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Lifelong Learning of Instructional Design and Educational Technology Professionals: a Heutagogical Approach

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Abstract

Lifelong learning is an important but often implicit part of the job for instructional designers and educational technologists (ID/ETs). While literature discusses improving on-the-job learning experiences of others, relatively little has been written on the lifelong learning practices of ID/ETs. We interviewed 31 professionals to explore ID/ETs' attitudes towards lifelong learning, motivation for seeking learning opportunities, and learning approaches. The Constant Comparative Method for Naturalistic Inquiry was used to analyze the transcripts. As predicted by heutagogy, the study of self-determined learning, participants demonstrated traits of capable learners who view learning as part of their job and use a range of approaches to plan and continuously reflect on their learning. We recommend that employers promote self-determined learning practices within their organization, and that educators prepare students to be self-determined learners. We further recommend that academia, practitioners, and students contribute to repositories of resources and examples to learn from each other.

Keywords Educational technologist · Heutagogy · Instructional designer · Lifelong learning · Life-long learning · Reflection-on-action · Reflection-in-action

Introduction

The life's work of instructional design and educational technology professionals (ID/ETs) is to help others master knowledge and skills, by designing learning experiences for classroom, online, on-the-job, or informal learning environments. Yet, globalization, diversifying communities, rapid evolution of technology, transformations in the market, and the changing needs of organizations and individuals require ID/ETs to constantly (and often rapidly) update their knowledge and skills, grow professionally, and help their learners grow. While there is significant literature aimed at ID/ETs related to professional development of those they serve, research on their *own* lifelong learning practices is still limited. (The few studies we were able to locate include Klein & Moore, 2016; Moore & Klein, 2015; Yanchar & Hawkley, 2014.)

The purpose of this study is to learn more about the attitudes, motivations, and learning approaches used by ID/ETs on the job. We interviewed 31 instructional designers and educational technologists from across K-12, higher education, and corporate domains. Findings of this study may be of interest to practicing ID/ETs, managers and HR staff interested in promoting a learning organization and supporting individual learning endeavors, and other professionals interested in lifelong learning approaches. Educators who seek to prepare ID/ETs to thrive in the workplace throughout their careers may use our findings and insights in developing curriculum and pedagogy aimed at preparing ID/ETs to thrive in a constantly evolving profession.

Literature Review

Andragogy and Heutagogy: Two Sides of a Coin

Adult learning is often discussed in terms of andragogy, or how to teach adults by capitalizing on learning preferences, past experiences, individual needs, and relevancy of information (Knowles, 1980). However, andragogy does not discuss the ways that professionals *teach themselves* without instructors or pre-determined materials. Heutagogy, the study of self-determined learning, recognizes that learners seek out

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their own learning experiences, develop the capacity to learn, reflect on their own learning processes, and apply knowledge and skills to complex problems, often in unfamiliar or changing settings (Blaschke, 2012; Eberle, 2013; Hase, 2009; Hase & Kenyon, 2007, 2013). Because IT/ED requires practitioners to continue learning across their professional lives, heutagogy better reflects their learning needs of design professionals than andragogy.

Heutagogy assumes: (1) everyone has the potential to learn; (2) people learn throughout their lifetime; (3) learning is learner-defined and proactive, and supports creativity, innovation, and new ideas; and (4) adults need to re-learn how to learn to become self-determined learners (Hase & Tay, 2004). Heutagogy embraces the notion of "capable learners": learners who have the ability and self-efficacy to learn effectively and independently, to reflect on their learning, and to apply that learning to unfamiliar situations (Blaschke, 2012). Heutagogy relies on a high level of learner autonomy and intent to fill knowledge gaps (Tay & Hase, 2010), as well as the motivation and emotional commitment to engage in learning (Hase & Kenyon, 2013).

In heutagogy literature, learning is often represented as a double-loop process (Eberle, 2013). Single-loop learning involves learning through and from an iterative problem-action-outcome approach to problem-solving. Heutagogy literature also discusses how this new knowledge influences existing beliefs and values that govern our understanding about how to approach problems within a particular domain; this, in turn, impacts our understanding of the problem and therefore actions taken as a result (double-loop learning) (Argyris & Schön, 1978; Eberle, 2013; Eberle & Childress, 2009). This type of learning is required to move from reacting to immediate problems, and from focusing on current problems to growing as a designer.

Learning from and through Engaging in Design

Holistic reflection is critical to heutagogy, as it allows synthesizing not only what was learned, but also *how* it was learned (metacognition) (Blaschke & Brindley, 2011; Blaschke & Hase, 2016). Reflection on one's own lived experiences is an important part of knowledge and skill acquisition, particularly in design fields (Schön, 1987). Since there is no single solution for ill-structured design problems, designers need to be able to evaluate problems, ideas, constraints, and potential outcomes (Nelson & Stolterman, 2003). To do so, they use reflective thinking to stay cognizant of their actions and decisions, and how these impact the design process itself (Hong & Choi, 2011).

Discussions about reflection typically refer to *reflection-on-action*—analyzing and making sense of individual experiences, practices, and beliefs after-the-fact. However, individuals also engage in *reflection-in-action* during a design experience. This is often triggered by an unexpected outcome to earlier design decisions, which then forces critical reflection on the situation, in turn leading to on-the-spot experimentation and problem solving. For experts, reflection-in-action is naturally embedded in practice as a context-specific, cyclical process, where a reframed problem becomes the field for new experimentation and, if a solution is not found, a new reframing (Schön, 1987).

Such reflections both in- and on-practice can help instructional designers build their own repository of design precedents (Tracey et al., 2014). *Precedents* typically refer to episodic memories of past design situations with an underlying pattern, theme, or affordance that, in their own mind, connects the two situations (Lawson, 2004). Experts have a large mental repository of relevant precedents based on their prior design experience as well as the ability to use others' work as a starting point for their own designs (Lawson, 2004). However, novice and experienced designers alike should take advantage of multiple, diverse opportunities to build and organize design precedents through reflection-on-action, as well as the analysis of the work by other designers (Baaki & Tracey, 2015; Lawson, 2004; Tracey et al., 2014).

Lifelong Learning of ID/ETs

A significant body of research on the work of instructional designers or educational technologists reflects the complexity of the field (e.g., Gray et al., 2015; Sugar & Luterbach, 2016) and the diverse knowledge and skills needed in the profession (e.g., Park & Luo, 2017; Ritzhaupt et al., 2018). Formal education (e.g., higher education) and development of expertise to meet workplace needs has been a topic of much research (e.g., Kumar & Ritzhaupt, 2017; Sharif & Cho, 2015). However, research on lifelong learning among ID/ETs is limited, much of it done by a small set of scholars. One review of empirical research by Klein and Moore (2016) identified 20 categories of informal learning (i.e., self-directed independent learning) across multiple fields that occur in the workplace, including the use of resources (e.g., professional publications, tutorials, job aids), interactions with professionals and peers, and experiential learning opportunities (e.g., engagement in trial and error/experimenting, critique sessions, and individual or group reflections). Moore and Klein (2015) found that graduate students use informal learning methods such as searching the Internet, talking with others, sharing resources, reflecting on their own actions, trial and error, collaboration, scanning professional magazines and journals, and observing others (Moore & Klein, 2015). Yanchar and Hawkley (2014) found that informal learning is an implicit part of instructional design practice, and that it is innovative, continuous, and part of the formation of design judgement. They also emphasized that instructional design itself is a form of informal learning, as each design project is an opportunity to explore a unique

design situation. Yanchar and Hawkley's (2015) participants utilized observations/shadowing and review of artifacts. Yet, professionals may not always take advantage of informal learning opportunities due to limited time, workload, and the perception that what they already know is sufficient for new projects (Yanchar & Hawkley, 2015).

The purpose of this study is to explore lifelong learning attitudes and practices among a diverse range of ID/ETs, through addressing the following research questions:

1. What attitudes towards lifelong learning do participants indicate are important for those working in this field?
2. What motivates participants to seek learning opportunities?
3. What approaches to learning are used by participants?

Methods

Data used in this paper was gathered as part of a larger study on knowledge, skills, and attitudes ID/ETs require on the job.

Participants

Thirty-one instructional designers and educational technologists were recruited through a combination of purposeful sampling techniques, as recommended by Palinkas et al. (2015). Criterion sampling was used to identify equal proportions of participants from K-12, corporate, and higher education, who: regularly design online and/or face-to-face training or materials; regularly modify or update existing training content; use educational technology to augment or adapt learning experiences; and/or guide others to use educational technology in their classrooms.

Link-tracing sampling was used, in which respondents recommend other respondents "according to some inclusion criterion defined by the researcher" (Spreen, 1992, p. 35), beginning with members of the researchers' own personal network forwarding invitations to individuals matching the criterion.

Thirty-one participants qualified for the study and completed the interview. These included 11 from K-12, 11 from higher education, and 9 from corporate settings. While the range of participants' experience ranged from being new to the field (1–5 years; eight participants) to over 20 years of experience (three participants), the majority (or 38.7%) had 6 to 10 years of experience (M = 10 years). All the participants had at least a master's degree (64.5% of those had a degree related to ID and/or ET). Additionally, 41.9% had a doctorate, including 11 in ID and/or ET related programs, and two in education administration and leadership.

Data Sources and Analysis

We conducted 60–90-min semi-structured interviews with each participant. Each interview was recorded and transcribed verbatim.

Data was analyzed using the Constant Comparative Method for Naturalistic Inquiry (Lincoln & Guba, 1985) to identify emerging themes within and across transcriptions. A discrete idea (i.e., word, phrase, or paragraph) served as a unit of analysis (Ellis, 2015). First, we analyzed each source individually. Next, we looked for themes across sources, reviewing each theme and sub-theme multiple times and combining, splitting, or regrouping coded segments to create categories (see Fig. 1). We placed each idea under a single category. However, surrounding text was included on individual cards to ensure that the ideas and rich descriptions stayed intact to provide context. For example, an interviewee shared "Within instructional design, you know, keeping abreast of the technologies in that, eLearning Consortium, Training Magazine… webinars" was divided into such themes as "Keeping up-to-date" (under the theme "Motivations"), as well as subthemes "Resource Websites," and "Webinars" (category "Resources," theme "Resources") (for more information see Exter & Ashby, 2019). We reviewed all the categories, themes, and subthemes on an ongoing basis to ensure that we focused on discrete ideas and were in alignment with our preliminary framework, as well as the existing research literature. The findings section is organized based on the categories, themes, and sub-themes that emerged (as summarized in Fig. 1).

Themes listed in this paper include those related to attitudes towards lifelong learning, reasons for informal learning, and strategies and resources used for lifelong learning.

Creditability and Trustworthiness

Trustworthiness of the data analysis was maintained by addressing multiple criteria as described by Lincoln and Guba (1985), including:

– *Credibility*: We implemented two types of triangulation (data source – by interviewing participants working in the field but with varied educational and professional backgrounds; and investigator triangulation; Carter et al., 2014).
– *Transferability*: We purposefully sampled to include participants with a range of backgrounds and job types. The findings are congruent with existing theory on lifelong learning and heutagogy, although they extend this to the field of ID (Miles et al., 2020).
– *Dependability*: Our interview protocols were rooted in extensive review of literature. Additionally, coding was done by two reviewers with an ongoing discussion and negotiation of categories and themes (Exter & Ashby, 2019).
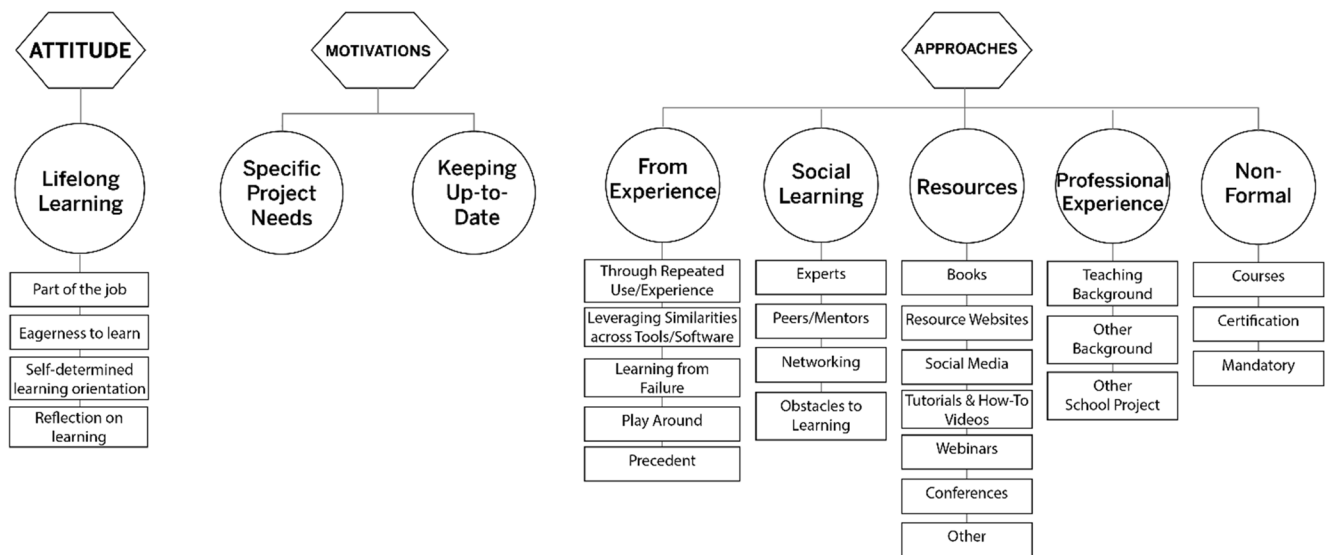
Fig. 1 Categories (1st level), Themes (2nd level), and Sub-themes (3rd level)

– *Confirmability:* We recorded our interviews and transcribed verbatim. Recordings were used again when the meaning of the transcription section was not clear.

Findings

Figure 1 summarizes the themes that arose from the interviews. In the sections below, we discuss some of the more interesting themes that align with heutagogy, including lifelong learning attitudes, motivations for lifelong learning, and themes related to learning from experience, which provide insights into how single- and double-loop learning occur on the job.

Analysis revealed no difference in themes between instructional designers and educational technologists, or between K-12, higher education, or corporate settings. Therefore, the themes and examples given below span all groups.

Lifelong Learning Attitudes of Capable Learners

Participants considered themselves capable learners, who were comfortable with their ability to efficiently and effectively learn what they need. "I know and I'm pretty much always aware of different sources where I can go and learn and that's really helpful."

Lifelong Learning Is Part of the Job

Participants frequently expressed the importance of lifelong learning in their work. As one explained, "You can't stop learning in a position like this. It's going to constantly be changing so you have to be ok with that." Another stressed,

"if you want this kind of job, you really have to be a self-starter and self-motivator. You are not going to have someone come in to teach you as much as you are going to teach yourself." While some connected this with the constant need to explore and become familiar with new technologies, it was clear that learning went beyond technical know-how:

I'm always learning about a whole bunch of things - new processes, new procedures, new concepts, and then I have to integrate them in a way that makes it possible for me to develop new training or learning for others.

Eagerness to Learn

Participants expressed that they were willing, even eager, to learn on an ongoing basis. As one articulated, "I am very open to learning new things and get excited when I learn new things." Participants mentioned that their level of comfort with technology aided them in acquiring new technical skills; "that's one of the best things about technology, you just need time and a willingness to learn."

Self-Determined Learning Orientation

Participants discussed the need to plan their own learning or find their own learning resources. Often, their learning plan relied entirely on self-learning:

You've got to be willing to create your own educational experiences, because somebody's not always going to be able to give you three thousand dollars to go to that conference…. That's how I use Twitter. I have several tech coaches, that are very, very active. We also use a lot

of Google Plus….. And that's how I would grow, be-cause that's what is available to me. That's what is af-fordable to me.

Even non-formal learning events such as professional devel-opment or certification courses were used it in self-determined ways.

> I just look for what I am interested in. Sometimes, it may be based on some question. And I just do not need to go deeper…. Normally if I am taking a course and I am interested in some key things in the course, I normally make a list. And I seek those things out. Or I may just contact the instructor and say "I just want this stuff, can you help me out?"

Non-formal learning could also be used to augment other forms of learning, or as a jumping-off point.

> I did an eLearning course on TinCan APIs. Wasn't suc-cessful in it because I didn't pay attention much, but I have an idea now that I really have to do a lot more. [After exploring more] I am filling in with the free MOOCs out there. 'Cause then I don't have to pay for an established course, but I can take a course based on my needs and build upon that. If I want to get a certif-icate at the end, I pay attention to what they want me to. But if I use it to get what I need out of it, I do not pay for it, I get the free one.

Reflection on Learning

Participants demonstrated that they were reflective on how they have learned from experience over time:

> I go back and look at the [courses] I've created when I first started…and think… "Oh my gosh, I can do so much better now!" But, I expect that I will continue, hopefully, to improve. With anything, the more experi-ence you get the better you are at it.

While some gained prior experience in similar roles, several mentioned the value of teaching experience, other profession-al work, and school projects. Explaining how some of the things learned working in the space industry carried over to a later position in healthcare, one participant mentioned that "having some kind of experience in the field is certainly help-ful, but… experiences transfer to one business to another."

Most comments involved reflection on the relationship be-tween prior experience and learning. As one started, "If you know that you've done this in the past and you can figure out

an answer, then that puts you in a better position than if you think it can't be done."

Motivations for Learning

Addressing Specific Project Needs

Just-in-time learning was often triggered by the need to select or use a technical tool. One participant explained that in the process of creating an educational app, "I was faced with 'I don't know what I don't know right now.' And trying to find out what tools are available and articulating what my needs are relative to what they're able to do."

Keeping up-to-Date

Participants also sought learning opportunities to keep up-to-date "on an ongoing basis" (as noted by the inter-viewees), either to prepare for potential future projects, or to help them reach the next level professionally. Participants ex-plored forward-looking trends on theory, best practices, tech-nical skills, and the availability of new technologies. One par-ticipant described regularly reviewing publications to "get an idea of what the hot topics are right now" in order to "tie [their work] with current trends." This participant gave the example of learning more about competency-based education, which later helped them to talk to faculty clients about a digital badging system their team supported.

Approaches to Learning from Experience

Participants described several different ways that they learn from and build upon prior experience. These include learning through repeated use or experience, leveraging similarities across tools/software, learning from failure, learning from "playing around", and use of prior experiences and materials one is exposed to as precedent (see Fig. 2).

Learning through Repeated Use or Experience

Participants discussed the value of gaining experience with the same approach or technique over time. As one explained, when learning new techniques, "Now, you just have to prac-tice and you have to go through it and do it over and over again, and have repetition, so you get more comfortable with it."

Others described recognizing how much they had im-proved over time:

> [Before I got the job] I didn't really know Storyline that well. But as a result of using it all the time, I've come pretty far. I would say that I'm advanced in Storyline, but I still do feel that I do need to learn more…
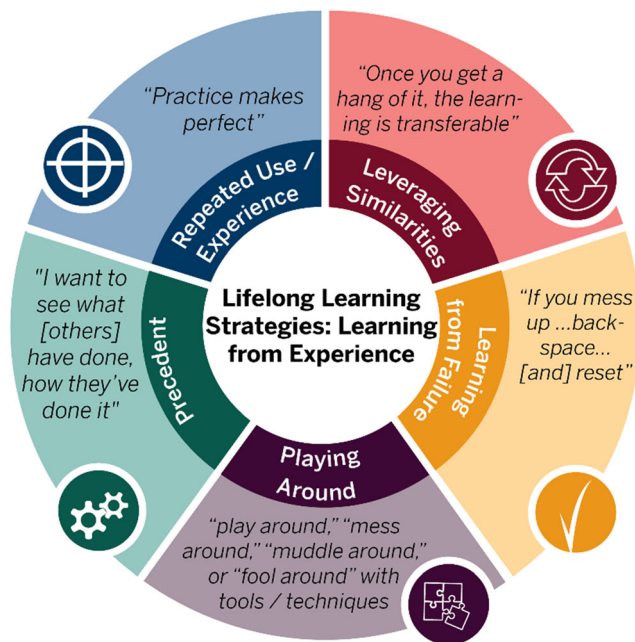
Fig. 2 Learning from Experience

Leveraging Similarities across Tools/Software

These comments typically referred to tool use. Participants explained that once experience had been gained in several software packages for similar purposes, learning the next one became quick, easy, and even intuitive, since they already had an idea of what features a type of software should have, or where features would be located within a particular software suite. As one explained, "Once you get a hang of it, the learning is transferable. So it becomes easier beyond that." Another gave a more specific example:

> And then being able to transfer this knowledge, like using Prezzi, when it came out, everyone was like "wow, that is such a cool tool," but now there are so many tools like Prezzi...There is Realtime Board, where you can use videos. Which is cool, it is just like Prezzi, but it …was not made for presentations alone, it was made for collaboration, but it acts just like Prezzi…

Another named this phenomenon: "you just have to have basic working knowledge of what I would call the trans-literacy of devices."

Learning from Failure

Participants discussed the practice of repeatedly trying different solutions until they found one that worked. As one explained, "everything I've learned, I've learned from just trying, and just keep on pushing buttons, and from many mistakes, and then learning from my mistakes." Participants

stressed they would not last long in this type of position if they allowed failure to upset them:

> If you mess up, you know it is not the end of the world. If you mess up, it does not mean that you are going to be in remediation. It just means that you have to backspace, or you have to reset or you have to start over.

Others explained that lessons learned accumulate across time spent in the field, "I have been working for a long time and hopefully have learned something from my mistakes in the past."

Learning through "Playing around"

Participants described a process of purposeful experimentation to learn a new tool or technique. This often took the form of developing a small personal project which required trying out features of new software. Terms used for this theme tended to be whimsical; in addition to "playing around," participants said that they "mess around," "muddle around," or "fool around" with technical tools or programming/coding languages or techniques. One gave the example of learning a new LMS:

> When you get a new piece of software, are you going to go in and play with it, or do you have the user's guide and how-to book from the very start? ….We give you a Blackboard account and ... you can go in and play with it…. You would go and add things, and upload things, and try to add a video. You know, you would do these [things] to learn how it works, and you would have an idea in your head about the best way to explore a type of technology. I think that [ability is] a lot more important than what specific skills people have.

This approach was not just used to learn individual features, but also to determine how to achieve the results required for a specific project.

> If we know a group needs to do a certain task, what we do is we try to run that task within the software, does it work, does it meet the needs of our audience? If it doesn't, then we have to look at other ways of getting information about it.

Similarly, one described the process of learning HTML: "It was important [that] I would meddle around with the code and try to figure things out on my own. And [then] go on the internet and get some understand[ing]."

Use of Precedent

Mental precedent included experiences with similar situations, designs, or ways of approaching problems that impacted the

approach to a new design. For example, one participant explained that due to prior experience with 60–90 min training sessions, developing similar events "comes very natural…. You still have to figure things out, but you have a good idea in your head of how it should look, how the pieces should come together, what's important, what's nice to have but not necessarily essential."

New situations did not have to be identical or even very similar to earlier experiences being referenced, as long as the participant found inspiration or insight that could apply to the new situation. For example, one explained that they were able to take what they had learned in creating books and e-books and apply this to a new position designing online learning:

> You still have very similar kinds of thinking that goes into it…. [For example,] you need to have a way for students to somehow assess their learning, whether that be for no stakes or lose stakes of whatever, but students like being able to assess...the points out of their learning that the faculty member thinks they should get out of it.

Precedent could also be taken from others' designs or process. As one explained "I find I learn best from other people's and my own experiences. So, not just theory, but I want to see what people have done, how they've done it." In a more specific example,

> I had already worked with this subject matter expert on another project and she saw how…I use Excel to create my objectives and my plan, my instructional design plan, and, so, she created her own Excel spreadsheet kind of similar to mine.

Discussion

A traditional ID lens would suggest that ongoing learning should be fostered through carefully planned training. However, our findings, as well as literature on heutagogy, design practice, and design education, indicate that much of lifelong learning occurs through self-determined, on-the-job learning and reflection. We discuss this further in the sections below. The implications sections provide explicit recommendations to foster self-determine learning and the creation of resources to support such learning on-the-job and within higher education programs.

Learning as Capable Individuals: Self-Determined Learning Orientation

Our participants indicated that lifelong learning is not only *part of the job*, but that they were *eager to learn* and exhibited

a *self-determined learning orientation*. This aligns with Raemdonck et al. ([2014](#)), who suggest that learning is viewed as both a responsibility and an enjoyable activity by lifelong learners. They clearly viewed themselves as "capable individuals" who are flexible in their learning, exhibit confidence in their own competency and ability to learn, reflect on their own learning, and can solve novel problems, all of which are important traits within the heutagogy framework (Blaschke, [2012](#); Blaschke & Hase, [2016](#)).

Our participants identified two major drivers for learning: *keeping up-to-date* and *specific project needs*. Van Rijn et al. ([2013](#)) described keeping up-to-date as acquiring new knowledge about the field by exploring new trends and discussions by reading professional publications, engaging in professional discussions, and presentations and similar activities. Examples given by participants showed that they are flexible and able to shift directions depending on where new information may take them (Blaschke & Hase, [2016](#)). Yet, prior research (e.g., Yanchar & Hawkley, [2015](#)) has shown that competing demands, workload, and similar challenges may make it difficult to prioritize learning, which is consistent with our findings.

Learning through Design: Reflection-on-Action, Reflection-in-Action, and Learning as a Part of the Design Process

Reflective practices are critical for designers to situate themselves within the design process and make sense of their experiences, especially if they involve uncertainty, novelty, and potential conflicted beliefs and values (Cross, [2011](#)). Schön ([1987](#)) discriminates between reflection-on-action, that is, reflecting back on what has been done, and reflection-in-action, that is, reflection in the midst of an endeavor. Our participants exhibited *reflection on their own experiential learning*, as well as what they learned during their formal and non-formal learning and how what they have learned in the past could be applied in the present. However, when asked about their own learning, they spoke much more about practices that align with reflection-in-action, including *playing around*, *learning from failure*, and *finding similarities to known technologies* when learning new ones. Such reflection is often part of a cyclical process, where a reframed problem becomes the field for new experimentation and, if appropriate, newly reframing of the problem.

As was noted by Yanchar and Hawkley ([2014](#)) in their study of instructional designers' informal learning practice, learning is an implicit part of the design process itself, as practitioners continuously reflect on what is occurring, reframe problems, and learn in a just-in-time basis. Instructional designers must be flexible, adaptable, intuitive, and continually engage in innovative learning, in which "encounters with unfamiliar aspects of the situation… propel the

work forward as they invite exploration and learning that leads to the formulation of more possibilities, working toward a progressively refined product" (Yanchar, 2016, p. 17). Learning that occurs as part of the design process will, in turn, challenge existing understandings, thereby promoting additional growth and development (Yanchar, 2016).

Use of precedent allows designers to leverage their own prior practice as well as the design experiences of others. Precedent use is common in design disciplines to enculturate novice learners into the field and help professionals innovate and advance their own skills (Boling et al., 2015). Precedent discussed by our participants generally took the form of their own past designs, or experience of those close to them, which reflects a lack of formalized methods for recording and sharing precedent (Boling, 2010; Boling et al., 2015).

Implications

Implications for Practice: Creating an Environment that Supports Self-Determined Learning

As discussed earlier, ID/ETs, and indeed designers in general, must move beyond utilizing resources to learn on their own time or for their own purposes. Learning must be seen as an intrinsic part of the design process. Yanchar (2016) suggests that designers must embrace their identity as sojourner-learners who use each design experience to continue developing their practical capacities as designers. This perspective requires designers to question accepted disciplinary practice and innovate within each design situation encountered.

Lifelong learning can be supported by design within the context of professional practice (Daley, 2002; Daley & Cervero, 2016; Duyff, 1999). One of the approaches that has shown some success is "learning organizations," or organizations that thoughtfully and purposely foster continuous development of skills and knowledge of their employees, are able to support self-directed and self-determined learning, communicate a shared vision, foster collaboration and teamwork, empower employees, provide opportunities/encouragement for continuous learning, and utilize relevant technologies (Rana et al., 2016). Klein and Moore (2016) recommend combining training when appropriate with an environment rich with resources that support informal learning, including opportunities for interaction and peer learning, coaching and mentoring; and access to tools and resources that allow for a wider access to information and precedents (e.g., YouTube, Pinterest or similar). This approach allows professionals to keep up with the field, explore new ideas, and troubleshoot their ideas before they spend time and funds on implementation. This may be especially important for organizations that have few instructional designers or educational technologists, who in turn may need to look beyond their own organizations to gain access to peers and resources. The compilation and curation of personal, organizational, and professional repositories of precedent materials in the form of designed artifacts as well as the sharing of design cases (Boling, 2010) allows professionals to add to their own episodic memory of personally experienced design situations.

However, designers also require practical freedom to determine when conceptual tools, including process models and prescriptive theories that are not the best approach, or that might be used in different ways than originally intended (Yanchar, 2016). This in turn points to the importance of not over-regulating which resources may be used and how they may be used within a work environment.

Implications for Educators: Preparing Self-Determined Lifelong Learners

Although being a self-determined learner is very important on the job, not all students are equally prepared as capable learners by the time they graduate; they may either not have the skills required to learn on their own or may not understand that this is both acceptable and necessary on the job. We, as educators and ID/ET professionals, can help learners gain skills and attitudes needed to become "capable learners" in the classroom and beyond. A formal educational environment that supports heutagogy fosters the development of active, self-determined, lifelong learners capable of working in the shifting conditions of the contemporary workplace (Eberle, 2013; Kenyon & Hase, 2013). Successful learning in an environment designed to support heutagogy is likely enhanced by "the joy and satisfaction from learning what was needed and wanted," as well as the additional time spent in the learning process (Kenyon & Hase, 2013, p.10). Motivation to learn and an emotional connection to what is learned are key foundations for the heutagogical approach (Hase & Kenyon, 2013).

Heutagogical considerations should include opportunities that allow learners to explore a variety of paths; create diverse artifacts; collaborate with others to further expand their knowledge and design; share their own knowledge and skills; and reflect on what was done and how the new experiences can be applied to other problems and situations (Blaschke & Hase, 2016). Heutagogical literature recommends the use of learning contracts, based on what the learner wants to learn or achieve, including not only topics but also the means of assessment (Blaschke & Hase, 2016). After creating a learning contract, the learner and instructor should work together to create learning activities that are challenging, achievable, and worthwhile, using resources that support the learner's unique learning goals. The learner should be the primary assessor of learning.

Heutagogical literature promotes the use of reflection to "ascend to higher levels of cognitive activity such as analysis and synthesis" (Blaschke & Hase, 2016, p. 35) through

reflecting on what was gained through new knowledge as well as *how* this knowledge was acquired. This can be achieved through practices such as the use of reflective learning journals, upon which instructors can provide formative feedback. This, in turn, improves learners' reflection-on-action. Likewise, Tracey et al. (2014) discuss the importance of reflection as a way to develop reflective practitioners capable of solving design problems through connecting existing precedent with the current problem constraints. While both reflection-on-action and reflection-in-action help develop the repository of precedents, novice instructional designers may need to start with reflection-on-action first to draw from their yet limited experiences.

However, when learners wait to debrief after design work is complete, they may miss crucial decision points made while they were engaged in design and may no longer accurately remember *why* these decisions were made. Therefore, we recommend that instructors promote reflection-in-action while working through ill-structured problems (Baaki & Tracey, 2015; Schön, 1987). While such opportunities are hard to provide in a traditional classroom, instructors might take inspiration from studio pedagogy used in other design fields (Tracey & Boling, 2014). The studio learning environment encourages students to analyze and reflect on their own work throughout the design process - a *reflective practicum* as Schön (1987) described it. Use of ongoing critique within a studio provides immediate feedback, just-in-time modeling of design practice and explanation of how decisions are made (especially if the work is presented as it is being developed to allow for maximum transparency of design process and thinking, as well as opportunities for growth and changes), and enculturation into design practice (Cennamo & Brand, 2012; Gray, 2019; Hokanson, 2012; Tracey & Baaki, 2014).

Finally, we recommend considering the importance of developing lifelong learning attitudes in our students across their formal educational experiences. The traditional view, in which higher education is the primary source of knowledge and skills used in professional life, is not sufficient in today's world (if it ever was). As demonstrated by this study, professionals learn a considerable amount working in the field and continue to do so throughout their professional career. Preparing students for this need can be difficult, especially when they are focused on acquiring a specific skillset that they believe is necessary to obtain a job in the field. Hearing from practitioners about how and why they learn on the job might be one element in encouraging an attitude of ongoing learning.

Implications: Potential Academia-Practitioner Collaboration

One way to serve both students and lifelong learners already in the field would be to provide more ways to built stronger connection between theoretical knowledge, practical implications and technical skills through increased engagement between professionals, academics, and students. One way to do this might include utilizing online communities where practitioners share techniques, lessons learned, and successes and failures. Materials shared on existing communities of this type are used as precedent for lifelong learners, as described in this paper. Furthermore, as discussed above, there is a movement focused on writing of design cases to share design experiences. Academia could benefit from strategic use of such resources by continuously updating and improving both content and activities used in the classroom. Encouraging students to utilize these resources as opportunities for learning and inspiration for class projects and activities would help encourage them to develop the practices successful practitioners use. In turn, academics may find additional ways to share their research and theoretical findings to the wider community – for example, through open-access journals and a more accessible writing style. Gaining feedback on these from practitioners may further assist faculty to adjust what and how they teach to better reflect the actual state of practice.

Limitations & Areas for Future Research

Since link-tracing began with our own personal contacts, our sample over-represented participants who either graduated from or worked at two universities. The interviews depended on self-report data and encouraged participants to focus on the ways they learned what they identified as the most important skills and knowledge for their jobs in an earlier section of the interview. Therefore, participants may not have mentioned *all* the informal and non-formal learning approaches used. Future research might further explore lifelong learning attitudes and skills, and whether they are fostered by the current educational system. It may also be interesting to study the degree to which a self-determined lifelong-learning orientation impacts professionals self-selecting into and/or persisting in ID/ET.

Declarations

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