Macrothink Institute™

Journal of Education and Training
ISSN 2330-9709
2016, Vol. 3, No. 2

# Effects of Online Instructional Design Training on TA's Perceptions of Efficacy, Competence, and Knowledge Satisfaction

John S. Madden, M.Ed.
University of Oklahoma, 1600 S. Jenkins, Room 101, Norman, OK 73069, U.S.A.
Email: jsm@ou.edu Tel: (405) 325-6458

Patricia L. Hardré, Ph.D. (Corresponding Author)
University of Oklahoma, 820 Van Vleet Oval, ECH 331, Norman, OK 73019, USA
Email: hardre@ou.edu Tel: (405) 325-3752

Received: May 19, 2016 Accepted: June 3, 2016 Published: August 19, 2016
doi:10.5296/jet.v3i1.9490 URL: http://dx.doi.org/10.5296/jet.v3i1.9490

**Abstract**

Teaching assistants (TAs) in higher education are expected to teach courses in their major subject area with little to no formal instruction in the principles of effective teaching methods. The demands on TAs time are high and there is a need for easy to access, flexible, high quality instruction to provide them with the tools necessary to be effective instructors at the college level. One method of meeting this need is to provide TAs with a "toolbox" of instructional theory and methods based on instructional design principles. In order to be effective, it is important for TAs to understand the interconnected nature of effective educational principles including: instructional design, motivation, learning environments, instructional technologies and assessment. The current study looks at the effects of a self-paced online instruction designed for TAs on their teaching efficacy, perceived teaching competence and satisfaction with knowledge of the delivered instructional concepts using a pre-post, self-report design. Thirteen TAs at a southwestern research university completed both pre and post measures of knowledge and perceptions. Findings indicate that self-paced online training in instructional design concepts significantly increased TAs' satisfaction with their knowledge of instructional theory and principles, design of learning environments and instructional technology. It further increased the significance and magnitude of their understanding of the interconnected nature of instructional principles and elements of the learning dynamic and led to appreciable knowledge change in key areas. These findings provide evidence of the benefits and utility of flexible, easily accessible training in instructional principles for TAs.

**Keywords:** Graduate Assistant, Teaching Assistant, Instructional Design, Training, Teaching, Higher Education

Journal of Education and Training
ISSN 2330-9709
2016, Vol. 3, No. 2

Many teaching assistants (TAs) are under-prepared for full teaching responsibilities, and have neither the time nor motivation for earning an additional degree in education (Hardré, Ferguson, Bratton & Johnson, 2008). Yet TAs are often responsible for much of students' foundational knowledge and understanding that may determine their success in postsecondary education (Dotger, 2011). To become effective teachers, TAs need to learn instructional principles and practices that can enable them to function more like expert teachers (Hardré & Chen, 2005, 2006). They also need a cognitive organizational structure within which to develop their continuing professional skill in teaching over time (Hardré, 2003a). This paper discusses the results of an online instructional design training on TAs' teaching-relevant perceptions of knowledge and competence, as well as their integration of knowledge components in the instructional dynamic.

## 1. Literature Review

Some TAs plan to transition directly into the professoriate and believe that teaching will be an important skill in that role. These TAs see the relevance of teaching expertise to their immediate career goals and are more likely to invest in learning to teach well (Lambert & Tice, 1993; Marincovich, Prostko & Stout, 1998). Others do plan to join the professoriate but see themselves mostly in a research role, so they tend to invest in skill development for research rather than teaching (Austin, 2002; Boyer, 1990; Hardré et al., 2008). Yet, all of these TAs face the challenge of teaching effectively while in graduate school.

### *1.1 Identifying the Needs*

#### 1.1.1 Teaching Expertise

In terms of its cognitive and procedural demands, teaching is a complex problem-solving task (Smith & Ragan, 1999). Expert teachers have cognitive frameworks that support tracking, analyzing and recalling patterns of strategic information about instructional situations (Sabers, Cushing & Berliner, 1991). Teaching effectively requires both *content* knowledge and skill, and *instructional* knowledge and skill, two different and equally important components (Bransford, Brown, & Cocking, 1999; Brookfield, 1986; Glaser & Chi, 1988; Shulman, 1986, 1987). TAs' domain or subject area knowledge and expertise, does not ensure that they can teach it effectively (Hardré, 2005; Hardré & Chen, 2006), in part because experts may lose the ability to see the content from a novice's perspective (Bransford et al., 1999; Brookfield, 1986).

Teaching expertise in general requires understanding students' typical difficulties and probable misconceptions, and possessing instructional strategies to help students succeed (Brookfield, 2006). Such skills enable TAs to support students in learning more discipline-specific nuances of knowledge and skill (Shulman, 1986, 1987). Effective teachers must be able to direct and hold the learners' attention, connect new to prior knowledge, motivate, and help learners move to application, synthesis and skill transfer (Bransford et al., 1999). To support teaching in the 21$^{st}$ century, TAs must also be competent in the effective instructional use of technology.

Effective teaching requires the flexibly adaptive application of a complex body of knowledge to a fluid set of circumstances (Biddle & Anderson, 1986; Bieleczyck & Collins, 1999; Hutchings, 1993). It requires knowing how to diagnose and address learning needs initially (Hardré, 2005), as well as responding to ongoing information about how student learning is progressing and tasks are being accomplished (Ashton, 1985; Leinhardt & Greeno, 1986). To meet these demands, teachers need an appropriate cognitive framework for systematically adjusting instruction that enables the rapid application of new contingencies to their existing mental representations (see Anderson, 1993; Borko & Livingston, 1989; Dick, Carey & Carey, 2001).

### 1.1.2 Cognitive Frameworks

A cognitive organizational framework is a relational representation of the various elements of a task, process, system, or abstract concept so that people understand its key features, and the nature of interactions within it (Anderson, 1993; Sternberg & Wagner, 1994). It is typically presented as a model including key elements of the task, so that learners can recall and visualize it when it is needed (Anderson, 1993; Ausubel, 1968; Sternberg & Wagner, 1994). Such frameworks promote learning and development, by promoting relational clarity among hierarchical and sequential components and processes, and supporting deep-level understanding and task performance (Druckman & Bjork, 1991, 1994; Leinhardt & Greeno, 1986). If well-learned, these frameworks can function as developmental schema with cognitive connections that function like 'hooks' for adding and organizing new knowledge and experience into ready connections for recall and transfer to future demands (Hardré, 2001, 2003; Druckman & Bjork, 1991). The more complex and ill-defined, or flexible and changing, a problem-solving context is, the more essential is a cognitive organizational framework for solving problems within it.

### 1.1.3 Motivation

Motivation is a key issue in TA development, because teaching must be motivated and motivating. Motivation can be generally defined as the desire to act toward a goal (Reeve, 1996). Yet human motivation is complex, and teachers and researchers have spent decades identifying and defining its key constructs, concepts and operational principles (Reeve, Deci & Ryan, 2004). Based on the past three decades of motivational research, we know that motivation is comprised of three different types of components: cognitive (how learners think about learning and make conscious choices); affective (emotional and subconscious ways learners respond to learning opportunities); and behavioral (actions that they take based on those other two types of processing information) (Beck, 2004; Pintrich & Schunk, 1996).

Motivation may be globally divided into two types, intrinsic (which originates within the self, from personal value, freedom and choice), and extrinsic (which originates from outside the self, in social pressure, or external rewards and punishments) (Deci, 1995; Deci & Ryan, 2000; Lepper, 1988). Intrinsic motivation gives the learner ownership, produces a deeper learning experience and high-quality motivation, while increasing relatedness, promoting competence, and reducing stress (Ames & Archer, 1998; Brookfield, 1986; Deci, Ryan & Williams, 1996; Reeve, 1996). In contrast, extrinsically motivated learners often experience shallow learning, choose easy means to complete the task, and lose much of the learning value (Reeve, 1996; Shapira, 1976).

Perceived competence and self-efficacy are important components of motivation to engage in, learn and complete any task. Competence is the individual's ability to achieve a task (Deci & Ryan, 2000, 2002), and self-efficacy is the learner's belief that he or she can succeed in the instructional and performance tasks presented (Bandura, 1997). These key motivational characteristics are supported by learning environments that provide: clear and personally relevant goals and information (Deci & Ryan, 2002; Hardré & Reeve, 2003, 2009); challenge (Bandura, 1986; Clifford, 1990); clear and timely feedback (Bandura, 1986; Corno, & Randi, 1999); and motivating strategies appropriately matched to learner and task characteristics (Beck, 2004; Gagné et al., 2005).

All of these principles of motivation are relevant for both design features of the TAs' online professional development and for content knowledge and principles that TAs need for teaching in their own classrooms. Motivation functions as an important supplement to the foundations of cognitive learning theory (Hardré, 2003a; Hardré & Miller, 2006), and teacher behaviors will affect students either explicitly or implicitly (Hardré, 2001b). To avoid unintended negative effects, TAs should be taught to design motivational elements explicitly into their instruction (Hardré, 2003a; Hardré & Miller, 2006).

#### 1.1.4 Using Instructional Technology

Using digital tools and distance learning systems in teaching has become an important part of TAs' skill set to succeed in higher education. Instructional technology is defined by what it is and how it is used, including the delivery system and the strategies it enables; thus "technology" is both the tool and its use in learning and teaching (McCombs, 2000). If used effectively, instructional technology can enhance learning and achievement, but if used ineffectively it can distract learners and impede their learning (Alessi & Trollip, 2000; McCombs, 2000). Many TAs are required by departmental policy or pressure to use technology in their teaching, often without preparation on how to do so effectively (Hardré & Chen, 2006; Hardré et al., 2008).

#### 1.1.5 Instructional Design

Instructional design (ID) is a process that can guide educational planning and management (Hardré, 2003a; Reiser, 2002). Its principles are grounded in learning theory and applicable across age, settings, ability levels, and content domains (Druckman & Bjork, 1994; Reigeluth, 1999). ID is a systematic distillation of teaching best planning practices, including a focus on strategically selecting learning activities, which furthers the achievement of learning objectives. ID supports learning because it is comprised of organized, theoretically-anchored instructional events and strategies that promote learning, retention, and performance (Gagné & Medsker, 1996; McGilly, 1996; Smith & Ragan, 1999). Even within a brief contact time, ID supports the organization and integration of prior and new knowledge; encourages self-awareness and reflection; and supports positive self-perceptions and confidence, offering important benefits as a professional development tool for TAs (Hardré, 2005; Hardré & Chen, 2006).

The primary goal of ID is the use of systematic design procedures to make instruction more effective and efficient than that produced by less rigorous methods (Gustafson & Branch, 2002; Knowles, 1990). A systematic approach requires coordination of all activities relevant to instruction (Reiser, 2002) because without such a systematic approach even good teachers, "can create major incongruities among goals, strategies, and evaluation" (Gustafson & Branch, 2002, p.18). Without experience to inform their instructional decisions, TAs are in greater danger of such errors than are more expert teachers (Hardré, 2004).

Though a variety of ID models and methods has been developed (Gustafson & Branch, 1997; Reiser, 2002), they all "include the core elements of analysis, design, development, implementation, and evaluation (ADDIE) in one form or another, to ensure congruence among goals, strategies, and evaluation and effectiveness of the resulting instruction" (Gustafson & Branch, 2002, p.18; see also Reiser, 2002). *Analysis* includes identifying the need and setting a goal for the instruction to achieve (Reigeluth, 1999). *Design* involves establishing specific objectives and specifying learning activities and media to achieve them (Dick, Carey & Carey, 2003; Gustafson & Branch, 2002). *Development* includes preparing student and instructor materials as specified in the design (Morrison, Ross & Kemp, 2004). *Implementation* involves delivering the instruction as designed (Smith & Ragan, 1999). *Evaluati*on includes both evaluation and revision of the instructional materials, and assessment of students' learning (Dick, Carey & Carey, 2003). The ADDIE phases are typically not conducted in a linear fashion, but are flexibly adaptive and iterative in authentic use (Reiser, 2002).

Giving teaching assistants the tools of instructional design can support their self-efficacy and teaching skill, and thus can help facilitate improved undergraduate instruction (Hardré, 2002; 2003a; Hardré & Chen, 2005). ID can function as a cognitive framework for TAs' current professional development toward teaching effectiveness, and for their ongoing learning and professional development, as they transition to the professoriate (Hardré, 2005).

#### 1.1.6 Self-perceptions

TAs' differential self-perceptions drive what they attend to, what they value, and what they adopt to use (Hardré & Chen, 2006). Positive self-perceptions of efficacy and competence position TAs for success in learning and teaching in the domain (Hardré, 2005). They support the development of expertise (Hardré, Ge & Thomas, 2006; Reeve, 1996), and also enable innovation that supports ongoing learning (Pintrich & Schunk, 1996). In addition, prior experiences, training received and satisfaction with current knowledge and skill, practice opportunities, views about knowledge, and learning environments all influence TA self-perceptions (Hardré & Chen, 2006; Sandi-Urena & Gatlin, 2013).

Realistic self-perceptions enable TAs to seek out additional guidance and support to build on their existing expertise, when they have access to appropriate resources (Buerkel-Rothfuss & Gray, 1991; Hardré, et al., 2008). Many TAs have low competence perceptions for teaching (Lambert & Tice, 1993; Hardré, 2003a; Ryan, 2000), and low teaching self-efficacy (Hardré, 2003a; Tice, Gaff & Pruitt-Logan, 1998), especially early in their TA experience (Hardré & Chen, 2005; Marincovich, Prostko & Stout, 1998; Nyquist & Sprague, 1998). Other TAs have unrealistically high self-efficacy, which reduces their attention to professional development, even when they need it (Hardré & Chen, 2005; Syverson & Tice, 1993). In one series of studies, an intervention in ID significantly increased TAs' ID knowledge and teaching self-efficacy and improved their performance on three different ratings of classroom teaching effectiveness (Hardré, 2003a; Hardré & Chen, 2006).

### *1.2 Why TAs Need ID*

Most TAs already have discipline-specific content knowledge and expertise—knowledge about what they teach-- but very limited knowledge of how to teach (Hardré, 2005; Marincovich, 1998). Most of their strategies for instruction have been learned either by 'trial and error' or by modeling of more expert TAs or faculty in their disciplines (Austin, 2002; Gaff & Lambert, 1996). They tend to lack the *how* of teaching: 1) generalizable principles from learning and motivational theory (how and why people learn); 2) principles of instructional design and implementation (strategic knowledge—what to use and under what circumstances); and 3) a cognitive organizational framework to link their knowledge about teaching into a coherent whole (Hardré, 2005; Marincovich, 1998; Marincovich, Prostko, & Stout, 1998).

TAs have diverse needs, skills and perceptions, so they require not just a generic content that presupposes certain knowledge, but a flexible, adaptive set of tools that can fit a broad range of instructional needs and circumstances (Hardré, 2005). An online professional development opportunity can be built with a high level of user selectivity and control, where TAs with differential perceived and actual needs can efficiently and effectively access and gain useful tools, from a teaching "toolbox" provided to them (Hardré, 2005, Hardré et al., 2008). The need for individualized information and strategies underscores the importance of the "toolbox" approach to providing professional development opportunities for TAs (Hardré & Chen, 2006). TAs may become frustrated and quit attending TA training and development, if they perceive that their needs are not being met, that the content is not relevant to their current issues and concerns (Hardré, et al., 2008).

TA training is still a glaring need in higher education institutions. Much of the current literature focuses on TAs in the sciences (Dotger, 2011; Harris, Froman, & Surles, 2009; Linenberger et al., 2014; Lockwood, Miller, & Cromie, 2014; Marbach-Ad et al., 2012; Pentecost et al., 2012; Sandi-Urena & Gatlin, 2013), while a few studies address TAs more generally (Buskist, 2013; Gallego, 2014; Hardré & Burris, 2012; Santandreu et al., 2011). Some examples of TA training include discipline-specific pedagogy as an important part of the design (e.g. Lockwood, Miller, & Cromie, 2014; Marbach-Ad et al., 2012). However, they tend to lack the foundations of a toolbox of principles from learning theory or a strategic scaffolding for meeting students' instructional needs. Thus, ID as a strategic cognitive and theoretical framework for TA development is an underutilized idea that deserves attention and investigation.

### *1.3 Research Questions*

In order to determine the utility of using self-directed online instruction in Instructional Design to deliver a toolkit for providing TAs with the knowledge and practices to foster good instructional methods, our research questions were:

Will self-directed online instructional design training increase TAs' perceptions of teaching competence and efficacy?

Will self-directed online instructional design training increase TA's satisfaction with their knowledge of instructional design, learning environments, motivation, instructional technology and assessment?

Will self-directed online instructional design training foster TAs' understanding of how these elements of teaching fit together?

Will self-directed online instructional design training increase TA's self-articulated knowledge of the elements covered?

## 2. Method

### *2.1 Study Design*

The study design was a pre-post intervention effects design, using data generated from identical pre and post self-report questionnaires. They were completed prior to and then immediately following completion of an online instructional design training comprised of four modules designed specifically for university-level TAs.

### *2.2 Instructional Intervention Description*

The instructional intervention was a four module, self-paced course created by graduate research assistants under the guidance of a faculty mentor and delivered through the Moodle learning management platform. The modules presented information on: 1) the ADDIE instructional design framework; 2) motivation as supportive of learning and instruction; 3) the nature and characteristics of learning environments; 4) definitions, descriptions and uses of instructional technology as well as the importance of quality design of assessment. The modules were presented in an integrated manner that underscored the interconnected nature of the concepts in all four modules. They were designed to facilitate the progressive building of knowledge from one module to the next. The modules were completed sequentially and included self-check quizzes and discussion boards as assessments of student progress and understanding. TAs that successfully completed the intervention were given a certificate of completion.

### *2.3 Participants*

The sample was comprised of 13 graduate TAs at a mid-sized university in the Southwestern United States. Despite some missing demographic data, the participants reported the following general characteristics: on gender, 7 females and 3 males (3 unreported); age range 22-31 years, mean age 25 (4 unreported); on ethnicity, 5 Caucasian, 1 Native American, 1 Asian (6 unreported); on highest prior education 4 Bachelor's degrees, 2 Master's degrees, 1 Doctorate (6 unreported).

*2.4 Instruments*

The parallel-forms instruments were presented electronically prior to beginning the instructional design training (pre) and immediately after completing the final module of the training (post). They were comprised of seven self-report Likert-type scales as well as 10 open-ended qualitative questions. The quantitative scales measured teaching efficacy, perceived teaching competence, satisfaction with knowledge of instructional design, satisfaction with knowledge of learning environments, satisfaction with knowledge of motivation, satisfaction with knowledge of instructional technology and satisfaction with knowledge of assessment. All five satisfaction measures included positively- and negatively-worded (reverse-coded) items to guard against response bias. All scales had been used in previous studies and demonstrated reliable and valid measurement of the intended constructs (see Hardré & Burris, 2012; Hardré & Chen, 2006).

2.4.1 Teaching efficacy scale (TE)

The teaching efficacy scale was comprised of 8 Likert-type items using a six-point response scale ranging from "strongly disagree" (1) to "strongly agree" (6). Sample items: "I believe that I can manage most classroom challenges;" and "I can usually get through to even the most difficult or unmotivated students" (*alpha* pre & post .71).

2.4.2 Perceived teaching competence (PTC)

The perceived competence measure was comprised of 3 Likert-type items using a six point response scale ranging from "strongly disagree" (1) to "strongly agree" (6). This scale presented a single item stem, "When I reflect on what I do in the classroom while teaching, I feel:" followed by three adjectives with responses requested for each: "Capable", "Achieving", and "Competent" (*alpha* pre .80, post .98).

2.4.3 Satisfaction with knowledge of Instructional Design (SID)

The satisfaction with knowledge of instructional design scale was comprised of 4 Likert-type items using a response scale "not at all true" (1)" to "very true" (6). Sample items: "I am highly satisfied with my current knowledge about how to design instruction" (positive) and "I sense that my present knowledge about designing instruction is inadequate" (negative) (*alpha* pre .83, post.86).

2.4.4 Satisfaction with knowledge of learning environments (SLE)

The satisfaction with knowledge of learning environments scale was comprised of 4 Likert-type items using a response scale of "not at all true" (1) to "very true" (6). Sample items: "I am highly satisfied with my current knowledge about how to design learning environments" (positive) and "I sense that my present knowledge about designing learning environments is inadequate" (negative) (*alpha* pre .77, post .86).

2.4.5 Satisfaction with knowledge of motivation (SMO)

The satisfaction with knowledge of motivation scale was comprised of 4 Likert-type items using a response scale of "not at all true" (1) to "very true" (6). Sample items: "I am highly satisfied with my current knowledge about how to motivate students" (positive) and "I sense that my present knowledge about motivating students is inadequate" (negative) (*alpha* pre .89, post .79).

2.4.6 Satisfaction with knowledge of instructional technology (STEC)

The satisfaction with knowledge of instructional technology scale was comprised of 4 Likert-type items using a response scale of "not at all true" (1) to "very true" (6). Sample items: "I am highly satisfied with my current knowledge about how to integrate technology for instruction" (positive), and "I sense that my present knowledge about using technology to support instructional goals is inadequate" (negative) (*alpha* pre.96; post .93).

2.4.7 Satisfaction with knowledge of assessment (SASS)

The satisfaction with knowledge of assessment scale was comprised of 4 Likert-type items using a response scale of "not at all true" (1) to "very true" (6). Sample items: "I am highly satisfied with my current knowledge about how to design and use assessments" (positive) and "I sense that my present knowledge about creating and using assessments to support instructional goals is inadequate" (negative) (*alpha* pre .92, post.89).

2.4.8 Qualitative measures

The qualitative measures were designed to capture the knowledge and strategic skills thinking of participants in the five core training topics, immediate prior to (pre) and directly following the intervention (post). There were ten qualitative items and all participants were asked to write "a paragraph or two" answering each of the following question prompts:

1) What is instructional design?

2) As a teacher, what are the most important things for you to analyze and include in your designing to create effective instruction?

3) What is a learning environment?

4) As a teacher, what do you need to consider and what can you do, to create a learning environment in which your students can learn successfully?

5) What is motivation?

6) As a teacher, what do you need to consider and what can you do, to promote students' motivation for learning in the classroom?

7) What is the role of technology in the classroom?

8) What are the design issues, principles and strategies surrounding using instructional technologies?

9) What are the keys to effective classroom assessment design?

10) How can a teacher design and utilize assessments effectively in the classroom?

The odd numbered questions were designed to capture basic knowledge of the training topics, while the even questions were designed to capture strategic knowledge and skill application of each element. Only 8 of the 13 participants answered both pre and post qualitative measures entirely.

### *2.5 Analyses*

To address the first two research questions, dependent sample t-tests were used to gauge the significance of change from pre to post on the quantitative measures. For the third research question, correlations were computed to ascertain how interrelated participants' satisfaction with knowledge of instructional design elements, teaching efficacy and perceived teaching competence were. For the final research question, qualitative data were analyzed using comparative text analysis to determine the presence of substantive knowledge change.

## 3. Results

### *3.1 Significance of Change*

Cronbach's *alpha* reliability coefficients of all quantitative measures for this sample were ≥ .70. The reliabilities, scale means, and standard deviations (pre and post) for all measures are presented in Table 1.

Table 1. Reliability and descriptive statistics (mean, standard deviation and number of responses) for pre and post measures

| | Pre | | | Post | | |
|---|---|---|---|---|---|---|
| Scale | Cronbach's α | M | SD | Cronbach's α | M | SD |
| Teaching efficacy | .71 | 3.68 | .58 | .71 | 3.82 | .60 |
| Perceived teaching competence | .80 | 4.77 | .64 | .98 | 4.87 | .66 |
| SWKO instructional design | .83 | 3.27 | .90 | .86 | 4.33 | .98 |
| SWKO learning environments | .77 | 3.52 | .86 | .86 | 4.23 | 1.07 |
| SWKO motivation | .89 | 4.13 | 1.16 | .79 | 4.40 | .98 |
| SWKO instructional technology | .96 | 3.73 | 1.36 | .93 | 4.40 | 1.14 |
| SWKO assessment | .92 | 3.94 | 1.03 | .89 | 4.27 | 1.16 |

SWKO (Satisfaction with knowledge of).

Dependent samples t-tests were conducted to determine the significance of change in teaching efficacy, perceived competence, and satisfaction with knowledge across all areas of instructional design covered in the training. Significance was determined at $p<.05$ as this is an appropriate *p*-level for a small sample (Johnson & Christensen, 2014). Results are presented in Table 2.

Table 2. Results of dependent samples t-tests for all measures

| | M Diff | SD | Std. Error of Mean | t | df | Sig |
|---|---|---|---|---|---|---|
| Post-Pre Teaching Efficacy | .13 | .36 | .10 | 1.37 | 12 | .197 |
| Post-Pre Perceived Teaching Competence | .10 | .44 | .12 | .84 | 12 | .416 |
| Post-Pre SWKO Instructional Design | 1.06 | 1.04 | .29 | 3.66 | 12 | .003** |
| Post-Pre SWKO Learning Environments | .71 | .98 | .27 | 2.62 | 12 | .022* |
| Post-Pre SWKO Motivation | .27 | .71 | .20 | 1.37 | 12 | .197 |
| Post-Pre SWKO Instructional Technology | .67 | .51 | .14 | 4.72 | 12 | .000*** |
| Post-Pre SWKO Assessment | .33 | 1.10 | .31 | 1.07 | 12 | .305 |

*p<.05, **p<.01, ***p<.001, SWKO (Satisfaction with knowledge of).

All of the satisfaction mean scores demonstrated positive change pre-to-post. However, only three measures showed statistically significant change: Satisfaction with knowledge of instructional design, satisfaction with knowledge of learning environments, and satisfaction with knowledge of instructional technology. Figure 1 shows the change from pre to post and all lines have a positive slope, evidence of positive change on all measures following the intervention. These TAs felt more competent and efficacious, and were more satisfied with their knowledge of all elements following the intervention than before.

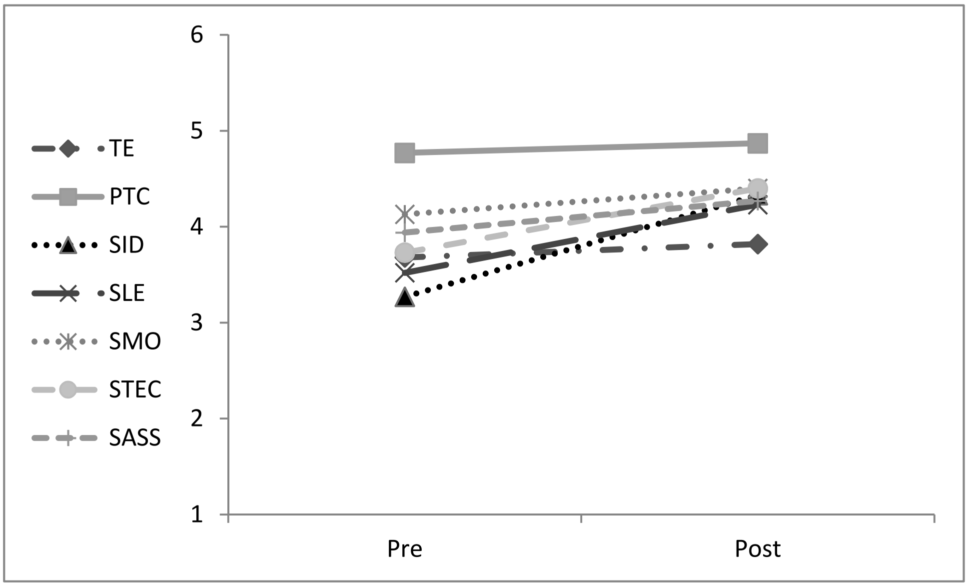


Figure 1. Graph of change from pre to post for all measures

*3.2 Correlations of Satisfaction of Knowledge Measures*

Correlational analysis for pre measures reveal that 13 out of 21 (62%) possible correlations were statistically significant (at p<.05). See Table 3 for significance and correlations for all pre measures.

Table 3. Pre-measure correlations

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Teaching Efficacy (1) | r | -- | | | | | | |
| | *Sig.* | -- | | | | | | |
| Perceived Competence (2) | r | .160 | -- | | | | | |
| | *Sig.* | *.30* | -- | | | | | |
| SWKO Instructional Design (3) | r | .604 | .152 | -- | | | | |
| | *Sig.* | *.01* | *.31* | -- | | | | |
| SWKO Learning Environments (4) | r | .509 | .446 | .833 | -- | | | |
| | *Sig.* | *.04* | *.06* | *.00* | -- | | | |
| SWKO Motivation (5) | r | .096 | .453 | .486 | .761 | -- | | |
| | *Sig.* | *.38* | *.06* | *.05* | *.00* | -- | | |
| SWKO Instructional Technology (6) | r | .500 | .691 | .417 | .660 | .597 | -- | |
| | *Sig.* | *.04* | *.00* | *.08* | *.01* | *.02* | -- | |
| SWKO Assessment (7) | r | .364 | .627 | .620 | .674 | .685 | .514 | -- |
| | *Sig.* | *.11* | *.01* | *.01* | *.01* | *.01* | *.04* | -- |

***Notes:*** Shaded cells indicate significant correlations, 1-tailed, $p<.05$; SWKO = Satisfaction with knowledge of.

Correlational analysis for post measures reveals a substantial increase in both magnitude and significance of relationships among components with 19 out of 21 (90%) possible correlations reaching statistical significance. See Table 4 for significance and correlations for all post measures.

Following the intervention, there was a 46% increase in correlations reaching statistical significance with 15 out of 21 possible correlations increasing in magnitude, five out of 21 possible correlations decreasing in magnitude and one correlation staying the same. Looking at these changes, the intervention increased the connection between efficacy and competence and increased the connection of efficacy with all knowledge satisfaction measures except for instructional design and learning environments. Furthermore, the intervention increased student connection of competence with all measures of knowledge satisfaction but decreased the perceived connection of learning environments to all measures of satisfaction of knowledge except motivation, which increased.

Table 4. Post-measure correlations

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| Teaching Efficacy (1) | r | -- | | | | | | |
| | *Sig.* | -- | | | | | | |
| Perceived Competence (2) | r | .556 | -- | | | | | |
| | *Sig.* | *.02* | -- | | | | | |
| SWKO Instructional Design (3) | r | .558 | .885 | -- | | | | |
| | *Sig.* | *.02* | *.00* | -- | | | | |
| SWKO Learning Environments (4) | r | .253 | .725 | .802 | -- | | | |
| | *Sig.* | *.20* | *.00* | *.00* | -- | | | |
| SWKO Motivation (5) | r | .293 | .740 | .830 | .897 | -- | | |
| | *Sig.* | *.17* | *.00* | *.00* | *.00* | -- | | |
| SWKO Instructional Technology (6) | r | .624 | .832 | .888 | .641 | .699 | -- | |
| | *Sig.* | *.01* | *.00* | *.00* | *.01* | *.00* | -- | |
| SWKO Assessment (7) | r | .663 | .904 | .944 | .654 | .685 | .919 | -- |
| | *Sig.* | *.01* | *.00* | *.00* | *.01* | *.01* | *.00* | -- |

***Notes:*** Shaded cells indicate significant correlations, 1-tailed, $p<.05$; SWKO = Satisfaction with knowledge of.

### *3.3 Degree of Knowledge Change*

Results of the qualitative measures revealed some interesting trends. Students gained the most knowledge on the basics of instructional design and how to apply it to teaching, how to apply motivation for learning in the classroom, the application of instructional technology, and the basics of effective assessment design. Students gained the least knowledge concerning the basics and application of learning environments, the basics of motivation, the role of technology in the classroom and the application of assessment in the classroom. Qualitative results are presented in Table 5.

The application of instructional design and the application of motivational strategies showed the most knowledge gain followed by the basic understanding of what instructional design is, the application of technology in the classroom and the basic understanding of effective classroom assessment. The elements where the least knowledge was gained are arguably the most abstract concepts to learn (e.g. concept of a learning environment and motivation) but students showed knowledge gains in these areas in terms of application of the concept. In the end, knowledge change was demonstrated in several core areas although not consistently across all elements.

Journal of Education and Training
ISSN 2330-9709
2016, Vol. 3, No. 2

Table 5. Qualitative response examples and summary of change

| Question | Example (Pre) | Example (Post) | Summary of Change | Frequency |
|---|---|---|---|---|
| 1 | Instructional design is different from development meaning that design focuses on what to teach how to teach and what/how to test. Design is the part of teaching where develop materials evaluate other materials revise existing material and use all of those to formulate lesson plans. | Instructional design can be divided into five sections. Commonly referred to as ADDIE instructional design helps teachers take teaching step by step. Teachers will analyze design develop implement and evaluate every class they teach. | Better able to articulate the complex nature of instructional design | 5/8 |
| 2 | Create a teaching style and assignments that will be applicable to the students. The learning styles should be multiple and should be handled in a way that is fun to teach for the instructor as well as complete for the students. The more interesting the assignments and lectures are the more chance that students will absorb the information and remember it for later in life and in the class. | Assess where the students are and how to best comunicate ideas to them so that they will retain the information and be motivated to learn. I would continue to assess and evalutate my teaching and students' learning. | Moved from a generic or shallow content-focused understanding to a more specific strategic process understanding. | 8/8 |
| 3 | The learning environment is the actual room where the teaching is taking place as well as any other distractions or | The learning environment includes the actual room and elements outside the classroom that might interfere with the | Moved from a very general understanding to a more strategic process understanding, with specific examples. | 3/8 |

| | | | | |
|---|---|---|---|---|
| | events occuring outisde the room. | students' learning process. A designer should consider the classroom's arrangement technology in the classroom the size of the class lighting and outside noise. | | |
| 4 | discover who the student is in order to create the environment necessary to open the discussion fields. What am I dealing with - first semester freshman or upper division students | Open behaviors - demonstrate own interests in the subject explain why it is interesting. model behaviors - keep the door open for discussions and be ready to allow students the floor when they have a point to make. | Moved from a generic, shallow or single issue understanding to a more holistic, strategic, and process-oriented understanding. | 4/8 |
| 5 | Motivation is a mental desire to learn. It is essential in learning something new and trying to go deeper into a subject. | Motivation is the certain amount of drive a person has to accomplish their goals. Some essential components would be discipline drive attitudes and emotions. | More comprehensive articulation of the nature and aspects. | 2/8 |
| 6 | Be enthusiastic and show that you believe the matierial is fun and important and encourage them to see it's importance and applicability. | Everyone is different so different things may inspire different people. Providing multiple examples and methods and opportunities to learn the material will help to motivate. As well as showing that I care that will help to motivate students as well. | Moved from a shallow content or personal understanding to a more synthesized, better articulated, strategic understanding, with relevant, theoretically-grounded examples. | 7/8 |

Journal of Education and Training
ISSN 2330-9709
2016, Vol. 3, No. 2

| | | | | |
|---|---|---|---|---|
| 7 | I did not recieve a booklet on my first day so I do not know this. | To help students learn and become compotent with the current technology. | No real knowledge change due to limited nature of pre measure response. | 1/8 |
| 8 | the room itself - what is available to the classroom and then what is available to the students outside of the classroom. how much technology is useful and how much just makes it another powerpoint session.... | Don't power point people to death - we are good at that. Visuals work with some groups and not with others. You have to determine what type of learners are in the room and design the technology around that. | Moved from a content, single-issue understanding to a more student-focused, strategic process understanding. | 5/8 |
| 9 | Assessment must be completed regarding both the learners (as to how well they have learned) and the instructors (how well they have conveyed information). Assessing learners could involve surveys quick quizzes (formal or informal) exams writing projects experimental design and/or performance or performance on other work completed. Assessment of the quality of instruction could involve final course evaluations informal surveys scattered through the semester and talking with students especially those who have difficulty with the material. | Assessments should be designed to assess student learning of course objectives usually in a way similar to how learning occurred. The assessment should take into account course objectives additional resources presented or used and the main topics which the student should know and/or be able to remember after leaving the course. Assessments should be drawn from materials students have access to (course notes textbook lab exercises etc.). Also the instructor must assess how efficient and effective their instruction was and | Moved from a shallow, content-focused understanding to a more process-oriented, systematic understanding. | 5/8 |

Journal of Education and Training
ISSN 2330-9709
2016, Vol. 3, No. 2

| | | | | |
|---|---|---|---|---|
| | | should keep notes about this. | | |
| 10 | Assessments should measure core concepts in the course that have been covered. They should occur regularly enough that students can use them to ascertain their own progression throughout the course. All assessments should relate back to the overall course learning objectives. | A teacher should begin with the concepts he or she wants to assess in terms of student learning. An activity assignment quiz or exam is then developed. The assessment should be easy to understand for the student and stick to information and ideas conveyed in the course thus far. Evaluation of the assessment should be done to see where either the assessment or the course was not succeeding. | Moved from content-focused and looser product-focused understanding to a more strategic process-based understanding. Also included the utility of assessments for evaluating course as well as student achievement. | 3/8 |

### *3.4 Limitations*

This study has several limitations. Most notable is the small sample size with only 13 participants completing both pre and post quantitative measurement instruments and only eight completing both pre and post qualitative measures. Another limitation is the unfortunate lack of comprehensive demographic information on the participants. Furthermore, the sample was highly homogenous being mostly female and mostly Caucasian. Due to these limitations, the current study is not broadly generalizable. However, as a pilot or proof of concept, it does provide some very promising patterns that deserve further investigation. The self-reported nature of the quantitative data, specifically assessment of satisfaction with knowledge (rather than an objective knowledge assessment), may be seen as a limitation; however, satisfaction with knowledge is a key factor in teaching competence and self-efficacy perceptions, and thus an important outcome of training and development. Furthermore, the qualitative data was evaluated by experts as an objective knowledge assessment providing more objective evidence for self-reported measures.

## 4. Discussion

Our hope in designing the online TA training was to increase participant perceptions of teaching efficacy and competence as well as their knowledge of instructional design, learning environments, motivation, instructional technology and assessment. Furthermore, drawing inspiration from Hardré (2005), we aspired to engender them to see the interconnected nature of the knowledge components within an ID framework as a cohesive toolset that can be used to aid their ability to teach regardless of discipline. The participants in our sample did increase their teaching efficacy and perceived teaching competence following the online intervention, though given the small sample, these changes did not achieve statistical significance. It is likely that the positive trend demonstrated here would achieve statistical significance in a larger sample.

As to the changes in satisfaction with knowledge of instructional design, learning environments, motivation, instructional technology and assessment, we see mixed results. All of the satisfaction with knowledge variables increased following intervention, but only instructional design, learning environments and instructional technology satisfaction demonstrated statistically significant increase. Again, this promising result would likely demonstrate more statistical significance in a larger sample.

Beyond learning the content and gaining satisfaction with their knowledge, it is important for TAs to see the critical connections among the various components of instruction, as a cohesive set of tools that go together to help them become better teachers. Reviewing the pre-intervention correlations between the variables, there is no great convergence apparent but there are some interesting interconnections worth exploring.

Prior to the intervention, participants' teaching efficacy and teaching competence were not highly correlated. Participants did not see the connection between perceived ability to teach and perceived competence as a teacher. Following the intervention though, the correlation between teaching efficacy and perceived competence was statistically significant and tripled in magnitude. The intervention seems to have solidified the connection for participants between their teaching efficacy and their perceived competence as teachers.

Prior to the intervention, participants' beliefs about whether or not they can teach were significantly correlated with their satisfaction of knowledge in the domains of ID, learning environments and instructional technology. With little prior instruction, these three areas were seen as highly related to the self-efficacy of the participants as instructors, indicating they understood the importance of these concepts in teaching effectively. Satisfaction with knowledge of assessment and motivation were not initially correlated with efficacy, indicating participants did not see them as integral to their perception of their ability to teach. Consistent with prior research on teachers' knowledge and perception of the role of motivation in instruction (see Hardré, 2003a; Hardré & Miller, 2006), motivation may be overlooked and assessment is often taken for granted as a natural by-product of instruction not connected to teaching or motivating skill.

It is likely that prior to the intervention the connection between designing instruction, the learning environment, and the technology used during instruction, are salient concepts basically understood, and something they have likely considered in preparation for, or even while engaging in instruction. Interestingly, these three measures of satisfaction with knowledge, which highly correlated with teaching efficacy prior to intervention, were the very measures of satisfaction that increased most significantly following the intervention. It is possible, that the instructional intervention enabled participants to increase their satisfaction of knowledge the most in these areas that initially related so strongly to teaching efficacy and might indicate that participant understanding of these concepts was naively related to their sense of efficacy at the beginning. After the intervention, the correlations between teaching efficacy and both satisfaction with knowledge of ID and satisfaction with knowledge of learning environments decreased in significance and magnitude, and satisfaction with knowledge of learning environments decreased to non-significance. Interestingly the correlation between teaching efficacy and satisfaction with knowledge of instructional technology increased in significance and magnitude following the intervention.

Prior to the intervention, participants perceived that teaching competence was only highly correlated with their satisfaction with knowledge of instructional technology and satisfaction with knowledge of assessment. It is possible that participants felt that their knowledge of instructional technology and assessment was something they understood well and was part of what made them feel competent as newer instructors. Technology and assessment are two things almost every course includes and tend to be more concrete in nature (i.e. they are either present or absent). Furthermore, initially participants did not link their satisfaction with knowledge of ID, learning environments, or motivation to their perceived teaching competence.

However, following the intervention connections between perceived teaching competence and all measures of satisfaction with knowledge increased dramatically in both significance and magnitude. Learning about instructional design, learning environments, motivation, technology, and assessment increased the cohesion of the connections with perceived teaching competence, and it is likely that as satisfaction of knowledge of all elements increases, so will participants' feelings of competence. Consistent with Hardré (2005), it is likely that having a toolset composed of these knowledge areas within an ID framework could engender TAs to feel much more competent as instructors.

Taking the SWKO measures together as a unit, participants saw the interconnected nature of all of the components even prior to the intervention. In the pre intervention measurement all of the SWKO measures were highly correlated with one another excluding the connection between instructional design and motivation which was right at the cutoff for statistical significance ($r$=.486, $p$=.05) as well as the connection between instructional design and instructional technology just outside of statistical significance ($r$=.417, $p$=.08). Eight of the ten possible correlations were statistically significant with Pearson's $r$ values ranging from .514 to .833. Following the intervention, six out of the ten possible correlations increased in both magnitude and statistical significance with one correlation remaining the same: SWKO motivation and SWKO assessment ($r$=.685, $p$=.01). Interestingly, three correlations actually decreased in magnitude but not in significance following the intervention: SWKO instructional design and SWKO learning environments (Pre: $r$=.833; Post: $r$=.802); SWKO learning environments and SWKO instructional technology (Pre: $r$=.660; Post: $r$=.641); and SWKO learning environments and SWKO assessment (Pre: $r$=.674; Post: $r$=.654). Finally, following the intervention, all ten possible correlations were statistically significant with Pearson's *r* values ranging from .641 to .944, representing a large increase in magnitude compared to pre-intervention measures.

The goal of the instructional intervention was to provide TAs with a toolbox to improve their teaching skills by providing them with an integrated knowledge of the fundamentals of instructional design and motivation theory. Within this framework, assessment, instructional technology and an understanding of learning environments was woven into an interconnected tapestry of teaching tools that we hoped would improve TAs' sense of teaching efficacy and perceived teaching competence. It was important that the participants saw the interconnected nature of the instruction, as together these knowledge areas are a powerful tool set for improving teaching. While the sample was very small, the data gathered provides a promising picture of how interconnected the participants perceive these areas of knowledge. Despite previous studies demonstrating positive effects of the ID framework on knowledge and self-perceptions (e.g., Hardré & Chen, 2005, 2006; Hardré & Burris, 2012), few researchers are exploring the use of ID as a framework for TA development, both short and long-term. Though on a small sample, the findings of the present study suggest once again that it is an idea that deserves more attention and study, in online as well as face-to-face formats. The increased correlations may also be evidence that the conceptual model of ID is supporting the TAs in making integrative connections among instructional components they previously considered separate and discrete. Additional research on the cognitive effects of the ID model in conceptually linking components of teaching knowledge could confirm this hypothesis.

These previous studies of ID effects were done in face-to-face, trainer-led and mentored learning environments. At the time the present study was launched, there were no others found (in an extensive search of scholarly journals) that had been delivered as self-paced, in a digital learning system. Unfortunately as time has elapsed, the original Moodle site with the instructional intervention was subsumed by other University resources and is for all intents and purposes lost, so a larger sample size with the original intervention is not possible. However, further investigation into online TA development training using a new version of the tool set investigated here would be an excellent addition to the literature and deserves further exploration. TAs are in need of accessible, adaptable and flexible training that will provide them with a tool set they are not likely to receive in their program area of study.

## References

Alessi, S. M., & Trollip, S. R. (2000). *Interactive multimedia: Tools for learning and instruction.* NY: Allyn & Bacon.

Ames, C. & Archer, J. (1988). Achievement goals in the classroom: Student learning strategies and motivational processes. *Journal of Educational Psychology*, *80*, 260-67.

Anderson, J. R. (1993). Rules of the Mind. Hillsdale, NJ: Erlbaum.

Ashton, P. T. (1985). Teacher efficacy: A motivational paradigm for effective teacher education. *Journal of Teacher Education*, *35*, 28-32.

Austin, A. E. (2002). Preparing the next generation of faculty: Graduate school as socialization to the academic career. *Journal of Higher Education, 73*(1), 94-122.

Ausubel, D. (1968). *Educational psychology: A cognitive view*. New York: Holt, Rinehart and Winston.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliff, NJ: Prentice Hall.

Beck, R. C. (2004). *Motivation: Theories and principles.* Upper Saddle River, NJ: Prentice-Hall.

Biddle, B. J., & Anderson, D. S. (1986). Methods, knowledge, and research on teaching, in M.C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 42-64). New York, NY: Macmillan.

Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Education Research Journal*, *26*, 473-498.

Boyer, E. L. (1990). *Scholarship Reconsidered: Priorities of the Professoriate*. Princeton, NJ: Carneigie Foundation for the Advancement of Teaching.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (1999*). How people learn: Brain, mind, experience, and school*. Washington DC: National Academy Press.

Brookfield, S. D (1986). Understanding and facilitating adult learning. A comprehensive analysis of principles and effective practices. San Francisco: Jossey-Bass.

Brookfield, S. (2006). *The skillful teacher.* San Francisco, CA: Jossey-Bass.

Buerkel-Rothfuss, N. L., & Gray, P. L. (1991). Teaching assistants training: The view from the trenches. In J. D. Nyquist, R. D. Abbott, D. H. Wulff, & J. Sprague (Eds.), *Preparing the Professoriate of Tomorrow to Teach* (*pp. 29-39),* Dubuque, Iowa: Kendall/Hunt.

Buskist, W. (2013). Preparing the new psychology professoriate to teach: Past, present, and future. *Teaching of Psychology*, *40*(4), 333–339. http://doi.org/10.1177/0098628313501047

Clifford, M. (1990). Students need challenges, not easy success. *Educational Leadership*, *48*, 22-26.

Corno, L., & Randi, J. (1999). A design theory for classroom instruction in self-regulated Learning. In C. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory* (pp. 293-318). Mahwah, NJ: Lawrence Erlbaum.

Deci, E. L. (1995). *Why we do what we do: Understanding self-motivation.* New York: Penguin Books.

Deci, E. L., & Ryan, R. M. (2000). The"what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*, 227-268.

Deci, E. L., & Ryan, R. M. (2002). The paradox of achievement: The harder you push, the worse it gets. In J. Aronson (Ed.) *Improving academic achievement: Contributions of Social*

*Psychology* (pp.59-85). New York: Academic Press.

Deci, E. L., Ryan, R. M., & Williams, G. C. (1996). Need satisfaction and the self-regulation of learning. *Learning & Individual Differences*, *8*(3), 165-185.

Dick, W., Carey, L., & Carey, J. O. (2014). *The systematic design of instruction*. New York: Longman.

Dotger, S. (2011). Exploring and developing graduate teaching assistants' pedagogies via lesson study. *Teaching in Higher Education*, *16*(2), 157–169.

Druckman, D., & Bjork, R. A. (1991). Optimizing long-term retention and transfer. In D. Druckman and R.A. Bjork (Eds.), *In the mind's eye* (pp. 23-56). Washington, DC: National Academy Press.

Druckman, D., & Bjork, R. A. (1994*). Learning, remembering, believing: Enhancing human performance.* Washington, DC: National Academy Press.

Gaff, J. G., & Lambert, L. M., (1996). Socializing future faculty to the values of the undergraduate education. *Change, 28*(4), 38-43.

Gagné, R., & Medsker, K. (1996). *The conditions of learning: Training applications.* New York: Harcourt Brace.

Gagné, R., Wager, W., Golas, K., Keller, J., & Russell, J. (2005). Principles of instructional design, 5th edition. *Performance Improvement, 44*(2), 44-46.

Gallego, M. (2014). Professional development of graduate teaching assistants in faculty-like positions: Fostering reflective practices through reflective teaching journals. *Journal of the Scholarship of Teaching and Learning*, *14*(2), 96–110.

Glaser, R., & Chi, M. T. H. (1988). Introduction: What is it to be an expert? In M. T. H. Chi, R. Glaser, & M. J. Farr (Eds.), *The Nature of Expertise* (pp. xv-xxi). Hillsdale, NJ: Erlbaum & Associates.

Gustafson, K. L. & Branch, R. M. (2002). What is instructional design? In R. A. Reiser & J. V. Dempsey (Eds), *Trends and issues in instructional design and technology* (pp. 16-25). NY: Prentice Hall.

Hardré, P. L. (2001). Designing effective learning environments for continuing education, *Performance Improvement Quarterly, 14*(3), 43-74.

Hardré, P. L. (2002). *The effects of instructional design professional development on teaching performance, perceived competence, self-efficacy, and effectiveness.* Doctoral dissertation, University of Iowa, Iowa City.

Hardré, P. L. (2003a). The effects of instructional design training on university teaching assistants. *Performance Improvement Quarterly*, *16*(4), 23-39.

Hardré, P. L. (2003b). Beyond two decades of motivation: A review of the research and practice in instructional design and human performance technology. *Human Resource*

*Development Review, 2*(1), 54-81.

Hardré, P. L. (2004). Starting from the end: Instructional design for teaching technology. *Association for the Advancement of Computing in Education Journal*, *12*(3), 315-330.

Hardré, P. L. (2005). A case for instructional design as a professional development tool-of-choice for university teaching assistants. *Innovative Higher Education*, *30(3),* 163-178.

Hardre, P. L., & Burris, A. O. (2012). What contributes to teaching assistant development: Differential responses to key design features. *Instructional Science: An International Journal of the Learning Sciences*, *40*(1), 93–118.

Hardré, P. L. & Chen, C. H. (2005). A case study analysis of the role of instructional design in the development of teaching expertise. *Performance Improvement Quarterly, 18*(1), 34-38.

Hardré, P. L. & Chen, C. H. (2006). Teaching assistants learning, students responding: Process, products and perspectives on instructional design. *Journal of Graduate Teaching Assistant Development.*

Hardré, P. L., Ferguson, C., Bratton, J. & Johnson, D. (2008). Online professional development for TAs: What they need, what they have, what they want. *Journal of Graduate Teaching Assistant Development, 22*(1), 11-23.

Hardré, P. L., Ge, X. & Thomas, M. (2005). Toward a theory of the development of expertise in instructional design. *Educational Technology*, *45*(1), 53-57.

Hardré, P. L. & Miller, R. B. (2006). Toward a current, comprehensive, integrative, and flexible model of motivation for instructional design. *Performance Improvement Quarterly, 19*(3), 25-52.

Hardré, P. L. & Reeve, J. (2003). A motivational model of rural students' intentions to persist in, versus drop out of high school. *Journal of Educational Psychology, 95*(2), 347-356.

Hardré, P. L. & Reeve, J. (2009). Training corporate managers to adopt a more autonomy-supportive motivating style toward employees: An intervention study. *International Journal of Training and Development, 13*(3), 165-184.

Harris, G., Froman, J., & Surles, J. (2009). The professional development of graduate mathematics teaching assistants. *International Journal of Mathematical Education in Science & Technology*, *40*(1), 157–172.

Hutchings, P. (1993). Preparing the professoriate: Next steps and what we need to do to take them. In L. M. Lambert & S. L. Tice (Eds.) *Preparing Graduate Students to Teach* (pp. 127-134), Washington, D.C.: American Association for Higher Education.

Johnson, R.B. & Christensen, L. (2014). *Educational Research: Quantitative, Qualitative and Mixed Approaches* (5th ed.). Thousand Oaks, CA: Sage.

Knowles, M. S. (1990). *The adult learner: A neglected species*. Houston, TX: Gulf

Publishing.

Lambert, L. M., & Tice, S. L. (Eds.) (1993). *Preparing graduate students to teach: A guide to programs that improve undergraduate education and develop tomorrow's faculty*. Washington, DC: American Association for Higher Education.

Leinhardt, G., & Greeno, J. G. (1986). The cognitive skill of teaching. *Journal of Educational Psychology*, 78, 75-95.

Lepper, M. R. (1988). Motivational considerations in the study of instruction. *Cognition and Instruction 5*(4), 289-309.

Linenberger, K., Slade, M. C., Addis, E. A., Elliott, E. R., Mynhardt, G., & Raker, J. R. (2014). Training the foot soldiers of inquiry: Development and evaluation of a graduate teaching assistant learning community. *Journal of College Science Teaching*, *44*(1), 97–107.

Lockwood, S. A., Miller, A. J., & Cromie, M. M. (2014). Preparing future biology faculty: An advanced professional development program for graduate students. *The American Biology Teacher*, *76*(1), 17–21. http://doi.org/10.1525/abt.2014.76.1.5

Marbach-Ad, G., Schaefer, K. L., Kumi, B. C., Friedman, L. A., Thompson, K. V., & Doyle, M. P. (2012). Development and evaluation of a prep course for chemistry graduate teaching assistants at a research university. *Journal of Chemical Education*, *89*(7), 865–872. http://doi.org/10.1021/ed200563b

Marincovich, M. (1998). Teaching teaching: The importance of courses on teaching in TA training programs. In M. Marincovich, J. Prostko, & F. Stout (Eds.) *The professional development of graduate teaching assistants* (pp. 145-162). Bolton, MA.: Anker Publishing.

Marincovich, M., Prostko, J., & Stout, F. (Eds.) (1998). *The professional development of graduate teaching assistants.* Bolton, MA: Anker Publishing.

McCombs, B. (2000). *Assessing the role of educational technology in the teaching and learning process: A learner-centered perspective*. The Secretary's Conference on Educational Technology.

McGilly, K. (Ed.) (1996). *Classroom lessons: Integrating cognitive theory and classroom practice.* Cambridge, MA: MIT Press.

Morrison, G. R., Ross, S. M., & Kemp, J. E. (2004). *Designing effective instruction* (4th ed.). New York, NY: Wiley & Sons.

Nyquist, J. D., & Sprague, J. (1998). Thinking developmentally about TAs. In M. Marincovich, J. Prostko, & F. Stout (Eds.) *The professional development of graduate teaching assistants* (pp. 61-88). Bolton, MA: Anker Publishing.

Pentecost, T. C., Langdon, L. S., Asirvatham, M., Robus, H., & Parson, R. (2012). Graduate teaching assistant training that fosters student-centered instruction and professional development. *Journal of College Science Teaching*, *41*(6), 68–75.

Pintrich, P., & Schunk, D. (1996). *Motivation in education: Theory, research, and applications*. Englewood Cliffs, N.J.: Merrill.

Reeve, J. (1996). *Motivating others: nurturing inner motivational resources*. Needham Heights, MA: Simon & Schuster.

Reeve, J., Deci, E. L., & Ryan, R. M. (2004). Self-determination theory: A dialectical framework for understanding the socio-cultural influences on student motivation. In D. McInerney & S. Van Etten (Eds.) *Research on sociocultural influences on motivation and learning: Big theories revisited* (Vol. 4, pp. 31-59). Greenwich, CT: Information Age Press.

Reigeluth, C. (1999). *Instructional-design theories and models (Vol. II): A new paradigm of instructional theory.* Mahwah, NJ: Lawrence Erlbaum.

Reiser, R. A. (2002). A history of instructional design and technology. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (pp. 26-54). New York: Prentice Hall.

Ryan, K. E. (Ed.) (2000). Evaluating teaching in higher education: A vision for the future. *In New Directions for Teaching and Learning, 83.* San Francisco, CA: Jossey-Bass.

Sabers, D. S., Cushing, K. S., & Berliner, D. C. (1991). Differences among teachers in a task characterized by simultaneity, multidimensionality, and immediacy. *American Educational Research Journal,* 28, 63-88.

Sandi-Urena, S., & Gatlin, T. (2013). Factors Contributing to the Development of Graduate Teaching Assistant Self-Image. *Journal of Chemical Education*, *90*(10), 1303–1309. http://doi.org/10.1021/ed200859e

Santandreu Calonge, D., Chiu, P., Thadani, D. R., Mark, K. P., & Pun, C. F. K. (2011). In-service development for graduate teaching assistants: A blended-learning and formative approach. *Journal of University Teaching and Learning Practice, 8*(3).

Shapira, Z. (1976). Expectancy determinants of intrinsically motivated behavior. *Journal of Personality and Social Psychology, 34*, 1235-1244.

Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4-14.

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*, 1-22.

Smith, P. L., & Ragan, T. J. (1999). *Instructional Design (2nd ed.).* Upper Saddle River, NJ: Prentice-Hall.

Sternberg, R. J., & Wagner, R. K. (1993). *Mind in Context.* Cambridge, MA: Cambridge University Press.

Syverson, P. D. & Tice, S. L. (1993). *The critical role of the teaching assistantship*. In L. M. Lambert & S. L. Tice (Eds.) Preparing Graduate Students to Teach. Washington, D.C.:

American Association for Higher Education.

Tice, S. L., Gaff, J. G., & Pruitt-Logan, A. S. (1998) Preparing future faculty programs: Beyond TA development. In M. Marincovich, J. Prostko, & F. Stout (Eds.) *The professional development of graduate teaching assistants* (pp. 275-292). Bolton, MA: Anker Publishing.

## Copyright Disclaimer