

Examining Instructional Design Principles Applied by Experienced Designers in Practice

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For many years, there has been an ongoing conversation regarding how to improve instructional design (ID) education (Bennett, 2010; Chen, Moore, & Vo, 2012; Kollmann & Hardré, 2013; Larson & Lockee, 2009; Shambaugh & Magliaro, 2001; Silber, 2007). This conversation has included questions regarding the efficacy of teaching ID models to novice designers, based on the fact that, in practice, models are applied neither consistently nor uniformly (Dick, 1996; Wedman & Tessmer, 1993). For example, Wedman and Tessmer (1993) determined that practitioners frequently omitted recommended ID activities from their projects. While some have argued that we should continue to teach models to novice designers due to the foundational knowledge they provide (Dick, 1996), others believe we should be teaching relevant skills, such as problem solving, instead (Jonassen, 2008).

If ID models are ineffective in helping novices learn how to practice ID, what alternative approaches are available? Three of the more common recommendations include contextualizing ID by engaging students in real-world design situations (Hartt & Rossett, 2000), teaching problem-solving strategies students can use to solve real design problems (Jonassen, 2008), and using case-based instruction to engage students vicariously in the realities of practice (Bennett, 2010; Ertmer & Quinn, 2007; Ertmer & Russell, 1995).

The first method involves engaging instructional design students in real-world contexts to develop the skills necessary to function as competent designers (Dabbagh & Blijd, 2010; Hartt & Rossett, 2000). For

There has been ongoing debate regarding the efficacy of teaching instructional design models to novice designers given that experienced instructional designers often use principles and adapted models when they engage in the instructional design problem-solving process. This study utilized the Delphi technique to identify a core set of guiding principles used by designers in their practice. The purpose of this study was (1) to examine and describe the principles that guided instructional designers' practice and (2) to identify the extent to which participants' frames of reference included components of the ADDIE instructional design model. Sixty-one principles were ultimately identified (reached consensus among the Delphi panel members). Thirty-two of the principles aligned with the primary components of the design process (e.g., analysis, design, development, and evaluation). Additional principles (n=29) related to other characteristics of design such as communication, project management, and design characteristics.

example, Dabbagh and Blijd (2010) used a situated and problem-based environment in which they engaged students in a team-based, authentic instructional design problem for a real client. Hartt and Rossett (2000) also paired students with real organizations to act as instructional design consultants. This allowed students to experience the daily activities of an ID practitioner, including interacting with the client, understanding project management, and working on a team to solve real problems.

A second suggestion for improving ID education is to teach students how to solve ill-structured problems, as opposed to how to follow step-by-step procedures, as suggested by ID models (Jonassen, 2008). Jonassen (2008) argued that learning how to solve ill-structured problems leads to more effective designers. In addition, Jonassen (2008) argued that because design problem solving involves a cyclical decision-making process, students should be taught how to meet constraints and client satisfaction while simultaneously solving the problem. Silber (2007) supported this notion when he argued that ID is composed of a set of principles (heuristics) used by designers.

A third recommendation for teaching instructional design is case-based learning (CBL; Bennett, 2010). CBL consists of students working on instructional design cases, presented through text or multimedia (Bennett, 2010), to discuss, analyze, reflect on, and make recommendations for solving the presented design problems. CBL can promote decision making by requiring students to reflect on the experience while explaining, justifying, and critiquing decisions made during the process (Bennett, 2010). Like situated learning, CBL utilizes authentic design problems, but in a safer environment where students can make mistakes without significant consequences. Similarly, Jonassen and Hernandez-Serrano (2002) proposed using practitioners' stories to help situate design problems, thereby enabling students to better understand the ill-structured nature of real design problems.

Applying ID Models in Practice

The conversation on how to improve ID education has included debate over whether, and to what extent, practitioners use ID models in their practice (Jonassen, 2008; Silber, 2007; Wedman & Tessmer, 1993). Wedman and Tessmer (1993) surveyed 73 practicing instructional designers to determine which parts of the ID models they used in their work. Results showed that designers selectively chose which ID activities to complete or omit and that only one of the 73 participants reported completing every activity for every design project on which they worked.

The use of ID models has been recommended and supported by a number of textbooks in the field (Brown & Green, 2016; Gagne, Briggs, & Wager, 1992; Morrison, Ross, Kalman, & Kemp, 2012; Smith & Ragan, 2005, among others), as well as by personnel in the military (Branson, 1977; Finch, 1987), and industry (Branson, 1977). However, Jonassen (2008) stated that adhering to a process model seldom leads to successful

outcomes. Silber (2007) agreed when he stated, “teaching the ADDIE model step-by-step... does NOT provide learners with either complete mental models of ID principles or sets of heuristics ... that can be selected and modified based on the uniqueness of the ill-structured problem presented in each situation” (p. 11). In 1996, Dick countered that his text was written for beginners and was never intended to describe “what practitioners actually do” (p. 58). Still, for novice learners, the model offers a workable strategy for how to approach design problems encountered in practice (Dick, 1996). According to Dreyfus and Dreyfus (1986), novices must first follow learned rules and procedures until they have accumulated enough experience, at which point they can set aside those rules and proceed using their past experiences as a guide.

Yet, experts in the field have described a number of problems related to relying on ID models to solve authentic design problems. For example, Gordon and Zemke (2000) stated that although “every training designer is schooled in some version of it” (p. 43), the ADDIE model should be abandoned for a number of reasons: (1) it is “too slow and clumsy to meet today’s training challenges” (p. 44), (2) when “used as directed, it produces bad solutions” (p. 44), and (3) it is better at describing what excellent designers “do, but [is] not very useful for *doing* those things” (p. 48).

Silber (2007) suggested that instructional designers do not actually follow procedural ID models. Rather, they engage in problem solving throughout the ID process, using principles derived from a multitude of sources: standard basic textbooks, different ID philosophies, research, and commonly accepted design practices. In place of a procedural model, Silber proposed the Silber ID principle-based model to represent a *mental model* used by an expert instructional designer (p. 11). Silber’s model is based on principles derived from the four aforementioned sources and is intended to be used, as needed, as designers “define and solve ID problems” (p. 10). However, Jonassen (2008) argued, “teaching students a set of principles and heuristics, specifically if done in the absence of context, will not help students learn to make decisions” (p. 26).

To what extent do the mental models of ID experts include the principles proposed by Silber? How, exactly, do experts apply their ID knowledge, including their knowledge of ID models, when solving complex problems of practice? To answer these questions, we turned to the literature describing the practice of expert instructional designers.

Examining Expert Practice

In the field of ID, advancement has been made in defining expertise (Ertmer & Stepich, 2005; Eseryel, 2006; LeMaistre, 1998), including delineating the differences between novices and experts when solving ill-structured design problems (Ertmer, Stepich, York, Stickman, Wu, Zurek, & Goktas, 2008; Ertmer, York, & Gedik, 2009; Eseryel, 2006; Fortney & Yamagata-Lynch, 2013; LeMaistre, 1998; Nelson, 1988; Perez & Emery,

1995; Rowland, 1992). For example, Rowland (1992) found that experts interpret, analyze, and represent problems differently than novices. Experts generated a list of potential solutions (versus establishing firm solutions), which were different from those proposed by novices. In addition, experts retrieved and utilized different resources and considered different and additional factors than did novices in solving the design problem. Rowland (1992) proposed that some of these differences could be related to the *mental models* used by the experts.

Ertmer et al. (2008) described how the seven experts in their study used organized collections of domain-specific knowledge, acquired through years of experience, to solve an ill-structured design problem. One of the main findings from their study was that the experts narrowed the problem space and interpreted the problem situation using specific and unique frames of reference, built from their prior knowledge and previous experiences.

More recently, Fortney and Yamagata-Lynch (2013) reported that experts were “more efficient in problem-solving activities” than novices (p. 104). In fact, the experienced designers in their study “relied more heavily on guiding principles than on any particular instructional design methodologies” (p. 103). Similarly, Perez, Johnson, and Emery (1995) described how their expert instructional designers used ID principles during the design process; for example, one of their participants “suggested that his practice was to treat theoretical principles as heuristics” (p. 340). Romiszowski (1981) also reported that experienced designers used principles to solve ill-structured problems; however, he stated that those principles were based on the ID models learned in school.

Frames of Reference

Although personal frames of reference have been described in the literature, the specifics related to these frames of reference are unknown. Even though we have a general idea of how they were developed (i.e., through knowledge and experience), we do not know the principles or models that compose them.

In an attempt to answer these questions, Visscher-Voerman (1999) conducted a study with 24 experienced designers to determine the design strategies used by professional, high-reputation designers in various training and education contexts. According to Visscher-Voerman, one factor that influenced the design process and solution generation was the designer’s *frame of reference*, comprising his or her experiences, ideas, and perspectives from earlier projects on which he or she had worked. Other researchers, in describing how experts work, have used similar terms. For example, Dreyfus and Dreyfus (1986) referred to this as *perspective*; Bransford, Brown, and Cocking (2003) described how experts organized their thinking around the *core concepts* or *big ideas* in the field; while Walker (1971) referred to experts’ frames of reference as a *platform of ideas* (p. 52), which he described as including ideas about what is as well as what ought to be. According to Walker, this platform, then, guides

the curriculum developer [designer] in determining “what he should do to realize his vision” (p. 52). Wilson (1997) noted similarities between personal theories and mental schemas, stating that they both “provide a framework for acting intelligently” (p. 22). Based on the work of Kelly (cited in Wilson), Wilson (1997) defined frames of reference as “personal theories that guide our perceptions and actions in what would otherwise be an impossibly confusing world” (p. 22).

In the Ertmer et al. (2008) study, the frames of reference used by the seven experts to solve the given ID problem were significantly different from each other and seemed to be related to each expert’s current role in the field. In addition, during problem analysis, all of the experts incorporated a mental model of the instructional design process within their frames of reference. This was verified in a subsequent study (Ertmer et al., 2009) in which 16 “seasoned” professionals described complex or challenging ID projects on which they had worked. As reported by the authors, the vast majority of the participants applied an adapted or modified ID model for analyzing the complex situation. It was concluded that although experts appear to use instructional design models, they do not necessarily use them in the manner described in ID textbooks.

An additional finding from the Ertmer et al. (2009) research was the authors’ description of rules of thumb, or a set of guiding principles, used by the participants. These rules of thumb were found to be relevant to the individuals telling the stories, but also included universal elements across participants. However, given the limited scope of that research (i.e., relatively few participants, primarily representing academia), the authors recommended that the principles be verified by a larger population, with participants who were working in a wider variety of contexts.

Therefore, the purpose of this study was (1) to examine and describe the principles that guided instructional designers’ practice and (2) to identify the extent to which participants’ frames of reference included components of the Analysis, Design, Development, Implementation, Evaluation (ADDIE) instructional design model.

Method

The current study was designed to examine the ID principles used by experienced instructional designers during the design process. The Delphi technique (Linstone & Turoff, 1975) was used to present the guiding principles identified in the York, Ertmer, & Gedik (2009) study to a panel of experienced instructional designers (n = 31). Successive Delphi rounds were conducted until panel consensus was reached.

Delphi Process

The Delphi process in this study consisted of the following 10 steps:

1. Selection of participants
2. Creation and review of the first Delphi survey

3. Execution of the first Delphi survey to present principles from the York et al. (2009) study and provide an open-ended forum for new possible principles
4. Data analysis of Round I responses
5. Creation and review of the second Delphi survey
6. Execution of the second Delphi survey
7. Data analysis of Round II responses
8. Creation and review of the third Delphi survey
9. Execution of the third and final Delphi survey to determine stability or consensus of principles
10. Final analysis and dissemination of Delphi results to participants

Selection of Participants

An initial email was sent to 54 instructional designers requesting their participation in a study about principles used by experienced instructional designers during the design-problem-solving process. This initial list was generated by the researchers and included the names of designers known to be experienced in the field. However, only 14 responded. Therefore, a request was posted on LinkedIn.com asking for experienced instructional designers to participate by completing a demographic survey. Responses to that request yielded an additional 80 people for a total of 94 responses to the demographic survey. The demographic survey requested the following information: name, email, gender, age range, current position and title, formal education, summary of instructional design background, and instructional delivery formats they currently use in instructional design. From the demographic survey, a purposive sample (Miles & Huberman, 1994) of the 50 most experienced instructional designers was selected according to criteria published in the instructional design and expertise literature (Eseryel, 2006; LeMaistre, 1998; Perez et al., 1995; Rowland, 1992). These criteria included the following, in order of importance: (1) minimum of 10 years of experience, (2) currently practicing ID, (3) number and level of educational degrees, (4) nominated or recognized by peers, (5) diversity of experiences, (6) on-going training/education/certification, and (7) manager/trainer (for apprentice instructional designers).

The 50 selected participants were emailed an invitation to participate on the Delphi panel. Of those emailed, 35 indicated they were willing to participate. For the Round I survey, 35 participated, however, from Round I to Round II, 4 dropped out of the study. This left a panel of 31 participants who completed all three surveys.

The final panel membership consisted of 18 females (58%) and 13 males (42%). Ages were listed by range: 5 were in the 31–40 range (16%), 14 were in the 41–50 range (45%), 10 were in the 51–60 range (32%), and 2 were in the 61+ range (7%). The panel had an average of 19.7 years of experience in the instructional design field, ranging from 10 to 43 years. The highest formal degree earned by participants included technical diploma (n = 1), associate's degree (n = 1), bachelor's degree (n = 2), MBA

(n = 4), MEd (n = 2), master's degree (n = 14), EdD (n = 3), and PhD (n = 4). Although the educational training of four of the panel members was less than a master's degree, their on-the-job training and experiences made up for the lack of an additional advanced degree. For example, the participant with the technical diploma had over 22 years of experience and had earned a number of training certificates, including the ID Certificate from Darryl L. Sink, Dale Carnegie Certified Coach, and more, which meets criterion 6. The participant with the associate's degree had 25 years of instructional design experience with one-third of that time spent managing other instructional designers, which meets criterion 7. All panel members were currently practicing instructional design with a range of job titles. Some participants had more than one job title. The primary job title of participants was instructional designer (n = 11). The second most frequent job title was consultant (n = 6).

PARTICIPANT JOB TITLES	
JOB TITLE	PARTICIPANTS N = 36
Instructional designer	n = 11
Lead instructional designer	n = 1
Senior multimedia instructional designer	n = 1
Consultant	n = 6
Senior logistics specialist	n = 1
Senior manager, learning and development	n = 1
Senior education specialist	n = 1
Senior curriculum developer	n = 1
Senior training associate	n = 1
Training manager	n = 1
Curriculum design and development manager	n = 1
Senior communications specialist	n = 1
Vice president of curriculum architecture design	n = 1
Owner	n = 4
Executive director	n = 1
Associate director of e-learning	n = 1
Director of enterprise learning and university relations	n = 1
Adjunct professor	n = 1

Delphi Process and Timeline

The three Delphi rounds were conducted over a two-month period in summer 2009. Surveys were provided online, hosted on a secure server. An email was sent to participants describing the Delphi procedure as along with directions for how to access the surveys. Follow-up emails

were sent to participants if they did not respond to a survey during the two-week open period. Successive rounds of surveys were initiated by an email to the participants informing them the survey was open and requesting their responses within two weeks. Once consensus was reached, an email was sent to inform participants that the Delphi rounds had ended, thank them for their participation, and request their possible participation during the verification of the results.

Each Delphi survey was reviewed by a five-member team before being presented to the Delphi participants. The review team consisted of an experienced instructional designer (PhD) currently practicing at a higher-education institution, two professors of educational technology, and two PhD students who had completed all required coursework in instructional design. This helped ensure clarity of the questions and also provided an estimate of the time needed to complete the survey. Feedback was used to revise the survey questions as well as to test the online survey tool.

The first round survey included the principles determined during the 2009 study (York et al., 2009), in a randomly ordered list. The survey contained specific instructions as to how to access the survey, how to rate principles, and how to provide open-ended comments. The survey contained three parts: (1) a list of 59 principles to be rated on a 6-point Likert-scale (from 1 = strongly disagree to 6 = strongly agree), (2) a space for comments after each principle, and (3) a space for additional principles to be added by participants. Participants were asked to include comments to justify their ratings, to question or clarify the given principle, or to elaborate on the principle.

Responses from Round I were analyzed and used to create the Round II survey. Panel ratings were analyzed using mean, median, mode, standard deviation, plus interquartile range (IQR). Frequency distributions and graphical representations were created for each principle. Principles that reached panel consensus in Round I were not included in Round II (Anderson-Woo, 2008). A principle reached consensus in Round I if either of the two following conditions were met:

1. IQR less than or equal to 1 and 75% agreement on a rating of 5 and 6 (agree, strongly agree) or 1 and 2 (disagree, strongly disagree).
2. A 97% frequency rating in the 4, 5, 6 (mildly agree, agree, strongly agree) categories or in the 1, 2, 3 (mildly disagree, disagree, strongly disagree) categories (97% indicated all but 1 participant).

The first condition allowed 29 principles to be removed, and the second condition resulted in the removal of 1 principle prior to the Round II survey. This means that the panel agreed that 30 of the original 59 represented instructional design principles and that 29 were still not at consensus and would be included on the Round II survey.

Any new principles suggested by participants were qualitatively analyzed to determine whether that principle was new or should be integrated into a previously existing principle (perhaps the participant used

different wording, but the meaning was the same). Before adding any new principles to the Round II survey, the research team reviewed the suggested principles, reworded some, and broke some into more than one. This resulted in 15 new possible principles for the Round II survey. Based on participants' suggestions, six of the original principles that had not yet reached consensus were reworded for Round II.

Statistical measures (e.g., mean, median, mode, frequency, standard deviation) were included in Round II for each of the remaining 29 original principles. Panel comments from Round I were also included so that participants could read other panel members' justifications for their ratings. Participants also were presented with their original responses to Round I and asked to either retain their original ratings or modify them based on the new information. Thus, in this round, participants rated 44 principles and provided comments to support their ratings.

The results of the Round II survey were statistically analyzed within a week of the final submission to determine consensus. Those that reached consensus in Round II ($n = 26$) were not included in Round III. In Round II, the criteria for determining level of consensus were not as restrictive as in Round I. That is, we decided to retain the first criterion but to lower the second criterion from 97% to 80% because this seemed more reasonable than the high level set for Round I. No literature was found regarding changing the level of consensus from one round to the next, only that level of consensus for any Delphi study is determined by the researcher (Hasson, Keeney, & McKenna, 2000; Powell, 2003).

In addition, if a principle received a 20% or less stable rating from Round I to Round II, it was an indication that participants were not likely to change their ratings enough to come to consensus. To calculate stability, the frequencies of Round I and Round II responses were determined. Following this, the net person-changes (total units of change/2) for a particular question was divided by number of participants (Scheibe, Skutsch, & Schofer, 1975). Using a criterion of 20% or less stability from Round I to Round II, seven principles were eliminated before the Round III survey.

In addition, two principles were determined not to be instructional design principles and were deleted before Round III. This was based on the fact that 80% or more of the participants disagreed with the principle (i.e., rated their level of agreement with the principles as 1, 2, or 3). One principle was divided into two based on suggestions from participants. This means 10 principles from Round II were included in Round III.

The Round III survey was created, reviewed, and disseminated to the panel within one week of receiving Round II submissions. Participants were again asked to submit their responses within two weeks. This final survey allowed the participants to review the feedback their fellow participants provided during Round II. As in Round II, participants were provided statistical measures such as mean, median, mode, frequency, and standard deviation for each of the 10 remaining principles included in the survey. Similarly, participants were presented with their original responses and all panel comments from the previous survey and

were asked to retain or revise their original opinions based on the new information.

The responses from the Round III survey were analyzed. Consensus and stability criteria remained the same as in Round II. Analysis resulted in five additional instructional design principles, one statement determined not to be a principle, two statements that reached stability, and two statements that did not reach either stability or consensus.

Results and Discussion

This study was designed to identify the principles instructional designers use to organize their knowledge of the field in general, and more specifically of the ID process. How do the principles that designers use relate to the steps in the ID model or other “big ideas” (Bransford et al., 2003) in the field?

Three rounds of the Delphi resulted in panel consensus on 61/75 instructional design principles. Of these 61, 32 were identified as readily fitting into a general ID model (i.e., ADDIE). Thus, we organized the first section of our results and concomitant discussion to highlight how the identified principles address the five ADDIE components: analysis, design, development, implementation, and evaluation. It is important to remember that many of the various principles could overlap multiple ADDIE components. In these cases, we categorized principles according to their most obvious or primary component.

The second section of this article discusses additional principles that, although they did not readily relate to the general ID model, related to other key components of the ID process, such as communication and project management.

Analysis

What principles do designers use when completing the analysis phase of the design process? Based on the responses of the Delphi participants, 10 principles were identified that relate to analysis tasks (see Table 1). These analysis principles centered on four main ideas: (1) determining whether instruction is the solution to the problem, (2) examining the project’s constraints, (3) understanding the learner or audience and their prerequisite knowledge, and (4) determining the objectives or goals of the project. It also includes understanding the scope of the project and creating a statement of work with the client to reduce the possibility for miscommunication.

Results reported by Rowland and DiVasto (2001) support our finding that analysis is one of the “big ideas” that designers use in design work. The 14 experts in the Rowland and DiVasto study all agreed that the instructional design “process includes thorough analysis, for example, of learners, task, and setting” (p. 14). In addition, three of their experts claimed that,

TABLE 1 ANALYSIS PRINCIPLES

COMPONENT	PRINCIPLE
ANALYSIS	<ul style="list-style-type: none"> • Ask yourself, "Is instruction the solution to this problem?"
• Problem	<ul style="list-style-type: none"> • Invest as much time as you can in your audience analysis.
• Need	<ul style="list-style-type: none"> • Know your learners or target audience.
• Goals	<ul style="list-style-type: none"> • Know your learners' prerequisite knowledge.
• Learners	<ul style="list-style-type: none"> • Needs analysis is the foundation for evaluation.
• Context	<ul style="list-style-type: none"> • Negotiate the scope of the project with the client and create a statement of work upfront.
• Constraints	<ul style="list-style-type: none"> • Determine what it is you want your learners to perform after the instructional experience. What is the criterion for successful performance?
• Content	<ul style="list-style-type: none"> • There are things that need to be determined at the front end to make you successful at the back end.
• Task	<ul style="list-style-type: none"> • Constraints are a key to design. Look for constraints that have been placed on a project.
• Timeline	<ul style="list-style-type: none"> • Never look at the problem at face value. You have to get to the core of the problem and solve all of the sub-problems.

in general, not enough analysis takes place. Their statement supports the principle, "Invest as much time as you can in your audience analysis."

The principle, "Ask yourself, 'Is instruction the solution to this problem?'" is also supported by Rowland and DiVasto (2001), whose instructional designers' analyses "determined when instruction was the right answer" (p. 15). Designers generally ask this question during the needs analysis phase. The ID literature also supports this principle (Romiszowski, 1981). One of the first things a designer must do after communicating with the client in the first project meeting is to determine whether instruction is necessary.

Design

What principles do designers use during the design phase of the ID process? Related to design, 17 principles were identified by the panel of participants (see Table 2). This component included the largest number of principles identified by the panel. The design principles centered on the following three main ideas: (1) solving the problem, (2) identifying potential learner activities, and (3) considering the technology.

Similar to the results of this study, experts in the Rowland and DiVasto study (2001) agreed that design was one of the most important features of an instructional design project. Project goals, outcomes, and/or deliverables are widely discussed in the instructional design literature (Rowland, 1993).

The principle, "Generate multiple possible solutions that will solve the problem," is supported by Liu, Gibby, Quiros, and Demps (2002), who suggested that instructional designers must use their best judgment in creating a solution for the client. Their discussion does not specifically

mention developing *multiple solutions*; however, because ill-structured problems typically have multiple solutions, the designer must decide which is the best to recommend to the client (Jonassen, 1997).

The principle, “When designing instruction, consider active learning,” is supported by Mayer (2003), who recommended various methods to promote active learning, even when using non-interactive media. Participants also agreed that scaffolding was needed, but disagreed as to the timing and quantity of the scaffolding. The instructional design literature supports the concept of using scaffolding, but the use of it depends on the context (Van Merriënboer, Kirschner, & Kester, 2003).

Development

What principles do designers use when completing the development phase of the ID process? In the development component, three principles

TABLE 2 DESIGN PRINCIPLES

COMPONENT	PRINCIPLE
DESIGN / SELECT <ul style="list-style-type: none"> • Objectives • Instructional strategies • Visual design/storyboards • Assessments • Media / Methods 	<ul style="list-style-type: none"> • When faced with something complex, look for previous examples that have characteristics that you can draw upon and that can give you ideas on how to solve the problem. • Approach the design problem with the end in mind. What are the deliverables? What are the learning/performance outcomes? • Generate multiple possible solutions that will solve the problem. • When designing instruction, consider the context in which the learning will be applied. Ask yourself, "How can I put learning into context?" • When designing instruction, consider active learning. Ask yourself, "How can I make learners more actively engaged?" • Determine what will keep learners motivated during the instructional experience. • Consider utilizing scaffolding in your instructional experience. Give the learners the tools they need to succeed. • Be sure the instruction gives learners the opportunity to make choices. • Ensure that design speaks to a value chain of learning (i.e., that learning contributes to behaviors and that behaviors contribute to organizational or business results). • Understand the learning associated with the technology. • Don't let technology drive the design. • Resist the technical expert's propensity to focus on the most complex or innovative aspects of a product. Remember the novice learner who needs to build basic skills. • It is the instructional designer's job to press for quality in the design. • Resist the subject matter expert's desire to teach the solution to the hot problem of the day unless it is a common problem seen by the average learner. • Prepare to do a lot of work that is never going to show up in the final product. • When designing instruction, think about elaboration theory. Ask yourself, "What's the 'big picture' to which the components are attached?" • Design continues through the delivery or implementation phase.

were identified (see Table 3). These three principles related to being part of the production process; dealing with the technology involved; and allowing the content, not the technology, to guide how users interact with the training. Similarly, Liu et al. (2002) described how designers needed to understand the project’s needs and to determine which technologies could produce the best product for the learner.

Implementation

The panel of participants in this study did not identify any principles that related directly to the implementation phase. This could be because many designers tend to “pass” the instructional solution over to the client, who then implements it (Visscher-Voerman & Gustafson, 2004). This also appears to be the assumption of Dick (1996), whose ID model does not contain a “box” for implementation. Wedman and Tessmer (1993) reported that implementation was not a key activity among the instructional designers they surveyed, although it is unclear whether this finding would still apply among today’s designers. Although we can only hypothesize why the designers surveyed in this study did not use any implementation principles in their practice, one possible explanation is that they were not engaged in actual implementation activities.

An alternative explanation for the lack of implementation principles being identified in this study could be that the original 59 principles were derived from the stories of only 16 participants. Perhaps the second set of participants, in reading through the list, failed to consider additional principles specifically related to implementation that went beyond those on the initial list.

Evaluation

What principles do designers use for evaluating the design solution? In this study, two principles were identified by the participants (see Table 4) that related to evaluation. These included conducting a pilot test and having both a subject matter expert and a non–subject matter expert review the final project. Interestingly, Wedman and Tessmer (1993) found, based

TABLE 3 DEVELOPMENT COMPONENTS AND PRINCIPLES

COMPONENT	PRINCIPLE
DEVELOPMENT • Production of content and learning materials	<ul style="list-style-type: none"> • Allow the content to guide how users interact with the training (linear, user-driven, etc.), not the tools used to develop the training. • Technology can get in your way, and if you don’t deal with it you can get yourself into trouble. • Make every effort to be part of the production process.

TABLE 4 EVALUATION COMPONENTS AND PRINCIPLES

COMPONENT	PRINCIPLE
EVALUATION	<ul style="list-style-type: none"> • Always conduct a pilot. • When possible, have a subject matter expert and a non-subject matter expert review the final product.
<ul style="list-style-type: none"> • Formative • Summative 	

on the survey results of 73 designers, that pilot testing was the most often omitted step of the instructional design process. There were several reasons for this omission such as lack of time, money, and support from the client. Keppell (2001) supported the principle that reviews with subject matter experts were a necessary component of the instructional design process. The content being designed could be quite unfamiliar to the designer, whereas the subject matter expert is highly knowledgeable about the subject. An iterative process of explanation and clarification between the designer and the subject matter expert throughout the design process was described by Keppell.

In addition to the principles that related to the main components of an ID model, there were 29 other principles identified by the Delphi panel. These principles clustered around three other components of the design process: (1) communication, (2) working with a client, and (3) project management, as well as those that related to specific characteristics of the designer and the design process (e.g., recognize your limitations, recognize the uniqueness of each situation).

Communication

Communication is an important component in the instructional design process. The designer must have interpersonal skills such as being able to communicate with a number of people including the client, design team members, and other stakeholders, all of whom may use different terminology. McDonald (2008) explained, “Given the importance of communication in the work of instructional design, it is worthwhile to

COMMUNICATION

- As a designer you need to listen more than you talk.
- When verifying information, you often will learn more information.
- Verify all the information you receive from the client to prevent miscommunication.
- You need to understand and speak the language of your client.
- Don't use technical instructional design terminology with the client unless you have to.
- Ask all possible relevant questions throughout the entire design process.
- You are rarely going to collect all the desired outcomes with just one interview with the client.
- In communicating with the client, use visuals and documents to prevent miscommunication.

use the metaphor of instructional designers and their clients speaking different languages” (p. 19). This component centered on two communication principles, “You need to understand and speak the language of your client,” and “Don’t use technical instructional design terminology with the client unless you have to.” Liu et al. (2002) suggested that instructional designers should use either the jargon of the client or everyday terminology when communicating. Miscommunication can be avoided by verifying information, asking questions, and using visuals and other documents when communicating.

Client

The relationship between the instructional designer and the client is an important one. Working with a client is one of the major responsibilities of an instructional designer (Liu et al., 2002; Rowland, 1993). There were a number of principles noted by our participants that related to the designer–client relationship. The client could be the subject matter expert, owner, manager, or other stakeholder. It is the designer’s job to understand the clients, their culture, language, expectations, documentation, and communication. In addition, the designer needs to recognize the root of the problem, take prodigious notes, mock up a prototype, and make sure all stakeholders are updated throughout the process.

This implies that the designer should help clients understand how their stated expectations might translate into a design product (Liu et al.,

DEALING WITH THE CLIENT

- Be honest with the client.
- You have to be sensitive to the context and the culture of the client.
- You need to build trust with the client. This can be done through explaining what you are doing, why you are doing it, and how it is of value to them.
- Figure out who all the stakeholders are in the room; and figure out who is not in the room that is still a stakeholder.
- You need to manage the client’s expectations.
- You have to determine whether the client really knows what he or she wants.
- Subject matter expert’s documentation often fails to provide the necessary critical thinking. The subject matter expert forgets to tell you basic steps and concepts he or she forgot he or she once learned.
- When multiple stakeholders are involved, ask your client to identify your “single point of contact.” Make sure that person understands what is expected—gathering feedback on your design for you, getting approvals, and so forth.
- Bring together the client and other stakeholders for synchronous meetings at each “gate” in a phased process.
- The instructional designer should take prodigious notes during meetings. Do not rely purely on documentation or the subject matter expert.
- Sometimes the client will not tell you all there is to know about a problem.
- You may have to mock up something to show the client to make sure that you get all of the desired outcomes right.
- The client typically thinks it is much easier to move from the conceptualization to the implementation than it actually is.

2002). Liu et al. (2002) stated, “Some clients need assistance in producing a clear definition of the problem they are trying to solve” (p. 205). The designer needs to explain the process of moving from a design to an actual product. As Liu et al. (2002) stated, “Clients may not be aware of the steps and tasks that a designer takes to get to the end product. Some clients expect the designer to start from scratch and create a polished product within a short time” (p. 205).

Project Management

Project management is a component of design that may or may not be the responsibility of the instructional designer. According to Liu et al. (2002), the instructional designer “must have design and project management skills” (p. 197). As David Merrill stated, “You’re not going to go out and be designers even though we’re training you to be designers; you are going to go out and be managers” (personal communication, 2007). The one project management principle noted by practitioners was to involve the right people at the right time, because design is a people process (as noted in the following section on Design Characteristics).

Design Characteristics

Finally, there are some general characteristics of design that designers embrace when they work on a project. Some of these characteristics focus on the designer. For example, designers need to think abstractly while acknowledging their own limitations. Nelson (1988) discussed that “the success of initial understanding and problem specification is directly related to the designer’s experience and knowledge in the problem domain” (p. 18). His statement indicates that if a designer accepts a job outside his or her area of expertise, that designer could have difficulties understanding and defining the design problem.

The designer also needs to take into account foundational domain knowledge such as learning theories and various design models. Perez et al. (1995) noted that the novice instructional designers in their study were not able to transfer “theoretical knowledge into practice” (p. 339), despite having completed foundational instructional design courses. Thus, experience appears to play a part in how designers utilize that foundational knowledge during the design process (Liu et al., 2002; Perez et al., 1995).

Although every design situation is unique, if designers have previous experiences they can use as a starting point, they should do so. This has been widely corroborated in the instructional design literature (Ertmer et al., 2008; Hmelo-Silver, Nagarajan, & Day, 2002; Liu et al., 2002; Nelson, 1988; Perez et al., 1995). Researchers agree that experienced instructional

GUIDELINES FOR DESIGNERS

- Acknowledge your limitations. Don't accept a job that is outside of your expertise.
- You often don't get to do the best instructional design you want, due to constraints, resources, time, budget, and so forth.
- Use previous experiences, if possible, as a starting point for new projects.
- Be prepared to think abstractly.
- Understand that every design situation is unique.
- You need to know the theories. You need to know the models. You need to have that foundation.
- Design is a people process.

designers pull from their past experiences during the design process. The panel participants supported this principle with only three of them mildly disagreeing.

Summary and Implications

Experts, in any field, possess knowledge that is both well-organized and “conditionalized” (Bransford et al., 2003). This means that experts can readily search their personal libraries to find information that is relevant to the particular situation (Kolodner, Owensby, & Guzdial, 2004). Bransford et al. (2003) provided an example of physics experts, who organized their mental models around the big ideas in the field (momentum, energy, etc.), and when asked to analyze a problem, went beyond the surface details to consider the underlying big idea. Similarly, Walker (1971) described how curriculum developers (designers) used a platform of ideas, comprising their beliefs and values, to determine which path to take during the design process. Dreyfus and Dreyfus (1986) also noted that the perspective the expert brought to the task influenced the plans of attack. No matter the terminology used (big ideas, platform of ideas, frames of reference, etc.), designers are described as utilizing guiding principles during the design process.

No matter the terminology used (big ideas, platform of ideas, frames of reference, etc.), designers are described as utilizing guiding principles during the design process.

The purpose of this study was to examine the principles that guided instructional designers' practice and to identify the extent to which these principles incorporated components of the instructional design model. Based on the results of the Delphi process, we identified 61 principles that instructional designers used in their practice, of which 32 related to a general ID model (i.e., ADDIE). The other 29 principles related to three components of ID not typically described in ID models (communication, client, and project management) as well as some general characteristics of design. Although some models include one or more of these components (e.g., Gagne et al., 1992; Morrison et al., 2012; Smith & Ragan, 2005), one of the most commonly used models in the field (i.e., Dick & Carey, 2014) does not.

In this study, more than half of the principles identified by participants related to components of the instructional design model, suggesting its continued importance to the practice of ID. Although the participants in this study did not refer to an ID model by name, and did not add a guiding principle to the Delphi list of principles that specifically mentioned using an ID model, many of the resulting principles related to the major tasks outlined by the model. Perhaps as Romiszowski (1981) suggested, designers use the model as a heuristic, adapting it, as needed, to address the specific problem with which they are faced. Additionally, it is quite likely that the 32 principles that related to the model would not exist in the experienced designers' repertoire had they not been taught an ID model at some point in their education. Without having this foundation on which to build, their new knowledge and experiences may not have been as readily "categorized." Similar to the concept of "indexing" in the case-based reasoning literature (Kolodner et al., 2004), the practitioners in this study may have indexed their past experiences using the categories outlined by a general ID model. As noted by Stepich & Ertmer (2009), the ADDIE model may serve as a useful index for practitioners given that it is easy to remember, easy to build upon, and part of the common language of design.

In addition, 29 principles were identified that were not directly related to the instructional design model; instead they related to client interaction, communication, management, and other design characteristics. This suggests that the education of ID novices should incorporate concepts that go beyond the ID models. That is, ID education should be an amalgamation of models and skills. Case-based learning is one method that has been used successfully to foster the necessary skills (e.g., communication, problem solving) within novice instructional designers. As Ertmer & Russell (1995) stated, using case studies in ID education provides "an effective means for *bridging the gap between theory and practice*" because it "*integrates content knowledge with strategic thinking*" (p. 25).

Previous research (Ertmer et al., 2008; Visscher-Voerman, 1999) has demonstrated that designers utilize "frames of reference" when solving design problems. These frames of reference are derived from the designer's knowledge, experiences, and fields in which they work (Ertmer et al., 2008). Although our participants did not mention frames of reference explicitly, the guiding principles identified in this study were likely part of these frameworks. That is, the participants in our study delineated principles that were based on their prior knowledge and experiences. For example, one participant commented that he believed that experienced instructional designers had an "internalized theory" from which they approached new design projects. In many ways, this is similar to the definition of a frame of reference as described by Wilson (1997). Another participant described how her prior experiences were constantly influencing her work and decisions.

If we equate principles with the core concepts or big ideas in the field, then the core concepts of design with 17 principles, and of analysis with

10, as well as client interaction with 13, may, perhaps, be most salient to designers' practice. Of the 11 activities listed by Wedman and Tessmer (1993) as being common to the ID process, all but two comprise analysis and design components. The remaining two activities were evaluation activities. This supports the idea that analysis and design are two of the core concepts of ID. Client interaction was not included in Wedman and Tessmer's survey because they included only components that were common to ID models. Of course, greater numbers of principles does not suggest greater importance. Rather, it may be possible that there are simply more elements contained in the design, analysis, and client interaction components of design. It would be necessary to verify this by surveying the participants and querying what they believe are the core concepts of ID. Again, this may differ depending on their design contexts and their current roles in the field.

The results of this study have implications for the education of instructional designers. Because design is a problem-solving process, novices should understand what practicing instructional designers do and what principles they work from, rather than just memorizing steps in a model. Still, familiarity with the models appears to offer the basis for many of these principles. According to Stepich & Ertmer (2009), expert instructional designers "use their knowledge of ID models in flexible and dynamic ways" (p. 155). Even though novice instructional designers do not yet have the amount of experience that allows them to create a robust set of personal principles, their design performance has the potential to be improved if they know, a priori, some of the principles others use when solving instructional design problems. It is possible that novices could learn, vicariously, from the stories of experienced instructional designers including lessons learned and principles used (Jonassen & Hernandez-Serrano, 2002). Just as ID models are used to help novices understand the steps involved in the analysis, design, development, implementation, and evaluation phases of the process, principles might help them understand the overarching communication and management aspects, as well as other areas. For example, if novices are taught to verify all the information they receive from a client, they could improve their communication with the client. These results imply that ID principles should be incorporated within our ID programs, if they have not been already.

So, how can principles be incorporated into our ID programs, and more specifically, how can principles be used in conjunction with ID models? This could occur in a number of different ways as previously suggested—case-based learning, internships, or consulting. Vicarious learning from the stories (either narrative or video) of expert instructional designers could enhance novices' learning, particularly if the experts were asked to explicate the principles they applied during those problem-solving situations. A number of ID programs emphasize reflection at

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the end of lessons or internships. By including an explicit discussion of the learned instructional design principles, perhaps the learners can be reminded of principles they may otherwise have overlooked. Finally, ID instructors might consider integrating textbook information about the steps in the ID model with relevant principles identified in this study, as well as others found in the literature (e.g., Silber, 2007).

The results of this study suggest that communication and project management skills should be taught to, and nurtured in, our novice instructional designers. While some ID programs do teach or emphasize these skills, many do not require that these skills be mastered by all students. However, given the variability in courses that doctoral students are permitted to take (Larson, 2005), they might be advised to take courses in these content areas. Communication skills could come in the form of human communication courses, interpersonal communication courses, or practical experience such as internships or apprenticeships with real clients (Larson & Lockee, 2009). Learning to interact with a client includes multiple skills such as knowing how to read nonverbal behavior, as well as being skilled at negotiation tactics. Finally, although we identified only one project management principle, we should also consider teaching project management content. A good number of the principles identified by the panel imply that there should be a project management course in instructional design curricula, if it does not already exist.

Limitations and Suggestions for Future Research

This study was designed to generate a thoughtful analysis of principles used by experienced instructional designers. However, one limitation to this study was that the fields in which the instructional designers worked did not represent all possible areas of work for instructional designers; for example, designers working in the military were not included because we did not have access to any. Since this study was conducted, York & Ertmer (2013) have addressed this gap with a study on the heuristics used by instructional designers in the military. Interestingly, the authors found that the military instructional design principles were more similar to than different from those found within academia and corporate contexts.

In addition, all judgments made by participants in the current study were based solely on their own knowledge, skills, and experiences and may not be representative of all instructional designers. The decision to start the first Delphi survey using the principles that emerged from the York et al. (2009) study also may have affected the results. An open-ended question was included on the first survey to prevent the possible omission of a critical principle from the panel's perspective; however, starting with an initial list may have unduly constrained the potential principles considered by the panel participants. For example, there may be shortcuts that designers use that did not emerge from their stories about ID projects. This could be a fruitful area for future research.

This study is based on the assumption that we need to learn and teach more instructional design principles. However, it should be noted that more research is needed to determine whether principles are already being taught and if not, how they might be best taught. Therefore, future research will focus on determining the best methods for sharing the resulting principles with novice designers and examining whether it affects their experiences as instructional designers. Some questions we plan to pursue include (a) Can we teach principles to novice instructional designers? (b) What methods should we use to provide this information (e.g., case-based reasoning, expert guest speakers)? and (c) How does learning ID principles affect novices' practice? In addition, the relative importance of different principles to the instructional design process (as well as to the instructional design field) should be examined. A more thorough examination of the importance of the different principles should be undertaken. Perhaps a Delphi panel could rank-order the current principles—not just in terms of their importance to the instructional design process but in terms of how frequently they use them in practice. It could also be productive to ask new instructional designers questions about their experiences such as (a) What was the most important instructional design component you learned, and (b) What do you wish you learned more about?

A more thorough examination of the principles found in the current study and their inclusion in, or exclusion from, various other instructional design models as well as the textual descriptions of the models is needed (besides ADDIE). From that examination, there could arise a need for the creation of a new ID model that incorporates relevant principles not found in current ID models.

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