with curriculum content, using QM standards for learner-centered online courses, is significant in higher education and has been extensively tested in the ID field for many years. QM has been used as a course design rubric to establish a level of quality in online course design. The QM Higher Education Course Design Standards and the QM Rubric are updated regularly and are supported by literature reviews of online learning research (MarylandOnline, 2019). Currently, QM is in its 6th edition.

Gibson & Dunning (2012), exploring Troy University's Quality Assurance Initiative based on Quality Matters (QM) principles, conducted a case to improve the quality of their online courses and to expand their online program, which resulted in subsequent continuous improvement of the design of their online courses and found that online programs were improved by applying the QM rubric principles to effectively improve the quality of online courses (2012, p. 219). The authors agreed with Yang and Cornelious (2005) that in online instruction the effectiveness of the learning experience is manifest, in part, in the course design, and that the investment in planning a course is critical to constructing a comprehensive plan of instruction, explains the intentions of instruction, the methods of delivery, and the assessment of learning

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necessary for their graduates (Gibson & Dunning, 2012, p. 1). The authors affirmed that online programs do not need to institute an institutionalized quality assurance program to use the best course design practices exemplified by the QM rubric (p. 219).

In addition, the authors indicated that applying QM principles in course design gave them a means to suggest course improvements and to continue to improve online course design – as well as to meet the challenges that come with new technology and a new generation of students with advanced technological skill sets and expectations from their educational experience (2012). This is also supported by Kozinsky's view (2017) from the literature that today's 'digital learners' expect on-demand and seamless access from any device, and without any access issues. Thus, content must be accessible for all learners and digital objects/DMOs need to be in the accessible media file formats to provide access to learning anywhere on any platform, including mobile online access. The findings of this study coincided with the literature supporting that QM standards serve as a guide for course design with appropriate technologies and to augment accessibility in online course design.

According to a senior instructional designer at the University of Wisconsin, although the QM Rubric is designed as a peer review tool, instructional designers and course developers are also using it as a course design guide, a key design element checklist, and a faculty development tool (Ralston-Berg & Nath, 2008). Results of their study indicated that *all* items in the QM Rubric were valuable to students. This confirms the path of Quality Matters, encouraging such features in online course design (2008, p. 3). Over a decade later, this trajectory of the copious use of QM in the ID field and higher education continues and is significant in light of findings for the purpose of this study, as the views of senior instructional designers and directors in public online higher education revealed.

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UDL helps ensure that content in the entire course is usable and accessible for all learners. As cited in Chapter 2, the purpose of UDL is to produce learners who can assess their own learning needs (learner-centered), monitor their own progress, and regulate and sustain their interest, effort, and persistence during a learning task (Ralabate, 2011). While students value online courses, they are not all prepared to be successful in online learning environments, therefore, course designers must use media pragmatically to encourage deeper learning from engagement with interactive online instructional content (Gormley, 2009, p. 34).

Wei Lei (2016) urged that multimedia technology can be utilized in designing the learning module to better attract attention from students, increase learner motivation, and improve retention (p. 1). A more user-centered design can be augmented by Design Thinking. Green (2017) asserted that Design Thinking uses techniques and tools to truly get to the heart of a user's problem and build a solution to meet their needs, as it allows for designers to ideate after empathizing with user problems, thereby putting a valuable, purposeful, and creative design process back into instructional design.

ADDIE's advantages as a macro ID model are that it is adaptable to user-centered learning because it has an iterative development process, and because it is also an automated ISD that utilizes computer system tools in online course development. Many ISD models today, such as Dick and Carey and the Kemp model , are spinoffs of ADDIE (Cullata, 2019). The ID model, Interactive eLearning (IeL) model offered in this paper is an iterative ISD model that inclusive of macro and micro level design for use with ID standards and for its reliance on course outcomes. The researcher adapted her template for IeL in part from the ADDIE model for its flexible and iterative features. Another reason offered in the literature was that ADDIE is used by

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instructional designers to guide the entire process of creating the learning platform, while various ID models are plugged into it to complete the vacant areas (van Merriënboer, 1997).

In (IeL) ID model in Figure 3, the arrows indicate the direction of steps for the design processes, which appear darker after each step/process in the iterative design model. Steps may be updated with each step or iteration of the model based on need. The IeL model is inclusive of instructional design standards in the ID strategy, ensuring content integration with modern technology tools to maintain digital currency and that DMOs/OERs are aligned with curriculum content inclusive of design standards. Course Outcomes in Step 5 includes those outcomes related to learner-content transactions (or interactivity) and engagement with DMOs/OERs, and Step 6 is to provide analysis for course improvements for the next iteration of steps in the model.

Step 1 Curriculum and Course Design, refers to the given course curriculum and initial design framework, Step 2 refers to the User-Centered (Learner-Centered) ID Strategy for supporing ID standards, Step 3 is DMO/OER Integrated Content developed with modern technology tools, Step 4 is Learning Interactions as a result of learner-content activities and Engagement with DMOs/OERs, Step 5 represents Course Outcomes, Step 6 is Summative Course Evaluation for Analysis.

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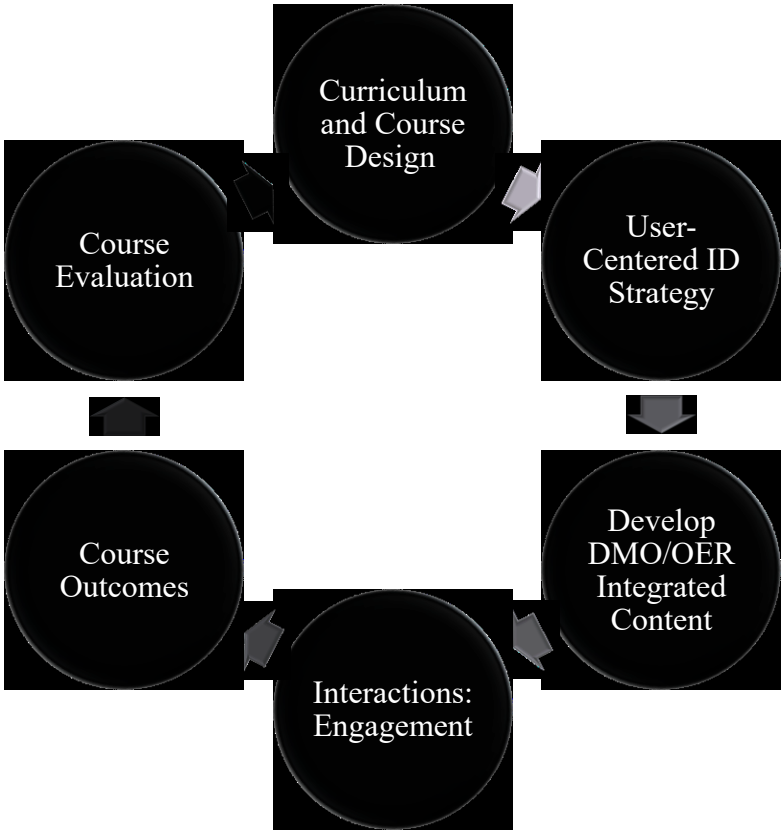

Figure 3. The instructional design model for Interactive eLearning (IeL Model). Note. Adapted partially from the ADDIE model. Created with a Word template. ADDIE Model, 2019. Retrieved from en.wikipedia.org/wiki/ADDIE_Model.s

The model allows for iterative improvements in course design for online courses in the last step, Course Evaluation. A summative course evaluation can be used to evaluate the effectiveness of a course design at course end from collected student course evaluations (Steward, B. L. et al., 2005). From their study, *Formative and Summative Evaluation of Online Courses,* the authors stated,

> Summative evaluations were used to evaluate students' perceptions of online courses. Inquiry focused on three primary areas including a) interaction with course content and instructors, b) accessibility of resources in an on-line environment, and c) perceptions of

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> online course engagement. Findings indicated that students both anticipated and experienced positive interactions with course materials, graphics, visuals, and instructors. Additionally, students anticipated and experienced adequate access to needed resources including support personnel. Finally, students favorably perceived course design components. Overall, students valued the flexibility of using online technology and thought the course was well organized and met their expectations (p. 1).

The literature and the results of this instrumental case study indicated a lack of an applied ID model(s) inclusive of an ID strategy for developing DMO/OER integrated content aligned to ID standards. Although a third of the participants did not refer to any one specific ID model for designing online courses, the ADDIE ID model has been well known for training in the past, but it was relegated at best as a subordinate design approach after the application of ID standards for designing online courses, according to the participants in this study. As Culatta (2019) explained,

> While the ADDIE Model was predominantly used in the development of multimedia content for learning for many years, the model has some significant weaknesses. The major weakness of the model is that it assumes that you can know all of the requirements before you develop the content. From practical experience we realize that the design process (developing and experimenting with the content) actually shapes the final design (p. 1).

Although ADDIE is still used as an ubiquitous IDS (Instructional Design System) in the field of ID, with modern technology tools automating content integration and development processes, there has been a need for their efficiencies to be more aptly applied within a flexible, experiential design model that can enable the overall course design process to be more effective. Instructional

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designers are tasked with driving the direction of the instructional design process and developing integrated course content to align with curriculum goals.

Quality content was a priority as a common response to the main interview question in the study. This central finding revealed that quality content was feasible by applying design standards, and that design standards for content integration and alignment with curriculum were essential to online course design. A double-edged sword for the instructional design of online courses can be the difference between automation of the design versus well-implemented, creative design solutions for supporting purposeful online course content. As was evidenced by the main finding in this study, applying Quality Matters standards as part of the course design process offers a more refined and detailed approach to instructional design for integration of DMOs with curriculum content – which can enable interactivity and delineated learning transactions with media-rich content. Consequently, automation for integration of digital media objects is not as necessary throughout the entire design process while other areas of ID may need to be automated, such as using modern technology tools to create or develop/update DMOs with valid digital currency, which provide learner-content interactions directly connected to what is being learned. As Merrill (1996) held for ITT, any issues for improved ID methods may be in the implementation, not by the systematic approach itself**.**

Yet, the findings also supported that all ID participants felt there is a lack of time and staff for design processes and content development, and that therefore, more (skilled) ID staff is needed. Time for developing instructional content helps instructional designers be more responsive to an organization's curriculum needs (Wojtecki, 2012). This researcher sought to explore how instructional designers in public higher ed are integrating DMOs in alignment with

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curriculum content for online courses during the design process itself, which could enable a seamless or continuous and more unified design approach.

A collaborative website for Instructional Designers, multimedia developers, faculty SMEs, and other course developers, could be utilized as an instrument for forming or improving their collaborative and centralized ID strategy, integrating DMOs (OERs) with online course content as part of an improved design process, and all content development. A course design form on the internal campus website could itemize "checklist" points for ID staff and include questions for SMEs for feedback as to how Quality Matters, Universal Design for Learning, etc. are being applied. This online course design form would help form an ID strategy and the ID process for integrating course content in their online course design. The online design form would support inclusive collaboration between designers, developers, and SMEs – since participants in this study indicated that an increase in ID staff and time was not only needed. It would also be helpful for solving problems creatively, and/or entertaining ideas for content in collaboration with SMEs who have had ID consultation already.

All of the senior instructional designer participants in this study mentioned the use of their departmental "checklists" for design and development of course content, including digital media objects (DMOs) and other OERs. Instructional design checklists could be incorporated into the online design form tool as means of streamlining and/or automating the design process. The online design form tool could then function as a channel to confirm any updates made to the "checklists" that instructional designers use to coordinate and manage the course design process. The online form could be flexible enough to augment the course design and development process for online courses. Any existing built-in instructional design standard guides, which the institution accepts for its mission for online courses and that the ID department follows and

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promotes for use at their institution, are linked documents at the bottom of the form tool. This form tool could aid as a way for staff and faculty to improve the launch time of online courses before they go live for learners. Time and effort are among the commonly cited barriers to the successful implementation of digital learning, per Babson's survey results (T4C, 2019).

Green (2017) inferred how Design Thinking allows for designers to ideate after empathizing with user problems, thereby putting a valuable, purposeful, and creative design process back into instructional design. Similarly, the form tool could serve as a mechanism to aid online course designers, media developers, and facilitators, to begin to collaboratively ideate their instructional design strategy for a course in one place – for instance, to apply QM design standards, UDL guidelines, Design Thinking's user-centric design approach, and for creating a template which could then be applied to online courses. As Stephanie Fuhr (2017), discerned at the 2017 QM Conference, "A simple template can be adapted to any course and can include elements that help set the stage for a successful development."

Likewise, the application of such a course design form becomes an adaptable paradigm as a tool for streamlining the overall course design process. In higher education institutions where consultations with staff instructional designers are not required of SMEs, the form would be a way for dialogue to take place between ID staff and SMEs/faculty regarding a design process of their online courses, and to ascertain what is available to SMEs, as well as to share what is being done with regard to course design, development, and alignment of DMOs/OERs (interactive content). The course design form can also provide a link to an internal DMO/OER repository in the same website and/or the form. The course design form could be updated for later reference as a flexible online checklist that can be modified or updated as course design needs evolve.

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This online course design form could also be helpful as a tool for IDs to guide other collaborators of online courses, including digital multimedia developers, and with coaching faculty/SMEs as well as in the areas of assessing learning outcomes, content development, and instructional alignment of course content. As new or updated LMS tools and multimedia development applications must be considered to keep DMOs/OERs up to date with their digital currency, an online design form would be a place where requests could be made for training on the institution's applications, or to make suggestions for using other applications or technologies.

The participants in this study relayed time was the biggest constraint, as they expressed the need for more time for design and less on training faculty in person. The study by Gibson & Dunning (2012) found that having staff available in sufficient numbers was important to assist faculty members with course design changes (p. 218). Training needs should be identified and addressed, and to ease the knowledge gaps faculty may have in using available LMS tools and modern technologies afforded by their institutions for course design purposes (2012, p. 219). The online course design form could also provide a place on the form tool to voice any knowledge gaps faculty/SMEs might have with using modern technologies, including the learning management system (LMS) at their institution and/or using any other modern learning technology tools for online course content. Thus, an online course design form can include a place to request virtual or campus meetings with ID staff, or self-paced workshops in any aspect of course design. The availability of this type of form could increase time and cost efficiencies.

A generic sample online course design form is provided in Appendix F, which contains types of questions for these purposes, including links for QM standards, UDL, Design Thinking, higher education ID guides in use at their institution, and their ID workshops, etc. Some possible questions are listed in the sample online design form for drawing an ID strategy in the course

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design process, including any content-interaction plan for the online course at hand, and whether faculty SMEs are developing any new DMOs/OERs. Online course evaluations should include questions for feedback of learner-content interactions relative to ease of use of DMOs and related interactive learning activities – as well as what impact that feedback (of learner-content interactions) has on the design processes of online courses. Following the development and use of DMOs/OERs as instructional tools are significant considerations in the online course design process and for supporting learner interaction and engagement.

Implications for Future Research

The limitations of this study were that it focused solely on public higher education in the country because public institutions offer the most online courses, as the literature revealed. However, to expand upon the scope of this study, a future study could also compare the differences between private and public institutions of higher education in a region. Such a study may show where course design processes for online courses are improved, what those improvements entail, and if budgets for instructional designer staff/resources were less restrained between public and private higher education sites in their region – or when compared to other regions. Future research could delve into instructional design staffing and budgeting and to any related under-resourced institutions of higher education.

Correlating to the data from this case study, research efforts could also include the applications and adherence to course design standards like, QM, UDL, and more inclusive, collaborative, as well as productive ways of approaching course design process as ID strategy, like Design Thinking. As Angel Green (2017) stated, “Design Thinking is a philosophy as much as a process. Originally credited from Stanford University, Design Thinking is about creating solutions that meet the needs of the user audience. Design Thinking uses techniques and tools to

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truly get to the heart of a user's problem and build a solution to meet their needs" (p. 13). Design Thinking utilizes those uniquely human characteristics that can't yet be replaced by Artificial Intelligence - empathy, creativity, innovation, and original thought, according to Green (2017). Green rationalized that Design Thinking allows for designers to ideate after empathizing with user problems, thereby putting a valuable, purposeful, and creative design process back into instructional design, (2017).

As three public higher education institutions from one state in the country were used for this instrumental case study, future research might include other public or private institutions of higher education with more participants as well. Since case study may be indicative of what may be found in similar institutions, research would be needed to verify whether the findings from one study could be generalized elsewhere (Simon, M.K. & Goes, J., 2013). The theoretical lens of ITT by Merrill (1996), implied that any issues for improved instructional design methods may be in the implementation, and this researcher suggests that future research might include whether online course evaluations include any questions for feedback for learner-content interactions relative to ease of use of DMOs and related interactive activities – as well as what impact that has on the design processes of online courses. Future research could explore DMOs/OERs as instructional tools for their efficacy – as learner-content transactions need to be more connected to what is being learned and courses need to be designed with this purpose in mind.

As technology advances future research directions could study how user experience (UX) or user interaction (UI) design practices can support online course design in higher education. This study showed that the participants considered non-responsive design practices are outdated. Therefore, instructional design practices using modern technologies is needed for supporting responsive online course formats. Future research for learner-content feedback of interactions

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with digital media could be invaluable information for instructional design practices for online courses in higher education and for faculty/SMEs, since the DMOs and other OERs are always updated with modern technologies. Future research might also include how newly acquired or updated LMS tools and multimedia development applications are being considered by stakeholders in higher education to keep DMOs/OERs up to date with their digital currency, or how these ID and media development tools are being utilized or underutilized at their institution.

Overall, collaborative development efforts for digital educational resources could be more inclusive of both SME and learner co-created DMOs/OERs. As digital learners are interacting directly with the content they are learning, this can be useful for course design and development with DMOs and OERs. More support for widespread initiatives like the Massachusetts Open Education: Achieving Access for All project could make a substantial improvement in the availability of such resources browsable by curriculum area. For instance, the PBS Learning Media website was launched just last year, making thousands of digital resources more accessible to instructional designers, educators, and students across the country (Teaching and Learning, October 2018, p. 42). Accessibility to DMOs and other OERs is vital to everyone – to all learners, to those working in education, and to the advance of the education field itself and to its institutions. As provided in the literature review for this study, Petrides & Dezmon (2017) suggested that state education agencies provide both technical support and training to empower schools to help educators work with the technology to access digital materials.

A future study that researches the effects of accessibility of OERs on instructional design could be beneficial as access to digital content has a profound impact on education. The literature supports the need for greater accessibility is at issue. The impact of Net Neutrality may mean

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more costs for online higher education while accessibility is an ongoing issue. “While some institutions will be able to pay more to maintain high-level access on campus, others won’t. And, for students and programs that are fully online, the institution’s ability to pay more is moot,” Sano reasoned (2018, p. 2).

Accessibility of digital resources and related costs is, therefore, a more general and broader concern for everyone. In the big picture Net Neutrality is the principle that individuals should be free to access all content and applications equally, regardless of the source, and without Internet Service Providers discriminating against specific online services or websites which goes against digital equity. Current Net Neutrality efforts by the states, like the legislation of 2019 that passed the House last month, are attempting to improve accessibility for individual states affected by the shifting political landscape at every level, which also alters access to digital resources for higher education institutions that digital equity groups are resisting to offset. Net Neutrality supporters pushing for legislation to reinstate Net Neutrality continue to pressure Congress and await an appeals court decision (Reardon, 2019). In similarity to the earliest beginnings of the Internet, the backbone of the Wide World Web, more collaborative efforts between the government and higher education would not be amiss if they were aimed at accessibility issues on a wider scale; rather than just for *some* entities – states, regulators, or those within the telecommunications industry.

According to experts (Becker et al., 2017) contributing to the NMC Horizon Report for key trends accelerating technology adoption in higher education, while mobile and digital learning strategies have increased over time, disparities in high-speed broadband connectivity and in engagement between different student groups (socioeconomic status, race, gender, etc.) prompt higher education leaders to continuously evaluate the affordability, access, and quality of

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their offerings (p. 8). Consequently, the affordances online learning offers are now understood for its flexibility and ease of access, and the integration of sophisticated multimedia and technologies are high among the list of appeals (2017, p. 8). Support for accessibility and digital equity in the larger arena would be helpful to educational institutions to sustain availability and sharing of accessible digital content, which could also reduce costs for the development and curation of DMOs as reusable, open educational resources.

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Appendix A

Six Sources of Evidence

Documentation	Archival Records	Semi Structured Interviews (Questions)	Direct Observations	Participant Observation	Physical Artifacts
Shared institutional ID documents from Participants: Quality Matters Course Design Standards and Blackboard Exemplary Course Rubrics used for course design and Universal Design for Learning	Participants Interview Recordings, and/or Written Responses to Interview Questions	How are you integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses? (in the design process)	Meetings with ID staff (instructional design workshops) Access to ID online group posts via the public higher education institution website	Participants References, Documents for ID standards, rubrics, and Design Thinking ID approach	Participant transcripts and recordings from interviews. Emails from Participants related to ID workshops QM workbook from ID workshop
Shared ID documents above	Participants Interview Recordings, and/or Written Responses to Interview Questions	How can a course design effectively integrate DMOs (knowledge objects) in alignment with curriculum content?	Collaborative ID staff/faculty workshops with the Information Technology/ID and Media Services departments for workshops on QM, UDL, DMO/OERs, LMS integration	Participants References, Documents for ID standards, rubrics, and Design Thinking ID approach	Interview transcripts; Shared documents: Quality Matters Course Design Standards and UDL
Shared instructional ID documents as above	Participants Interview Recordings, and/or Written Responses to Interview Questions	How can course design effectively integrate DMOs that provide instructional transactions, or interactivity, in alignment with curriculum content in online higher education courses? (i.e. as some DMOs can be *interactive* multimedia objects)	Instructional Design workshops and/or LMS workshops	Participants References, Documents for ID standards, rubrics, and Design Thinking ID approach	Interview transcripts; Shared documents for Quality Matters Course Design Standards and UDL QM workbook from ID workshop
Operational documents for technology	Participants Interview Recordings,	What instructional design (ID) models and higher education	Researcher observation of	Participants References, Documents	Interview transcripts; Newsletter

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implementation, learning management system/LMS, design methods, ID documents	and/or Written Responses to Interview Questions. Participants described the information they use through the LMS reporting tools controls to track learner DMO interaction in online courses	ID standards are useful or are being employed to achieve alignment of DMOs with curriculum content in the design of online courses?	ID staff collaborations with subject matter experts in ID workshops (SME's/faculty) at ID Workshops ID meetings or collaborations from ID staff	for ID standards, rubrics, and Design Thinking ID approach	created by ID/IT staff for ID workshop via email from ID staff; LMS features and LMS workshops
	Online course evaluations; LMS system reporting tools that track student interaction activities	The representation and organization of DMOs is important in ID of online higher education courses. What technologies are being utilized to achieve alignment of DMOS with online content?	Researcher observation in ID workshops with ID staff collaborating with subject matter experts(SME's and faculty).	Participants References, Documents for ID standards, rubrics, and Design Thinking ID approach	Transcripts of interviews
Shared documents from ID staff related to integration of digital objects; QM Course Design Standards and UDL	Participants Interview Recordings, and/or Written Responses to Interview Questions	What instructional design *practices* for the integration of DMOs in online course content could produce a more effective course design for interaction with online course curriculum content?	Researcher observation of ID staff collaborations with SMEs in ID workshops, ID staff meetings, faculty collaborations	Participants References, Documents for ID standards, rubrics, and Design Thinking ID approach	Emailed links and information for online ID/media workshops; QM, UDL, Design Thinking information
ID/IT Department or Institutional documents for the use of resources such as reusable digital objects, including DMOs from repositories at the university, and OERs from outside resources.	ID Workshop information distributed by ID department staff site-wide of design information relative to online course development	How can a course design effectively integrate digital multimedia objects that provide relevant instructional transactions in alignment with curriculum content related to course goals? Sub question: How is DMO alignment with online curriculum content necessary?	Researcher observation of ID staff collaborations with subject matter experts in ID workshops (SME's/faculty) at ID Workshops	Participants References, documents for ID standards, rubrics, and Design Thinking ID approach	Interview transcripts; ID/IT staff newsletter of online course ID workshops sent via email from ID staff

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Appendix B

Interview Questions and Protocol

Introduction

Thank you for taking the time to participate in this study. The purpose of this study is to explore how instructional designers are integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses.

The interview will last approximately up to 60 minutes. Before the interview begins, you will select a pseudonym to maintain privacy and all data captured from this interview will be coded in a manner to maintain and protect your confidentiality. At any time, you reserve the right to skip questions or stop the interview in its entirety.

Do you have any questions before we begin?

Semi-structured Interview

After reading the introduction and obtaining a pseudonym, the interviewer will turn on and test the voice recorder, prior to obtaining participant consent.

The interview will start with the researcher asking: "Do you give consent for me to record and proceed with this interview?"

1. How are you integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses? (in the design process)
2. How can a course design effectively integrate DMOs (knowledge objects) in alignment with curriculum content?
3. How can course design effectively integrate DMOs that provide instructional transactions, or interactivity, in alignment with curriculum content in online higher education courses? (i.e. as some DMOs can be *interactive* multimedia objects)
4. What instructional design (ID) *models and higher education ID standards* are useful or are being employed to achieve alignment of DMOs with curriculum content in the design of online courses?

   Sub questions: How? Why?

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5. The representation and organization of DMOs is important in ID of online higher education courses. What *technologies* are being utilized to achieve alignment of DMOS with online content?

   Sub question: What ID methods are being implemented to achieve this?

6. What instructional design *practices* for the integration of DMOs in online course content could produce a more effective course design for interaction with online course curriculum content? (e.g., Use of ID model(s), after collaboration with SMEs, media services, technology implementation, learning management systems/LMS, design methods, higher education ID standards, institutional design documents/templates, institutional mission statements for online courses/course development, new initiatives)

   Sub question: How?

7. How can a course design *effectively* integrate digital multimedia objects that provide relevant instructional transactions in alignment with curriculum content related to course goals?

   Sub question: How is DMO alignment with online curriculum content necessary?

8. What instructional *design process* for the integration of digital multimedia objects (DMOs) in online higher education course content could produce a more effective course design?

   Sub question: How do you develop instructional content transactions (interactivity) using DMOs as part of the course design? *Sub question:* What is used, if anything, to automate that ID process? *Sub question:* How can interaction with DMOs factor into the instructional design (ID) process of online courses?

9. If any open education resources (OERs) (digital online repository of collections of DMOs or library collections of images and videos that are openly shared for academic purposes for selecting DMOs) are being utilized, how are these DMOs integrated for alignment with curriculum content? *Sub question:* How are they being integrated for interaction?

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Sub question: Is the integration of interactive DMOs automating the ID process (in part, or overall)? How?

10. What other innovative techniques might support digital media alignment with online curriculum content? *Sub questions:* How? (what ways) Why?
11. What might be potential future trend(s) for Instructional Design of online higher education courses in the (digital) platform? (e.g. these can be for example, Human Computer Interaction or HCI, synchronous tools, UI/UX (UI Development, UX Design), Agile course development, etc.)
12. As a professional staff member in higher education who is involved in the development and design of online courses, how do you see Instructional Design evolving or changing for online higher education courses in the next five years?
13. If there were no limits for creativity how would you envision the future of Instructional Design? *Sub question:* What can be done?

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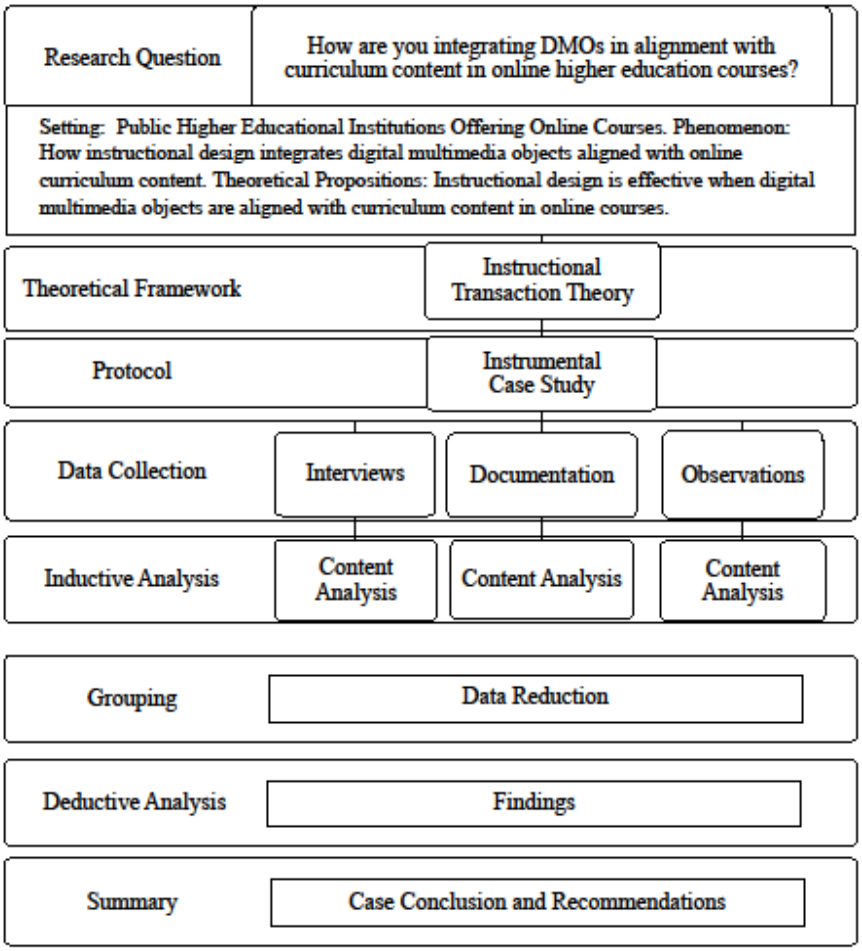
Appendix C

Case Schematic



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Appendix D

Recruitment Letter

Email Subject Line: Katherine Nolin, M.Ed. Requests Your Participation in a Research Study

Dear Name of Participant,

My name is Katherine Nolin and I am currently a doctoral student in the Doctor of Education (Ed.D.) program at Northeastern University. I am seeking research participants for my doctoral thesis study. The purpose of the study is to explore how instructional designers are integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses. As a researcher my goal is to expand upon current knowledge in the ID field and online higher education.

I am inviting you to participate in this study, given your involvement in instructional design at a university that offers online courses. If you volunteer to participate in this study, you will be asked to participate in an in-person interview that is expected to last 45 minutes and no more than 60 minutes. The interview will ask a series of question pertaining to your thoughts relative to the study topic. I will work with you to schedule an interview up to an hour (either in-person or online interview via Skype, WebEx, BlueJeans, or Google hangouts). In-person interviews will take place at a location of your choosing at the campus. If you would like to clarify or elaborate upon your answers, you may contact me for a follow-up interview for up to 30 minutes. I will cross check all information derived from interview(s). In appreciation of your time you will receive a $20 Barnes and Noble gift card upon completion of the interview.

Should you choose to participate you will choose a pseudonym for your participation in the study and the location of your interview at the university site to ensure confidentiality. All information and data obtained for the study is coded and kept confidential. The data will only be used for the intended case study to ascertain findings. Your participation is completely voluntary. If you choose not to participate, it will not impact your relationship with the study or the university.

The study is supervised by Dr. Bryan Patterson, Teaching Professor with the School of Education at Northeastern University and has been reviewed and approved by the Northeastern University Institutional Review Board.

If you would like to volunteer as a participant, need more information, or have questions, please contact me at nolin.k@husky.neu.edu. If you do not email me at nolin.k@husky.neu.edu regarding this research, you will not be contacted for this study.

To get started please respond to this email and complete the information in the chart below. Should you decide to participate in the study, I will send you an unsigned informed consent form with more information, and I will provide you with my institution's Institutional Review Board information pertaining to the study. Thank you in advance for your time and consideration.

Sincerely,

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Katherine Nolin, M.Ed.
Doctoral Student, Northeastern University
nolin.k@husky.neu.edu

Name: Email: Phone Number: Preferred days, times, and meeting format (either in-person, or via Skype, WebEx, BlueJeans or Google hangouts): Follow up interview requested (Yes/No):	

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Appendix E

Signed Informed Consent Form
Northeastern University College of Professional Studies
Doctor of Education Program

Title: An Instrumental Case Study in Instructional Design: Integrating Digital Media Objects in Alignment with Curriculum Content in Online Higher Education Courses
Principal Investigator (PI): Dr. Bryan Patterson, Northeastern University
Student Researcher: Katherine Nolin, Northeastern University

Informed Consent to Participate in a Research Study

We are inviting you to take part in a research study. This form will tell you about the study, but the researcher will verbally explain it to you first. You may ask the researcher any questions you may have. When you are ready to decide you may tell the researcher if you want to participate or not. You do not have to participate if you do not want to. If you decide to participate, the researcher will ask you to sign this statement and will give you a copy to keep.

Why am I being asked to take part in this research study?

You are being asked to take part in this research study because your involvement in Instructional Design, and you meet any one of the following criteria:

- you are Instructional Design staff who design content for online courses at a public university
- you are Course Developer/Administrative staff whose job tasks include designing content for online courses at a public university
- you are Media Designer/Course Developer staff whose job tasks include designing content for online courses at a public university

Why is this research study being done?

The purpose of this study is to explore how instructional designers are integrating digital media objects (DMOs) in alignment with curriculum content in online higher education courses.

What will I be asked to do?

If you decide to take participate in this study, you will be emailed 13 main questions before participating in an in-person interview. The interview will last up to 60 minutes. Should the participant request to clarify or elaborate with additional information, a follow-up interview for no longer than 30 minutes will be scheduled.

Where will this take place and how much of my time will it take?

You will be emailed interview questions initially. Then, you will be interviewed in-person at a time and place that is convenient for you or through an online meeting. The interview will last up

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to 60 minutes. Should the researcher require additional information either for clarification or elaboration, a follow-up interview will be scheduled and will last no longer than 30 minutes.

Will there be any risk or discomfort to me?

I do not foresee any risks with participating in the study. If any questions make you feel uncomfortable, to minimize risks you can skip questions or stop the interview at any time.

Will I benefit by being in this research?

There will be no direct benefit to any participants taking part in this study. However, the researcher hopes that the information gathered through this study will expand upon current practices in the field of Instructional Design and Higher Education. The findings from this study may help those in higher education to improve instructional design practices. The findings from this study will be shared with faculty, staff, and administrators.

Who will see the information about me?

Your part in this study will be confidential. At the beginning of the study you will select a pseudonym that will be used throughout the study to protect your identity and to ensure confidentiality. All data will be identified with the participant's pseudonym. Only the researchers involved with this study will see the information you share during your interview(s). No reports or publications will use information that can identify you in anyway or any individual as being of this project.

Our interview(s) will be audio recorded and transcribed into writing. All physical documents or files related to this study will be stored in a locked file cabinet. All electronic files will be stored in a password protected online file storage program and on an external data storage device. Only the researchers associated with the study will have access to these storage mechanisms. All data will be retained for a year from its publication and then destroyed.

If I do not want to take part in the study/I want to quit the study, what choices do I have?

There is no risk if a participant declines the opportunity to participate in this study. Their information will be omitted from the final results.

Can I stop my participation in this study?

Your participation in this research is completely voluntary. You do not have to participate if you do not want to, and you can refuse to answer any questions. Even if you begin the study, you may choose to cease participation at any time. If you do not participate or if you decide to quit, you will not lose any rights or benefits that you would otherwise have.

Who can I contact if I have questions or problems?

If you have any questions about this study, please feel free to contact Katherine Nolin at (617) 901-7527 or via email at nolin.k@husky.neu.edu, the person mainly responsible for the research. You can also contact Dr. Bryan Patterson at (857) 407-9652 or via email at b.patterson@northeastern.edu, the Principal Investigator.

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Who can I contact about my rights as a participant?

If you have any questions about your rights in this research, you may contact Nan C. Regina, Director, Human Subject Research Protection, Mail Stop: 560-177, 360 Huntington Avenue, Northeastern University, Boston, MA 02115. Tel: 617.373.4588, Email: n.regina@neu.edu. You may call anonymously if you wish.

Will I be paid for my participation?

You will receive a $20 Barnes and Noble gift card for your participation in this study.

Will it cost me anything to participate?

No.

I agree to take part in this research.

_____ _____

Signature of person agreeing to take part Date

_____

Printed name of person above

_____ _____

Signature of person who explained the study to the participant above and obtained consent Date

_____

Printed name of person above

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Appendix F

Table 3. Online Course Design Form

Course Code-Title of Online/Hybrid Course: _____ 1) For any of the following for this online course, please indicate () if any are needed at this time and whether you prefer a *virtual* workshop or in person meeting, or a *campus* workshop (write '*V'* or '*C' in column)*. 2) Indicate if you develop any DMOs/OERs that can be shared with a repository or our library website with *'*'*. Course design LMS or LMS tools and applications Applying and adhering to all course design standard guides (at links below), to your online course design and content Content development Integrating digital media objects (DMOs), and/or open ed resources (OERs), with online course content in your course Using applications/technology tools that you are using for developing new DMOs or other OERs or that you want to incorporate into the course in the LMS Learner-content interaction plan with digital media and/or open ed resources (OERs) Incorporating Design Thinking Updates to course after course evaluations Course review for adherence to Quality Matters Updating DMOs/OERs course content for improvements from summative course evaluations (effectiveness of course design, interactive/DMO content is for learners) Group workshops for any of the above Consultation with instructional designer for anything else for your online course Other? Write here:_____ Quality Matters Course Design Standards (link here) Universal Design for Learning (link) ADA Compliance (link) Design Thinking (link) Internal Repository of DMOs and other OERs (link) External Repositories (Library links, etc.)	Yes/No

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Appendix G

Higher Education Quality Matters Course Design Rubric, Sixth Edition

HE Specific Review Standards from the QM Higher Education Rubric, Sixth Edition

General Standards	Specific Review Standards	Points
Course Overview and Introduction	1.1 Instructions make clear how to get started and where to find various course components.	3
	1.2 Learners are introduced to the purpose and structure of the course.	3
	1.3 Communication expectations for online discussions, email, and other forms of interaction are clearly stated.	2
	1.4 Course and institutional policies with which the learner is expected to comply are clearly stated within the course, or a link to current policies is provided.	2
	1.5 Minimum technology requirements for the course are clearly stated, and information on how to obtain the technologies is provided.	2
	1.6 Computer skills and digital information literacy skills expected of the learner are clearly stated.	1
	1.7 Expectations for prerequisite knowledge in the discipline and/or any required competencies are clearly stated.	1
	1.8 The self-introduction by the instructor is professional and is available online.	1
	1.9 Learners are asked to introduce themselves to the class.	1
Learning Objectives (Competencies)	2.1 The course learning objectives, or course/program competencies, describe outcomes that are measurable.	3
	2.2 The module/unit-level learning objectives or competencies describe outcomes that are measurable and consistent with the course-level objectives or competencies.	3
	2.3 Learning objectives or competencies are stated clearly, are written from the learner's perspective, and are prominently located in the course.	3
	2.4 The relationship between learning objectives or competencies and learning activities is clearly stated.	3
	2.5 The learning objectives or competencies are suited to the level of the course.	3
Assessment and Measurement	3.1 The assessments measure the achievement of the stated learning objectives or competencies.	3
	3.2 The course grading policy is stated clearly at the beginning of the course.	3
	3.3 Specific and descriptive criteria are provided for the evaluation of learners' work, and their connection to the course grading policy is clearly explained.	3
	3.4 The assessments used are sequenced, varied, and suited to the level of the course.	2
	3.5 The course provides learners with multiple opportunities to track their learning progress with timely feedback.	2
Instructional Materials	4.1 The instructional materials contribute to the achievement of the stated learning objectives or competencies.	3
	4.2 The relationship between the use of instructional materials in the course and completing learning activities is clearly explained.	3
	4.3 The course models the academic integrity expected of learners by providing both source references and permissions for use of instructional materials.	2
	4.4 The instructional materials represent up-to-date theory and practice in the discipline.	2
	4.5 A variety of instructional materials is used in the course.	2
Learning Activities and Learner Interaction	5.1 The learning activities promote the achievement of the stated learning objectives or competencies.	3
	5.2 Learning activities provide opportunities for interaction that support active learning.	3
	5.3 The instructor's plan for interacting with learners during the course is clearly stated.	3
	5.4 The requirements for learner interaction are clearly stated.	2
Course Technology	6.1 The tools used in the course support the learning objectives or competencies.	3
	6.2 Course tools promote learner engagement and active learning.	3
	6.3 A variety of technology is used in the course.	1
	6.4 The course provides learners with information on protecting their data and privacy.	1
Learner Support	7.1 The course instructions articulate or link to a clear description of the technical support offered and how to obtain it.	3
	7.2 Course instructions articulate or link to the institution's accessibility policies and services.	3
	7.3 Course instructions articulate or link to the institution's academic support services and resources that can help learners succeed in the course.	3
	7.4 Course instructions articulate or link to the institution's student services and resources that can help learners succeed.	1
Accessibility* and Usability	8.1 Course navigation facilitates ease of use.	3
	8.2 The course design facilitates readability.	3
	8.3 The course provides accessible text and images in files, documents, LMS pages, and web pages to meet the needs of diverse learners.	3
	8.4 The course provides alternative means of access to multimedia content in formats that meet the needs of diverse learners.	2
	8.5 Course multimedia facilitate ease of use.	2
	8.6 Vendor accessibility statements are provided for all technologies required in the course.	2

* Meeting QM Specific Review Standards regarding accessibility does not guarantee or imply that the specific accessibility regulations of any country are met. Consult with an accessibility specialist to ensure that accessibility regulations are met.

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For more information or access to the fully annotated QM Rubric, visit qualitymatters.org or email info@qualitymatters.org

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