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Project Management Competencies of Educational Technology Professionals in Higher Education

A Qualitative Analysis of the Knowledge, Skills, and Abilities

James Kline, Swapna Kumar, & Albert D. Ritzhaupt

The purpose of this research is to explore the competencies of project managers in the field of educational technology in the higher education context. A conceptual framework is presented based on the current definition of the field of educational technology; knowledge, skill, and ability (KSA) statements; and the sixth edition of the Project Management Body of Knowledge (PMBOK). Using this conceptual framework, an interview protocol with 11 open-ended questions was developed by the research team to gather relevant information from experienced educational technology project managers. We then interviewed N=13 educational technology project managers from institutions of higher education across the United States and analyzed these data using the Constant Comparative Method. Three dominant themes emerged during data analysis: “knowledge,” “skills,” and “abilities.” These themes are described in detail along with the properties and categories from our data, and a discussion of our findings is provided. Recommendations are made for both researchers and professionals.

Introduction

What project management competencies (knowledge, skills, and abilities) must an effective educational technology professional possess to be successful in their role and responsibilities? Unfortunately, we do not have a clear and definitive answer to this important question from our current knowledge base. Project management as a field of endeavor has a rich history, a well-developed knowledge base (e.g.,
Project Management Body of Knowledge), a diverse set of practicing professionals across many disciplines (e.g., construction, information technology), and a strong professional credentialing system used to certify the active members of the profession (e.g., Project Management Professional certification). The field of educational technology utilizes knowledge, skills, tools, and techniques from project management to assist in the creation of our products and services. Project management has long been recognized as a vital aspect to the individuals who practice the craft of educational technology (Donaldson et al., 2007; Van Rooij, 2010; Van Rooij, 2011). Though project management is deemed essential to the field of educational technology, scant research has documented the project management practices utilized by our professionals (Brill et al., 2006; Kang & Ritzhaupt, 2015; Ritzhaupt, & Kumar, 2015). In each of the few empirical studies we do have, project management is recognized as a key competency for educational technology professionals (Brill et al., 2006; Kang & Ritzhaupt, 2015; Ritzhaupt, & Kumar, 2015; Sugar et al., 2012). Yet we are still lacking a complete explanation of who, what, how, why, where, and when these project management competencies are employed by professionals within the field of educational technology, particularly in the higher education context.

While project management has been described as a generic methodology for managing most projects across disciplines (Pollack, 2007), the studies on educational technology project management have placed particular emphasis on the formalized standards contained within the Project Management Institute’s (PMI) “Project Management Body of Knowledge” (PMBOK) (Brill et al., 2006; van Rooij, 2010). This collection of commonly accepted project management principles has become the de facto framework for managing projects, including educational technology projects in higher education. The PMI is the leading professional association in the United States governing the PMBOK and the Project Management Professional (PMP) certification, one of the most widely sought-after professional certifications (Starkweather & Stevenson, 2011). The PMBOK is a standardized body of literature approved by the American National Standards Institute (ANSI) (Cabanis-Brewin, 1999; Project Management Institute, 2017, p. 539) and underlies many project management training programs in the US. This document operationalizes and explains 10 knowledge areas (e.g., project cost management), five process groups (e.g., planning), and 49 individual processes (e.g., estimate costs) that cover the broad knowledge in the profession of project management. The PMBOK defines project management as the “application of knowledge, skills, tools, and techniques to project activities to meet the project requirements” (Project Management Institute [PMI], 2017, p. 10). The knowledge, skills, tools, and techniques are the resources that educational technology professionals draw from to complete their tasks in an effective and efficient
manner.

Of particular importance for the current study is that the PMBOK is a descriptive project management framework that “identifies a subset of the project management body of knowledge that is generally recognized as good practice” (PMI, 2017, p. 2). The PMBOK is not a prescriptive methodology (e.g., PRojects IN Controlled Environments, or PRINCE2) or product development method (e.g., waterfall, agile) but claims to be “a foundation upon which organizations can build methodologies, policies, procedures, rules, tools and techniques, and lifecycle phases needed to practice project management.” Likewise, the PMBOK asserts that “the knowledge and practices described are applicable to most projects most of the time, and there is consensus about their value and usefulness.” The PMBOK assumes that practitioners will “tailor” (p. 28) the appropriate aspects of their project management frameworks to the needs of their particular industry or project. Project requirements are the criteria by which projects can be deemed a success or failure. These criteria are typically established early in a project life cycle and are uniquely tied to a specific project for a specific purpose. For instance, educational technology projects might have learning outcome requirements, accessibility requirements, or usability requirements that serve as these criteria.

The field of educational technology deploys nearly an endless list of possible products and services. These can range from technology enhanced learning environments, such as an immersive, educational game or simulation used in K-12 classrooms, to interactive and personalized online learning courses used in institutions of higher education, to performance improvement processes adopted in a Fortune 500 company. While the intellectual property and creations of these products are vastly diverse, they are all characterized as “project work” (Donaldson et al., 2007). These diverse projects are implemented by a wide range of professionals in the field of educational technology. We use the term “educational technology” to be inclusive of the many roles in our discipline, including titles like “instructional designer” (ID), “e-learning specialist,” “instructional technologist,” and more.

According to the PMBOK, a project is “a temporary endeavor undertaken to create a unique product, service, or result” (PMI, 2017, p. 4). The nature of the work in educational technology is such that we create unique products and services in a specified period of time. This work typically involves a team of stakeholders (e.g., subject-matter-expert, ID, graphic designer) working towards a common goal with limited time frames, budgets, and resources (van Rooij, 2010). Projects are the basis for much of the work undertaken in the field of educational technology,
which is why we draw so heavily from the field of project management.

Academic programs in the broad field of educational technology (inclusive of instructional design, instructional technology, learning design and technology, instructional systems, etc.) do not consistently offer academic courses in project management to prepare professionals entering the field (van Rooij, 2010; van Rooij, 2011). Therefore, many educational technology professionals may find themselves in the roles of managing projects or participating as a stakeholder on a project without any formal training on how project work is executed. While the nature of many projects in the field of educational technology might be considered small (e.g., designing and developing an online course) with fewer than 10 stakeholders, 6-month durations, and budgets less than $75,000 (van Rooij, 2010), some educational technology professionals might find themselves working in multi-million dollar initiatives without any preparation on how to function in these project-driven environments. A project is generally deemed successful if it is delivered on time, within budget, and meets the project requirements negotiated by the project sponsor(s) with an acceptable level of quality (PMI, 2017, p. 13).

Empirical research has documented that educational technology professionals spend a significant portion of their time on project management activities (Cox & Osguthorpe, 2003). While we know the fields of educational technology and project management work in tandem to meet the requirements of our work environments, none of the present studies explore the project management competencies of educational technology professionals using in-depth qualitative procedures to explore these phenomena. Since researchers from our field have questioned the preeminent value of the PMBOK to our profession (Brill et al., 2006), more empirical research is necessary to understand the actual aspects of project management that educational technology project managers in higher education are using in practice. We need a stronger understanding of how educational technology professionals are managing intricate projects in increasingly complex work environments with limited resources, evolving requirements, and multiple stakeholders.

Thus, the purpose of this research is to document the project management competencies (i.e., knowledge, skills, and abilities) utilized by professionals in the field of educational technology working in the higher education context using qualitative procedures to explore the deeper “who, what, how, why, where, and when” questions. Although qualitative research methods are rarely employed in project management research literature (Cicmil, 2006; Pollack, 2007), they can provide answers to exploratory research questions and assist with generating theory and hypotheses about a phenomenon. We explore the experiences of
educational technology professionals that serve or have served in the role of project manager in higher education. This research sheds light on the educational technology field and provides useful knowledge to guide the practice of the professionals, professional associations, and academic programs in our field as we embrace the ideas from our sister discipline—project management. In order to do this, we explore a range of exploratory questions: How do educational technology professionals in higher education manage projects, and what competencies are necessary for them to succeed within this important role? In what ways does educational technology project management in higher education contexts reflect the standards of the PMBOK? Lastly, what other project management knowledge, skills and abilities are essential in our field?

Conceptual Framework

The conceptual framework proposed for this study is based upon research by Ritzhaupt, Martin, and Daniels (2010), Ritzhaupt and Martin (2014), and Kang and Ritzhaupt (2015). In these studies, the Association for Educational Communications and Technology (AECT) definition of educational technology (Januszewski & Molenda, 2007) was integrated with statements of knowledge, skill, and ability (KSA) (Ritzhaupt & Martin, 2014; Ritzhaupt et al., 2010). Specifically, the framework incorporates the AECT definition of educational technology with its three actionable concepts of “create, use, and manage” to explain the following statement: “Educational technology is the study and ethical practice of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources” (Januszewski & Molenda, 2007, p. 1). The primary focus of this article is on the dimension of “managing” in the context of educational technology projects in higher education, specifically focusing on those aspects of managing that are employed in the practice of project management.

Figure 1 provides an illustration of the conceptual framework with each actionable concept as an intersecting circle creating a Venn diagram. The conceptual framework illustrates a triangle in the center to visually represent the interconnections between the actionable components of the AECT definition of educational technology as well as the processes and resources (i.e., tools and techniques used by project managers). Project management competencies are defined as KSAs mapped unto the PMBOK’s five Process Groups, 10 Knowledge Areas, and 49 individual processes used in the formal project management standard (PMI, 2017). Additionally, we connected the KSAs to the “PMI Talent Triangle,” which emphasizes competencies of project managers in three areas according to the newest edition of the PMBOK: “technical project management,”
“leadership,” and “strategic and business management” (PMI, 2017, p. 56). These combined elements can be represented as KSA statements or competencies using this conceptual framework. As such, Ritzhaupt and Martin (2014) defines a knowledge statement as “an organized body of information” (p. 14) A skill statement is defined as the “manual, verbal, or mental manipulation of things” (Ritzhaupt & Martin, 2014, p. 2). Finally, an ability statement denotes “the capacity to perform an activity” (Ritzhaupt & Martin, 2014, p. 2).

As presented in Figure 1, KSAs merge and overlap within the three actionable concepts to represent the processes and resources employed by professionals in the field of educational technology with a focus on the actionable concept of “managing.” These processes and resources are indicative of the 49 individual processes that account for the PMBOK, and the broader domains of competence outlined in the PMI Talent Triangle. The processes and resources are also representative of the tools employed in project management, such as common project management software packages (e.g., Microsoft Project). Ritzhaupt, Martin, and Daniels (2010) illustrated that the “knowledge, skill, and ability statements can be thought of as overlapping in which skills rest upon knowledge, and abilities rest upon skills” (p. 427). For example, the category, “[a]bility to create a risk management plan,” requires related knowledge and skills to be able to fulfill the proposed ability statement. In particular, this ability might require knowledge of similar risks from previous projects of similar scope (e.g., expert judgement), stakeholder needs, and various analytical techniques for planning risk management as well as skills in decision-making, delegation, estimating, and budgeting.

Figure 1

Method

Participants

The participants in this study were recruited from AECT’s existing members in the spring of 2017. An e-mail request was sent which required potential participants to fill out a short pre-selection survey covering demographics, educational background, and professional experience. Given the nature of the study, participant selection for this qualitative study was intentionally purposeful with selection criteria established to identify participants who could best inform our research questions and enhance understanding (Creswell, 2009; Sargeant, 2012) of real project management competencies used in higher education. As such, the primary criteria for inclusion were that the professional worked in the field of educational technology within a higher education context, either had a job title of “project manager” or had professional experience serving in a project manager role regardless of formal title or institutional context, had worked in that capacity...
for at least one year, and was available for an online interview. We selected these criteria to ensure that the participants were experienced professionals in the higher education context using project management. Of 25 educational technology professionals who responded, 13 met the inclusion criteria based on their background, job title, and experience. These individuals were subsequently invited and agreed to participate in the study.

Of the 13 participants, eight were female and five were male. Their ages ranged from 27 to 65 years old, and their work experience ranged from three years to over 20 years. Ten of the participants held doctoral degrees, and the remaining three participants held master’s degrees. All 13 participants worked in an educational technologically related role and either had a current title of project manager or previously held such a position. They all represented a diverse range of educational technology positions, including: two IDs, two senior IDs, two assistant professors, one associate professor, one full professor, four participants at a college director’s level (Director eLearning and Instructional Technology; Director of Training; Director, Professional Development and Training; Director of Teaching and Learning Excellence), and an associate dean. Five of the participants worked at public universities, three worked at private universities, one worked at a community/state college, one worked at a for-profit online university, one worked at a private, Christian liberal arts college, and two worked for independent instructional design service firms with major stakeholders in higher education. In total, eleven American states and one Asian country were represented.

In terms of project management experience, eight (the majority) participants managed project teams of one to five people; another four participants managed teams of six to 10 people; and one participant managed a team of 11 to 20 people. Only one participant reported having earned a formal project management certification. Of the thirteen participants, only one of the participants had a year or more of formal project management education or training; six had one project management course only; and another six had no formal project management training at all.

Survey and Interview Questions

The research team developed a semi-structured interview protocol of 11 open-ended questions intended to capture the essence of the specific project management KSAs that educational technology professionals who have served as project managers needed in order to manage complex projects. All questions were designed according to Patton’s (1990) Interview Guide Approach to ensure uniformity and to facilitate an open dialogue with the participants without leading
them toward a particular response. Of note, the questions were deliberately
designed using simple language and not the technical jargon found in the PMBOK.
This decision was made to ensure the interviewees fully understood the language
and intent of each interview question in the event they did not have formal project
management education or training. Each interview question was reviewed by two
IDs in higher education following a standard think-aloud protocol (Ericsson &
Simon, 1984; van Someren et al., 1994), and minor revisions in diction and
sequencing of questions were made to the original items. Appendix A features the
final version of the interview protocol.

Data Collection Procedures

All 13 interviews were conducted with each participant individually using the
online web-conferencing software, Adobe Connect. All questions were presented
orally (i.e., the voice of the interviewer) and in written form on the screen to assist
participants in the virtual environment and to keep the interviewees focused on
the topic being discussed. The same member of the research team conducted all
13 interviews to ensure consistency in the data collection process. Each interview
was recorded using web-conferencing software for subsequent transcription and
coding. The software generated individual video files with audio, which could then
be used for data transcription. Each interview lasted from 45 to 60 minutes across
all participants.

Data Analysis

Data were transcribed using a professional transcription service and then analyzed
using the Constant Comparative Method (CCM), described by Glaser (1967) as
that which is “concerned with generating and plausibly suggesting (but not
 provisionally testing) many categories, properties, and hypotheses about general
problems” (Glaser, 1967, p. 104). The CCM was selected because it can be used to
generate theoretical explanations of the phenomenon–project management
competencies used by educational technology professionals–with a large corpus of
qualitative interview data. In the CCM, incidents applicable to each category are
first compared (Glaser, 1965; Glaser, 1967). Then, within each category (i.e., open-
ended interview question), each incident (i.e., participant response) was coded.
The category was then reviewed to compare and determine the codes across
participants. Codes within each category were generated, and then codes across
categories were compared and integrated into a set of themes; for instance, the
codes “communication skills” or “empathy” occurred across multiple categories
and were combined to form a larger theme.
We maintained a detailed audit trail during both the data collection and analyses processes to establish the dependability and confirmability of the findings. To increase trustworthiness, two members of the research team independently coded two categories and discussed their codes for differences. Following comprehensive discussion, all other categories were coded by one researcher, reviewed by a second researcher, and discussed by members of the research team before codes were collapsed across categories and finalized to create an initial taxonomy of codes. The overarching themes “knowledge,” “skills,” and “abilities” were confirmed by looking within and across the taxonomy to discover relationships.

**Results**

As mentioned previously, three dominant themes emerged during data analysis: knowledge, skills, and abilities. Additionally, contextual information supporting these themes is provided in the following sections, including the project manager responsibilities and stakeholders, project management certifications, and project management technology resources. Additionally, we present our coding properties and categories in Appendix B

**Responsibilities and Stakeholders**

Common job responsibilities of the participants in higher education included managing both online and blended course design, development and improvement efforts for courses, training and professional development, faculty and user support, student support, staff support, training and technical support, or maintenance initiatives. In order to provide context and insight into their work environments, participants were asked about the primary stakeholders that they served as well as those that they viewed as most critical to their projects. Since all of these participants represented the higher education context, eight of them cited faculty members as being their critical stakeholders, and five others stated that their funding sources were the most critical stakeholders. Provosts and supervising partners were also mentioned as critical stakeholders in projects. In terms of primary stakeholders, participants mentioned the organization, learners, end-users, university administration, executive boards, program directors, and design departments.

**Project Management Certification**

While most of the participants recognized the extensive knowledge gained through formal project management certification, responses were largely mixed in their
support for formal certification as a means of acquiring a ready skillset for managing real projects in the field. Instead, participants emphasized that the educational technology project manager should know the needs of the organization and client when opting for or against certification. One participant highlighted project management skills over project management certification, stating that “[c]ertification might [emphasis added] help you get clients. It’s like if you’re a small person consulting sort of job, but whether you have that or not, the schedule would be critical because you’re not going to have that ability to bring in departments on time and on budget.” Another reflected:

So, I don’t have one, so I can’t say that there’s an advantage to it [emphasis added], but had I not had the two (project management) classes I took, I think I would be behind the eight ball. [For instance,] I don’t think that I ever would have understood that this is an 80-hour project, not an eight-hour project...And we know in the tech world nothing is perfect, and nothing works the first time through. So, in the absence of taking a class, I can see why a certificate would be beneficial, in giving you that background knowledge [emphasis added].

Still other participants were entirely against the idea of getting formal project management certification as an essential requirement for managing educational technology projects in higher education. One participant taking this position stated:

Not PMP. They’re still too wedded to linear models that really end up being games between project managers and the people who do the real work. I’ve never met an engineer who knows what’s going to happen more than two weeks or three at the most anyway. So I know PMP is popular. I know that certificate commands a pay grade. So there is a value to it. I don’t necessarily think it’s that helpful in managing [instructional design] or performance consulting work. I’d be very curious to start seeing what happens as you start seeing certifications wrapped around agile [certification]...You know, it’s like, I would be far more interested in an agile [certification] that was actually focused on E-learning or performance support, performance improvement kind of thing.

Although there is no consensus of support for project management certification, several participants shared their experiences working on both ID projects and for higher education organizations of different sizes. They noted that the size of the project or organization may influence whether certification is necessary. Specifically, if the project or organization is large, then professional project managers may actually take the place of IDs who are focused on project
management. Such professionals who focus solely on project management may actually benefit from gaining project management certification. However, for IDs working on smaller projects as part of smaller organizations, the likelihood of becoming an ID project manager increases. Therefore, whether project management certification is necessary for these project managers is more of a personal decision rather than essential. The key in this case is to acquire the essential project management KSAs, either through certification, other training, or through professional experience. One participant explains that “[f]or projects [which] are big and complex, I’d much rather have someone who specializes in project management and can run four or five difficult projects for me at the same time.” The same participant then elaborated that:

If you're going to only work in big organizations, it may not be as critical for you. Then it probably limits your options later on...for me it was important. Not to have the certification, but certainly to have the skills. [For instance,] it allowed me to manage when I was independently running projects. Now, it matters less to me [in the larger organization] because I'm going to specialize and hire people who are just project managers. As you move into larger organizations, I think it’s better to specialize in that, so we use project managers. And that's what they do, they're not [IDs]; they're people who are trained and learned project management.

**Project Management Technology Resources**

The technology resources that project managers need to use when managing educational technology projects span across KSAs. Technology resources are some of the more tangible tools and techniques that practitioners use and can include both hardware and software tools developed specifically for project management or other general productivity purposes (PMI, 2017). The technology resources mentioned by the project managers were vast, and many reflect the professional preferences of a particular respondent or the needs of their organization. For simplicity, some of the resources and their stated purposes are summarized in Table 1. The technology resources listed can be linked to project management processes (e.g., the process “develop project charter”) defined in the current version of the PMBOK. Participants did not identify a single technology resource that was universal to the craft of project management. However, several general purposes and technology resources did reoccur across the participants. We noted that many of the technology resources and stated purposes listed are for communication management functions (e.g., team collaboration) among the various project stakeholders or focus on schedule management functions and
include things like collaborative calendars, Gantt charts, and to-do lists. What is clear is that these project management professionals must be abreast of multiple technology resources to function in their work environments.

Table 1

Resources: Technology and purpose in project management.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft Project</td>
<td>scheduling, resource allocation, Gantt charts</td>
</tr>
<tr>
<td>Microsoft Word</td>
<td>scope of work (memorandum of understanding), project charter, issue/bug tracking, and status reports</td>
</tr>
<tr>
<td>Microsoft Excel</td>
<td>budgeting and project charter</td>
</tr>
<tr>
<td>Microsoft Outlook and other email</td>
<td>client, team, and other stakeholder communication</td>
</tr>
<tr>
<td>Google Suite, Google Smartsheet, Google Hangouts, and SharePoint</td>
<td>team communication, collaboration, and agile scrums</td>
</tr>
<tr>
<td>Google Docs</td>
<td>collaboration and archiving</td>
</tr>
<tr>
<td>Trello, Slack, and Basecamp</td>
<td>streamlined project management processes and scheduling</td>
</tr>
<tr>
<td>Tableau</td>
<td>data display</td>
</tr>
<tr>
<td>Google Sheets and Google</td>
<td>scheduling</td>
</tr>
<tr>
<td>Calendar</td>
<td>video conferencing</td>
</tr>
<tr>
<td>Polycom and Yammer</td>
<td>agile project management and issue/bug tracking</td>
</tr>
<tr>
<td>JIRA, Bugzilla, and Mantis</td>
<td>agile project management</td>
</tr>
<tr>
<td>Daily Scrums</td>
<td>document sharing and revision control</td>
</tr>
<tr>
<td>Subversion</td>
<td>time tracking and timesheets</td>
</tr>
<tr>
<td>Toggl</td>
<td>time management</td>
</tr>
<tr>
<td>To-do list app (and manual lists)</td>
<td>presentations and storyboarding</td>
</tr>
<tr>
<td>Microsoft PowerPoint</td>
<td>project research and data collection</td>
</tr>
<tr>
<td>Qualtrics</td>
<td>project archiving</td>
</tr>
<tr>
<td>Sharedrive and Google Drive</td>
<td>communication with developers</td>
</tr>
<tr>
<td>Working knowledge of HTML, JavaScript, and Flash</td>
<td>communication with developers</td>
</tr>
<tr>
<td>Video and graphics production terminology</td>
<td>communication with team and faculty</td>
</tr>
<tr>
<td>Learning management system basics</td>
<td>stakeholders</td>
</tr>
<tr>
<td>Paper calendars</td>
<td>scheduling</td>
</tr>
<tr>
<td>Traditional whiteboards and flipcharts</td>
<td>planning and brainstorming</td>
</tr>
<tr>
<td>Phone and text messaging</td>
<td>communication</td>
</tr>
<tr>
<td>Various templates and hardcopy documents</td>
<td>project documents, course blueprint, and archive data</td>
</tr>
</tbody>
</table>
Knowledge

All 13 participants had academic backgrounds in educational and instructional technologies as well as e-learning and learning technologies, both of which they highlighted as essential to their role as project managers in the field of educational technology. They perceived their academic backgrounds as providing them with essential educational technology project management knowledge in the following areas: instructional design models, practice, and theories (11 participants); learning and pedagogical theories and strategies (4 participants); learning sciences (2 participants); or research, data analysis, evaluation and assessment (3 participants). One participant stated that an “academic background in instructional design teaches you how to problem-solve. It teaches you how to keep goals, project goals, long-term organizational goals at the forefront of your planning.” Meanwhile, another participant said:

[Project managers] have to have a good command cognitively of the elements that make up the instructional design model that they're using in the project. In, you know, whether it's ADDIE [Analysis, Design, Development, Implementation, and Evaluation] or some other model that they're using rapid prototyping or whatever. As the project manager in successfully managing that project they have to know... be well versed in that particular model and the tasks associated with each phase of development within that model...So that kind of knowledge is important.

Several participants mentioned that their academic backgrounds gave them confidence to communicate with their project team and stakeholders. They acquired the vocabulary to communicate with their stakeholders, be it pedagogically, or through research or leadership. One participant stated, “I found that it helped me to have confidence speaking to some of these people who had been working with many of these things for a long time.” Another stated that he “was able to translate the vocabulary of the field into common language,” while yet another stated that it gave him credibility with his stakeholders. All participants highlighted the importance of project management skills as essential to their roles. They cited knowledge gained through prior teaching experience, professional experience as an ID, experiences with diverse projects, and other types of professional opportunities as valuable to project managers in their field.

General business and institutional knowledge

The first category of “essential knowledge” relates to the higher education institution itself, that is the context in which educational technology project work is done. By being cognitively aware of the organizational context in which
educational technology projects are situated, the project manager ultimately becomes more effective at aligning project-level goals with the greater strategic objectives of the institution. Regarding the institution, all 13 participants voiced the need for educational technology project managers to have various types of general business and institutional knowledge. In particular, all 13 participants stressed the importance of having professional levels of interpersonal intelligence and strategies and having broad familiarity with the commonly used technologies and tools needed for conducting office work, managing projects, or performing instructional design and development tasks. Although most of the participant responses about the category of “interpersonal intelligence” were directly centered on a variety of soft skills and not necessarily knowledge, it is evident from their responses that having an active understanding of the complexities of social interaction as well as the motives, perspectives, and needs of the people around them is essential when managing even the simplest of projects in the educational technology field. Likewise, such an understanding of complex projects also requires deep knowledge of implementation strategies for the various interpersonal skills reported. The importance of knowing how and when to use a particular skill or ability was a common theme among all 13 participants.

In support of having broad awareness of various technology resources, one participant stated:

I think it's also important for a successful [instructional design] project manager to at least have a working knowledge of various programming languages, video production terminology, [and] graphics-production terminology. I'm not saying that they need to be programmers or video producers or graphic artists, but they certainly need to know how to communicate within those specific genres associated with the development of a course, or a program, because absent that communication they're not gonna be able to handle those elements of the project.

Other types of general business and institutional knowledge that emerged throughout the interview process include: knowledge of communication strategies for working with diverse project team members and stakeholders (7 participants); being well-versed with various work prioritization tactics (4 participants); decision-making strategies (2 participants); ethics and copyright laws (2 participants); research techniques (2 participants); consulting, collaboration and general budgeting concepts (2 participants); and principles of emotional and organizational intelligence (4 participants). In emphasizing the principles of emotional and organizational intelligence, one participant stressed the importance of “knowing how the organization works so you can work that organization. So how are things done? Who’s where? Where are the big paying points? Where are
the opportunities? What’s the nature of your business? What things are keeping people up at night?” Similarly, another participant added that the educational technology project manager should be “[e]motionally intelligent enough, socially intelligent enough to quickly determine what it is the stakeholders need, and then focus the communication directly to that need, and that’s it. Nothing else.”

**Project management process knowledge**

The second category of knowledge to emerge was “project management process knowledge.” Participants noted that educational technology project managers needed comprehensive project management process knowledge to help guide them through the various overlapping phases and processes involved in managing multiple and diverse projects. When asked what type of knowledge is deemed essential, one participant emphasized knowing the basics of integration:

[Project managers] need some basic project management skills, knowledge in order to keep track of all the various pieces that have to come together, and as we both know instructional design is an organic process. It's not as linear as we would like to think it is. And so, lots of details, and lots of things that could fall through the cracks with someone who is not attentive to those types of details and keeping everybody on track.

Other participants not only recognized the importance of knowing project management basics, but also stressed a core responsibility of the project manager is knowing how to allocate and manage with finite resources to achieve the project goals. One participant stated:

I think understanding the phases of project management, and understanding when you have more flexibility, when you have less [emphasis added]. You know, there’s a curve that tells you, you know, the further you get into a project, the more costly and the less effective changes become. So understanding that and managing with that knowledge is very important.

Among the core project management areas identified by participants as requiring a certain depth of knowledge include: project team management (12 participants), project management foundations and practice (7 participants), project scope and needs assessment (7 participants), project scheduling and time management (5 participants), stakeholder engagement (3 participants), budgeting and cost management (2 participants), and resource estimation and management (2 participants). Within the largest of these subcategories of project management
knowledge—“project team management”—participants emphasized the need for the project manager to understand the “roles, skills, and abilities of the team members: (6 participants) in order to be successful. One participant explained this idea in this manner:

As a project manager you really have to have a solid understanding of the roles that you’re managing, right? It doesn’t mean that if you are managing a content developer, and a content designer, and a media developer…It doesn’t mean that you have to be able to build the media. It doesn’t mean that you have to have that same attention to detail that a content developer does or that you have to be able to master or have a mastery of all of the, you know, learning theories or design approaches that an [ID] does, but you do have to have an awareness of what all goes into that…in order to be able to appreciate the process and also estimate how much time it’s going to take for that process.

In terms of engaging different stakeholders, six participants mentioned the importance of understanding scope definition and the challenges associated with it. One participant explained:

You know the scope of work [that the stakeholder is] going to come up with is going to be, you know, huge. And so one of the things that we did to help on the project management side is in the early analysis stuff, we just put in a whole bunch of questions from one deliverable to the next. Are you scoping this appropriately? Is this appropriately scoped?

Still another participant emphasized the importance of knowing the scheduling and time management needs of the project and the individual team members. (Although all participants managed teams as a project management responsibility, some of the participants had sole responsibility for project and team scheduling.) However, on this participant’s team, each member was responsible for scheduling the completion of their own tasks:

[Those on the team] do typically two levels of scheduling. There’s a high-level schedule that’s major project milestones. The other level of schedule is a lot more detailed, and we’re calling those serial review schedules. And it’s how a team will take a particular deliverable and the process that they use to get that deliverable out and through everybody for review.

**Instructional design knowledge**

In addition to having broad business and institutional knowledge as well as project
management process knowledge, the third category of knowledge to emerge was “instructional design knowledge.”

All 13 participants felt that educational technology project managers need a solid understanding of instructional design in order to effectively manage projects, team members, and stakeholders in the higher education environment. Project managers need to have a wide range of foundational knowledge in their field to recognize and coordinate the many interconnected parts of their projects. For instance, one participant stated:

I don’t have to be a content expert in the area; that’s the faculty member’s job, or the subject matter expert. My job is to have knowledge of instructional design theories, pedagogy, best practices, and then take their [faculty or subject matter expert] content and their goals, and put it in, put it to work. So to me, the knowledge of the instructional design theories, pedagogical theories, brain research, you know, understanding how students learn.

All responses related to the category of “instructional design knowledge” fell within the areas of instructional design best practices (6 participants), instructional design models and theories (5 participants), and learning and pedagogical theories (4 participants). The importance of project managers getting real-world knowledge through professional experience working on instructional design projects – with real people and a variety of modalities – was a common theme of the participants. One participant summarized this perspective by stating the following:

[As project manager,] you do have to be up on best practices, in terms of course design, in terms of working with the subject matter experts. Some of those interpersonal skills are really important, and if you don't have that ability to work with people, you're not even gonna get off the ground with a project management project or course design or other.

All 13 participants stated the importance of being knowledgeable of the basic ADDIE model or other design-based approaches to managing projects, and eight participants highlighted the importance of backward design to their job roles. One participant explained this in the following way:

My project management probably looks a lot like an instructional design model. So the instructional design model is gonna be[,] what would the outcome be? And what are the assessments? We really have moved in the last several years to using the backward design model. And so we look at, what are the outcomes. Then, how are we gonna assess whether we got to those or not? And then what are the steps
Another participant described her approach to project management through a design-based lens:

We really use these days more of a design approach [in which] we have a spiral model, and the integrative approach where we try to turn out a prototype, test the prototype, modify the prototype in a continuous cycle like that. So, we’ve gone over time from the more waterfall approach to much more of this cyclical design thinking type of approach.

Yet another approach mentioned was a focus on performance improvement, or the human performance technology perspective. A participant with this perspective stated:

We look at all this stuff through a performance improvement lens... We frame it within the context of, you know, we either have a problem where people aren’t doing what they need to, or we’ve got a future opportunity where we need people to do something different than they are. And when you frame things that way, you need to start looking at, you know, what is the gap in performance? What is the difference between expected and actuals? And given that difference, is the gap worth closing? And given a gap that’s worth closing, what are its causes?

Participants preferred specific approaches, such as iterative or performance improvement approaches, and provided examples of different models they used in their jobs. However, they all stressed knowledge of different models as an essential part of the project manager’s repertoire. While all 13 participants identified instructional design models that they used in their own practice to manage projects, some also mentioned the importance of having knowledge of proprietary models, of agile project management approaches, of rapid-prototyping, of active learning, and of program review processes as useful for project managers. One of the participants even acknowledged that intuitive and informal systems to managing projects have their place as well, instead of just a focus on “Gantt charts and rigorous documentation.”

Skills

Just as gaining knowledge of instructional design through experience was a common theme, acquiring project management skills through hands-on experience was also a commonly discussed topic across participants. The nature of such experience occurred within both formal training and professional contexts in the workplace. To illustrate the importance of hands-on experience, one participant
commented on the importance of a project manager being able to differentiate between the roles of ID and project manager yet interconnect them again when needed.

Another participant noted the value of having real experience in actual course design in order to manage projects:

[As a project manager,] you still need some real background of what course design looks like, and what kinds of things are appropriate in an online or a hybrid or a face-to-face setting. You know, you have to know that certain types of learning activities are gonna work in one modality or another or be more effective or not be more effective.

In terms of essential skills needed to manage educational technology projects in higher education contexts, participant responses fall within one of four dominant skill categories: project planning and management (90 references across participants), general management and design skills (35 references), interpersonal and communication skills (33 references), and intrapersonal (i.e., self-mastery) skills (18 references). Of these four overarching categories of essential skills, 24 separate subcategories were also identified and are discussed in this section.

**Project planning and management skills**

Within the first category, there are nine subcategories of skills that directly relate to planning and managing various project components. These subcategories reflect nine out of ten knowledge areas of the PMBOK. Particularly noteworthy is that all 13 participants considered it essential for the educational technology project manager to have skills in the areas of “determining project scheduling strategy,” “determining project scope and needs,” and “developing the project team.” In relation to the “determining project scheduling” category, one participant noted various elements needed to show these skills:

Well, you want to know what are the outcomes that you're gonna have at the end of that project. And so thinking from a management perspective, it's breaking it down to the tasks and so forth that need to be done, setting up some sort of timeline for that with milestones and so forth, and looking at what kind of resources you're gonna need for those kinds of things.

Yet another participant discussed the need for scope-management skills, while a third participant discussed various sub-skills needed to become skilled at “developing the project team”:
You will also need to be able to build and appreciate rapport with others, right? You have to be able to empathize, ‘cause I mean it’s very easy for a relationship to become adversarial, right, for whatever reason. Maybe the person’s having a bad day. It can become very adversarial and you need to be able to empathize with them and not just react when you’re having that. ...But one of my early project managers, he was amazing at, first of all really appreciating his team, and appreciating our needs to work well together, right? You have to be able to recognize when your team needs some bonding moments in order to get over the finish line or whatever, and when you need to be a little bit silly.

Another essential project planning and management skill that was discussed by a large majority of participants is managing stakeholder engagement (11 participants). In one discussion, a participant referred to the project manager as a “consultant-collaborator” with the stakeholders and the project as “surfing,” in which “everything is going to move underneath your feet as you're going along.” In this discussion, the participant implied that most project management processes, including the management of stakeholder engagement, involve some type of surfing:

And so if you think about the other aspects of project work, one of those aspects is consulting and collaborating with your client in ways that don’t let them do stupid things, and in ways that shape their expectations, and in ways that are collaborative because they know how their organizations work; we don’t. And so we have to find this kind of balancing point between the strong suits of [ID]/performance consultant and clients.

**General management and design skills**

In relation to general management and design, all 13 participants identified having broad technological skills as crucial for the educational technology project manager in higher education. Participants stated that project managers should be skilled at using information and communication technologies, using project management software, designing project charts, and using other scheduling and budgeting tools. Some participants also emphasized the importance of having broad skills in programming, video production, and graphics production for project managers. Participants agreed that the educational technology project manager needs to have some skills in using common productivity technologies (e.g., Microsoft Suite, Google Docs, Microsoft Outlook) for general day-to-day purposes. Still other participants highlighted skills in using project management-specific software such as Microsoft Project.

Other general management and design skills mentioned by participants fall within
one of three additional subcategories: general management skills (10 participants), research skills (9 participants), and instructional design skills (3 participants). The first of these, general management skills, consists of various miscellaneous skills mentioned by two or fewer participants each. These include skills like creating project value (2 participants), determining the project management approach (2 participants), and using agile (2 participants) and linear (2 participants) project management models. One participant listed the research skills needed by project managers:

...so, the ability to conduct focus groups, the ability to write a survey and implement a survey, and then review the data, analyze the data, come up with hopefully a learning solution or a problem solution at the end of those analyses that we do.

**Interpersonal and communication skills**

All 13 participants placed great emphasis on general interpersonal skills (i.e., people skills) and communication skills. Like general management skills, the skillset identified as general interpersonal skills includes a synthesis of various interpersonal skills, each of which was mentioned by two or fewer participants. Skills in this general category include assertiveness (2 participants), collaboration (2 participants), diplomacy (2 participants), empathy (2 participants), listening (2 participants), negotiation (2 participants), confidence-building (1 participant), and teaching (1 participant). As for communication, although all 13 participants identified communication skills as essential when dealing with stakeholders, clients, and team members, there were two major areas of emphasis into which communication skills fell: clear and consistent communication (9 participants) and general project communication (8 participants). Regarding project managers maintaining clear and consistent communication, one participant talked about being able to explain a concept in multiple ways and that “[y]ou have to be a good communicator. You have to be clear. And realize that even though you think you’re being clear, you have to realize how the other person needs to hear it in order for them to understand it.” Another participant described clarity in communication in terms of careful articulation of project outcomes based on realistic expectations:

It's [our] role, I think, to listen, to take what [faculty] say and then be able to craft that into a very tangible measurable outcome. And be able to articulate that back to the client, so to speak, the faculty member, the academic department, whoever might be initiating or ultimately using this piece of instruction so that you’re clear that you all have realistic expectations.

As for having general communication skills, the same participant explained this
type of skill as “keeping everyone informed, assessing the progress, setting up milestones” and that everything needs to be “guided towards that shared vision.” In relation to essential communication skills, not only did the participants emphasize effective communication for project managers, but they also stressed skills in managing expectations, input, and communications between stakeholders and the project management team.

Furthermore, according to participants, project managers who have well-developed interpersonal and communication skills are better equipped to “acquire the right team members” (3 participants), “understand team roles and assign them according to team members’ skills and abilities” (8 participants), and “facilitate team collaboration” (6 participants) for successful project completion on the timeline. One participant reflected:

…the most important [element for project success] really is that collaboration and communication piece because [the team] start off as strangers, and if they're going to do well in the course, they need to work through storming and norming to become a high performing team. And they're going to do that because everybody is in on this, even people with a lot of experience. They're going to slip schedule, and they're going to have to overcome it.

Finally, in addition to the categories previously mentioned, project managers need to have background knowledge on the strategies needed to develop emotional intelligence (discussed under “Knowledge” above), three of the participants underscored that skills related to emotional and social intelligence are most vital to deal with a wide range of relational scenarios that a project manager may face when working with a diverse team or set of stakeholders.

**Intrapersonal skills**

Within this category is a set of widely varying general intrapersonal skills that all participants argued were important to project managers. These include understanding oneself, particularly those desires, intentions, moods, strengths and weaknesses with which each person must live. Although all 13 participants cited skills that fall within the category of “general intrapersonal skills,” only two types of “self-mastery” skills were identified as essential by three or more participants: personal time management (5 participants) and focus on details (3 participants). Other intrapersonal skills identified include an appreciation for process (1 participant), flexibility and adaptability (1 participant), taking initiative (1 participant), possessing organization (1 participant), having persistence (1 participant), self-reflecting (1 participant), maintaining self-responsibility (1 participant), and having tolerance for ambiguity (1 participant). One participant
summarized her view:

I think you have to have a high tolerance for ambiguity, in the initial stages of the project, because a lot of times when you’re working with clients, they may not know what they want, and they may have just a vague idea, and you kind of got to be willing and able to go with that and sort of explore the outcomes that you’re trying to achieve as you move forward.

Abilities

The third and final dominant theme that emerged in the data is “essential abilities,” or “the capacity to perform an activity” (Author, 2010, p. 427). As for essential abilities that project managers need to manage higher education projects, 42 distinct ability statements were identified across participant responses, and each ability statement aligns with one of 11 overarching ability categories. Of these 11 categories, nine directly relate to managing various project aspects and, interestingly, align rather closely with nine out of ten knowledge areas of the PMBOK. The nine categories of abilities that align with the PMBOK include using and managing resources (54 references across participants), managing stakeholders (17 references), managing schedules (15 references), managing communications (12 references), managing scope (9 references), managing project integration (8 references), managing cost (4 references), managing risk (3 references), and managing quality (1 reference). The two remaining categories of abilities in this study include general “project-wide” abilities (59 references)—which apply across multiple project phases—and industry-specific abilities (12 references). This section provides an overview of those abilities cited most often by participants—and thus deemed essential.

Project management-specific abilities

The PMBOK (2017) standard tells us that a primary project management goal is “to meet the project’s objectives and stakeholders’ expectations” (p. 53), which is accomplished through balancing “the competing constraints on the project with the resources available.” In alignment with the primary project management goal of managing stakeholders, the one ability statement for which all the participants in the current study agreed was the ability to proactively manage stakeholder expectations and engagement (13 references). In a discussion on engaging and managing the expectations of faculty stakeholders, one participant stated it like this: “I would say proactive. Getting back to that sort of people skills, you kind of have to manage your client, sometimes the expectations to the client, but sometimes the actual getting input from clients. Again, university faculty are
typically pretty busy people. And their job description isn't necessarily centered around instructional development.”

In the area of scheduling, all participants considered it essential for project managers to be able to develop and follow a project schedule (13 references) in order to manage time constraints. To highlight the importance of being able to develop and follow a project schedule, one participant mentioned that “all of those aspects of producing, of course, successfully, and adhering to a project management plan or timeline...If the project manager is not knowledgeable about those kinds of details, those can actually be the fly in the ointment that holds up the project from being delivered on time and within budget.”

Similarly, most of the participants believed that various communication-related abilities were a vital part of the educational technology project manager’s arsenal. However, while 12 participants deemed it essential to be able to communicate clearly, openly, and constantly in order to manage project communications, the emphasis of each participant varied widely. For instance, one participant stressed the ability to communicate clearly, while another focused on the ability to communicate in a transparent manner with an “open-door” approach to communications. Yet another participant highlighted the ability to focus communications to meet the needs of the stakeholders:

And so, part of the project manager’s responsibilities might fall in the area of negotiating different timelines or different resource options that might be available. So some negotiation skills, I think, are helpful as well, but good, solid communication skills, and understanding what it is each of these stakeholder groups really needs to know in order to make a decision...and that’s where the communication needs to be focused. I work with a lot of instructional design graduate learners who want to go into a lot of lengthy explanation about the process, about the value of instructional design, about how it happens, who all’s in. And these stakeholders, they don’t care. That’s not what they wanna know, so the instructional design project manager needs to be political enough to quickly determine what it is the stakeholders need and then focus the communication directly to that need.

In relation to using and managing resources, all 13 participants deemed it essential that educational technology project managers have the ability to use common technology software and terminology for instructional design projects. Although the types of technologies mentioned varies, participants all suggest that having the broad ability to use technologies and associated terminology is essential to communicate with people managed by a project manager.
Similarly, most of the participants further delineated the ability to use common project management software (10 participants), such as Microsoft Project or Gantt charts, as essential.

Other common overarching ability statements related to overseeing resources include managing people (9 participants) and managing all (non-human) resources (8 participants). In relation to managing people, one participant noted that “[i]t comes down to the management piece of it though. Of how do you effectively manage people? I think [that is] the key to me at least.” Likewise, key statements that various participants used to describe the ability to manage all resources include “identify resource requirements,” “estimate properly,” “allocate resources to accomplish an end,” and “you have time, money and resources, and you have to balance those out.”

The final two categories of essential project management-specific abilities include: managing scope (9 participants) and managing project integration (8 participants). Of these dominant categories, the specific participant statements of essential abilities include determining the project’s scope of work (9 participants), developing and following project plans and tools (4 participants), and evaluating project outcomes and status (4 participants). To this end, a participant noted that:

Spending time to [develop and] really assess what the client wants, what’s expected, and then articulating that so that the whole team understands it, I think is where it all begins. And then once you have that, then it’s basic instructional design and project management. What are the milestones? What are the steps? Who are the people? What are the resources? What are the timelines? And then just planning the rest of it and working that plan.

Finally, while some participants noted useful abilities related to the larger project management categories of “managing cost,” “managing risk,” and “managing quality” (4, 3, and 1 participant[s] respectively), ability statements in these categories were not widely mentioned by the participants.

General “project-wide” abilities

In the current study, all 13 participants recognized the need for project managers to have general abilities that apply across project tasks, phases, or even the life of a project. Altogether the participants identified 18 distinct “project-wide” ability statements. Within this category, only one ability statement was held in common among most participants. The ability to apply general interpersonal skills was discussed by 12 of 13 participants. One participant described the importance of this ability in the following way:
So the first and foremost is the people skills, or rather people abilities. You’ve gotta be able to relate; you have to be able to listen, what is their end goal, you know, what do they wanna achieve, and they’re gonna tell you, they want to do 1, 2, 3 and achieve X, Y, Z, and you have to figure out how to make them understand [participant laughs] ‘cause they’re two different processes coming together.

Yet another participant focused instead on project managers possessing an interpersonal skill such as assertiveness, which he termed “the ability to push in a nice way.” He further elaborated that “you wanna remain friendly, but you’ve got to, you know, with each successive message or phone call, you’ve got to up the pressure to perform.” Only one specific interpersonal skill—the ability to work well with others (7 participants)—was a shared response by more than half the participants. While there was broad variety among participants regarding which general project-wide abilities are essential, three particular ability statements were discussed by at least five participants. These include the abilities to apply different project management lens to each project (6 participants), to apply suitable project management principles (5 participants), and to manage diverse project details (5 participants). In the words of one participant:

The last part of this project beast is the notion of the project management. How do you deliver quality work on time within budget? How do you manage changes? What kinds of project management approaches do you use given the kinds of risks that you need to mitigate in the project? How do you identify and classify “risk?” How do you work with others to mitigate those? And, you know, in order to deliver quality work on time and budget that the client’s actually going to value, because at end of all this stuff, you deliver value behavior change in the workplace.

**Industry-specific ability**

Although participants in this study only identified one ability statement that applies to the level of the industry or organizational context, this ability statement represents a significant consensus among the participants. Specifically, 12 of 13 participants noted the importance of having the ability to apply instructional design principles and theories of teaching and learning. For instance, one participant this ability in the following way:

My job is to have knowledge of instructional design theories, pedagogy, best practices, and then take their content and their goals, and put it in, put it to work [i.e., to apply it]. So to me the knowledge of the instructional design theories, pedagogical theories, brain research, you know, understanding how students learn...
**Discussion**

Before drawing conclusions and interpreting the findings of this study, it is important to take note of the limitations of this study. This is a qualitative inquiry with an intentionally small and homogeneous sample, and as such, these data should not be generalized to the larger population of educational technology project managers. Instead, these results should be viewed as “transferable” to the reader’s professional experiences and background in their contexts. Further, the participants in this study were largely representative of the United States as they were recruited from AECT, and participants practiced project management in the context of higher education settings. Readers should be cautious in transferring the findings of this study to other educational technology contexts (e.g., the military), and especially, other disciplines (e.g., construction management). Also, we only interviewed participants on one occasion, and we did not collect additional data sources (e.g., each participant’s resume or curriculum vitae) to triangulate the findings from the study, which could have enhanced the validity of our results. Finally, the participants in this study served as the source of expertise (per our selection criteria) about educational technology project management in higher education. Thus, our findings are subject to the experience of the professionals in our limited sample. The results of this study may be applicable to other educational technology professionals with project management experience in higher education.

With these caveats in mind, this research has expanded our understanding of the project management competencies of educational technology professionals working in institutions of higher education. The findings from our study illustrate that educational technology professionals practicing project management must possess a wide variety of competencies to fulfill their roles and responsibilities. Consistent with previous research (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017), our findings show that educational technology professionals in higher education identify faculty members as being their primary stakeholders. Although students are the main audience of much of the project manager’s work, faculty members are often perceived as both the client and subject-matter expert in higher education settings. The participants in our study all had academic backgrounds in the broad field of educational technology with formal training in topics like learning theories, instructional theories and strategies, instructional design and development models, learning sciences, research, data analysis, evaluation, and assessment. However, six of the participants had no formal training in the craft of project management. This finding is consistent with the reality that many educational technology programs do not offer coursework in project management (van Rooij, 2010; van Rooij, 2011).
The participants in this study blend instructional design model processes with project management processes to guide their work efforts and manage their projects effectively. This is not an unusual practice in the field of educational technology with educational technology professionals using methods like rapid-prototyping (Tripp, & Bichelmeyer, 1990) or agile methods (Sweeney, & Cifuentes, 2010) to serve as the project management function. Several of the participants noted using the principles of backward design to guide their creations and project efforts (McTighe, & Thomas, 2003). Instinctively, the educational technology professionals are using project management processes, tools, and techniques without having detailed knowledge of formal project management methodology. Their knowledge of project management processes is often derived from the experiences of implementing their product development life cycles (i.e., instructional design models) with customized features. It would appear that educational technology professionals are tailoring instructional design models with custom project management processes to function within their work environments. Regardless, several of the professionals are unconsciously using formal processes mirroring the PMBOK without ever having been trained in this subject.

This is not to say that the professionals in this study did not have some background in formal project management. After all, more than half of the participants had taken at least one course in project management during their academic preparation. Several of the project managers described traditional project management processes, tools, and techniques, including things like defining and managing scope, estimating activity resources and durations, developing budgets, or developing schedules and timelines. Participants also noted that they used applications like Gantt charts, the critical path method, and project management software. The participants did not necessarily use the formal language presented here to describe the ideas, but nonetheless, the principles and ideas were still present in their narratives. Consistent with prior research (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017; Kang & Ritzhaupt, 2015), educational technology professionals in higher education must be abreast of a wide variety of information and communication technologies, ranging from standard productivity tools like word processors and spreadsheets, to authoring packages to Learning Management Systems (LMSs) and cloud-based tools for collaboration. These tools are used for a range of purposes, to include scheduling, budgeting, conferencing, planning, communicating, storyboarding, and version control. It is therefore clear that project managers in the educational technology context must develop competencies in a wide range of processes and tools.

Also consistent with prior research, the role of communications skills and the ability to work with diverse stakeholders floated to the top of the list for many of
these educational technology professionals (Ritzhaupt & Kumar, 2015; Kumar & Ritzhaupt, 2017; Kang & Ritzhaupt, 2015). Communications management and stakeholder management are two of the ten knowledge areas described in the PMBOK and are incredibly important competencies to develop as project managers. After all, Schwalbe (2015) reported that project managers spend as much as 90 percent of their time communicating with project stakeholders. Educational technology professionals serving in the project manager role also have to carefully balance client expectations with the resource constraints of the work environment and effectively lead project team members to achieve goals that are sometimes unclearly defined yet progressively elaborated as time passes. Both written and oral communication skills are essential to this role; project managers must be effective communicators and develop expertise in engaging with and managing stakeholders from diverse backgrounds. These findings are also consistent with the competencies described by the PMI Talent Triangle in the newest edition of the PMBOK, which emphasize technical competence in project management and the importance of leadership and knowledge of the business domain – in this case, higher education (PMI, 2017).

The educational technology professionals serving as project managers in this study had varying attitudes towards the value of professional certifications in project management. Most of the participants saw value in project management credentials, while others felt the PMP in particular was too linear and rigid. Prior research in our field has also questioned the importance of certifications like the PMP for educational technology professionals (Brill et al., 2006). Even project management scholars have reservations about the value of the PMP to professionals managing projects across disciplines and contexts (Starkweather & Stevenson, 2011). Nonetheless, what is clear from this research is that many of the project managers in the educational technology context that we interviewed are practicing the ideas described by the PMBOK with or without consciously realizing they are doing so. The PMP is intended to certify professionals from any industry (e.g., construction management, information technology) so that they may practice effective project management on any type and size of project. Many of the educational technology professionals interviewed in this research were managing smaller teams (less than 20 team members) and smaller projects (i.e., projects with duration of less than 6-months, with budgets less than $75,000, and with fewer than 10 stakeholders). Some of the processes prescribed by the PMBOK might seem inappropriate for smaller projects; thus, the question of value remains unanswered in the educational technology context, particularly in higher education. More empirical research is necessary to determine if these credentials are truly leading to better project management in educational technology.
The interview data we collected from these project managers touch upon most aspects of the PMBOK (e.g., knowledge areas). Again, the participants did not always use the jargon of the PMBOK to express themselves during the interview; nor were they expected to do so. What we can conclude is that educational technology professionals are practicing varying aspects of integration management, scope management, schedule management, cost management, communications management, stakeholder management, quality management, risk management, and resource management in their regular work environments. In fact, they have developed their own tailored processes and domain expertise in these areas. Also evident in our data is that project managers are involved in the full life cycles of the projects from initiation to closing.

Though many aspects of the PMBOK were evident, there were also many aspects that were not present in our interview data. For example, we did not see as much evidence aligned with the processes within procurement management, which involves acquiring goods or services from vendors. Also absent from the interview data are specific project management tools, techniques, and processes outlined in the PMBOK and other project management literature. For instance, the Earned Value Management (EVM) method is a powerful and popular tool that supports the management of scope, schedule, and cost in an integrated mathematical framework supported by common project management software packages (Anbari, 2003). Quantitative and qualitative risk analyses were also not discussed, nor was the use of a risk register to manage the risk events for a project. The concept of a Work-Breakdown Structure (WBS) was also not mentioned directly, even though project management software such as Microsoft Project and Gantt charts were noted. These missing elements are likely a function of our interview protocol. However, future research needs to examine which processes are useful and which processes are not to project managers in educational technology working in institutions of higher education.

**Recommendations for Practitioners**

Professionals, professional associations, and academic programs may find this research useful in planning professional development opportunities and academic curricula. Project managers in our field can assess the extent to which these findings are applicable to their work environment and employ some of the many ideas presented in their own professional practices. Aspiring project managers can use this study to assess their current competencies and plan learning events to prepare them for this important role. Professional associations such as AECT, the Association for Talent Development (ATD), or the International Society for Performance Improvement (ISPI) can work to refresh their standards and
credentialing programs (e.g., ATD’s Certified Professional in Learning and Performance) to target specific project management competencies relevant to the field. Professional associations, like the Online Learning Consortium (OLC), are already offering professional development experiences focusing on project management in higher education (OLC, 2018). Academic programs in the field of educational technology should start to address the gap in project management curriculum in our field by offering robust courses and authentic project experiences to prepare educational technology professionals for their increasingly complex work environments.

**Recommendations for Researchers**

Future research on the role of project management in educational technology is a fruitful research avenue with ample opportunities to address questions of both theoretical and practical significance. As the present study was an exploratory study using qualitative procedures, some of these findings may be useful in contributing to the development of a survey or other data collection tools for educational technology professionals working as project managers. A large cross-sectional sample of professionals across the United States, and even beyond, would provide useful information in understanding the roles and responsibilities of project managers within our discipline. This information is also useful for human resource professionals to acquire the appropriate professionals to serve in these roles. As this study focused on those individuals within a higher education context, it would also be advantageous to interview professionals in educational technology working in other contexts, like business and industry, the government, the military, or K-12 education. These data could be compared and contrasted to examine the moderating influences of the contexts in which the project manager works. At some point, we will have to examine the influence of credentialing systems like the PMP on the practices of project managers of professionals in the field of educational technology and the overall success of projects managed by those professionals.

**References**


van Rooij, S. W. (2011). Instructional design and project management: Complementary or divergent?. *Educational Technology Research and Development, 59*(1), 139-158. doi:10.1007/s11423-010-9176-z


**Appendix A: Interview Questions**
Interview Questions

General
1. Please talk a little about your academic and professional background. Do you think your academic background has helped you in your professional responsibilities? If so, how? (If not, why not?) Please explain.
2. Please explain how your role fits within the organizational structure of your institution. (Who do you report to? Also, what function[s] do the team members play in your work?)

Project Management
1. In terms of project management, how many years of formal (or formalized) experience managing projects would you say you have at this point?
2. From your experience, what knowledge, skills, and/or abilities should you possess to be successful in managing projects?
3. Who do you consider to be the primary project stakeholders you work with most frequently? Which of them would you consider to be most critical?
4. Are project management models, processes, or standards useful in your job? If so, which ones?
5. What type of project management preparation or training would you recommend for your position (if any)? What advantages are there in holding a professional certification in project management (if any)?
6. What specific types of technology or tools do you use most frequently in your line of work when managing projects?
7. In your opinion, what general aspects of managing projects require the most attention and/or challenge in your role?

Wrap-up
1. What would you consider to be a successfully managed project?
2. From your professional experience, what would you consider to be your greatest lesson learned about managing projects?

Appendix B: KSA Categories and Subcategories

Table 2

KNOWLEDGE (3 Categories; 20 subcategories identified)
<table>
<thead>
<tr>
<th>CATEGORY 1 - General Business and Institutional Knowledge</th>
<th>49</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpersonal Intelligence and Strategies</td>
<td>13</td>
</tr>
<tr>
<td>Common Technology and Tools</td>
<td>13</td>
</tr>
<tr>
<td>Communication Strategies</td>
<td>7</td>
</tr>
<tr>
<td>Emotional &amp; Organizational Intelligence</td>
<td>4</td>
</tr>
<tr>
<td>Work Prioritization Tactics</td>
<td>4</td>
</tr>
<tr>
<td>Decision-Making Strategies</td>
<td>2</td>
</tr>
<tr>
<td>Ethics and Copyright Laws</td>
<td>2</td>
</tr>
<tr>
<td>Research Techniques</td>
<td>2</td>
</tr>
<tr>
<td>Consulting and Collaborating Techniques</td>
<td>1</td>
</tr>
<tr>
<td>General Budgeting Concepts</td>
<td>1</td>
</tr>
<tr>
<td>CATEGORY 2 - Project Management Knowledge</td>
<td>38</td>
</tr>
<tr>
<td>Project Team Management</td>
<td>12</td>
</tr>
<tr>
<td>Project Management Foundations &amp; Practice</td>
<td>7</td>
</tr>
<tr>
<td>Project Scope and Needs Assessment</td>
<td>7</td>
</tr>
<tr>
<td>Project Scheduling &amp; Time Management</td>
<td>5</td>
</tr>
<tr>
<td>Project Stakeholder Engagement</td>
<td>3</td>
</tr>
<tr>
<td>Project Budgeting and Cost Management</td>
<td>2</td>
</tr>
<tr>
<td>Project Resource Estimation and Management</td>
<td>2</td>
</tr>
<tr>
<td>CATEGORY 3 - Instructional Design Knowledge</td>
<td>16</td>
</tr>
<tr>
<td>Instructional Design Best Practices</td>
<td>6</td>
</tr>
<tr>
<td>Instructional Design Models and Theories</td>
<td>6</td>
</tr>
<tr>
<td>Learning and Pedagogical Theories</td>
<td>4</td>
</tr>
<tr>
<td>Top Knowledge Statements (at least 7 participants)</td>
<td></td>
</tr>
<tr>
<td>Interpersonal Intelligence and Strategies</td>
<td>13</td>
</tr>
<tr>
<td>Common Technology and Tools</td>
<td>13</td>
</tr>
<tr>
<td>Project Team Management</td>
<td>12</td>
</tr>
<tr>
<td>Communication Strategies</td>
<td>7</td>
</tr>
<tr>
<td>Project Management Foundations &amp; Practice</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 3

SKILLS (4 categories; 24 subcategories identified).
### CATEGORY 1 – Project Planning and Management

<table>
<thead>
<tr>
<th>Skills</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule Management Skills</td>
<td>13</td>
</tr>
<tr>
<td>● Determining Project Scheduling Strategy</td>
<td></td>
</tr>
<tr>
<td>● Managing Project Schedule</td>
<td>7</td>
</tr>
<tr>
<td>Scope Management Skills</td>
<td>13</td>
</tr>
<tr>
<td>● Determining Project Scope &amp; Needs</td>
<td>3</td>
</tr>
<tr>
<td>● Managing Project Scope</td>
<td></td>
</tr>
<tr>
<td>Team Management Skills</td>
<td>13</td>
</tr>
<tr>
<td>● Developing Project Team</td>
<td>7</td>
</tr>
<tr>
<td>● Managing Project Team</td>
<td>3</td>
</tr>
<tr>
<td>● Hiring Project Team</td>
<td></td>
</tr>
<tr>
<td>Managing Stakeholder Engagement</td>
<td>11</td>
</tr>
<tr>
<td>Identifying and Managing Project Risk</td>
<td>7</td>
</tr>
<tr>
<td>Budgeting and Managing Costs</td>
<td>5</td>
</tr>
<tr>
<td>Planning and Managing Communications</td>
<td>5</td>
</tr>
<tr>
<td>Managing Project Change</td>
<td>2</td>
</tr>
<tr>
<td>Setting and Managing Quality Control</td>
<td>1</td>
</tr>
</tbody>
</table>

**CATEGORY 2 – General Management and Design**

<table>
<thead>
<tr>
<th>Skills</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological Skills</td>
<td>13</td>
</tr>
<tr>
<td>General Management Skills</td>
<td>10</td>
</tr>
<tr>
<td>● Monitoring &amp; Controlling Project Work</td>
<td></td>
</tr>
<tr>
<td>● Creating Project Value</td>
<td></td>
</tr>
<tr>
<td>● Determining Project Management Approach</td>
<td></td>
</tr>
<tr>
<td>● Skill with Agile Models</td>
<td></td>
</tr>
<tr>
<td>● Skill with Linear Project Management Models</td>
<td></td>
</tr>
<tr>
<td>Research Skills</td>
<td>9</td>
</tr>
<tr>
<td>Instructional Design Skills</td>
<td>3</td>
</tr>
</tbody>
</table>

**CATEGORY 3 – Interpersonal and Communication**

<table>
<thead>
<tr>
<th>Skills</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Interpersonal Skills (mentioned by ≤ 2 participants)</td>
<td>13</td>
</tr>
<tr>
<td>● Assertiveness</td>
<td>3</td>
</tr>
<tr>
<td>● Collaboration</td>
<td></td>
</tr>
<tr>
<td>● Diplomacy</td>
<td></td>
</tr>
<tr>
<td>● Empathy</td>
<td></td>
</tr>
<tr>
<td>● Listening</td>
<td></td>
</tr>
<tr>
<td>● Negotiation</td>
<td></td>
</tr>
<tr>
<td>● Confidence-Building</td>
<td></td>
</tr>
<tr>
<td>● Exploring Potential Outcomes</td>
<td></td>
</tr>
<tr>
<td>● Teaching</td>
<td></td>
</tr>
<tr>
<td>Emotional and Social Intelligence</td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>9</td>
</tr>
<tr>
<td>● Clear &amp; Consistent Communication</td>
<td>8</td>
</tr>
<tr>
<td>● General Communication</td>
<td></td>
</tr>
</tbody>
</table>

**CATEGORY 4 – Intrapersonal**

<table>
<thead>
<tr>
<th>Skills</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Intrapersonal Skills (mentioned by ≤ 2 participants)</td>
<td>13</td>
</tr>
<tr>
<td>● Appreciation for Process</td>
<td>5</td>
</tr>
<tr>
<td>● Flexibility and Adaptability</td>
<td>3</td>
</tr>
<tr>
<td>● Initiative</td>
<td></td>
</tr>
<tr>
<td>● Organization</td>
<td></td>
</tr>
<tr>
<td>● Persistence</td>
<td></td>
</tr>
<tr>
<td>● Self-Reflection</td>
<td></td>
</tr>
<tr>
<td>● Self-Responsibility for Project Issues</td>
<td></td>
</tr>
<tr>
<td>● Tolerance for Ambiguity</td>
<td></td>
</tr>
<tr>
<td>Personal Time Management</td>
<td></td>
</tr>
<tr>
<td>Focus on Details</td>
<td></td>
</tr>
</tbody>
</table>

**Top Skill Statements (at least 7 participants)**

<table>
<thead>
<tr>
<th>Skills</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determining Project Scheduling</td>
<td>13</td>
</tr>
<tr>
<td>Determining Project Scope &amp; Needs</td>
<td>13</td>
</tr>
<tr>
<td>Developing Project Team</td>
<td>13</td>
</tr>
<tr>
<td>Technological Skills</td>
<td>13</td>
</tr>
<tr>
<td>General Interpersonal Skills</td>
<td>13</td>
</tr>
<tr>
<td>General Intrapersonal Skills</td>
<td>13</td>
</tr>
<tr>
<td>Managing Stakeholder Engagement</td>
<td>11</td>
</tr>
<tr>
<td>General Management Skills</td>
<td>10</td>
</tr>
<tr>
<td>Clear &amp; Consistent Communication</td>
<td>9</td>
</tr>
<tr>
<td>Research Skills</td>
<td>9</td>
</tr>
<tr>
<td>Open Communication</td>
<td>8</td>
</tr>
<tr>
<td>Identifying and Managing Project Risk</td>
<td>7</td>
</tr>
<tr>
<td>Managing Project Schedule</td>
<td>7</td>
</tr>
<tr>
<td>Managing Project Team</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 4

ABILITIES (11 categories; 42 abilities identified).
## Corresponding to PMBOK Knowledge Areas (PMI, 2017, p. 25)

| CATEGORY 1 – Using and Managing Resources (23 distinct ability statements) |
|-----------------------------|-----------------------------|
| Use common software and terminology for ID projects | 13 |
| Use common project management software | 10 |
| Manage people | 9 |
| Manage all (non-human) resources | 8 |
| Estimate project resources accurately | 3 |
| Use team member skills effectively | 3 |
| Meet needs of team members | 2 |
| Plan, conduct, and manage meetings | 2 |
| Advocate for project team | 1 |
| Hire the right team members | 1 |
| Motivate team members | 1 |
| Reward team | 1 |

<table>
<thead>
<tr>
<th>CATEGORY 2 – Managing Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proactively manage stakeholder expectations and engagement</td>
</tr>
<tr>
<td>Consult and collaborate with clients</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 3 – Managing Schedules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and follow a project schedule</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 4 – Managing Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate clearly, openly, and constantly</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 5 – Managing Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Determine project scope of work</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 6 – Managing Project Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and follow project plans and tools</td>
</tr>
<tr>
<td>Evaluate project outcomes and status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 7 – Managing Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and follow a project budget</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 8 – Managing Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop and follow a risk management plan</td>
</tr>
<tr>
<td>Apply appropriate risk responses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 9 – Managing Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliver quality work on time and on budget</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 10 – Industry-Specific Abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply instructional design principles and theories of teaching and learning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CATEGORY 11 – Project-wide Abilities (18 distinct ability statements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apply general interpersonal skills (see Skills table)</td>
</tr>
<tr>
<td>Work well with others</td>
</tr>
<tr>
<td>Apply different project management lens to each project</td>
</tr>
<tr>
<td>Apply suitable project management principles</td>
</tr>
<tr>
<td>Manage diverse project details</td>
</tr>
<tr>
<td>Teach, mentor, and provide feedback</td>
</tr>
<tr>
<td>Find solutions to problems</td>
</tr>
<tr>
<td>Conduct research and analysis</td>
</tr>
<tr>
<td>Develop and implement contingency plans and workarounds</td>
</tr>
<tr>
<td>Expect and manage change</td>
</tr>
<tr>
<td>Manage paperwork and routine tasks</td>
</tr>
<tr>
<td>Multitask</td>
</tr>
<tr>
<td>Perform negotiation tactics</td>
</tr>
<tr>
<td>Adhere to ethical and legal requirements</td>
</tr>
<tr>
<td>Deliver quality work</td>
</tr>
<tr>
<td>Design project charts</td>
</tr>
<tr>
<td>Manage multiple projects</td>
</tr>
<tr>
<td>Take responsibility for actions</td>
</tr>
</tbody>
</table>

Top Ability Statements (at least 7 participants) |

- Develop and follow a project schedule | 13 |
- Use common technology software and terminology for instructional design projects | 13 |
- Apply general interpersonal skills (See Skills table) | 12 |
- Apply instructional design principles and theories of teaching and learning | 12 |
- Communicate clearly, openly, and constantly | 12 |
- Use common project management software | 10 |
- Determine project scope of work | 9 |
- Manage people | 9 |
- Manage all (non-human) resources | 8 |
- Work well with others | 7 |
From Zero to Designing Instruction

Scaffolding in Undergraduate Instructional Design Courses

Joanne E. Beriswell

Employees in instructional design fields are expected to have three critical areas of knowledge and skills: knowledge of instructional design, project experience, and technical writing skills, especially the ability to report on their design projects. However, students in instructional design courses come from a wide variety of backgrounds, and many have not been exposed to these areas. This paper describes a unique scaffolded curriculum cycle for instructional design courses for novice undergraduate students that integrates knowledge construction, design skills, and writing skills.

Overview

Employees in instructional design fields are expected to have three critical areas of knowledge and skills: knowledge of instructional design, project experience, and technical writing skills, especially the ability to report on their design projects. However, students in instructional design courses come from a wide variety of backgrounds and many have not been exposed to these areas, especially technical writing skills. This paper focuses on the scaffolding employed for a required, two-course sequence on instructional design and delivery for undergraduate Information Technology Services (ITS) students within the College of Education and Business Information Systems (BIS) students within the College of Business.

The Courses

The two courses are sequential; however, they have to cover different delivery systems. The first class is required for both ITS and BIS students and covers instructional design, video-based training, and online course delivery via Blackboard. The second class is only required for ITS students and covers
instructional design and face-to-face training, essential for students from the College of Education. The majority of the students graduating as ITS or BIS majors seek jobs as technical support personnel. While their first jobs most likely will not require technical writing nor instructional design, as they progress or advance at their jobs, the graduates may require skills such as technical writing, instructing those they supervise, and making effective presentations. Therefore, those skills are the foundation of the courses.

Students

The only prerequisite for the sequence is a course entitled “Presenting with Media” that predominantly explores advanced uses of PowerPoint. Most students are in their senior year but have not had a course on instructional design. The students’ writing skills vary widely from very poor to above average; however, to date, none have technical writing experience.

Scope

The three projects for the courses address two types of instruction: face-to-face and online delivered via the Blackboard-based course management system. For each of the three projects, the students must demonstrate their knowledge of instructional design; they must design, develop, and deliver instruction projects; and they must write a report reflecting on the instruction they have designed. Table 1 compares the foundational core of the courses: instructional design knowledge, project stages, and corresponding report sections. The courses focus on the following phases: analysis, content design/development, instructional design/development, media design/development, formative evaluation, and delivery/implementation. The knowledge aspect includes readings for the course from the textbook, Designing Effective Instruction (Morrison et al., 2012) with supplementary information on motivation, advanced organizers, graphic organizers, designing for e-learning, visual design, and usability testing. The project materials are designed and developed in successive approximations (Allen & Sites, 2012) through a variety of deliverables, beginning with a exploratory analysis of possible lesson topics and ending with the completed multimedia and print-based materials. The report includes sections for analysis, instructional design (relating to content design and instructional design decisions), media design, formative evaluation, and implementation.

Table 1

Foundational Core of the Courses
Sequencing

The process for each project employs the identifiable prerequisite sequencing method (Morrison et al., 2012) that follows a basic instructional design process: analysis, content design, instructional design, media design, formative evaluation (for usability testing), and implementation/delivery (see Table 1). With each step of the process, the students follow a knowledge-application-reflection cycle. They build or review knowledge about that step, apply that knowledge as they design their instructional project materials, and report on their process.

Scaffolding

The course curriculum is scaffolded to add support to the novice students. Scaffolding involves adding structured guidance to complex instructional tasks (Wood et al., 1976). It can be in the form of giving frequent corrective feedback, providing simplified tasks to complete as precursors of the complex task, or providing reference and resource materials to assist in completing the complex task. This scaffolding is removed over time so that the end goal of having the
students complete the complex instructional task independently—still remains intact. The sections that follow illustrate the way scaffolding is employed for the three separate projects.

**Course 1: Project 1**

The first project spans the entire first course (see Figure 1). In the first two weeks of the course, the instructor, acting as a Subject Material Expert (SME), demos four procedures that can be chosen as the topic for the projects: creating design masters in PowerPoint, touching up photos with Photoshop, creating animated gifs with Fireworks, or basic coding of HTML pages. The students use the SME-provided demo video of their chosen topic for their own lesson materials. However, they have to modify the content information because they must make the instruction match their own sample files and practice activities. Controlling the topics provides scaffolding because the content scope is appropriate for a 10-12 minute instructional video, one of the final deliverables of the project. The students work on projects individually; however, by having multiple students on the same topic, they can act as expert reviewers for each other during usability tests. The knowledge, project, and report aspects of this project work together to support the student’s understanding of design. Additionally, all the topics are procedural knowledge so that narrows the types of instructional strategies needed.

*Figure 1*

*Scaffolding in the First Project’s Cycles*
Knowledge

For the first project, the cycle of knowledge learning begins with having the students read a textbook chapter or supplement. As they read, they have a series of understand and apply level focus questions (Anderson & Krathwohl, 2001) to complete before attending class. During the class, the instructor brings up the empty focus question file and carries out a collaborative discussion with the students. As the students discuss the questions and how they apply to their situation, they are constructing their own knowledge of the field and tying that to their own experiences. The instructor facilitates the discussion, clarifying and sharing her insights on the topics, as well. As the discussion progresses, the students are able to correct and amplify their own focus question answers.

Project

Since instructional design, development, and delivery is a complex task, the students begin to apply their design knowledge through problem-based learning activities (Duch et al., 2001) during class; then, they work on their design projects. The process used for the design project is analysis, design/development with formative evaluation through usability testing during the design/development iterations, and delivery. The students begin designing, developing, and delivering
their own instruction. They answer planning-related questions, such as content availability, possible practice activities, technology needs, and audience availability. The project deliverables include the procedural task analysis (for usability test 1), print-based tutorial mockup (for usability test 2), final draft print-based tutorial, video-based tutorial mockup (for usability test 3), final draft video-based tutorial, instructions and practice activities (for usability test 3), and Blackboard course. The students carry out limited usability testing with one expert reviewer and two or more novice users. Finally, the students deliver the instruction by taking each others' courses.

Report

The report writing phase of the first project follows the sequencing of the textbook with sections on analysis, instructional design (including content design), media design, formative evaluation, implementation (Morrison et al., 2012). To begin the report writing process for a given section, the students first receive an outline of the section with descriptions and prodding questions. For example, the audience analysis section prompt is “Give a detailed description of the students this lesson is geared toward. Use the slides from class and the descriptions of learner characteristics from the textbook. You should describe at least 5 characteristics.” Next, they read sample reports and score them based on their quality and completeness in answering the section questions. Then they are ready to write the section in accordance with their own instructional project. They turn in each section for instructor review. After completing several sections, the students meet individually with the instructor to discuss their own writing efforts. When all the sections are completed, the students submit their final report.

Course 2: Project 2

The second project takes approximately 60 % of the second class and involves the students designing face-to-face training on the evolution of a type of technology (see Figure 2). This topic limits the types of knowledge taught to facts and concepts. In the past, students have chosen everything from commonly acknowledged technologies, such as laptops and cellphones, to non-traditional technologies, such as coffee makers. To constrain the scope, the students are limited to 10-15 total minutes for their training and practice activities.

Figure 2

Scaffolding in the Second Project's Cycles
Knowledge

Since the students have completed the readings during the first course and applied them to their first project, they can take more responsibility. Individually or in pairs, they present an interactive review of the pertinent readings for 15-20 minutes with a 5-minute practice activity they have designed.

Project

For project 2, the students complete problem-based activities just for the tasks that are specific to the delivery method of face-to-face training, such as voice projection, movements and gestures, and vocal variety. The students still need much accountability. As with the first project, the students must turn in drafts of their instruction periodically through the project process so that they can do usability testing and focus on improvements. Project deliverables include a content outline (for usability test 1), presentation mockup (for usability test 2), slide design options (for usability test 2), slide design options (for usability test 2), and final presentation slides. The students carry out limited usability testing with one expert reviewer and two or more novice users. During both usability tests, the
students provide the participants with a hardcopy of the deliverables and also present the information verbally. Finally, the students deliver the instruction to an audience of their classmates.

**Report**

The students follow the same report outline with descriptions and prodding questions that they used for their first project. Since they have already completed one report successfully, they do not need to analyze sample reports formally, but they do have access to them. They turn in each section for instructor review and have an individual meeting with the instructor in the middle of the project. As with project 1, when all sections are completed, the students submit their final report.

**Course 2: Project 3**

The goal of the two instructional design courses is for students to be able to carry out their own instructional design projects. Therefore, the third design project is designed to remove the majority of the instructional scaffolding, in order to make students as independent as possible (see Figure 3). For this project, the students must design concept, procedure training based on the use of a computer program of their choice. The 10-15 minute lesson may be delivered face-to-face or via instructional video. Previous project topics include creating music tracks, job searching techniques, designing infographics, and how to select a vehicle that meets a person’s needs. For classes begin with a roundtable session in which students share their progress on the project, things with which they are having difficulty, and what their plan is for the lab time. If there are areas where a number of students could use refresher instruction on an aspect of instructional design, the instructor provides a quick review. The remainder of the class is used as a lab, during which the instructor circulates and facilitates the students’ design process.

**Figure 3**

*Scaffolding in the Third Project's Cycles*
Knowledge

By project 3, the students have internalized most of their knowledge of instructional design. As needed, the instructor carries out an interactive review, usually 5-10 minutes with students. Usually, if three or more students are having a need for the same instruction, this is carried out using the instructor station and is projected.

Project

There is much more lab time during the class period during project three because the readings and problem-based activities no longer need to take place. The atmosphere is like a design studio with students working on their projects with the mentoring of their instructor and creative feedback from their peers. The students make their own contract with the instructor that includes the deliverables they will be creating and their due dates. Students must carry out at least two usability tests on their deliverables. They deliver their instruction to their classmates during the last few class sessions and the exam session.
Report

By project 3, the students have also internalized much of the report writing process. They are not required to turn in individual sections; however, some students request feedback on them during class lab times. Additionally, there is a free review day ten days before the final reports are due. The majority of the students choose to submit their reports for free review; although, at that point there are usually only minor improvements needed. For the free review, the report is graded according to the report rubric and detailed feedback is given. The student can choose whether to make the revisions or submit the report as is. Thus far, most of the students who have submitted their reports for free review have also made the revisions, resulting in high-quality final reports.

Conclusions

Traditionally, graduate programs have prepared instructional designers. However, this two-course sequence introduces instructional design skills at the undergraduate level in order to expose BIS and ITS students to other ways of supporting technology endeavors.

This curriculum design provides ample opportunities for students to practice their knowledge and skills. All projects are based on authentic instructional design tasks that are at the same difficulty level. Scaffolding enables students to create high-quality materials throughout the three-project sequence, as they built up their instructional design expertise. As scaffolding is removed, the design process is also shortened. Project 1 extends over fifteen weeks; project 2 spans ten weeks; and project 3 lasts only five weeks. While the two-course sequence is a time-intensive undertaking for both students and instructor, it results in systematically-produced instruction and design reports that are polished and effective. As projects progress, grading and feedback cycles are less frequent and take less time due to increasing initial quality as the students progress through the projects. The increasing quality of deliverables paralleled with movement toward independent work indicates that this scaffolded approach is effective.

References


By Hook or by Crook

Designing Physics Video Hooks with a Modified ADDIE Framework

Martin McHugh & Veronica McCauley

This paper delineates the specific design strategy used in the creation of physics video hooks over the course of an eight-week project. A hook is an instructional technique which stimulates student attention (Hunter, 1994; Lemov, 2010), interest (Jewett Jr., 2013) and engagement (McCrary, 2011; Riendeau, 2013). The hook videos are aimed at post primary/middle school students (11–15 years old) with relevant topics being selected from the Irish science curriculum. The project employed a modified Analysis, Design, Development, Implementation and Evaluation (ADDIE) design framework that allowed videos to be developed in an efficient and practical manner. Pertaining to design considerations, the videos are aligned with the cognitive theory of multimedia learning. Furthermore, specific design elements are embedded into the videos, which include relevance, questioning, discrepancy, and novelty. Finally, the key findings and challenges encountered during the hook design process are examined.

Introduction

Coffman (2003) asks “[w]ouldn’t it be great if our students came to class prepared—not just having read the assignment, but mentally prepared as well—alert and ready to debate, challenge, interact, and contribute?” (p. 2). Coffman advocates that students should anticipate a teaching strategy that provokes these attributes and enthuses them into an active state of learning from lesson introduction. “Hooks” are any form of pedagogical strategy that catch attention and serve as an enticement for learning (McHugh & McCauley, 2016). They are different from other teaching strategies in that their primary aim is to foster interest (Jewett Jr., 2013; Marinchech, 2013), reinforce attention (Hunter, 1994;
Lemov, 2010; McCauley et al., 2015), and encourage engagement among learners (McCorry, 2011; Riendeau, 2013).

The purpose of this study is to design and construct an instructional resource that acts as an effective hook when applied to science classrooms with post primary/middle school students (11-15 years old). This project stems from a collaborative design project with pre-service science teachers and educators at the National University of Ireland, Galway (McCauley et al., 2015). As part of this project, six pre-service science teachers were recruited to work with a science and technology educator. Working in separate pairs, the goal was to design a suite of physics, chemistry, and biology video hooks. This paper delineates the specific design strategy used in the creation of the physics video hooks over the course of the eight-week project. To develop the hooks, a modification to the Analysis, Design, Development, Implementation and Evaluation (ADDIE) instructional design framework was employed. This modification involved the removal of the “implementation” phase and the instigation of an enhanced evaluation step to compensate, a process that is described in detail below. In what follows, the creation of the physics video hooks is articulated through the lens of each phase of the instructional model.

**Instructional Design Framework**

The creation of the physics video hooks employs an instructional design framework, which according to Martin et al., (2013) refers to the detailed design and evaluation of instructional materials, necessary to facilitate successful learning and performance. Other scholars concur with this depiction, describing instructional design as a systematic and iterative approach to developing educational materials and programs (Smith & Ragan, 1999), the goal being to follow a process that can make instruction more effective (Gustafson & Branch, 2002). Additionally, Merrill (2002) reports on the value of using instructional design for the generation of learning products; thus the framework was embraced for the design of the video hooks, as a learning product for the science classroom.

**Modified ADDIE Framework**

The instructional design framework initially utilized during this project was the ‘Analysis, Design, Development, Implementation and Evaluation’ ADDIE model (Gustafson & Branch, 2002). The ADDIE model provides dynamic and flexible guidelines for the construction of teaching and learning tools (Moradmand et al., 2014). It is a common approach used in the development of instructional programs and training courses. The process is iterative and sequential (Molenda, 2003), yet
functions as a generic model in which any type of instructional material can be created (Martin et al., 2013).

The hooks’ project worked through each phase of the ADDIE model. However, it was not within the scope of the project to complete the implementation stage. Implementation of the videos involves school testing by science teachers with associated feedback, the scale of which demands a separate and substantial research project. Moreover, hook design and creation was constrained within an eight-week project, held during the summer months, making it infeasible. Therefore, the exact instructional design model used was a four-stage model instead of five (Figure 1) changing ‘ADDIE’ to ‘*ADDE’. To compensate, an enhanced evaluation stage was employed.

It should be noted that the *ADDE model followed is not linear. For convenience, steps may be presented in an undeviating manner; however, designers transition in and out of phases as needed. This allows for a “self-corrective” strategy in which mistakes can be identified and corrected at almost any stage of the design (Gustafson & Branch, 2002).

**Figure 1**

*Summary of Phases enacted during the ADDIE Model of Instructional Design.*
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Analysis

The motivation behind the study arose from both a lack of curriculum specific multimedia resources for the Irish post primary/middle school science curriculum, and the declining number of students choosing to study physics (Drudy, 2011, Kennedy, 2014). Moreover, today’s students, often defined as ‘digital residents’ (Connaway et al., 2011, White and Le Cornu, 2011) and are totally attune with multimedia and digital content, thus echoing the consideration of a digital based platform. However, following an examination of the ever-expanding web, the dearth of technology-based resources that are pedagogically designed for teachers and students was realised. To address such issues, a detailed analysis of the following areas took place: instructional techniques used to augment attention, interest, and engagement among students; student needs and characteristics; and teacher needs and characteristics. Analysis of these various components resulted in a comprehensive literature review, a brief snapshot of which follows.

Instructional Techniques used to Augment Attention, Interest, and Engagement

Educators have long espoused the imperative role of attention, interest, and
engagement in stimulating student learning (Dewey, 1913; Johnston & Roberts, 2011; Schraw et al., 2001). Hence the analysis phase revealed a theoretical and practical need for resources that specifically explore how the aforementioned constructs affect learning among the student body. Anderman et al., (2004) postulates that “[s]tudents often are not motivated to engage in academic tasks that are boring” (p. 1). Implicit within any theories of academic achievement, learning, and motivation is the assumption that the student will pay attention. Motivation, interest, and engagement theories are redundant if the student were to ignore instruction. Thus, attention is a necessary precursor of cognitive processing. Motivational theories, such as the expectancy-value theory (Wigfield, 1994) and goal orientation theory (Nicholls, 1984) are widely advocated among educators; however, these theories do not explain how instruction and tasks initially grab a learner’s attention (Anderman et al., 2004).

A further difficulty in the analysis phase revealed that the constructs ‘attention’, ‘interest’ and ‘engagement’ are often used colloquially by educators as a way of referring to students being actively involved in a lesson, both cognitively and physically, and thus the credibility around their reference within the literature may be challenged. Furthermore, according to Renninger and Bachrach (2015) within modern educational literature; attention, interest, and engagement are seen as separate constructs with overlapping aspects. In appreciation of the complexity of the literature, and to narrow down the field search, the following search was conducted: an examination of instances where authors discuss instructional strategies used to augment attention, interest or engagement relative to hook-like teaching strategies.

The first record of which came about in the 1960s with a method known as “set induction.” Developed by Schuck (1969, 1970, 1981) and further developed by Perrott (2014), set inductions catch attention through the use of analogies that are relevant to the student. The goal of set induction is to demonstrate real world application of learning to students with the aim of increasing attention. Hunter (1994) expands on set induction and writes about “anticipatory sets” (p. 37). These are short activities used at the start of a lesson with the aim to capture student attention. They can take the form of a demonstration, statement, or question but should orientate students toward learning goals.

Several years later, McCrory (2011) formally introduces the term “hook” (pg. 97) into the scholarly conversation. McCrory argues that ‘engagement’ should be used to foster a positive learning environment, lending credence to demonstrations as an instructional technique to create anticipation, surprise, and curiosity. Complementing this finding, Zehr (2011) articulates the use of students’ personal
interests as potential hooks. The pop culture icon “Batman” is given as an example that can be linked to many aspects of science and social sciences. From an educational technology perspective, Zavalani and Spahić (2012) discuss the use of Virtual Reality (VR) as a hook. Using the novelty of new technology, they discuss how to promote student engagement by encouraging curious behaviour in class. Jewett Jr. (2013) adds to this growing body of literature and specifically discusses hooks in terms of promoting interest. Like previous scholars, Jewett Jr. promotes relevance-based pedagogies. He links physics to topics such as cooking, driving, and climate change. In addition to this, Jewett Jr. advocates for discrepant and novel based instructional techniques, termed “mysteries” or “magic” (p. 422), as ways to spark interest. Jewett Jr. notes “startling demonstrations can be used to raise student interest before moving onto the material” (p.422).

Although the above literature is limited, it does provide a grounding for the “analysis” phase and the emergent design process for the video hook project. Key instructional techniques such as relevance, novelty, questioning and discrepancy have the potential to excel as hooks within the post primary/middle school classroom (students aged 11–15 years old). As potential ‘design elements,’ each strategy must be tested with regard to how they can be visually represented through the medium of video. Moreover, when using ‘relevant’ or ‘novel’ materials in education, an instructional designer must take note of any signal characteristics of their target student audience. In this regard, the design took account of its audience as “digital residents”, a concept which is detailed in the following section.

Digital Residents

Analysing modern student needs in the science classroom lead to the consideration of learning drivers. Duffy (2008) asks “how can we as educators engage the YouTube, Google-eyed generation?” (p. 119). Our target audience are often referred to as ‘digital residents’ (Connaway et al., 2011; White & Le Cornu, 2011) or millennials (Steffes & Duverger, 2012). Education today must compete with contemporary and instantaneous technology in grabbing student attention and maintaining their interest (Clifton & Mann, 2011). Such students command a wide range of digital resources to manage their social lives (Prensky, 2012). According to Clifton and Mann (2011), it is imperative that science education finds new ways of engaging such students. As such, technology was chosen as a transmission medium to provide a novel hook delivery method. Furthermore, as digital video becomes the dominant form of student learning (Ni et al., 2020) either formally in class, or informally beyond the classroom; digital video was selected as the platform.
Digital Video

As noted previously, the main consideration during the analysis phase is the target audience. In our case this refers to teachers and students within science (Peterson, 2003). From a teacher perspective, digital video was chosen due to its ease of use and dissemination. According to Andrews (2012) video can be ‘pulled’ by learners and ‘pushed’ by teachers. This means that learners can access the video at any time and teachers can present the content in a suitable pedagogical manner. Learners have increased control over their learning pace (Andrews, 2012) and teachers, through stopping and starting the video can achieve a ‘bite size’ delivery suitable to their needs (Fill & Ottewill, 2006).

From a student user perspective, the demographic of YouTube users aligns with the current demographic of students. Therefore, they are more likely to identify with the content (Steffes & Duverger, 2012). According to Jones and Cuthrell (2011) students make positive gains in learning outcomes from the inclusion of video technology in the classroom. Furthermore, video can also display hard to capture phenomena that are common in physics. It has the ability to present both static and moving material with additional animation to further highlight focus points (Harwood & McMahon, 1997). Video provides an information rich and realistic context, referred to by Kumar (2010) as “macro-contexts” (p. 14). This allows educators to teach about the processes and nature of science (Vaughan, 2004). Adding to this, Gilbert (2005) states that “[c]onveying process in static diagrams is not straightforward” (p. 37). Processes normally involve fluid movement and changes in structure. Students who find mental visualisation difficult are at a disadvantage in a science curriculum based on static diagrams. Therefore, physics video hooks have the potential to bring to life a number of moving processes grounded in a realistic context to benefit learners and teachers alike.

Although one of the notable criticisms of using video as the hook delivery method is that many science videos can be found online especially on YouTube; the abundance of such resources can be burdensome, in narrowing down to the appropriate selection. Often video quality is lacking and videos are not entirely fitting or correct for teaching and learning environments (Trier, 2007). Furthermore, Michalovich & Hershkovitz (2020) found that perceived scientific credibility is linked to the perceived video quality. They also note the users’ history, and note that working with, and watching video on the platform can influence their perception of content. Another problem is commercials within video and suggested videos on the website that may not be appropriate for the classroom (Trier, 2007). Additionally, the structure of a YouTube video for
example, may not be suitable for instructional use, as many videos are lengthy, contain inapt language or are confusing and distracting (Berk, 2009). In consideration of these numerous issues around digital resource development (e.g. the need for clear language, short video bites, curricular alignment etc.) the hook videos are specifically built for the science classroom, underpinned with the Irish science syllabus. The content is wholly relevant to science teaching. Furthermore, teachers do not have to search for the videos as the entire suite is available at the following website: www.sciencehooks.scoilnet.ie/physics.

**Design**

The analysis phase provides an informed context for the design phase, in this instance, of the physics video hooks. The design phase includes the identification of objectives to be completed and elements to be built into the videos (Peterson, 2003). During the design phase, objectives are defined that would embed a theoretical framework into the videos based upon the principles of a) cognitive load theory and b) multimedia design. Such principles are integral to the design and creation of the physics hook videos, as moving images present new pedagogical hurdles to be overcome (Gilbert, 2005). Moving images are a natural way of presenting processes and this is one of the reasons for student enthusiasm. However, they are often far too fast and complex to be adequately perceived (Kozma, 1986; Spanjers et al., 2011). There are sometimes too many moving parts occurring at various times. The mind and the eye are working together to figure out the process, but often cannot keep up. Some students find it hard to identify what to focus upon (Gilbert, 2005). Given the above, cognitive theories of multimedia learning acted as key design considerations that framed the video hooks all the way from storyboarding to editing. These design considerations are elaborated upon directly.

**Cognitive Theory of Multimedia Learning**

The following sections delineate the design framework and design elements that are essential to all elements of hook videos. All of this work is conducted through the lens of cognitive theories pertaining to multimedia learning (Mayer, 2005). A model demonstrating the approach in this study is displayed in Figure 2 below. It should be noted that the steps Storyboarding, Filming and Editing do not occur in a linear fashion and are activated and adapted intermittently throughout the process when required. They are thus discussed periodically in the sections that follow.

**Figure 2**
Model showing how Cognitive Theory of Multimedia Learning (Mayer, 2005) influenced all other facets of the design process for video hooks.

Cognitive Theory of Multimedia Learning

- Experimentation with design elements
- Storyboarding
- Filming
- Editing

Essentially, items presented in a video format should be made as simple and as legible as possible, to aid cognitive processing and the various techniques described. Cognitive load is concerned with the difficulty level of the material to be learned (Ayoob et al., 2020). To reduce load, information needs to be structured in a manner that reduces difficulty (Sweller, 1994). Cognitive load theory posits that the capacity of working memory is limited. Hence, pedagogy needs to be cognizant of potentially overloading working memory and restricting learning (De Jong, 2010). As such, the design of instruction should be optimized to avoid cognitive overload (De Jong, 2010; Smith & Ragan, 1999), a design goal of the physics video hooks. As explained by Mayer and Moreno (2003), cognitive overload is an issue when processing demands exceed the learner’s cognitive capacity. This is described as a “central challenge for instructors (including instructional designers)...” (p. 45). The following strategies (Redundancy Principle: Signalling and Weeding; and two strategies that promote deep learning through multimedia design: Multiple Representation Principle and Split Attention Principle), are set out in the design phase to reduce cognitive load on students. These principles are detailed forthwith.

To impactfully reduce cognitive load, instructional designers are advised to streamline content by following the ‘Redundancy Principle’. Videos should be streamlined, involving the removal of any extraneous material that may inappropriately distract student attention. Student attention should be directed toward essential information (Berk, 2009; Mayer & Moreno, 2003). The two main streamlining methods include signaling and weeding. Signaling limits words and narratives, however, it highlights certain sections of interest or application (Spanjers et al., 2011). Signaling involves the highlighting of objects to focus attention. Such cues orientate the student through a video and facilitate the
extraction of essential information. This also reduces extra cognitive load as the learner does not have to try to locate the most vital aspects intended for comprehension (Mayer & Moreno, 2003). Signaling is enacted by placing words on screen at pivotal times. The example in Figure 3 is asking the viewer to explain the phenomena being observed by placing the word ‘Explain?’ on the screen.

Figure 3

Screenshot from the Sink or float physics video hook exhibiting the signaling principle

The second process is weeding where irrelevant information is removed from a multimedia project. This principle applies to sounds, words and visuals. Irrelevant information diverts attention away from the intended focus (Mayer & Moreno, 2003). Given this, the physics video hooks are kept as simple as possible.

The former strategies of signaling and weeding reduce the cognitive requirements of the learner when interacting with multimedia content. However, certain strategies can be used to augment deeper learning, and this is especially important for video. In terms of multimedia design, deeper learning occurs when
words and images are used over words alone (Ayoob et al., 2020, Mayer, 2002, 2003; Paivio, 1969, 1990). The promise of multimedia is that students can learn more effectively from well-designed multimedia applications combining both visual and word-based platforms rather than traditional forms of instruction. Words are a single medium presentation format and the dominant vehicle for instruction (Mayer & Moreno, 2003). However, humans are adapted to interact with moving visual images, similar to those we encounter on a daily basis. Winkler (2005) states that “80–90% of all neurons in the human brain are estimated to be involved in visual perception” (p. 5). Humans naturally gravitate toward visual stimulation and this is potentially why Vaughan (2004) posits that multimedia can ‘electrify’ the action centres of peoples’ brains. Pertaining to multimedia design, there are two principles that are instrumental in the physics video hooks.

The first is the multiple representation principle that suggests that it is better to present information in word and pictures rather than one alone. Two modes of representation are better than one. An example of this is highlighted in Figure 4. This is known as the multimedia effect (Mayer & Moreno, 1998). This principle suggests that multiple formats provide multiple platforms on which retrieving information is possible (Kalyuga et al., 1999).

The second is the split attention principle of multimedia, which states that words should be delivered in an auditory manner rather than visually. Narration and visual information are processed differentially (Mayer & Moreno, 1998). The human eye can only observe a certain amount of concurrent information and this is where narration can help (Mayer & Moreno, 2003; Koć-Januchta et al., 2019). That is, it can be challenging to read excessive on-screen text while simultaneously focusing on the intended image. Hence, narration is used when one or two words on screen are not sufficient to explain the phenomena being demonstrated and the multiple representation principle is not appropriate. As recommended by Berk (2009) and Mayer (2005) the narrative is written in everyday and non-scientific language. Thus, narration formed an integral part of the video hook design.

Figure 4

Screenshot of the energy conversions physics hook video displaying the use of the multimedia principle with words and corresponding image
Experimentation with Design Elements

As noted previously, the analysis phase examines instructional techniques that can act as potential hooks. The specific list of instructional techniques includes a) Relevance, b) Questioning, c) Discrepancy and d) Novelty. These techniques are positioned as the design elements of the video hooks. A scientific laboratory provided the facility to test out the visual appeal of experiments that were linked to curriculum relevant topics. The designers assess experiments by examining ways in which they could be storyboarded with cognisant consideration of their ease of transition to a film format. This is one of the most pivotal steps in the *ADDE process as it develops and tests the core video content. Many experiments were trailed and not used. An example of which is the ‘solar oven’. In this experiment, sunlight is reflected into a box and used to cook food or melt marshmallows. Based on the discrepancy design element, the idea was rejected as the experiment is reliant on a sufficient amount of sunshine. Moreover, aspects of the experiment such as sun rays and heat are completely invisible to the viewer. In addition, not being able to show the method of action in the video meant that the solar oven was not legible to a novice audience and therefore did not align with the cognitive theory of multimedia learning that framed all parts of the design phase.

To further illuminate this process, the following sections explore the four
design elements. Starting with relevance, successful examples that made it through experimentation, storyboarding and editing are demarcated.

**Design Element 1: Relevance**

Numerous authors note the importance of relevance in education for creating interest in a topic (Osborne et al., 2003; Pikaar, 2013; Roe, 2011; Rotgans & Schmidt, 2011). The relevance strategy is twofold. Firstly, relevance is constructed throughout the videos by using items students would find and see in everyday life. This ranges from foodstuffs such as maple syrup and honey to hardware such as hammers and simple aluminium cans (Figure 5). This approach enables the viewer to observe how interesting and engaging scientific experiments and phenomena can be constructed with objects students encounter on a daily basis.

The second relevance strategy is to align with curricular relevant content. The omission of extraneous content strengthens the relevance both for both teacher and student. Further to this, cross-curricular links are also integrated within the videos. Links to art, music and in particular mathematics are emphasised to broaden the scope and appeal of the videos and to show the various connections between science and other subjects.

**Figure 5**

*Displaying every day and relevant materials used in the density hook.*
Design Element 2: Questioning

The basic premise of the questioning strategy is that questioning facilitates attention (Bergin, 1999), one of the primary constructs of a lesson hook. The physics hook videos use two types of questions, lower order and higher order. This is heavily dependent on the content of the video and when opportunities for questions within footage presented themselves. The following are examples of generic questions either presented on screen or asked by the narrator of the videos.

a. “Can you explain this?”
b. “What is happening here?”

The questions are very simple and direct students thinking toward the discrepant phenomena within the video. They are employed to focus and direct the viewer’s attention.

The second type of question is a higher order more complex question. For example, during the pressure video in which a balloon is pressed against a bed of nails and then against one nail, the narrator asks –

a. “Why was the balloon safe on this bed of nails, but popped on this one
The second strategy is employed at the end of the videos so that students are left pondering about the science behind what they observed. After these questions are asked, the video ends. This open nature of the videos is key to their design as a classroom resource that is used to ‘set up’ teachers and their bespoke learning environment.

**Design Element 3: Discrepancy**

The presentation of discrepant events in class has a strong potential to stimulate attention and interest among students (Bergin, 1999; Cakir, 2008; Edelson, 2002; Thornton & Sokoloff, 1998). Discrepancy is a method in which an educator presents a phenomena that does not make sense or has associated misconceptions (Broughton et al., 2010). When designing the physics video hooks, efforts were made to create effects or visuals that look impossible or implausible, similar to magic tricks. Such a technique presents a student with a gap in their knowledge that has the potential to spark interest (Bergin, 1999; Edelson & Joseph, 2004; Rotgans & Schmidt, 2011). An example of which is illustrated in Figure 6. A screenshot from the centre of gravity video hook is displayed, in which a meter stick and sledgehammer are balanced off a table with string. It is not intuitive to explain why the items are balanced and therefore attempts to create a discrepancy within the video for students to notice.

**Figure 6**

*An example of a discrepant event in the centre of gravity physics video hook (McHugh & McCauley, 2017)*
Design Element 4: Novelty

The final design step involves the design team’s deliberate consideration of ideas that make the videos novel. In this regard, it should be noted that the aforementioned discrepancy strategy also works on the basis of novelty. The two are heavily interlinked. According to Silvia (2008), novelty may result in greater attention, interest, recall and behavioural intentions. Novel events act as a form of surprise (Itti & Baldi, 2009) which rely on the uncertainty of prior beliefs. This unpredictability impacts on all stages of neural processing indicating that novelty within a hook may augment attention, interest and engagement. Thus both novel and discrepant events were considered as strategies to draw and hold students in the learning moment.

Development

The development phase, drawing upon the results of the former phases, involves the construction of a product (Peterson, 2003). The physics hook videos display numerous scientific phenomena which required verification in the laboratory to establish their ease of use and appropriateness for a visual medium before filming.
Once testing was complete, a list of ten physics-based topics with ten storyboards were developed. These included: atmospheric pressure, centre of gravity, conservation of energy, convection, density, energy conversions, friction, pressure, sink or float and sound. A storyboarding process was used to document exact shots and transitions. Storyboarding provides a particular type of diagram for efficient communication between design members (Shi et al., 2020). The diagram attempts to convey in static pictures the flow and shots of a finished video or film (Goldman et al., 2006). A professional cameraperson was hired to film the video hooks. Videos were directed by the teacher designers in close collaboration with the cameraperson. This took place in a laboratory setting over the course of two days. A 7D Canon camera was used for filming with the Adobe Premiere Pro CC.4. software suite used for editing.

**Enhanced Evaluation**

The enhanced evaluation phase in this project involved both formative and summative evaluation. In terms of formative evaluation, weekly meetings were organised throughout the eight weeks to critique and assess the work that had been conducted by the three pairs of teacher designers. This was a collaborative effort chaired by the project lead. Each teacher design team presented on embryonic and developed ideas which were challenged by fellow design teams. The fact that opposing teams were out of field teachers further challenged designers to explain the science simply. Changes were identified and modifications made to improve the end product. This evaluative step provided formative feedback that interlaced each step of the *ADDE model. A similar formative evaluation process is conducted by Moradmand et al., (2014) in which evaluation is present during every phase of instructional design. An additional summative evaluation is built into the project enhancing the overall evaluation process, to compensate for not being able to conduct a full-scale implementation phase. Although conducted near the end of the project, the summative evaluation was timed to allow changes to be made to the video hooks. Briggs et al., (1991) state that products should be tried out on members of the targeted population. The target population is both teachers and students. Hence, for the enhanced evaluation, it was decided to invite members of the other design teams (pre-service science teachers) to critique the videos from a science teacher perspective and to welcome critical subjective expert opinions. Teacher evaluation is an appropriate strategy as teachers are the gatekeepers to their own classrooms. If a resource does not fit their teaching criteria, then it will not be implemented within the classroom and will not reach the second user group of students. Thus, the enhanced evaluation allowed the videos to be revised upon the user needs.
The two separate pairs of teachers who worked as designers on biology and chemistry hooks critiqued the physics hook videos, highlighting their user needs as teachers. They also evaluated the instructional products based upon the following criteria:

- a. The characteristics of target teachers
- b. The characteristics of target learners
- c. The characteristics of intended learning environments

This provided two sets of user feedback based upon a needs assessment from four teachers in total. This is what Briggs et al., (1991) denote as subjective expert opinion in which an expert is asked to render an opinion in relation to a product, procedure or programme. Although in many instances, the opinions generated from these scenarios can often be personal, and thus limited in this regard; “experts can usually provide insights for decision makers that are absent from more objective methodologies” which in the case of this research was a full scale implementation (p.228). Edits and revisions were conducted based upon the user generated feedback.

**Project Considerations and Limitations**

Project limitations are detailed here relative to framework selection, design elements and consideration of a collaborative stance.

**Framework selection**

Before the initiation of the project, one of the challenges faced was to find an instructional design framework that ‘fit’ the project. The ADDIE framework was employed and modified. Other frameworks including the ‘Pebble in the Pond’ design (Merrill, 2002) and the ‘Spiral Model’ as described by Goodyear (2013) were considered, however their emphasis was dependent on in-classroom teaching strategies. Although the ADDIE framework also considered an implementation phase, the adapted *ADDE framework provides a comprehensive model that demands a robust design, testing and evaluation phase as sought. Originally, the ADDIE model was used because of its simple layout and approach to design. The application to the resource design described here was found to be particularly useful for novice designers. An implementation phase would have been desirable; however, it would have been wholly impractical within the remit, time and funding restrictions of the project. When discussing the process of instructional design, Jonassen (2008) notes that “[d]ecisions are driven less by accepting principles than they are by constraint satisfaction and beliefs, some of which are culturally
accepted and others are context specific” (p. 21). In the design process described in this paper, decisions were made based upon content specific constraints to enable the completion of the project. Additionally, Jonassen raises the problem of adhering too closely to instructional design models, when they can be a limiting factor to some projects. This was initially problematic, yet design in itself is a problem-solving process and *ADDE was the most efficient route to follow, providing a solution to our context specific problem. Jonassen continues and characterises successful design as one that “must address the constraints imposed by the context” (p 26). As such, constraints must be addressed by decisions, in this instance, the decision was taken to modify the design process to accommodate our constraints and goals.

Design elements

One of the biggest quandaries that arose during the design and development phases of the project was how to build the specific design elements of relevance, questioning, discrepancy and novelty into the videos. The video suite includes physics topics that are more suitable to the incorporation of some design elements over others. Every design element was not used in the creation of every video hook. An example of which is the use of a tuning fork in the sound video. This item does not abide by the relevance strategy as it is not an everyday object for a lot of students; however, some students may find it novel.

Indeed, the design element of novelty proved to be the most difficult to build into the videos. The challenge being: How can you judge novelty? What is novel to one student may be mundane to another. Videos are aimed at digital residents, however one questions if the videos are novel enough to stimulate the attention, interest and engagement of a potential cohort of students who are competent with YouTube and Web 2.0 applications? Our novelty strategy is to use everyday items in unusual ways and testing this with students would have demonstrated its potential. This is where the *ADDE instructional design framework is lacking most, and an implementation phase would have been beneficial.

Collaborative development

Gilbert (2005) postulates that visualisations in science require excellent design input from both an educational and scientific perspective. In achieving this, discourse is advised between scientists, teachers and technologists. Collaboration leads to more effective interventions. However, it could be argued that it would have been beneficial if teachers perform every part of the development phase so that a clear and concise vision can be achieved. None of the designers had any
experience with cameras or filming. The cameraperson had limited knowledge of science. Therefore, this created a knowledge gap that could not be bridged fully. Making the link between the teacher and the cameraperson meant that certain aspects of the videos do not capture phenomena in the way originally intended due to camera and angle restrictions. This is a problem if there is limited filming time for every video. The storyboarding process noted earlier did not ameliorate this negative effect. In future, this could be combated by the teachers/designers filming the phenomena using tablets or phones to acquire a rough idea of what will look good on camera and this mock video then to be shared with the camera operator to further inform planning. Other options include teachers and designers gaining camera experience to film the videos themselves or the cameraman forming part of the design team throughout every phase of the project.

Conclusion

This article describes the design process involved in the creation of physics video hooks. It is argued that the adapted instructional model in the form of *ADDE is highly suitable for the creation of video content for the science classroom. The videos are aligned with cognitive theories of multimedia learning which proved to be an effective alignment for the creation of the videos. Some specific design elements worked better than others. The main constraint was not being in a position to assess the videos from a student perspective. This is where the implementation phase of the ADDIE framework would have been beneficial. However, a formalised intervention process is currently being undertaken in schools.

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Design Considerations for Bridging the Gap Between Instructional Design Pedagogy and Practice

Jill Stefaniak, Rebecca M. Reese, & Jason K. McDonald

Research indicates there is a gap between employers' expectations of instructional designers' roles and responsibilities, and what designers actually do. The purpose of this paper is to explore the unique nuances inherent in instructional design practices from a variety of work settings. Our paper is grounded in a practitioner’s perspective utilizing long-standing careers in the instructional design sectors and informal discussions with many practitioners. The goal of the paper is to highlight constraints and contextual considerations that instructional designers must address while working on projects. We also discuss how instructional design educators can support instructional design students to better prepare them for real-world instructional design contexts.

Introduction

Individuals with advanced degrees in instructional design and technology are employed in a variety of industries ranging from higher education, healthcare, government, K-12, and for-profit corporations (Klein & Kelly, 2018, Pershing et al., 2006; Sugar et al., 2012). Within these varying work environments, they assume roles that require them to facilitate learning (Tracey & Boling, 2014); however, each instructional design role is accompanied by unique contextual factors that designers must address while working on projects.

Research has shown that there is a gap between employers' expectations of instructional designers' roles and responsibilities and what designers actually do...
on-the-job (Klein & Kelly, 2018; Sugar & Moore, 2015; Villachica et al, 2010). There is a logical need, then, for instructional design programs in higher education to develop a better understanding of the practices performed by instructional designers in the field and align these practices with their curricula. Not only will this help programs address workforce development needs as they relate to instructional design, it will also position academic programs to prepare their learners for the expectations of the workplace. In turn, learners will be better able to articulate instructional design principles in practice, communicate with project constituents, and educate employers on the skills and competencies possessed by thoroughly prepared instructional designers.

A key skill for new Instructional Designers (IDs) is the ability to embrace project constraints, working among changing project expectations, and interacting with multiple stakeholders on a variety of projects. Academic instructional design programs can provide new Designers with a solid foundation in fundamental instructional design concepts as well as work towards cultivating their learners' interpersonal skills (Visscher-Voerman, 2017).

It is important for academia to take inventory of how they facilitate authentic learning experiences for their learners to ensure that novice or newly trained Instructional Designers (IDs) are confident to adapt to different situations and factors that may impact the results of their projects (Bannan-Ritland, 2001; Quinn, 1994, 1995). As educators provide these situated real-world experiences, learners are able to develop abilities as IDs and create artifacts showcasing their skills making them more competitive and viable in the workforce.

This paper explores the unique nuances inherent in instructional design practices from a variety of work settings and is grounded in a practitioner perspective utilizing long careers in instructional design and informal discussions with many practitioners. The goal is to highlight constraints and contextual considerations that IDs must address in their designs while working on projects in sometimes very different cultures or contexts. We also briefly discuss how instructional design educators can facilitate real-world learning opportunities through case-based learning to instill confidence in instructional design students as they prepare to work in diverse situations.

**Context 1: Instructional Design in Higher Education Institutions**

Is the practitioner role in higher education for you? Before making There are a few
things you should consider before making this choice. First, the world of a non-faculty or non-teaching Instructional Designer (ID) is quite different from that of an instructor/faculty member. Second, no amount of coding classes will help you secure a job offer if that is not a job requirement. Every organization has different expectations for how an Instructional Designer (ID) will engage with course development. The key is to identify your strengths and grow those, then find the job that best fits your particular skill set. The many hats that IDs wear during course development often includes project manager, multimedia editor, graphic designer, and subject-matter experts (SMEs) whisperer. Of these, you will spend a great deal of time fostering relationships with your subject-matter experts (SMEs) or Faculty member. You become their eLearning trainer, technology support and online resource connection (e.g., introducing them to a Librarian to identify open education resources).

IDs must plan for continuous improvement and professional development to keep up with the rapid changes in trends and research. For example, the addition of educational technology and users demands for more innovative methods for engaging with learners. With a large number of eLearning software options to enhance an online course, it is important to have strong design skills, creativity, and knowledge of learning theories. An IDs efforts to keep on top of learning research ensures courses are applying eLearning tools in the most effective way. To stay on point professionally, connect with professional organizations, follow instructional design forums, grow your digital identity through social networks, and subscribe to journal resources.

One of the toughest challenges faced by instructional design practitioners in higher education is obtaining ‘buy-in’ from faculty (Mansbach & Austin, 2018). Faculty often have little experience working with IDs, and might find it hard to accept suggestions for changes to teaching strategies or struggle with technology. For example, it is easy to fall into a routine and to lose that critical eye for how your course operates, and the IDs presence is not to supersede the faculty, rather provide an alternative perspective. IDs working with faculty provide suggestions for improving alignment of activities to learning outcomes, and creating meaningful digital experiences for learners. IDs want to communicate their goals for the course, they must be sure to intentionally listen to the faculty to help facilitate their thoughts and intentions into the course. One way to ease tensions around an ID working in a course is to provide clear definitions of roles and contributions during development. A successful ID is willing to negotiate the workload, assigned tasks, and responsibilities based on the skills of the faculty (Ritzhaupt & Kumar, 2015).
Context 2: Utilizing Instructional Design to Support Performance Improvement Initiatives in Healthcare

Oftentimes, IDs working in healthcare settings are required to be sensitive to constraints associated with time and access to SMEs. There is increased pressure to design viable and sustainable solutions as they often have a direct impact on patient safety. Frequently trainees in healthcare-related fields learn and perform under a significantly higher levels of cognitive load. This is due to the amount of subject matter content that must to be covered in a condensed amount of time. IDs working with program directors and instructors in healthcare-related programs; must correctly identify and employ instructional strategies to mitigate the effects of cognitive load on the learner. They must also account for the need for healthcare professionals to make decisions promptly and work in highly stressful situations.

Historically, healthcare professionals have been taught how to perform a variety of medical procedures through the “see one, do one, teach one” approach (Beck, 2004). Of course, prescribing this type of training philosophy can pose several problems for the learner and trainer. IDs will often come across instructors and program directors who use to these types of learning strategies because they were trained in a similar manner. IDs, therefore, should be comfortable with questioning their SME and communicating the need to implementing different instructional strategies that yield improved learning and performance outcomes. This can be challenging and push IDs outside of their comfort zone (Visscher-Voerman, 2017). Failure to have these difficult conversations often leads to issues with the delivery of instruction and the inability of the learners to transfer knowledge to a working context.

Healthcare professionals regularly find themselves working within teams to deliver patient care. While the expectation is that individuals from varying disciplines will work together, these disciplines train separately. While research in medical education is promoting more interprofessional educational training opportunities earlier in programs (Reeves et al., 2013; West et al., 2016), the ID can provide a pivotal role when designing instruction that poses implications across the healthcare system.

Within contexts involving multiple learners and disciplines, it is beneficial for the ID to utilize a systems view of the organization (Stefaniak, 2020). Design decisions
must account for the systemic implications of proposed solutions. The ID must
demonstrate an understanding of the inputs and outputs pertinent to the authentic
environment they are designing within. Failure to do so will result in design
solutions that will fall short of their intended goals or are unsustainable.

Context 3: Promoting Instructional Design Practices Among Startup Companies

In many ways, working in startup environments magnifies many of the challenges
that instructional designers experience working in other types of organization. For
instance, although it often is not the case that being first to market provides a
competitive advantage (Suarez & Lanzolla, 2007), the leadership of many startups
assume this is true and so push their employees as hard as they can so they can be
the first to offer a product in their given sector. Additionally, many startups work
with limited funding, which may not provide IDs with the resources (e.g., financial,
technological, etc.). IDs are increasingly used as inputs for creating high-quality
educational materials. There may only be one ID in a company or perhaps they are
a member of a very small team, yet they are often expected to produce large
quantities of material in a short time. This means IDs working for startups find
themselves experiencing even more pressure to bypass the phases of analysis or
evaluative, unlike in a larger organizations. They may even find themselves
pressured to release "beta" or "alpha" versions of their materials so as to not
forego windows of opportunity for learners within the company or their customer
base.

As a consequence, IDs in startups must find ways to creatively use their resources
in order to be successful. While working with fewer resources, IDs must still
produce results. Sometimes this could mean the first evaluation of instruction
occurs in initial situations, having built in designs mechanisms to quickly update
even foundational, structural elements of instruction responding to the results the
initial group of participants (see Gibbons, 2013). Perhaps to do this IDs will rely on
simpler technologies that allow them to update components without the
involvement of other team members. Being successful could also mean finding
creative ways to help learners achieve the desired learning outcomes. For
example, enlisting other employees within the company as ad-hoc trainers to help
others master skills in which they may have some pre-existing expertise.

To help make these concepts more concrete, we describe the case of a recent
graduate (we’ll call them ‘Nia’) from one of our instructional design programs. Nia
accepted a position as the Director of Training in a local startup. Their experience
at this position illustrated many of the factors described above. For example, Nia was expected to not only develop training curriculum for new employees but also to travel throughout the United States and internationally to facilitate the training as the organization opened new facilities. Often Nia’s timeline, from receiving an assignment to traveling on-site for training, was measured in weeks. Nia was expected to guarantee that every employee in the new facility was fully prepared for the business to open and welcome customers immediately after training. Nia is the first contact for employees at all levels after returning from a trip, to provide remediation or otherwise reinforce the learning outcomes on which employees were trained. In addition, Nia has also assumed responsibility for being a leader within the organization to advocate for good learning and training practices. This is not a small responsibility—preparing, discussing, following-up, creating materials that take advantage of opportunities that present themselves—all take additional time that is worthwhile in ultimately improving the culture of learning in the organization. This creates additional work that she must balance with the duties for which she is officially held accountable.

This balance of responsibility that Nia engages in is one of the most meaningful goals instructional design programs can adapt to help their graduates become successful in start-up environments. Other jobs in this context will almost certainly be more self-paced and self-directed than are found in other organizations. While this provides a sense of freedom that many IDs appreciate, it also comes with roles and responsibilities needed in the organization. IDs who cannot manage their own workload, or effectively pace activities within projects, or who do not clearly and precisely negotiate their stakeholders’ priorities in a project, are likely to find themselves misaligned with the organizational culture in which they find themselves. Instructional design programs that provide support for students in developing these skills will be more successful in helping their students excel in startup environments.

**Aligning Pedagogy with Practice**

Recent discussions in the field of instructional design are focusing on how educators are preparing the future generation of instructional designers to be adaptable to real-world design (Boling, 2017; Stefaniak et al., in press). As a contribution to this conversation, and consistent with the diverse environments described above, this paper proposes two-tiered approach to align pedagogy with practice in preparing future generation of IDs to work in varied organizational cultures: 1) instructional design students should engage in more hands-on learning experiences; and instructional design scholarship should better support the need of helping students transition from academics to practice.
A hands-on instructional design learning experience

In addition to the foundational and theoretical concepts that every ID must understand, instructional design students should be presented with multiple opportunities to gain hands-on design experience in authentic and situated environments. It is important that they recognize how contextual factors can impact design solutions (Arias & Clark, 2004; Parrish, 2009; Perkins, 2003, Tessmer & Richey, 1997). This can be achieved through case-based instruction, situated design, and learning from design failures (Tawfik et al., 2015).

Use of Case-based Instruction

Case-based instruction provides opportunities for instructors to present a range of unique instructional situations for students to review and identify design solutions for a particular learning space. Incorporating realistic examples in the classroom can help instructional design educators observe how students are applying conceptual knowledge presented in a course. Case-based instruction provides a platform for students to use their analysis skills to provide the rationale for their design decisions (Tawfik, 2017; Tawfik & Jonassen, 2013). Through the use of case-based instruction, students are more apt to establish mental models related to problem-solving as they pull from their experience and domain-specific knowledge (Ifenthaler, 2010; Mayo, 2004).

It is important for IDs to not only be able to design for all types of situations, but also be able to converse about it with stakeholders (Visscher-Voerman, 2017). The practice of discourse helps ID students become more comfortable with communicating various themes of ID as well as serves as an indicator as to the extent of their awareness for the nuances of design. Instructional scaffolding can be used through guided debriefings to elicit students’ rationale for proposed solutions to case scenarios (Cho & Jonassen, 2002).

Situated design outside of the classroom

In addition to case-based instruction, instructional design educators should look for facilitate learning experiences that encourage students to design within authentic learning environments. These types of experiences provide students with opportunities to apply their knowledge of instructional design to authentic projects, in real-time (Correia et al., 2010; Maddrell, 2015; Stefaniak, 2015; Tracey et al., 2008). Designing for authentic learning experiences puts the ID in the position of designing solutions to address contextual and environmental factors that may not be covered in detail while learning the fundamentals of instructional design. The most effective experiential assignments expose students

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to many of the demands highlight in this article, plus inter- and intra-team communications, negotiating with supervisors or other organizational stakeholders, as well as providing leadership to a team, in both formal and informal ways.

A benefit of these kinds of experiences is that as while students engage in domain-specific knowledge, they have the opportunity to see how it directly translates to the field, while their instructor(s) provide the necessary scaffolding to aid students in bridging theory and practice. An implication of this is that instructors of instructional design are, in fact, capable of providing such mentoring. It will be important for instructional design educators to take advantage of professional development opportunities themselves via consulting or contract work for the development of instructional materials in an organizational setting. We anticipate that this should include more than maintaining their current skills. Rather, instructors should seek opportunities to improve their context-specific skills or interpersonal skills in order to be effective mentors. For example, educators who have deep experience in design methodologies might intentionally seek out opportunities to provide project management leadership, thus giving them an experiential base to coach future students who struggle when placed in similar situations.

Learning from design failures

Cross (2011) contends that good designers must be comfortable exploring. While he was speaking to design in general, this certainly lends itself to the discussion of educational practices for instructional designers. Instructional design educators need to work towards breaking the stigma that failure is bad. Instructional design students should be encouraged to embrace failure. Students learn to employ different instructional strategies and approaches through trial and error. This practice helps students gain perspective into how different contextual factors may affect design solutions (Tessmer & Richey, 1997). It is through iterations of design that students will hone their craft as designers.

Learning from failed attempts can help IDs "better understand the complexity of the problem" (Tawfik & Jonassen, 2013, p. 388). Failed design assists learners in constructing a mental model related to the problem they are attempting to solve (Rong & Choi, 2019). It can be argued that these failed attempts help the ID embrace the iterative nature of design and understand the intricate relationship between design strategies, context factors, and situated environments.
Instructional design scholarship that supports transitions from academics to practice

To date, instructional design scholarship can be categorized in three ways: 1) the application of instructional design practices to solve problems; 2) the exploration of educational technologies to facilitate learning, and 3) the role of the instructional designer. While many studies focus on the applications and utility of instructional design, few studies are directed towards the pedagogical practices for training purposes (Bannan-Ritland, 2001; Boling, 2017; Ertmer & Cennamo, 1993; Ertmer & Koehler, 2015; Lowell & Ashby, 2018; Rich et al., 2015). Additional research is needed to identify and refine the necessary instructional strategies that support the professional development of instructional design students in order to continue to espouse the skills needed to for instructional design practices in solving problems from a variety of contexts (Stefaniak et al., 2018).

Instructional design educators should look to research studies (Boling et al., 2017; Klein & Kelly, 2018; Lachheb & Boling, 2018; Roytek, 2010; Williams et al., 2011) reporting on the trends in the field, or trends in related fields, and integrate that information to leverage their instructional practices in the learning space. Instructional activities should be tailored to address the challenges facing IDs in the field. For example, using studio-based pedagogical methods found in other fields to act as a bridge for supporting students as they move beyond their academic identities and into the identities of professional practice (Brandt et al., 2013; Gray, 2014). We encourage further study of this approach in instructional design, along with the study of other methods that promise similar results.

Conclusion

In this paper, we have presented a need for greater alignment between the pedagogical practices of instructional design programs, and the practical realities of instructional design work in the field. We have described three very different contexts in which IDs may find themselves working (higher education, healthcare, and startup organizations), and highlighting some of the contextual factors within these environments that are vital for success but that are typically not addressed by instructional design programs. We have suggested two ways that instructional design programs can support the transition from academic learning to practice: by providing more hands-on instructional design learning experiences, and by more instructional design scholarship that studies this transition experience.
As a final point, we note that our exploration of this topic is intended to demonstrate the importance of such a line of inquiry. We call on instructional design researchers, educators, practitioners, and students to engage in this type of research together and to tell each other their stories. Creating instructional design programs that successfully address the challenges we raise will require a united effort by all of these groups—in addition to close collaboration with their organizational stakeholders—to ensure that changes to programs meet the needs in ways that are both rigorous and meaningful. The time to start is now. The challenges facing IDs in practice promises to grow more complex as time goes on. However we believe the effort it takes will be worthwhile in the pursuit of more effective and relevant learning for those that our instructional design students will help in future.

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Building Empathy and Developing Instructional Design Experience and Skills

A Case Study of Using Personas to Design Open Education Resources

John Baaki & Jennifer Maddrell

This single case study involves the authors’ participation and observation of a massive open online course. To help instructional designers (IDs) develop open education resources for adults attempting to pass a United States high school equivalency exam, we constructed six personas that helped IDs put themselves in the users’ shoes. We begin by providing an overview of the scholarship that connects empathy, empathic design, persona construction, and meaning-making. After presenting our case study methodology and how we constructed six authentic personas, we present eight themes that demonstrate how IDs used the personas to build empathy for users and to develop instructional design skills and experience.

Grown-ups love figures. When you tell them that you have made a new friend, they never ask you any questions about essential matters. They never say to you, “What does his voice sound like? What game does he love best? Does he collect butterflies?” Instead, they demand: “How old is he? How many brothers has he? How much does he weigh? How much money does his father make?” Only from these figures do they think they have learned anything about him. (de Saint-Exupéry, 1943, p. 17-18)
Introduction

De Saint-Exupéry (1943) captures the essence of what matters when we learn and make meaning about a new friend or a companion, a colleague, or someone we may meet on a city street. Learning about and relating to a new friend is not about figures (e.g., “How old is he?”), but rather about finding out why a new friend loves collecting butterflies or what game he loves best. Learning about a new friend means we are able to make meaning of his or her thoughts and feelings. We put ourselves in his or her shoes.

This case study involves our participation and observation of an 18-week Designers for Learning 2016 course on Canvas Network, a massive open online course (MOOC) platform. Designers for Learning was a nonprofit organization that had a twofold charitable purpose. First, Designers for Learning provided instructional design support to underserved social needs and a mission to provide educational resources and service-learning experiences designed to promote all aspects of literacy. Second, Designers for Learning provided opportunities for instructional designers to gain design experience. Our goal was to study designers who developed open education resources (OER) for adults attempting to pass a high school equivalency exam. To guide the designers, we developed an empathic design process driven by six authentic personas that represented adult learners. Designers followed an empathic design process and received feedback from adult basic education subject matter experts. Empathy is the intuitive ability to identify with other people’s thoughts and feelings (Kouprie & Visser, 2009). A persona is generally written in a narrative and describes a day in the life of a fictional individual who represents a key user group (Dotan et al., 2009). Kouprie and Visser (2009) summarize an empathic design approach as a deep understanding of the user’s circumstances and experiences which involves “relating to,” more than just “knowing about” the user (p. 441).

Because personas are qualitative instruments used in design processes and contextually describe people in specific situations, Vestergaard, Hauge, and Hansen (2016) call for rigorous published evaluations that are best achieved through case descriptions. Chapman and Milham (2006) note that rigorous published evaluations are important for the advancement of persona use. We offer a single, intrinsic case study on the design of OER and examine how designers constructed, authenticated, and used personas to relate to adult learners. We begin by providing an overview of the scholarship that connects empathy, empathic design, persona construction, and meaning-making. After presenting our case study methodology and how we constructed six authentic personas, we then describe how designers used the personas in an empathic design process to
develop OER for adults preparing to pass a United States high school equivalency exam. We were guided by two questions: First, how did designers use personas to build empathy for users during the empathic design process? Second, how did designers use personas to develop instructional design skills and experience while developing OER?

**Background**

As alluded to previously, the term persona is derived from Latin, and its meaning is close to the idea of a mask worn during drama performances and ritual activities (Goh et al., 2017). To understand how designers build a relationship with their audience of focus, we present how empathy and empathic design, persona construction, and meaning-making are interrelated.

**Empathy and Empathic Design**

Kouprie and Visser (2009) describe empathy, specifically for design, as an intuitive ability to relate with other people’s thoughts and feelings. Empathic design encourages a designer to get closer to the lives and experiences of learners, and ultimately increases the likelihood that the ID’s service or product will meet users’ needs. Empathy supports a design process as design discovery and exploration informed from rational and practical issues move to design commitment and decisions meeting users’ personal experiences and private contexts (Cross, 2011; Mattelmäki & Battarbee, 2002).

In empathic design, designers must be willing to personally engage with users. Accordingly, our study employed a framework developed by Kouprie and Visser (2009) that breaks the design process down into four phases: “discovery,” “immersion,” “connection,” and “detachment.” Kouprie and Visser’s framework helps IDs develop personal engagement strategies as well as empathy in their design practices. To illustrate, designers probe a users’ situations and experiences in the “discovery” phrase. In the “immersion” phase, a designer maintains an open mind and remains nonjudgmental while naming their users and meandering around in the users’ world. In the “connection phase,” a designer identifies with the users on an emotional level by recalling their own feelings and experiences. Finally, in the “detachment” phase, a designer steps back and takes stock of the users’ worlds. This allows a designer to reflect on new ideas and insights to help their users.

Reflecting on new ideas and insights to help users enables designers to bound empathy and creativity together in the design process. Coleman, Lebbon, and
Myerson (2003) advocate for empathic design practices that allow designers to discover what makes users tick, thereby allowing designers to also tap into the users’ feelings for sources of insight and inspiration. Thus, an empathic approach to design includes, rather than excludes, people. Coleman, Lebbon, and Myerson reflect, “[e]mpathy is the key word, and, when combined with creativity, it holds the promise of more popular and attractive design solutions” (p. 491).

A designer is active during an empathic design approach. Kouprie and Visser (2009) point to three key elements that involve the designer. First, motivation is critical for an effective empathic design process. If designers do not embrace the advantages of empathic design, they can experience unsatisfying results. Second, as designers engage in the four-phase framework of empathy, they are able to experience stepping into and out of users’ lives while simultaneously reflecting on these results. Kouprie and Visser contend that the stepping in and stepping out may be a key element of empathic design. Lastly, empathic design requires a structured investment of time. Designers must be committed to the empathic design process by leading the process among others involved in the design.

**Persona Construction**

Again, empathic design is an attempt to get closer to the lives and experiences of users, so personas are a way to drive the design process (Cooper, 1999; Miaskiewicz & Kozar, 2011). In an authentic, engaging, and practical way, personas communicate a key user group’s goals, behavior, and what the users want to accomplish. Personas are memorable representations that are conspicuous in a designer’s mind throughout the design process (Pruitt & Adlin, 2010). Additionally, personas are helpful because they are constraining by determining who is and is not the audience of focus. Miaskiewicz and Kozar (2011) used a Delphi methodology to examine the benefits of incorporating personas into a design process. Design experts agreed on five design process areas that would most significantly benefit from persona use: (a) audience focus, (b) product requirement prioritization, (c) audience prioritization, (d) the challenging of assumptions, and (e) the prevention of self-referential design (i.e., a way of helping designers realize how the audience is different from the designer).

Understanding end users during the entire design process facilitates the development of empathy because the designer puts himself or herself in the shoes of the users. Persona construction should therefore be an ongoing activity throughout the empathetic design and development process (Nielsen, 2012; van Rooij, 2012). Although a persona is not a statistically significant representation of a group of learners, a persona can be authentic and an engaging tool (Vestergaard...
et al., 2016). Authenticity can help motivate designers and allow them to remain on a path to design for actual needs. Designers must accordingly construct personas from context and real-life people. This requires validating personas and recognizing that personas are dynamic, thus implying that they also must be revisited and redrafted at regular intervals (Grudin, 2006; Vestergaard et al., 2016). This begs the question, “do personas appear realistic to the people they are supposed to represent?” When personas are not credible and not associated with methodological rigor and data, Pruitt and Adlin (2010) suggest that personas can fail.

Nielsen (2012) suggests that personas’ engaging perspective stems from the ability of narrative to foster insight and involvement. Nielsen explains, “[t]he purpose of the engaging perspective is to go from [IDs] seeing the user as a stereotype with whom they are unable to identify and whose life they cannot envision to actively involving themselves in the lives of the personas” (p. 16). In persona construction, the goal is to create empathy, engagement, and identification with users so that IDs understand the users’ worlds, allowing them to create effective solutions for those worlds. Stereotyping and categorization work in opposition to that overarching goal and results in the creation of “flat characters,” (p. 62). A flat character could be an elderly woman with a cane or a businessman in a navy suit.

An engaging perspective points to complex persona descriptions that draw from screenwriting, fiction writing, and narrative design (Nielsen, 2012). Flat and unrealistic characters are a risky thing in narrative design (Bell, 1997). When discussing narrative as modular design, Bell compares the assembly of a persona’s narrative to the work of a mosaicist. The writer assembles fragments of social and cultural contexts to make a more lifelike narrative. This allows the writer to throw off the chronology burden, and, rather, show relationships between events, people, motifs, or themes that are not generated by sequences of cause and effect. When constructing authentic and engaging personas, a ID adopts some of these writer strategies and assembles fragments of user characteristics. A persona must tell a story. As Baxter (1997) notes, “We understand our lives, or try to, by the stories we tell,” (p. xii).

Meaning-Making

Personas can often fall flat by failing to engage designers on an emotional level (Hanna & Ashby, 2016). When the story around a persona provides narrative tension and an element of surprise, designers find it easier to talk about users, remember users, and get a shared view of users (Blomquist & Arvola, 2002; Hanna
& Ashby, 2016). Gotschall (2012) explains the desire for a personal story as humans evolved to crave a story and the human mind is addicted to meaning.

Bruner (1986) notes that there are two modes of thought—a story mode and an argument-logics-scientific mode. A story must simultaneously construct two landscapes, one of action and one of consciousness. A landscape of consciousness is what those involved in the action know, think, or feel, or conversely, do not know, think, or feel. Bruner (1990) later contends that a central concept of human psychology is meaning as well as the processes and transactions involved in the construction of meanings. Bruner believes that people participate in symbolic systems of culture in which meanings achieve a form that is public and communal rather than private. Bruner concludes that cultural psychology has folk psychology at its base. Folk psychology is narrative in nature rather than logical or categorical. Moreover, folk psychology’s (Bruner, 1990) premises characterize human nature in the following ways:

- People believe that the world is organized in certain ways. People want certain things, and some things matter more than others.
- People hold beliefs about the past, present, and future.
- These beliefs should unite and form a whole in some way.
- Lastly, when human beliefs and desires become sufficiently coherent and well organized, they become called “ways of life” (p. 39).

Bruner (1990) contends that people have an innate predisposition to narrative organization. Through the traditions of telling and interpreting in which people come to participate in, people quickly and easily comprehend and use narrative. Bruner sums up the human desire to make meaning by claiming that “[i]n the end, even the strongest causal explanations of the human condition cannot make plausible sense without being interpreted in the light of the symbolic world that constitutes human culture” (p. 138).

Kearney (2002) talks about the double vision of narrative imagination: empathy and detachment. With similarities to Kouprie and Visser’s (2009) framework for empathy, one vision enables designers to empathize with the characters in a story who act and suffer, while the other vision provides designers with a certain aesthetic distance from which to view events unfolding. With stories, designers know what it is like to be in someone else’s head, shoes, or skin. The double attitude of empathy and detachment means designers are distanced, and designers are involved in the action to feel that both matter.

Nielsen (2012) connects ideas around meaning-making and narrative when discussing the engaging perspective of personas. Persona descriptions balance
data and knowledge about real applications and fictitious information that is intended to create empathy. Nielsen explains that people understand their experiences, the social world that surrounds their experiences, and see their ways of life as meaningful stories organized as narratives. The power of stories allows one to peek into another person’s mind and vision, as a participant rather than an observer (Baker, 2016). Therefore, a participatory peek into a day in the life of users offers an opportunity for designers to empathize with their users and design to ensure that the users’ needs are met.

**Methodology**

In this section, we first describe how we constructed the six personas to ensure that the personas were authentic and engaging. We then present how we introduced the personas and Merrill’s (2002) First Principles of Instruction to the IDs who designed OER lessons. Finally, we describe our observations of designers using personas to design and develop OER.

**Constructing the Personas**

We worked through multiple rounds of design to ensure that the six personas we created—named “Crystalle,” “Geoff,” “Jamie Ann,” “Malcolm,” “Mary,” and “Robert”—represented adults who were planning to take a high school equivalency exam. To construct and validate six authentic personas, we reviewed personas that had been developed for a Designers for Learning project in 2015, scrutinized the results of a subject matter expert (SME) survey, researched adults preparing for a high school equivalency exam, recruited adult basic education (ABE) SMEs to review early drafts, and examined the persona and fiction literature.

In a previous Designers for Learning project, a designer who was familiar with persona construction and an ABE SME had developed four personas who represented adults who had a desire to complete their general educational development degree. These four personas (Crystalle, Geoff, Jamie Ann, and Geoff) provided a starting point in constructing the six authentic personas.

**SME Survey Results and Feedback**

In preparation for the MOOC development, the second author conducted an online survey. Completed by 18 ABE SMEs, the survey data helped place us in the shoes of our study population—the adult preparing for the high school equivalency exam. For example, respondents noted that rural areas have little ABE resources and are desperately seeking resources that support instructors and learners. For some
reason, underserved ABE students have been unsuccessful in traditional school, and therefore, OER designers should avoid a traditional school approach. The SME feedback illustrated that ABE contexts vary including desperately underserved groups: incarcerated students and adults from rural areas.

After reviewing the SME survey results, the first author became interested in incarcerated ABE students and students from rural areas. We changed Geoff to represent an adult learner from a rural area. Of the original four personas, there was no persona representing an incarcerated learner. The first author found a newspaper article regarding an ABE program at a Texas (USA) County Jail which inspired the construction of Robert (a fifth persona) who was a learner in the Corner Bend County Jail (Figure 1).

**Figure 1**

Robert represented an adult learner who was incarcerated in a county jail.

Meet Robert

Robert just celebrated his 32nd birthday as he waits for his trial in the Corner Bend County Jail. He admits that jail is not as depressing as it used to be. He knows, as he has seen a few. The Corner Bend County Jail launched a new program this year where Robert can take classes to prepare for the General Educational Development (GED) test. In fact, the second set of students in the 4-month-long program will graduate this week.

Robert looks forward to the classes. He thinks it will help him get out of jail and put his mind into something different. It is a cool program because it is at a jail. He has heard about GED programs in prisons, but not in county jails. He is lucky that Corner Bend County has a program. Since he is waiting for trial instead of serving out a sentence, he knows it is hard to keep a GED program going in a county jail. Guys are coming and going all the time.

For Robert the toughest part of jail is that he gets depressed and worries a lot. He is not convicted on anything yet, but he worries about his family. Robert’s mom is in poor health with diabetes and high blood pressure. His dad’s health is not too good either. His younger sister just got out of college and lives across state. So, mom and dad are alone. He has a big problem making fast money. He has a lot of dope cases, a gun case, and an aggravated case. He did not have much of a childhood. He can remember getting his first car early in his junior year of high school. Once Robert got his car, he stopped going to school.

Robert is pretty smart. He even sometimes corrects the teacher. He has a good mind for fractions and percentages. He also started writing a book of short stories. He always liked reading and making up people who have had hard times and then succeed. His favorite part of class is going up to the white board to work out a problem. It can be tough being at the white board. When the answer comes to him, he just breathes a big sigh of relief. He just feels so proud. He doesn’t want to sit back down. When the teacher tells Robert to take his seat, he just wants to stay up there and work out another problem.

In the classroom, Robert sits behind a computer. His computer skills are improving. He wishes he had access to the Internet, but he gets why he doesn’t. Robert thinks that he is a pretty good student. He wants to learn. It is his first uninterrupted shot at high school in a real long time.

Robert doesn’t want to be a statistic. The class helps keep him straight. If you steal, fight, or cause problems, you get expelled. Robert knows one of the teachers has a friend who works with Goodwill Industries. He can help him get a job across the city once he is released.

When he looks around the classroom, he sees a lot of guys who haven’t had success in their life for whatever reason. A GED certificate is something that he can hold in his hand that shows he has had success. There’s nothing like success.

During an online design conference, we introduced five personas to four ABE SMEs. Enthusiastic and supportive of the personas, the SMEs provided invaluable, detailed, and constructive feedback that helped us construct the final authentic
personas. The SMES recommended that we create personas exhibiting the following ABE characteristics: (a) a student who has a discrepancy in abilities between reading and math; (b) a student who hated school, dropped out, and now realizes it was a mistake; (c) a student who has a high school diploma based on social promotion and not academic mastery; and (d) an 18 to 22-year-old student whose schooling was interrupted because her family migrated to the United States to find work in harvesting crops. This final student also has low levels of English language proficiency or may be illiterate. To this need, Mary (Figure 2) became the sixth and final persona. The other SME feedback was threaded into the existing five persona narratives. For example, we described that Geoff (Figure 3) was tested at a sixth grade reading level and a 10th-grade math level. This fit well with Geoff’s already described challenges in needing more time to understand things that he reads.

Figure 2

Mary has experienced interrupted schooling because her family has migrated to the United States to find work in harvesting crops.

Meet Mary

Mary’s Story

Mary is 19 years old. When Mary was 12, she and her family migrated to the United States from Mexico. Her mother, father, and older brother found work harvesting crops throughout the west and southwest in California, Arizona, New Mexico, and Colorado. Once Mary was old enough, she also began working in the fields. The family has always been mobile, moving seasonally, to where the work is.

Although Mary regularly attended school in Mexico, in the U.S. her schooling has been interrupted at best, and non-existence at worst. Moving from place to place made attending school regularly difficult and finishing high school impossible. Finally, after 7+ years, it appears that the family will have an opportunity to settle down in one place.

Mary is a bright and talented woman. She is very artistic, often sketching the landscapes she has experienced on her many travels, Mary would like to drastically improve her English, get a driver’s license, and find a job where she can use her artistic talents. Witnessing firsthand her parent’s health issues, she wants healthcare. Mary sees preparing for and completing her General Educational Development (GED) certification as an opportunity to reach her immediate goals.

Mary is eager to learn, and she loves to read history and short stories and write poetry. However, as of right now, she is unable to meet high school requirements for lack of proficiency in math, technology, and English. Mary needs to develop proficiency in conversational English, as well as academic literacy in reading and writing. Mary is between illiterate to low level on the English language proficiency scale. Her poor academic skills are a direct result of her interrupted schooling.

Figure 3

Geoff was tested at a sixth-grade reading level and a 10th-grade math level.
Persona and Fiction Literature

We integrated effective principles (i.e., providing direction that we interpreted, applied, and adapted situationally in context [Patton, 2011]) from the persona and fiction literature in constructing the six personas. For instance, we used third person instead of first person when we wrote our personas’ narratives. First person narratives can detract from authenticity as it can be unrealistic for a person to have certain insights about him or herself (Bell, 1997). Guided by the persona literature (Nielsen, 2012; Vestergaard et al., 2016; van Rooij, 2012), we gave each persona a name and had IDs select an image to represent each persona. Nielsen (2012) maintains that images evoke empathy of real people in real situations. Therefore, we described Crystalle, Geoff, Jamie Ann, Malcolm, Mary, and Robert in contexts that said something about their everyday life. IDs then searched for images that showed personas in their situation.

We made every attempt to avoid stereotypes, which affect the authenticity of personas. In constructing personas, we had to be cognizant of inadvertently
creating stereotypes as humans naturally stereotype as a way of categorizing conceptions of others (Macrae & Bodenhausen, 2001). We therefore presented the personas in a narrative style, rather than in a bullet-point style, to ensure that we were differentiating and humanizing our personas through their goals, motives, and expectations (Macrae & Bodenhausen, 2001; Turner & Turner, 2011). For example, we explained that Geoff’s family expected him to manage the family farm rather than providing a general description of an ABE student in a rural community.

Introducing the Personas

As designers worked through the overview and seven modules of the Designers for Learning course, they first dissected the ABE design scenario to explore key aspects of the opportunity. Designers asked themselves the following questions: What are the needs, goals, and constraints of this situation? Who are the target learners described through six authentic personas? What is the instructional context, and how do the personas fit in that context? We introduced Merrill’s First Principles of Instruction (Merrill, 2002) as an instructional design framework that the IDs could follow as they developed the lessons. Designers explained their instructional design solutions with a written design proposal. They then developed a prototype that was subject to a round of formative evaluation from other IDs and adult basic education subject matter experts. As the final deliverable, designers submitted a complete unit of instruction that conformed to the project’s guidelines and incorporated all necessary content presentation, learner practice, and assessment materials. Each course module contained materials for review and activities to complete related to the instructional design project. The module activities included individual practice items, reflection, and assignments, as well as conversation prompts for a MOOC discussion forum.

In Module 1, we introduced the six personas. In modules thereafter, we used reflection prompts to ask designers which (if any) of the six personas from Module 1 continued to be their focus as they considered the audience for the OER. In some cases, designers focused on the same personas throughout the design process. In other instances, designers changed personas, added another persona, developed their own persona, and/or did not focus on any persona as they had not thought about the personas since Module 1.

Designers began practicing how to identify with learners’ thoughts and feelings in Module 1. Designers used the four-phase empathy framework (Kouprie and Visser, 2009) to discover, immerse, connect, and then detach from Crystalle, Geoff, Jamie Ann, Malcolm, Mary, and Robert. Then, we used a reflection activity to prompt
designers to choose a persona that resonated most with them. To that end, it is worth noting that our intention always was to have the designers focus on adult learners and take an empathic design approach. However, we fully understood that the time constraint of Module 1 would not allow designers to construct their own personas. Our solution was to introduce Crystalle, Geoff, Jamie Ann, Malcolm, Mary, and Robert without images and then have the OER designers participate in the persona construction by finding an appropriate image to represent the persona(s) chosen.

Guided by the reflection activity, designers moved onto the “discovery” phase of the four-phase empathy framework. They spent one to two minutes on each of the four separate prompts in order to enter into the persona’s world and discover the persona’s situation and experiences. Next, designers entered the “immerse” phase by responding to a prompt that required them to explore the persona’s world. This phase required designers to withhold judgement so that they could appropriately expand their knowledge about the persona as an adult learner. The prompt in the “connect” phase asked designers to recall their own memories and experiences so that they could create an emotional tie with their one chosen persona. Finally, designers ended the reflection by responding to a prompt that encouraged them to take a step back and make sense of the persona’s world. Known as the “detachment” phase, designers reflected on new insights they gained from the reflective experience and used them to generate ideas to help the persona.

Module 1 concluded with a discussion activity where designers shared their perception of the learners with one another. Using discussion instruction prompts, designers were able to read other’s discussion posts and comment on those posts. The discussion prompts asked designers to share their reflections on the following question: How can you provide opportunities for this learner to engage in learning experiences and activities that can prepare this learner for his or her goals? To move along the design process, we then directed designers to start thinking about possible learning activities that they could design.

**Introducing Merrill’s First Principles of Instruction**

After a Module 2 explanation of how high school equivalency exams align with high school math and English standards, we did not assume that all designers were instructional designers (IDs) or were proficient in or even aware of instructional design processes. In Module 3, designers explored Merrill’s First Principles of Instruction (i.e., “activation,” “demonstration,” “application,” and “integration”) (Merrill, 2002), which helped them design the instructional experience. Merrill’s principles include activating prior knowledge, using specific
portrayals to demonstrate component skills, applying newly acquired knowledge and skills, and integrating the new knowledge and skills into the learner’s world. The goal of Module 3 was to assist designers in creating and developing instructional activities that guide adult learners to process, apply, and integrate new incoming information into their life. For the reflection activity, designers refined their decisions about the instructional experience that they were developing for their target learners. More specifically, designers began by identifying which (if any) of the six personas from Module 1 continued to be the focus as they considered the audience. From there, designers followed Merrill’s principles and completed the following actions:

- They drafted two to four learning objectives.
- They described the problem or task that would frame their lesson.
- They specified the activation, demonstration, application, and integration strategies they used in their design processes.

**Observing Designers Using Personas**

The goal of the MOOC was to design and develop OER to help adults prepare to take a high school equivalency exam. In return for volunteering in service-level projects, participating designers gain real-world experience and receive support from SMEs in the field of education. Our case study, the free instructional design service MOOC on Canvas Network, was a 12-week course that was extended an additional six weeks (total of 18 weeks) in spring 2016. The MOOC was designed and facilitated by five ABE SMEs and eight experiences instructional designers. A total of 1,866 participants were enrolled, and 37 designers completed instructional materials that were made available for free in the “Adult Learning Zone” on oercommons.com. This case study focuses on the 37 designers who completed instructional materials.

An exciting part of taking a MOOC is the ability to connect, share, and compare experiences with others. In this course, some designers worked or volunteered in ABE programs. Others had academic or work backgrounds as IDs or as educators familiar with the subject matter, possibly in a K-12 or higher education setting.

To get conversations started, we asked designers to reply to a post to provide a brief introduction. This required them to share their backgrounds and to reflect on why they were taking the course. Of the 37 designers who completed instructional materials, 24 (65%) were women. Twelve designers (33%) noted that they are working on or have a graduate instructional design-related degree while two designers shared that they are earning a certificate in instructional design.
Why designers were taking the course resulted in a number of responses which are summarized in Table 1. Craig (all designer names have been changed), an art and design instructor who is transitioning to an ID role, wrote, “I’m taking this class to pick up pointers, get some practice, meet some great people, and possibly generate some more portfolio materials.” Carin, a recent instructional design masters graduate, shared, “…as a recent graduate in the instructional design community, I am a novice and am looking forward to the opportunity to gain additional instructional design experience and network with other professionals…” Echoing these sentiments, a veteran educational consultant named Adam posted:

I created two years’ worth of curricula without formal training except for what I’d learned from backwards design and lesson planning as a teacher. The company loved my products. I thought, ‘Wow! I can get paid for this!’ I then completed my second Masters, this time in ID.

Table 1

Reasons Designers Enrolled in Course

<table>
<thead>
<tr>
<th>Number of Designers</th>
<th>Why Designers were Taking the Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Want to sharpen or improve instructional design skills</td>
</tr>
<tr>
<td>13</td>
<td>Want to gain real-life instructional design experience</td>
</tr>
<tr>
<td>8</td>
<td>Want to be part of a service project</td>
</tr>
<tr>
<td>8</td>
<td>Want to gain practical knowledge in instructional design and/or adult education</td>
</tr>
<tr>
<td>7</td>
<td>Want to work and network with other instructional designers (IDs)</td>
</tr>
<tr>
<td>3</td>
<td>Have a desire to move into an instructional design role</td>
</tr>
<tr>
<td>2</td>
<td>Want to generate portfolio material</td>
</tr>
<tr>
<td>1</td>
<td>Have an interest in instructional design</td>
</tr>
</tbody>
</table>

Note. Designers may have chosen more than one reason why they were taking the course

We followed a single, intrinsic case study approach where context is crucial. Designing OER for ABE was a complex endeavor. Our method was to place
ourselves in the thick of the design process. According to Stake (2005), an intrinsic case study’s purpose is not to understand some abstract construct or generic phenomenon. Its purpose is not theory building. An intrinsic case study is conducted because one desires a better understanding of the particular case. The study is initiated because of an intrinsic interest. Our method was to detail the case in descriptive narrative so readers can experience what happened and draw their own conclusions.

Data were collected using multiple techniques that directly used human sources (i.e., designers’ responses to electronic reflection prompts and discussion board prompts) and nonhuman sources (i.e., project artifacts that included design proposals, design prototypes, and final lessons). During the entire open ABE MOOC implementation on Canvas Network, we collected data in the form of designers’ reflections and project artifacts as they moved through the design proposal, design prototypes, and final lesson phases.

Reflection prompts and discussion board prompts were included within specific MOOC modules (see Table 2). As designers moved through various prompts, they were asked to reflect on which persona they were using in the development of their OER. Following a thematic analysis (Braun & Clarke, 2016), we used constant comparison (Braun & Clarke, 2016) to analyze and triangulate reflection and discussion board data. We focused on reflection and discussion board responses that clearly referenced at least one persona. Our focus was to investigate how these personas helped build empathy and develop instructional design skills and experience. As we continuously collected data, we simultaneously processed coded reflection information units to understand how designers used personas to build empathy for users during the empathic design process as well as how designers used personas to develop instructional design skills and experience while developing open education resources.

Table 2

**Reflection and Discussion Prompts Within Specific Modules**

<table>
<thead>
<tr>
<th>Module</th>
<th>Reflection Prompt</th>
<th>Discussion Board Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

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To inform our guiding research questions and strengthen our case study’s chain of evidence, we dealt with a variety of evidence. Additionally, both authors analyzed data to ensure the triangulation of results (Yin, 1994). We reviewed designers’ responses to both individual reflection prompts within modules as well as to conversation prompts within the whole MOOC discussion forum. We additionally referenced the designers’ three deliverables—design proposals, design prototypes, and final lessons—to provide context and to gain a sense of what actually was being designed. Along with a thematic analysis, we also followed Yin’s elements of high-quality analysis for a case study. Our analysis relied on all the relevant evidence appearing in all seven course modules. As both of us analyzed the evidence, we included both of our interpretations and addressed the most significant aspects of the case study that related to our research questions. Finally, as designers and developers of the course, we brought our own prior, expert knowledge to the case study.

Results

We observed 37 designers who used six authentic personas as well as an empathic design approach to complete ABE OER. We used the following research questions to guide our participation in the study and our observations:

1. How did designers use personas to build empathy for users during the empathic design process?
2. How did designers use personas to develop instructional design skills and experience while developing open education resources?

We now present the themes that emerged as a result of each research question.

Using Personas to Build Empathy

As 37 designers drew upon Crystalle (Figure 4), Geoff, Jamie Ann (Figure 5), Malcolm (Figure 6), Mary, and Robert to guide the development of instructional materials, designers responded to specific reflection prompts and had an opportunity to discuss the progress of their designs with other designers. Table 3 presents how many designers focused on each persona during each module of the design process. In Module 4 and Module 5, designers continued to reflect and receive feedback on the lessons. Since Module 6 did not have a reflection activity, designers did not note which persona was their foci. Four themes emerged from the reflections and discussions that we analyzed: (a) Designers made a connection with a persona; (b) designers put themselves in the shoes of the persona, therefore empathizing with the adult learners preparing for a high school equivalency exam;
(c) designers engaged with facilitators, other designers, and SMEs about the designers’ own personas and other designers’ personas; and (d) designers stepped out of personas’ shoes and reflected on their own ideas to help the adult learners.

**Figure 4.** Crystalle made it through high school based on social promotion and not academic mastery.
Meet Jamie Ann

Jamie Ann's Story

Jamie Ann is 21 and lives with her parents. She was raised in a well-educated, financially stable family. While she was definitely the under-achiever in her family of two sisters and a brother. Jamie Ann has always been too unfocused to settle down at anything – including school. Her family has always stepped in and helped her when she needed it.

Jamie Ann’s unique approach to life showed early. She was an energetic little girl, very smart, eager to learn, and bounced from one activity to another. Teachers talked to her often for too much talking and for getting out of her seat. They also praised her for learning quickly. In junior high school, this energy began working against her. Jamie Ann had trouble concentrating long enough in class to learn the more complex material like science and advanced math. In high school, she could read two or three books a week, but she hated school. She hated sitting in school all day bored out of her mind. She hated dealing with what she called, idiot kids and teachers. By the first semester of her senior year, even though her grades were not bad, she was so miserable that she dropped out of school. She soon got a job as the receptionist at a local commercial plumbing contractor and supplier. Her parents had arranged for her application to this job, and they did their best to find new jobs for Jamie Ann every few months when boredom or a bad error due to inattention caused her to lose job after job.

Jamie Ann has been jobless for two months. It has been two and half years since she dropped out of high school, and she realizes it was a mistake. She wants to move out. She wants to find a job that she will like, and now sees that she first needs her General Educational Development (GED) certification so she can get on a path to start making more money. She is getting ready to prepare for and tackle the GED.

As a learner, Jamie Ann is still as eager as she ever was. It excites her to absorb new information, and she has plenty of technology skills to call on for navigating lessons on the computer. The problem is she assumes she understands everything once she has learned a little, so she often races on to another topic before she has fully grasped the current one.

She hates when people criticize her work. Although her reading level is 12th grade, she is missing some of the background knowledge that a high school graduate should have. She admits that she focuses on herself. While Jamie Ann likes to learn new things, they do not mean much to her unless she can relate them directly to her own interests or needs.

Her goals now are to pass the GED. She concludes that she is almost done with high school anyway, so it won’t be hard. Then, she wants to get into college, and find a well-paying job that she likes. She is motivated to succeed and achieve her goals. Some people say she has too much confidence. She thinks it is better than having too little.

Figure 5. Jamie Ann hated school and dropped out of high school in her senior year.
Meet Malcolm

Malcolm's Story

Malcolm is 24 years old and has been on his own since he was 16. He dropped out of school at the beginning of his junior year, and ran away from his foster home. He was placed in a foster home when he was 12 because his mother died of cancer and his father was in prison. He left his foster home because of abuse he experienced over two years at the hands of his foster mother’s brother who had moved into the apartment next door. He did not tell his foster parents because he thought that no one would believe him. Plus, he felt ashamed and afraid. This abuse made him feel worthless.

He moved in with a school buddy whose mom, Helen, was using and selling drugs to help pay for her habit. She told Malcolm he could stay, but he needed to pay his own way giving her $200 a week. He got a part-time job at a party store making about $160 a week before taxes. But, he needed more money than that to stay with his friend. Helen introduced him to her dealer who allowed him to sell drugs at places where the high school kids hung out.

Malcolm became a successful dealer, and began to use drugs himself. After about six months, the dealer Malcolm was working for was sent to prison for five years, so Malcolm took over the entire area. He made a lot of money and moved into his own apartment when he was 18. To get more buyers, he began hosting parties at a warehouse just three blocks from the high school. By the time he was 20, he had begun to feel he could do anything, so he began smoking crack cocaine. He threw himself a big 21st birthday party, which hundreds of young kids from neighboring schools attended. The police broke up the party and arrested Malcolm, charging him with several felonies. He was convicted and sent to prison for two years.

He continued to use any drugs he could get while in prison. When he was released at age 24, he tried to go back to his old neighborhood to deal drugs again. However, his territory had been taken over by a gang, Malcolm had no way to make a living and had no place to live. He stole scrap metal and sold it to get money for drugs. One night a community-based homeless shelter worker and drug counselor found Malcolm asleep in a doorway of a vacant store. The worker took him to the shelter for the night. The next day, the worker convinced him to stay for another night. Although Malcolm was anxious to leave, he liked being warm and talking with the worker, who seemed to understand him. The worker convinced Malcolm to enter the one-year residential program sponsored by the shelter. He is a little afraid of living in a dorm setting with other men due to his past experience with his uncle. He doesn’t want anyone to know about his past. He has a hard time trusting people and believing they really want to help him.

Because Malcolm did not finish high school, the residential recovery program requires him to take General Educational Development (GED) test preparation courses and take the GED test before the year is over. He was an average student in high school where he participated in some extra-curricular activities, including chess and computer club. He really liked working with computers, but it has been eight years since he was in high school. Except for using a cell phone, Malcolm has fallen behind in computer technology, knowing very little about the Internet or Web tools.

He tests at 10th grade reading skills. However, he is really behind in science and math knowledge. Plus, he has a hard time seeing the relevance of subjects like algebra, calculus, and science. He does better when instruction is connected to the real world. He is a little afraid that he is too far behind to succeed. He is willing to try, but he doesn’t want to have anyone know about his past failures. His self-esteem is low due to his family’s background, the abuse he experienced, his drug dealing and use, and his time in prison. He wants to finish the program, obtain his GED, get a job, and work his way through college to become a counselor at a community center that focuses on at-risk kids.

Figure 6. Malcolm look forward to passing his general educational development test and eventually becoming a counselor for at-risk children.

Table 3

How Many Designers Focused on Each Persona During Each Module

<table>
<thead>
<tr>
<th>Persona</th>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
<th>Module 4</th>
<th>Module 5</th>
<th>Module 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalle</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Geoff</td>
<td>8</td>
<td>9</td>
<td>6</td>
<td>7</td>
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<td>Jamie Ann</td>
<td>8</td>
<td>11</td>
<td>9</td>
<td>4</td>
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<td>Malcolm</td>
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<td>7</td>
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<tr>
<td>Mary</td>
<td>10</td>
<td>11</td>
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<td>Robert</td>
<td>4</td>
<td>3</td>
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<td>3</td>
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<td>Own Persona</td>
<td>0</td>
<td>3</td>
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<td>No Persona</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>42</strong></td>
<td><strong>44</strong></td>
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</tr>
</tbody>
</table>
Note. Designers may have picked more than one persona within a module and/or switched personas from a previous module.

**Made a Personal Connection with a Persona**

In Module 1’s “connection” phase, designers connect with one or more personas by recalling their own feelings and experiences. Across the first three modules, 28 different designers personally reflected and discussed with one another how they were able to make an emotional connection with their chosen persona(s). The designers’ reflections on these connections were often prefaced with similar statements. The sentiments of these statements generally demonstrated that designers connected with personas who reminded them of people that they knew. Similarly, designers were attracted to personas who had stories that paralleled the designers’ own backgrounds (e.g., “I was like this persona;” “I could have been this persona;” or “I have a similar story to this persona.”). For example, one designer named Jasmine used her reflection to explain how she connected with Geoff in Module 1, stating that “I was homeless at one point too. I was alone and hungry. During that time, I was so overwhelmed and frightened.” Similarly, another designer named Darlene wrote, “[a]s a person over fifty, learning to use computers and embrace technology created anxiety. I had to overcome my own fears of using computers and learning various applications.”

The “I-have-a-similar-story” reflections were particularly notable as designers spent time sharing stories that connected to personas’ stories. A designer named Carol wrote an 84-word reflection on how, like Mary, she was sensitive and artistic in high school. Carol also noted that she had a hard time connecting with most people. Yet another designer, Marcel, shared a 117-word story to illustrate his similarities to Crystalle. Marcel explained that he was indifferent in high school and that none of his teachers or courses “really [stuck] out as life changing.” Writing about a specific memory that resonated with the persona “Mary,” Leslie included a 485-word reflection on how, as an American student studying Spanish abroad, she found herself out of place and alone in Portugal with no way to communicate with people. Leslie ended her story explaining that “I can imagine that Mary, like any other immigrant to the U.S. without English skills, feels homesick and out of place frequently while living here.”

**Beyond Preparing for a High School Equivalency Exam**

As we mentioned previously, designers were tasked with developing OER on specific topics meeting the College and Career Readiness Standards (CCRS). Several designers developed these resources through a lens of teaching skills in the context of future use. They began to develop the instructional experiences in
Module 1 and Module 3, and ultimately, 17 different designers shared ideas on how to teach skills that would benefit adult learners by transferring to future contexts. Additionally, to recall, in the “detachment” phase of the empathetic design model, a designer steps back and takes stock in the users’ worlds. This practice allows a designer to reflect on new ideas and insights to help the users. For all six personas, we observed designers reflecting and discussing on how to help the personas beyond just preparing high school equivalency exams. For example, designers noted that: Malcolm wants to work with at-risk kids; Robert is looking for a fresh start after jail; Jamie needs to discover what she wants to do with her life; Mary confidently communicates in English at the supermarket or bank; Crystalle earns a college degree for herself and her daughter; and Geoff successfully runs the family farm.

Engaged with Others

Throughout the course, designers engaged with course facilitators, other designers, and course SMEs to discuss their own personas as well as other designers’ personas. Designers’ empathic connections with personas made discussions engaging and seamless. Everyone involved with the course (designers, facilitators, and course SMEs) knew the six personas so when one discussed a specific persona the others understood. In discussions across the first five modules, we witnessed 14 different designers, collaboratively, using personas to drive their empathic design process and help drive other designers’ empathic design process.

We observed designers discussing how they agreed with another’s assessments of personas, confirming their perspective of walking in the learners’ shoes. In other instances, designers looked to one another for more insight into a persona. A designer named Linda responded to another designer to confirm her view of Malcolm and then commented, “This is an interesting concept – usually in higher or adult Ed classes I feel students have more control over which teachers they take classes from[,]” Linda then followed up by asking, “…[D]o you think Malcolm is aware enough about this issue to gravitate towards choosing female teachers for himself?”

Sometimes, a post like Linda’s led to more discussion around what instructional strategies are appropriate for a persona and how a particular insight may add to or change an instructional idea. When discussing the details of a lesson with a course facilitator or SME, the designer communicated the lesson by putting the persona in the middle of the lesson. For instance, Wayne, a designer participating in our study, responded to an ABE SME’s questions regarding his activity:
Thanks. I appreciate your comments. I am still thinking of tightening this. The idea of using graph paper is to allow Malcolm to see concretely how the area of a regular polygon is calculated. For example, if the length is 6 inches and the width is 4 inches, he can actually see 24 boxes (squares) on the graph. Thus, he is engaging in something practical. Then, we can move to the more abstract area of a rectangle with length 16 and width 12. The answer will be in square units. We will go on to examine more complex polygons.

Reflected on Ideas to Help

In the final phase (“detach”) of the empathetic design framework, designers stepped back to take stock in the users’ worlds, allowing them to both reflect on new ideas and gain insights to help the users. We observed two different ways in which 19 different designers discussed and reflected on how they could help learners across the first five modules. First, some designers demonstrated a desire to linger in the connection phase and not completely detach. These thus designers shared instructional approaches that connected with personas but varied in focus. Some approaches aimed to ensure positive reinforcement; some presented achievable learning tasks, while others provided motivation driven by real-life scenarios. Lastly, some approaches encouraged interpretation and meaning-making through fiction and nonfiction passages. To this end, Penny reflected on a specific novel:

My thought is to build up to an excerpt from *The House on Mango Street* by Sandra Cisneros. My recollection is that this novel is required reading during the high school years. Also, I think that the cultural context portrayed in the novel would be one Mary could relate to.

The second way, conversely, saw designers “detaching” from the personas. This detachment allowed designers to describe a specific CCRS that would benefit the learner. Focusing on identifying and choosing a CCRS, Module 2 was lengthy, complex, and, at times, difficult to navigate through. Some designers slowly walked through the CCRS in the shoes of a persona. For example, one designer named Charles wrote the following discussion post in Module 2: “I plan to make a lesson to suit the learning preference of the persona ‘Jamie Ann’. Reading like a Historian, Unit 12: Cold War Culture/Civil Rights explores recent history through text. It is a CCSS.ELA-Literacy.W. 11-12.9b unit.” He continued, “I chose this because it uses secondary sources and images which will give the unit a blended delivery style of which I am a strong advocate and will aid Jamie Ann’s concentration and engagement levels.” Charles stepped out of Jamie Ann’s shoes and reflected on ideas to help her learn as she cannot concentrate in a traditional classroom setting. Charles coming up with instructional ideas transitions to our
second research question: How did designers use personas to develop instructional design skills and experience while designing open education resources.

**Using Personas to Develop Instructional Design Skills and Experience**

As presented in Table 1, the top two designers’ responses as to why they were participating in the course were that designers wanted to sharpen or improve instructional design skills and that designers wanted to gain real-life instructional design experience. As a result, we asked designers to provide feedback on the following statement in the Module 7 reflection: “I gained relevant design experience during this service-learning project.” Of the 28 designers who responded to the statement, 26 (93%) designers answered agreed or strongly agreed.

Designers view empathic design methods as tools for developing instructional design knowledge and abilities (Hanington, 2003; Mattelmäki, 2008; Mattelmäki et al., 2014). We were interested in learning how designers used personas as a tool to cultivate instructional design skills and experience while developing OER. A purpose of the course was therefore to guide designers through the instructional design process using an empathic framework.

We observed our study participants’ instructional design processes through a lens informed by Richey, Klein, and Tracey’s (2011) domains of the instructional design knowledge base. Richey, Klein, and Tracey break the instructional design knowledge base down into six content domains: (a) learners and learning processes, (b) learning and performance contexts, (c) content structure and sequence, (d) instructional and non-instructional strategies, (d) media and delivery systems, and (e) designers and design processes. We analyzed reflection and discussion board responses using the Richey, Klein, and Tracey framework to investigate how personas helped build empathy and develop instructional design skills and experience. Our investigation of the reflections and discussions yielded: First, designers put themselves in personas’ shoes when structuring content and sequence. Second, designers put themselves in personas shoes when developing instructional strategies. Third, designers put themselves in personas’ shoes when choosing media and delivery systems. Lastly, designers put themselves in the personas’ shoes when engaged in Merrill’s First Principles of Instruction (year). Based on these themes, personas clearly provided a context that designers could return to as they worked through the instructional design process.
Structure Content and Sequence

Across Modules 1-4, 15 different designers shared how they structured OER content and sequencing around one or more persona(s). In Module 4, designer Nicole described a five-part lesson series with each lesson lasting 30 minutes. Putting herself in Mary’s shoes, Nicole’s content centered on social stratification and the American dream. Nicole’s sequence of five lessons ended with students presenting their experience learning about social stratification and whether the American dream is achievable or not.

Marcel also focused designing for Mary’s situation and aligned his content directly to CCRS standards. In the Module 2 discussion, he offered two instructional content options for Mary’s persona: a speaking lesson focused on grammar in use or a social studies lesson focusing on Hispanic history and immigration. In both cases, Marcel was designing to Mary’s Hispanic background and her desire to learn English.

Develop Instructional Strategies

In Modules 1-3, 21 different designers described their instructional activities and/or experiences centered one or more specific persona(s). The ABE SMEs who helped facilitate the course consistently led designers to create real-world, practical activities and experiences. Therefore, when reflecting on and discussing instructional strategies, designers stressed activities and experiences that:

- engaged adult learners
- chunked information that was simple and practical
- provided constant feedback
- focused on critical thinking skills
- presented problem-solving and scenario-based situations

To illustrate, a designer named Cedric connected the empathic design approach with the development of instructional strategies for Jamie Ann when he noted, “[t]he empathy framework provided a good way of thinking about the challenges facing Jamie Ann and her possible motivations.” He continued, “[i]n designing the ideal learning experience for Jamie Ann[,] I think it is important to keep in mind she is a motivated learner and has the supports and skills to succeed.” Cedric noted that his learning experiences for Jamie Ann would emphasize “practicality and variety.” He also concluded:

If the learning opportunities are varied enough to have a practical element[,] I
believe Jamie Ann can be made to succeed in her own learning and realize the value of being able to take in, use, and create things all as part of a larger learning process in developing her skills and attitudes for the job market.

**Choose Media and Delivery Systems**

Most designers came to the service-learning experience wanting and expecting to develop e-learning lessons. Designers who put themselves in the shoes of the adult learners appreciated the realities of choosing media and delivery systems. Low digital literacy skills and lack of internet access among adult learners influence the feasibility of e-learning as a viable media and delivery system. Designer Arlene captured this reality when observing the following about Robert, a persona who is incarcerated in a county jail:

Robert will not have access to the internet, so many learning modules will need to be stand-alone. He would benefit from a blended environment where an instructor is present for a limited amount of time to introduce concepts and topics, and then Robert will be encouraged to work independently on his own. He is a quick thinker but needs to use repetition to ‘cement’ his learning.

As demonstrated by Arlene’s analysis of Robert, the 16 different designers who discussed the media and delivery systems as it related to the adult learners grasped that, for whatever reason, many adult learners working toward high school equivalency exam success did not fit in a traditional classroom. Designers focused on alternate media and delivery systems like asynchronous, blended, computer based training, and traditional face-to-face.

**Engage in Merrill's First Principles of Instruction**

Merrill’s First Principles of Instruction (year) aligned very well with the ABE SMEs’ insistence that lessons needed to be problem or task focused rather than a lesson that merely teaches a topic associated with a subject. Most designers had little experience using Merrill’s principles. However, Module 3 broke down the four phases (i.e., “activation,” “demonstration,” “application,” and “integration”) and had designers work through each phase as they began to relate the empathic design approach learned in Module 1 with the CCRS learned in Module 2. We observed five designers center a specific persona in each phase of Merrill’s First Principles. For example, Wayne designed a self-paced lesson for adult learners like Malcolm who tended to have challenges in distinguishing between area and perimeter. For the integration phase, Wayne designed specific situations (e.g., painting a wall and tiling a floor) where Malcolm could practice calculating the
area to determine how much paint and tile is required.

Discussion

In this section, we discuss the strengths, weaknesses, and limitations of using personas to build empathy for adult learners and to develop instructional design skills and experience while developing OER. Personas ultimately helped designers put themselves in the shoes of the adult learners and so that they could understand who adult learners really are. Adult learners are not graduate students. Adult learners are adults who have not completed high school and/or have low basic literacy and/or math skills. This characteristic of adult learners thus required ABE SMEs to put stereotypes when they constructed personas, especially with regard to the well-known high school dropout stereotype. For multiple reasons, underserved ABE students have been unsuccessful in traditional school, so we found that OER designers should avoid a traditional school approach. Avoiding traditional school approaches approved to be a constraint that our study participants had to face. Designers embraced this constraint and explored all possibilities for real-world, practical OER.

Using personas to build empathy for adult learners helped surface important design elements that may have been ignored. As mentioned before, Robert, a persona who represented a desperately underserved group, is incarcerated in a county jail. Robert has no access to the internet. When focused on Robert, designers had to work within this constraint. Similarly, many designers picked up on the personas’ low digital literacy skills. Some designers developed digital literacy skills OER, while others were careful when including technology with the OER. Designers ultimately created simple digital interactions and/or have a brief section of the OER that helped to improve digital literacy skills.

Module 2 (College and Career Readiness Standard) and Module 3 (Merrill’s First Principles of Instruction) were difficult modules to navigate. Focusing on a persona(s) helped designers connect and keep the persona centered in their work throughout the course, no matter the module’s focus. Designers stepped back and took stock in the adult learners’ world. Detaching as part of the four-phase framework of empathy allowed designers to reflect on CCRS ideas and insights to help the adult learners.

As designers engaged in the four-phase framework of empathy, they practiced stepping into and stepping out of the adult learner’s life. Kouprie and Visser (2009) contend that stepping in and stepping out of another individual’s life may
be a key element of training designers at designing with empathy. Kouprie and Visser also note that empathic design requires a structured investment of time. When designing the course, we created an environment where designers would continuously step into and step out of personas’ worlds. Lasting four and half months, 37 designers participated in a structured empathic design process that resulted in instructional materials that were made available for free in the “Adult Learning Zone” on oercommons.org.

Designers had limited involvement in constructing personas. In Module 1, we directed designers to choose one of the six personas that resonated with them, work through the four-phase framework with the persona, and then select an image for the persona. We intentionally did not involve designers in persona construction. Knowing the 12-week course would demand a commitment from designers, we could not envision how a designer could engage with the four-phase framework of empathy and at the same time construct a persona. For all reflection prompts, when asking which persona the designers were focused on, we allowed designers to choose that they had created their own persona. For the Module 7 reflection (Table 3), eight designers marked that they had constructed their own persona. We had no way of viewing a persona that was constructed by a designer.

Kourpie and Visser (2009) state that motivation is critical for empathic design. If designers do not embrace the advantages of the empathic framework, then designers can experience unsatisfying results. Our intent was to have designers participate in an empathic design process driven by authentic and engaging personas. We consistently engaged designers with the six personas, the four-phase framework, and an empathic approach. However this does present the following question: Although we observed designers embracing an empathic design process, without the constant prompting, would designers have stayed engaged with personas and the empathic design process throughout all seven modules? Our case study provides no answers to this question and is one avenue for future scholarly inquiry.

Another limitation of our case study was selection bias. We observed 37 designers who completed the course and submitted instructional materials. Of the 1,829 people who registered for the course but did not complete OER, we do not know why they did not finish the course. Yet another limitation of our case study is that we participated as designers of the course and facilitators to the course. Yin (1994) noted that as a source for collecting evidence, there is a tradeoff to observing as a participant. The opportunities are two-fold: gain access to events that are inaccessible and perceive reality from the viewpoint of an insider. The problems of observing as a participant are becoming a supporter of the group (37
designers in our case) and assuming advocacy roles (i.e., designers and facilitators of the course). Knowing this, we triangulated data to increase the trustworthiness of the study.

Conclusion

Designing OER for adults who have a desire to pass a high school equivalency exam was a complex process. The strengths of using personas to help designers gain empathy for adult learners outweighed the weaknesses. Personas helped designers gain an understanding and empathy for adult learners, facilitate the empathic design process, and ensure that adult learners’ needs were met. We observed why a friend collects butterflies and what games he loves best does matter when we put ourselves in his shoes and reflect on ideas and insights to help him.

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Evaluating a Capstone Course

Graduate Student Efficacy and Instructional Strategies to Accommodate Them

Megan Adams

This article investigates the depth of knowledge and sense of efficacy of graduate students in a capstone course. Grounded in literature on successful learning, high impact practices, and signature assessments, this article contributes to the literature on students' perceived success in conducting graduate-level research and the writing of that research. The aim of this study is to determine if students enrolled in a capstone course increased their depth of knowledge in research processes and if they increased efficacy in conducting research over the same time period. The findings indicate a decrease in many areas of efficacy and the need for an additional course supporting their research knowledge prior to the capstone. This work indicates that graduate students in service field programs--especially anywhere internationally--require support without the resources to ask for the proper support. The instructional strategies and design are reliant upon these results; this is a program evaluation research project.

Introduction

This study investigates an authentic assessment housed in the final course students take as they complete their master’s degree in education. This course, the capstone, is specifically listed as a high impact practice and authentic assessment (Kuh, 2008). The capstone is a project and paper that requires students to integrate what they have learned across an entire program. In our program, this culmination results in a paper comparable to a master's thesis. In previous semesters, students in this course have offered anecdotal feedback about their struggles with such a challenging course. Instructors described the lack of depth illustrated in the content areas by the capstone papers, and students
indicated a lack of efficacy in completing a daunting project. A study designed to determine how much the anecdotal data mirrored formal data was needed. Therefore, this study was a Scholarship of Teaching and Learning (SoTL) project to investigate the depth of knowledge and sense of efficacy reported by students in a capstone course (August & Dewar, 2010). SoTL is the systematic inquiry of student learning, often used in the humanities and most often at the university level (McKinney, 2012).

This study was designed to determine the depth of knowledge students reported before and after completing the stand-alone capstone course. Additionally, determining students' sense of efficacy and concerns with the course was critical, as student perceptions of learning do not always align with their performance (Brown et al., 2014; Unrau & Beck, 2004). This study allowed for an in-depth look at what students experienced in completing a signature assignment as well as their performance based upon a program assessment rubric (Hazelkom, 2015). Did students formally report feeling unprepared or overwhelmed by taking this course? Were students appreciative or intimidated by the amount of instructor feedback provided in this course? There is literature indicating that students often have a negative emotional response when receiving critical feedback (Taggart & Laughlin, 2017). This study was done with an intent to increase the student engagement needed that high impact practices provide (Sweat et al., 2013). Literature on growth mindsets indicate that if students do not feel confident in their ability to complete a challenging task or do not indicate depth of knowledge following completion of a task, they may not remain engaged (Brown et al., 2014). For example, did students perform at a high level if they perceived their performance as needing improvement? This follows suggestions by some SoTL scholars to apply SoTL work to enhance curriculum and learning (McKinney, 2012). This research is not an exploration but is instead research to improve. The instruction in the course was part of what was being improved - a self-study and SoTL effort for the instructor/author/researcher to improve practice. However, it was also a study on how the program in which the capstone resides could be improved.

The assignment in the course being investigated is the only focus of this course, the capstone project and paper. This assignment is aligned with research on “lasting learning,” assignments requiring students to pursue rigorous activities beyond their comfort zone lead to learning that lasts (Brown, Roediger, & McDaniel, 2014). In this study, as will be noted in the findings, student learning was measured by a rubric based upon course standards. The results showed that students believed they had accomplished more than their assessment results indicated (Brown et al., 2014; Carlisle & Kruzich, 2013; Lambie et al., 2013).
Additionally, students perceived they were performing beyond the level indicated by multiple assessments. Multiple studies note this as typical of graduate students (Christie et al., 2015; Lambie et al., 2013). This resulted in a lack of efficacy and failure to develop a growth mindset; students believed they were performing quite well in the course and that their writing needed little improvement. When the faculty team met to look over the results, each instructor who taught the course shared what he or she had experienced over the previous several years. Based upon those experiences and this student data, the team decided to break the one course, described here, into two courses. This was done to allow more time to explicitly teach APA and research methods in course 1 and data collection, analysis, and writing in course 2.

**Problem Statement**

Students indicated difficulty in completing a signature assignment at the end of their master's program in education. In order to formally investigate this anecdotal information, a study was designed to investigate students' sense of efficacy in completing the assignment and their depth of knowledge before and after the course. This study is therefore an investigation into the depth of knowledge and sense of efficacy of students in a capstone course at the end of a master's degree program using pre- and post-surveys, midpoint open-ended survey questions, and observation. This study is based upon data from one course only and is intended to provide a description of the students' learning as they completed a capstone course over one semester. Additionally, the study was designed to trace students' changing sense of efficacy during the process. Lastly, this is a SoTL study that used qualitative inquiry in the form of a longitudinal panel study (Creswell, 2012). This methodology was most appropriate given the need to look in depth at a small population and in response to the following research questions:

- Did the capstone course increase the depth of knowledge of students, as evidenced by their signature assessments (the capstone papers)?
  - Sub question: Did the capstone course increase the depth of student knowledge with regard to formulating a statement of the problem and research questions based upon what they have learned in their program, followed by a review of literature and the execution and write up of a research project?
- Did the capstone course increase the sense of efficacy of students with regard to conducting and describing research in their content areas/fields?
Literature Review

As indicated by the problem statement, there was a question about how much students learned in their capstone course. The question was about their depth of knowledge; how much did students know about conducting research when they left the program? There was also a question about their sense of efficacy. Upon completing a signature assignment (the capstone) requiring the integration of so many skills, did students feel more confident in their ability to design and execute a research project? Finally, there was a question of what was meant by a signature or authentic assessment. A signature assignment is listed as a high impact practice in the field of education. These are assignments that allow students to show depth of knowledge and critical thinking through some culminating paper, project, or portfolio (AACU, 2013). An authentic assessment was first used by Wiggins (1990) in the field of education. Additionally, an authentic assessment is often a signature assignment; it is an assessment that allows students to show the depth of their knowledge (Koh, 2017). How did faculty know that the capstone (as designed) adhered to the norms of authentic assessment? These, therefore, became the themes of the literature review.

Depth of Knowledge and Growth Mindset

In order to impact student growth in the classroom setting, teachers and teacher candidates must have a deep understanding of their content (Harris & Sass, 2011; Hashweh, 1987; McConnell et al., 2013). Professional development in these content areas is widely cited as impactful to increasing the depth of content knowledge in teachers (Czerniak & Chiarelott, 1999; McConnell et al., 2013; Reeves, 2000; Stewart, 2014). When teachers return to university for a graduate degree, this can be an extended form of professional development. In the instance that a teacher pursues a degree in the field they are most often assigned to teach, they are seeking professional development in that content area.

The specifics of what teachers should know, and how much of it they should know, has largely gone unquantified (Grossman & Richert, 1988). Pedagogical content knowledge is generally thought to be the complex process of coming to terms with what a teacher must know to effectively teach his or her content area (Grossman & Richert, 1988; Schulman, 1987). The depth of content knowledge needed to successfully impact student learning has been of interest to policymakers since the passing of the No Child Left Behind Act of 2001 (Klein, 2015). The requirement of No Child Left Behind for "highly qualified teachers" (Hill et al., 2005) demanded that content knowledge be quantifiable. Quantifying that content knowledge has largely been done by investigating courses completed and degrees obtained (Hill...
et al., 2005). While this method provides administrators and policy makers with a big picture view of how teachers are prepared, it does little to investigate how teachers use that content knowledge to impact student achievement. More recent studies suggest that how teachers apply content knowledge as well as their knowledge of teaching pedagogy are more important than the number of courses taken in their specific content areas (Darling-Hammond & Richardson, 2009; Darling-Hammond, 2012). There are multiple studies showing that knowing how to teach the students in ways that they can learn, defined by using culturally relevant pedagogy, allows for a depth of knowledge that is more impactful on student achievement (Darling-Hammond, 2012; Ladson-Billings, 1998).

**Efficacy in Conducting Research**

Bandura (1997) situates self-efficacy within social-cognitive theory. The theory posits that self-efficacy is a perception of self, where one uses “beliefs in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p. 3). For graduate students in a research course, this would mean that self-efficacy is needed to believe that completing a project is possible. This belief is based upon both their knowledge of and ability to execute the steps of the research process. Additionally, one large scale study by van Dinther et al. (2011) presented the following finding:

> [E]nactive mastery experiences are stated as the most powerful source of creating a strong sense of efficacy. With regard to this... almost every study stresses the relevance of providing students with practical experiences, i.e. students performing a task while applying knowledge and skills within demanding situations. (p. 11)

This review of self-efficacy in students in higher education investigated how to foster self-efficacy in challenging tasks; completing challenging tasks and providing authentic experiences were indicated as having critical importance. This indicates that students must perform a task—in this case the research project—and receive feedback on their performance to increase their efficacy.

While limited studies have been conducted investigating what factors must be in place to foster graduate students’ sense of self-efficacy in conducting research, several studies have conducted linking undergraduate research with a decision to pursue graduate degrees with a research emphasis (Russell et al., 2007). Those studies indicate that students must experience success conducting research in order to pursue additional degrees where it is required. There are also investigations into the research environment—including the program expectations...
and amount of time learning about research prior to conducting any studies—and the connection between the environment and productivity (Phillips & Russell, 1994). These studies indicate that students who feel productive and successful conducting graduate-level research are in programs where they are supported by faculty and given ample time to conduct their projects. Finally, there is a connection between the immersion of the graduate student into research and the self-efficacy of the graduate student in conducting research (Phillips & Russell, 1994; Russell et al., 2007).

**Methods**

The research questions led to a pre- and post-survey with identical questions. Thus, as mentioned previously, a longitudinal panel study (Creswell, 2012) was most appropriate. The panel study was created to study the same people over time while investigating some identified criteria. The identified criteria in this study are “depth of knowledge” and “sense of efficacy” as well as how these two criteria change over time. Therefore, the defining characteristic demanding a panel study was being enrolled in the capstone course in a specific semester—specifically, the last semester before program revisions were implemented. To supplement survey data, however, the researcher added open-ended questions and used observation for analysis. For observation, a reflexive journal was maintained by the researcher. All data were entered into Dedoose and will be described further in the analysis section of this paper. Additionally, a midpoint survey with open-ended questions about the students' process was included to determine if the pre- and post-surveys were measuring changes due to the course. That tool is also included in the analysis.

**Context of the Study**

This study examined graduate students’ changing sense of efficacy in conducting research as well as their depth of knowledge about research in a capstone course. As mentioned before, the graduate program is a master's in education. Furthermore, the study took place at a regional university in the southeastern United States, and the participants were eight students enrolled in a capstone course during spring semester of 2018. The participants consisted of seven females and one male. There were three white females under 30 years old, two white females over 30, one African American female under 30, one African American female over 30, and one white male over 30. The participants all had some teaching experience; the range was between three- and 20-years teaching experience. The participants primarily lived within 50 miles of the university;
however, one participant lived outside of the state where the study occurred. There was also a range of teaching responsibilities. Most (five participants) were teaching in a K-12 setting. Of those five, two were teaching in an elementary school setting, and three were teaching middle school. Two of the participants were school administrators—one in an elementary school and one in a high school. The final participant was a middle school teacher who was acting as a substitute teacher. This was an online program, so all observations were done during optional face to face meetings online via Zoom. Additionally, all surveys were anonymous and were distributed using the course’s “Desire to Learn (D2L)” platform. There were no IP addresses collected to maintain anonymity, and the Institutional Review Board approved this study. The surveys were collected at the beginning and end of the semester.

One unique situational context is that this course was formative until the final capstone was submitted during the final week of the course. The paper was submitted multiple times for feedback; each candidate had the opportunity to make constant revisions until final grades were submitted. It should be noted that the feedback was asset-based and incredibly detailed. Students were provided with an “estimated” grade; this is what he or she would have earned on the paper if it were submitted without revision. Students were then given repeated comments through the “comment and track changes” feature in Microsoft Word. This allowed for the student to focus on both the paper’s strengths and areas needing improvement. It also allowed both the current instructor and future instructors to see all of the changes that students made to their papers and the feedback upon which those changes were based. In most cases, the paper submitted by the due date was the final submission—no additional edits were needed.

Data Collection

- In order to answer the research questions, there were two surveys and a midpoint questionnaire developed for this study. To recall, the research questions were: Did the capstone course increase the depth of knowledge of students, as evidenced by their signature assessments (the capstone papers)?

  o Sub-question: Did the capstone course increase the depth of knowledge of students with regard to formulating a statement of the problem and research questions based upon what they have learned in their program, followed by a review of literature and the execution and write up of a research project?

    - Did the capstone course increase the sense of efficacy of students with
regard to conducting and describing research in their content areas/fields?

The survey questions were aligned with categories on the capstone rubric. The first survey was on efficacy. It was 15 questions, with five questions each devoted to students' confidence in their abilities related to research concepts, confidence in their knowledge of the research process, and confidence in their knowledge of APA format (Appendix A). This survey was administered in the first week of class and again during the final week of class. The survey included five likert scale options as possible responses (Appendix A). These responses ranged from indicating “no knowledge” of the criteria to “mastery-level understanding” of the criteria.

The second survey was administered identically to the first. It was linked in the D2L course in the first week of class and again in the final week of class. The survey had similar likert scale response options, ranging from “strongly disagree” to “strongly agree” (Appendix B). The prompts in this survey were nearly identical to those in the efficacy survey; they asked about depth of knowledge (Appendix A). However, the efficacy survey included the term "confident" and phrased the prompts differently to address students' sense of efficacy in completing the process. The three sections were also devoted to research concepts, research process, and APA formatting (Appendix B).

At the midpoint of the semester, an open-ended questionnaire was linked through D2L as well. This allowed for anonymous candidate feedback on the process. The first question asked how students felt about completing a major research assignment (efficacy), and the second question asked how their depth of knowledge on completing a literature review had changed. These questions provided insight into the students' process; this was to determine if the course was responsible for the changes that might be seen when looking at the pre- and post-survey data.

Analysis and Results

Five out of eight students responded to the pre-surveys. Four out of eight students responded to the “Efficacy” post-survey, and three out of eight responded to the “Depth of Knowledge” post-survey. Each response was a forced single response, meaning that each participant provided only one response per question. The likert responses were identical for each survey. The possible responses were:

1. do not understand this concept or never seen before
2. have seen/am somewhat familiar with this concept
3. feel somewhat comfortable with this concept
4. understand this concept and/or am able to utilize this skill consistently
5. master level/I can teach this to others.

The results are included in Table 1 and Table 2. Both tables are included below in order to emphasize the changes from pre- to post-survey.

**Table 1**

**Efficacy Survey Results**

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Pre-Results</th>
<th>Post-Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficacy on choosing a problem related to content</td>
<td>4.0</td>
<td>4.75</td>
</tr>
<tr>
<td>Efficacy on using scholarly literature appropriately</td>
<td>3.4</td>
<td>4.0</td>
</tr>
<tr>
<td>Efficacy on using practitioner pieces appropriately</td>
<td>3.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Efficacy on connecting literature to problem of practice</td>
<td>3.6</td>
<td>3.75</td>
</tr>
<tr>
<td>Efficacy on importance for students and the field</td>
<td>3.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficacy on pulling literature from multiple databases</td>
<td>4.0</td>
<td>4.75</td>
</tr>
<tr>
<td>Efficacy on connecting literature to conceptual framework</td>
<td>3.4</td>
<td>4.5</td>
</tr>
<tr>
<td>Efficacy on research questions addressing topic</td>
<td>3.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Efficacy on choosing a research method appropriate to answer research questions</td>
<td>3.6</td>
<td>4.25</td>
</tr>
<tr>
<td>Efficacy in ensuring that capstone will reflect changes in thinking across the program</td>
<td>3.4</td>
<td>3.75</td>
</tr>
<tr>
<td>APA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficacy on locating sources and putting them in sections with APA headings</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Efficacy on citing appropriately throughout document</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Efficacy on evaluating sources prior to citing</td>
<td>3.6</td>
<td>4.0</td>
</tr>
<tr>
<td>Efficacy on citing appropriately in reference section</td>
<td>3.8</td>
<td>3.75</td>
</tr>
<tr>
<td>Efficacy on writing utilizing appropriate APA throughout</td>
<td>3.8</td>
<td>3.5</td>
</tr>
</tbody>
</table>

The most significant finding illustrated by Table 1 is the decrease in efficacy in two areas. The discussion section of this paper will go into more detail, but the "efficacy on citing appropriately in reference section" and "efficacy on writing
utilizing appropriate APA throughout" were criteria where students felt more confident at the beginning of the course than they did at the end. Given that the study is grounded in what Brown et al. (2014) call "the science of successful learning" (n.p.), this is important. Graduate students (and all learners) often determine at the end of a course that they were poor judges of when they learned well and when they did not (Brown et al., 2014, p.3).

Table 2

Depth of Knowledge Survey Results

<table>
<thead>
<tr>
<th>Content</th>
<th>Pre-Results</th>
<th>Post-Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can identify a problem of practice or research topic in my content area.</td>
<td>3.8</td>
<td>3.67</td>
</tr>
<tr>
<td>I can conduct a review of relevant literature.</td>
<td>3.4</td>
<td>3.67</td>
</tr>
<tr>
<td>I can differentiate between scholarly and practitioner articles.</td>
<td>3.6</td>
<td>2.33</td>
</tr>
<tr>
<td>I can connect appropriate literature to my research questions.</td>
<td>4.0</td>
<td>3.67</td>
</tr>
<tr>
<td>I can utilize literature to refine/formulate research questions.</td>
<td>3.6</td>
<td>3.33</td>
</tr>
<tr>
<td>Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can utilize multiple databases to search for literature.</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>I can construct a conceptual framework and problem statement.</td>
<td>3.4</td>
<td>3.0</td>
</tr>
<tr>
<td>I can craft appropriate research questions.</td>
<td>3.2</td>
<td>3.0</td>
</tr>
<tr>
<td>I can choose an appropriate methodology based upon my research questions.</td>
<td>3.6</td>
<td>2.67</td>
</tr>
<tr>
<td>I can complete the research process.</td>
<td>3.2</td>
<td>2.67</td>
</tr>
<tr>
<td>APA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I can utilize headings effectively and according to APA.</td>
<td>3.4</td>
<td>3.33</td>
</tr>
<tr>
<td>I can cite sources appropriately within the text of my paper.</td>
<td>3.8</td>
<td>3.33</td>
</tr>
<tr>
<td>I can evaluate sources, including identifying any problems with the article.</td>
<td>3.4</td>
<td>3.33</td>
</tr>
<tr>
<td>I can create a reference page using APA.</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>I can evaluate an article and find APA errors.</td>
<td>3.2</td>
<td>2.67</td>
</tr>
</tbody>
</table>
The Depth of Knowledge survey expanded upon the “Efficacy” survey. Aligned with the findings in Table 1 on being poor judges of personal learning, students revealed many decreases from pre- to post-survey in their depth of knowledge. As noted in Brown et al. (2014), this is likely due to students' use of "calibration" (p. 210). By investigating their "illusions" about their learning and comparing those to their evaluations, they found that they were not as knowledgeable about various criteria as they believed when the course began (Bailey, 2006). This is demonstrated by students’ increased responses criteria listed (Appendix B). The extent to which the students doubted their depth of knowledge is discussed further in the discussion section below.

In addition to the pre- and post-survey, there was an open-ended midpoint survey administered. Four out of eight students responded to that survey. The first question asked about students' confidence in completing a major research assignment at that point in the course (i.e., at the ten-week mark in a sixteen-week course). One respondent noted that he or she was surprised at how well he or she did on the literary analysis portion of the course, which referred to feedback from the instructor on the literature review section of the capstone paper. Another respondent noted that time management was critical in having confidence in completing a major research assignment and noted that "[t]he past few semesters have been marked by the constant interference of life. But no matter how ahead you get, or fall behind, just keep pushing forward.". This increase in confidence due to relevance of the research to the teaching context was repeated often in other contexts.

The second question asked how the students’ depth of knowledge in conducting a literature review had changed. At this point in the course, most students had only completed the literature review and had not done any data collection. Two respondents noted that their depth of knowledge had not changed but did not expound upon whether that meant they still knew very little or whether they felt comfortable with literature reviews prior to the course. A third respondent explained that staying focused was the key to doing well on literature reviews. The fourth respondent noted that while "getting used to writing again was a stumbling block," understanding how to find the literature was critical.

**Discussion**

The capstone course, specifically the process of conducting a research project, did not increase students' sense of efficacy in conducting research or their depth of knowledge on the research process in measurable ways. Generally, the observation data confirmed what was reported in the surveys. Students felt quite
confident in their ability to conduct a major research assignment and certainly felt confident in their ability to use APA formatting to write up their literature review and data processes when the course began. However, when asked about their depth of knowledge, their responses indicated a lesser depth than their efficacy scale indicated. Additionally, there were often decreases in the rating from the pre- to post-surveys, and if there was an increase it was minimal. This corroborates previous findings that people are "usually overconfident in their estimated knowledge" (Lundeberg et al., 1994, p. 3). Additionally, the findings parallel previous studies on "calibration in confidence"—meaning that as a person learns, they calibrate their confidence to reflect their increasing knowledge. As students in the current study responded to the post-survey, they realized that they knew less than they estimated on the pre-survey in many cases.

The midpoint survey was also illuminating in multiple ways. First, it confirmed another note in the researcher's observation journal. There was some confusion on the part of at least two students on the formative grading system. One candidate noted in the midpoint survey that he or she "was surprised by how well [he or she] did on the literary analysis assignment.". The literary analysis assignment he or she referenced likely referred to the graded literature review portion of the paper. However, that portion of the assignment was for a completion grade only; there was substantial feedback on each submission requiring edits prior to the next submission. In future iterations of the course, even after it was revised into two courses—"Capstone 1" and "Capstone 2"—the researcher should begin offering even more detailed formative feedback. In addition to the comments on papers, which were still asset-based and focused on both strengths and areas of improvement, it is now also a course requirement to have two face to face (synchronous) digital conferences where they used to be optional. This allows a conversation about the work of the graduate student and how it furthers his/her teaching goals.

Another candidate noted that "middle school students are thankful for their school and lives.". This certainly indicates a connection to the research topic and a sense of efficacy that the topic is impacting students. However, that same respondent noted that his or her depth of knowledge had not changed over the capstone course. This prompts the following question: If there is no increase in knowledge on how the research is impacting the students, is the change in efficacy warranted by knowledge of the research? The changes in the scores on the pre- and post-surveys indicate that it is not. One SoTL study indicates that this may be due to exposure; students who practice their craft repeatedly become more confident regardless of any change in their knowledge base (Gormally et al., 2009). A group faculty discussion also indicated that students were rushed in the original version.
At that point there was only one course as opposed to both Capstone 1 and Capstone 2, and this meant that students were not able to take the time needed to process so much new information.

**Efficacy Surveys**

The Efficacy surveys were divided into three sections. The first section was generally about research concepts. Questions in this section asked students to rate their confidence level in completing certain concepts—such as choosing a problem related to their content or using scholarly literature appropriately (see Appendix A). In this first section, students’ responses indicated show some increases in student efficacy between the pre- and post-surveys. For example, candidate scores measured from an average of 3.4 (with 3.0 being somewhat comfortable with the concept) to 4.0 (with 4.0 indicating comfort and ability to perform consistently in this area) on using scholarly literature appropriately. This gain reflects the work students did compiling the review of literature and revising that section repeatedly prior to the final submission. The largest increases measured using practitioner pieces appropriately and feeling confident that the research is important for students and the field; the first went from 3.2 to 4.0 and the latter went from 3.8 to 4.5. In both cases, the increases in scores are logical. Students likely knew little (if anything) about practitioner literature prior to the course, and all students engaged in research directly impacting their classroom or school.

In each question in the process section of the efficacy survey, students also showed in increase from pre- to post-survey. Students indicated significant increases in confidence in response to two prompts in particular. The first, efficacy on connecting literature to the conceptual framework increased from 3.4 to 4.5, and it was the largest increase across all surveys. The second increase measured student efficacy on formulating research questions that addressed the research topic; students average went from 3.8 to 4.5. In both cases, the increase indicates that students believe they are near mastery level upon completion of the capstone report. These results additionally indicate that research process instruction is a strength of the course design; each section of the paper was turned in as it was developed, and students received feedback with each revision. The process of formulating a question based upon a review of literature, choosing a methodology, determining the conceptual framework, utilizing APA to cite literature, collecting data, analyzing data, and writing up a report were all clearly defined for students. Additionally, modules were devoted to their development of those sections.

However, students' confidence may be falsely inflated (Brown et al., 2014). Students in this course were observed using performance goals as opposed to
learning goals. In setting a learning goal, students aim for learning and growth; in a performance goal, students focus on "validating or showing off... ability" (p. 180). For example, the APA manual was examined via a lecture, readings, and a quiz. APA was seen in the original version of the course as a drill of skills with a one-time assessment, where the refining of research questions and methodologies were repeatedly woven into future sections of the course. Based on the results of the pre- and post-surveys, it seems clear that this pedagogical approach was a failure. APA should be woven in as a process for students like other parts of the research process, especially considering that this citation format is updated every few years requiring all researchers (novice and expert) to re-learn.

The final section of the survey was devoted to APA. Students routinely struggled to master formatting in their papers in the college’s graduate programs. The survey responses reflected that the students realized this. Two questions reflect no growth; one question reflects a very slight increase; two questions indicate a decrease in efficacy. The decreases measured student efficacy on citing appropriately in the reference section and student efficacy on writing utilizing appropriate APA formatting throughout the paper. These also reflected the emotional response students sometimes possessed toward critical feedback. For instance, in the pre-survey, students’ responses indicated that they felt very confident in their APA knowledge, but as they received feedback throughout the course their confidence decreased (Taggart & Laughlin, 2017). In the new program model, Capstone 1 dedicates more time (3 weeks) to ensuring that students know how to use APA to format, revise, and cite in their formal research.

**Depth of Knowledge Surveys and Growth Mindset**

The depth of knowledge surveys offer an interesting contrast to the efficacy survey. The three sections were quite similar. Prompts on the depth of knowledge survey did not include terms of confidence, but they did use the term "I can." The phrasing was often adjusted in prompts, and students certainly responded to those differently. Where students’ responses reflected an increase in efficacy toward all five content prompts in the efficacy survey, the responses showed a decrease in depth of knowledge in four out of five of those same prompts. In response to "I can differentiate between scholarly and practitioner articles" (Table 2), students went from 3.6 (indicating familiarity) to 2.33 (indicating less familiar). Yet in the efficacy survey, students indicated increases in confidence from low 3.0 to 4.0 in using both scholarly and practitioner articles. This difference may be, in part, why the researcher did not see any changes in--or in the development of--a growth mindset during the course.
Finally, responses toward the APA section were a closer reflection to what was demonstrated in the efficacy survey. Students showed a decrease in response to four out of five prompts. The reference page was the only prompt where students’ responses indicated an increase in their depth of knowledge; however, that increase was only from 3.8 to 4.0. This also mirrors what was included in the researcher’s observation log. The students demonstrated both verbally and in the drafts of their capstone papers a thorough understanding of research concepts; they understood why and how to locate literature to support their topic and were able to connect their research questions to a conceptual framework and an appropriate methodology. Each draft and each optional conference also revealed students’ increasing knowledge of the research process; the midpoint survey responses also indicated that practice led to higher quality in their writing. APA formatting was not discussed during the conferences, but it clearly should have been since it was the area of weakness for most students. This change was implemented as an instructional improvement right away.

This survey’s responses mirror literature on “illusions of knowing” (et al, 2014, p. 15). Students who are exposed to material repeatedly (e.g., students hearing certain academic terms repeatedly as in the case of this research course), believe they have achieved mastery. When faced with critical, constructive feedback and forced to “reflect” and “calibrate” (p. 210), students realized that they still had much to learn to become competent in research. This growth mindset may be what students need to become more proficient beyond the course, but it explains why they showed a decrease from pre- to post-survey.

Conclusions and Limitations

This study affirms the literature that indicates what students described; an additional course devoted solely to reviewing literature and APA formatting is needed. Thus, this study provides information that can be used as points of comparison nationally and internationally. Additionally, this study provides information for other programs using authentic assessments such as a capstone course. Students in this study were not able to articulate increased depth of knowledge at the completion of the course and paper. Additionally, graduate students in programs of education may not know how to articulate what support they need to successfully complete assessments like thesis papers, capstones, or dissertations.

Correspondingly, another limitation of the study is that a pre- and post-survey is likely not the most effective way to determine what the course and project has done for students’ efficacy and depth of knowledge (Hess, Jones, Carlock, &
Walkup, 2009). Instead, in future studies, a pre- and post-survey may be administered, but interviews and a focus group would better determine causality. An interview would allow probing questions on why a candidate's sense of efficacy in using APA decreased over time, for example. In order to use this study to improve teaching, using more open-ended questionnaires at multiple points throughout each semester is prudent. There should also be a voluntary focus group session at the midpoint of the course for students to give feedback on growth areas based upon their initial drafts. This may not only add to SoTL scholarship on authentic assessments and high impact practices (e.g., capstone projects and master's level research), but it may also improve students' satisfaction with the course and program.

As self-efficacy is a predictor of graduate student success, this study adds to literature encouraging developing efficacy through appropriate supports (Huerta et al., 2017). As colleges of education--and service field graduate programs more generally--consider the needs of graduate students, providing support that include content knowledge and knowledge of the academic writing demands are critical (Darling-Hammond, 2012; Brown et al., 2014).

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Appendix A

Efficacy survey

1. I agree to participate in this research student (student moves forward)
2. I do not agree to participate (survey does not appear)

Directions: This survey is designed to provide the program faculty with a better understanding of the depth of knowledge students report in elements of completing the capstone.

For all questions, the responses are:

1=do not know/do not understand
2=have seen/am somewhat familiar
3=feel somewhat comfortable
4=understand and/or am able to do consistently
5=master level/could teach to others

Concepts

1. I am confident that my project addresses a problem relevant to my content
2. I am confident that my project utilizes scholarly literature appropriately
3. I am confident that my project utilizes practitioner pieces appropriately
4. I am confident that my project connects the literature to my problem of practice
5. I am confident that the problem of practice I identified is important to my students and my field

Process

1. I am confident that I am able to pull relevant literature from multiple databases
2. I am confident that I am able to connect literature to the conceptual framework
3. I am confident that the research questions address the topic I want to
I am confident that I chose an appropriate method to investigate the research questions.

I am confident that the signature assignment (capstone) appropriately reflects the progress I have made in my thinking across the program.

**APA**

1. I am confident that I am able to locate sources and place them in appropriate headings in my paper.
2. I am confident that I am able to cite sources appropriately using APA in the text of the document.
3. I am confident that I am able to evaluate sources in order to determine if they are methodologically sound.
4. I am confident that I am able to cite sources appropriately in the references.
5. I am confident that my writing, including headings, appropriately utilizes APA.

**Appendix B**

**Candidates' Depth of Knowledge Survey**

**Completing a capstone (signature program assignment)**

1. I agree to participate in this research student (student moves forward).
2. I do not agree to participate (survey does not appear).

Directions: This survey is designed to provide the program faculty with a better understanding of the depth of knowledge students report in elements of completing the capstone.

For all questions, the scale is:

1 - Do not know/understand this concept/have never seen this before.

2 - Have seen and/or am somewhat familiar with concept.
3 - Feel somewhat comfortable with this concept
4 - Understand this concept and/or am able to utilize this skill consistently
5 - Mastery level - I could teach this to others

Section 1: Content

1. I can identify a problem of practice or research topic in my content area
2. I can conduct a review of relevant literature of scholarly articles
3. I can differentiate between scholarly and practitioner articles
4. I can connect appropriate literature to my research questions
5. I can utilize literature to refine/formulate research questions

Section 2: Process

1. I can utilize multiple databases to search for literature
2. I can construct a conceptual framework/problem statement
3. I can craft appropriate research questions
4. I can choose an appropriate methodology based upon my research questions
5. I can complete the research process (from conceptualization to write up of project)

Section 3: APA

I can utilize headings effectively and according to APA

1. I can cite sources appropriately within the text of my paper
2. I can evaluate sources, including identifying any problems with the article methodologically.
3. I can create a reference page using APA
4. I can evaluate an article and find APA errors
Pivot—it’s a word that many educators, as well as those of us in the field of instructional design and technology, have come to view in less-than-positive terms over the course of the past several months. The term has been used repeatedly in reference to the transition of instruction to virtual delivery in response to the COVID-19 pandemic (e.g., Daniel, 2020; Darling-Hammond et al., 2020; Gardner, 2020; Ferdig et al., 2020; Fernandez, & Shaw, 2020; Lasse, 2020; Sullivan et al., 2020; Teräs et al., 2020). Given that pivot typically refers to a quick turn or rotation (MacMillan Dictionary, n.d.), anyone who has planned online instruction realizes this word does not accurately reflect the extensive amount of time and effort required for creating effective online learning experiences (Hodges et al., 2020).

The ubiquitous, global need to cease in-person educational experiences and shift to virtual delivery presented a unique opportunity to reflect on what are the important guiding principles for designing learning solutions during these challenging times. Before describing these four principles, it is important to be clear about the fact that the ideas shared as follows are nothing new. As a matter of fact, some of these ideas have been around for a very long time. Since the beginning of the pandemic, a deluge of information has emerged related to online course transition strategies, in an effort to support the immediate professional development needs of educators at every level and in every corner of the earth. In considering what guidance to share with regard to instructional design for online learning during these challenging times, some foundational ideas come to mind, ones that are underscored by research and best practices in the field.
Simplicity

The instructional design process provides a reliable foundation on which to build effective online learning experiences. At its core, the systematic nature of ID can guide our thinking about what learners need to learn, and how to successfully elicit these targeted outcomes within the affordances and constraints of the given learning environment. At a time of great uncertainty and constantly changing conditions, relying on straightforward, proven design approaches such as the ADDIE framework to guide the creation of learning solutions seems like an effective option (Hodges et al., in press). This is not to suggest that such a process is simple, but rather to propose relying on what is a known and trustworthy framework.

The creative aspect of instructional design may seem the most daunting at a time of so much change. Again, earlier work related to distance and online learning offers an abundance of ideas for how to plan engaging and effective learning experiences through a variety of delivery modes. For example, one of the most challenging aspects of ID during these ever-changing times is likely the selection of instructional strategies, given varying delivery modes. The IDT knowledge base provides excellent guidance for creative teaching method choices, aligned with the features of various learning environments. While technologies have evolved to bring interactive video conferencing to individual students, the affordances of desktop conferencing tools such as Zoom have much in common in terms of design possibilities. For example, Cyrs and Conway (1997) offer over 100 activities that can be employed to actively engage learners in synchronous learning sessions. While these activities were designed for use in classroom-based conferencing in an earlier generation of distance education, they still present viable and motivating ways to facilitate learning. Shank (2011) presents a wide array of creative and practical instructional strategies for online learning in both synchronous and asynchronous contexts. For assessment ideas, Palloff and Pratt’s (2008) exploration of ways to measure learning in online settings remains a standard guide for planning assessments for any type of outcome. These are but a few of the trusted resources that can provide helpful insights and ideas to incorporate into online course design efforts.

Flexibility

Has there ever been a greater need for flexible learning options? The notion of flexible approaches to teaching and learning is not new (Hill, 2006). Formal models of flexible delivery have been with us since the beginning of
correspondence study, representing the first instance of distance education, or home study (Holden & Westfall, 2010), providing learning opportunities for those who could not access traditional, location-based education. The idea of mixing modes of instructional delivery also has a long-standing history in our field. Keller’s Personalized System of Instruction (Keller, 1968) was one of the earliest forms of blended learning, including a mixture of independent learning with guided in-person instruction. This multi-modal design strategy was founded on consideration for which learning events could effectively be undertaken independently and which would benefit from social interaction, excellent guidance for those who need to plan for online and classroom-based experiences.

More recent forms of mixed-mode instruction have also originated from systematic design practices and been informed by research over the years. Best practices in hybrid and blended learning (Holden & Westfall, 2010; Stein & Graham, 2020), flipped learning (Altemueller & Lindquist, 2017) and hybrid-flexible, or the HyFlex model (Beatty, 2019) provide relevant and timely insights for the creation of learning experiences that are distributed across time and place. Going back to the notion of a standard ID approach, the analysis phase of design can be used to consider the many ways in which flexible learning approaches can help meet the needs of learners based on their current context (Hill, 2006; Willems, 2011).

**Accessibility**

The imperative to make learning solutions accessible to all is a long-standing requirement in the design and development of educational programs in general, with specific considerations needed in the realm of online learning. Perhaps a distinction between access and accessibility is important here—access related to the ability to obtain necessary resources or entry into the learning program and accessibility regarding the design of the instructional resources or activities so that all learners may benefit from them. Earlier this summer, Johnson et al. (2020) investigated U.S. faculty and administrator experiences and approaches in response to the pandemic and found that both access and accessibility posed challenges in the transition to emergency remote teaching. Returning to the notion of systematic design, consideration of the learning contexts, as well as the teaching context, can help guide decision-making related to the planning of materials and instructional strategies that are accessible in both aspects. Recent guidance on universal design for learning in online learning contexts can serve to address these related needs (Barrett et al., 2020; CAST, 2018).
Empathy

During this incredibly difficult time for those in education and learning professions, the need for empathy is essential, for our learners as well for ourselves. For those with little or no experience in the realm of online teaching and learning, the rapid shift to a completely different approach has left many with a multitude of negative emotions—anxiety, frustration, helplessness, and anger, to name a few. And then there are those who support these educators, perhaps feeling the same emotions as well. How can we be intentional about our efforts to support learners, our teaching colleagues, and ourselves?

While empathy is not typically featured in a specific sense in the systematic design of instruction, consideration for the learners and the learning context can form the basis for empathetic design. Lessons learned from the research conducted by Matthews et al. (2017) describe concrete ideas, as well as identify realistic tensions, involved in the deliberate inclusion of empathy in the design of distance and online learning. Possible strategies to support the well-being of learners during these challenging times include setting flexible expectations, creating a sense of belonging, incorporating routines, prioritizing design decisions with an eye toward streamlining requirements, and humanizing the learning experience (Hodges et al., in press).

In addition to attending to the care of our students through strategic planning and thoughtful design decisions, it is also important to care for ourselves. Instructional design efforts in the COVID-19 era are undoubtedly fraught with challenges—logistical, pedagogical, emotional, and more. When considering how to go about the planning, design, development, and implementation of educational experiences, we must think also of what is feasible for us as practitioners and learning professionals. Factors that should come into play involve identifying what is realistic for us in the design process in terms of time, access to necessary resources, and comfort level with potential technological systems or tools, or pedagogical approaches. Whatever can be done to ease the burden of creating learning solutions during this problematic time should be given serious consideration.

Final Thoughts

Though the aforementioned design “beacons” are likely not new ideas for most in the instructional design profession, it is hoped that they can be a helpful reminder of key factors to contemplate in future ID efforts during the COVID-19 era. May it
also serve to applaud the efforts of those on the front lines of education everywhere, striving to effectively meet the needs of learners while meeting the demands of changing professional practice. This difficult work will inform the creation of learning experiences in ways that we cannot possibly imagine.

References


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