

Development and Evaluation of a Decision Support Tool to Incorporate Redundancy in the
Development of Instructional Materials

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ABSTRACT

Novice Instructional Designers (IDs) often struggle to perform at the same level as experts. Specialized knowledge and experience are needed to discover the challenges and device appropriate solutions. Scaffold, guides, and heuristics can help novice when needing to perform tasks that require specialized knowledge. One common instructional design task requiring specialized knowledge is the development of instructional materials. Instructional message design (IMD) is a problem solving process to improve the quality of instructional materials through the application of research based principles. As this process is often not covered in novice IDs training, they will encounter more issues while attempting to address the challenges that come with creating instructional materials. Using a developmental study, a decision support tool was created to assist novice IDs with applying IMD, specifically the redundancy principle due to its ability to improve the communication within the materials. This study describes the operationalization of the principle, the design and development of the tool, expert review and revisions made based on their feedback, and the implications from the development of such a tool.

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GENERAL ABSTRACT

Novices usually struggle to do tasks like experts. This is truer as the number of tasks and amount of specialized knowledge needed to do those tasks increases. Novices can perform these tasks if guides or tools are available. When creating courses, there are many tasks to accomplish like creating course materials. There are many rules to support the making of good, effective course materials. This study focused on designing and developing a tool to assist the novice when making course materials. The tool would help novices apply a rule to improve course materials so that students would have a better experience when using them.

DEDICATION

To Aunt Joyce, Mom, Dad, Amanda & Sophie

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CHAPTER ONE

BACKGROUND AND RATIONALE

Instructional Design (ID) is a field bringing together many different areas of focus that contribute to the development of effective learning environments. One key element addressed by the instructional designer is the development of materials used to convey relevant information pertaining to desired knowledge and skills. Instructional message design (IMD), a sub-discipline of ID and sometimes referred to as the “linking science” between theory and practice (Fleming & Levie, 1978, p. ix), offers a body of knowledge to aid in the development of these materials by facilitating the process of creating a message that chunks, organizes, and sequences information with the intent to bring about a learning experience while taking into consideration development and delivery constraints.

IMD saw major developments in the 1970s – 1990s when advancements in educational psychology research were used to devise principles for how materials could be developed for greater impact. Fleming and Levie compiled many of these principles in their seminal book *Instructional Message Design: Principles From The Behavioral Sciences*, which was later expanded to *Instructional Message Design: Principles From The Behavioral And Cognitive Sciences* (1978, 1993). While this was a major step forward for the sub discipline, the initial and subsequent book suffered from a lack of clear guidance for designers on how to apply the principles in practice (Allen, 1993; Markle, Borich, & Clark, 1979; Merrill, 1980).

This limitation combined with a changing paradigm in the 1990s from instructor- to learner-centered instruction and the rise of the personal computer brought about a new line of inquiry termed “multimedia learning” (ML) that supplanted IMD inquiry for the next two decades (Mayer, 2002, 2003, 2005, 2009). While inquiry in ML had a component that was

focused on message design, the researchers aimed to develop their own principles of materials development using Cognitive Load Theory (CLT) as the basis. Mayer's work (2002, 2003) focused on one learning theory and mode of communication. This approach is effective to examine instruction through the lens of CLT that involves the presentation of content through multimedia but does not cover other delivery methods or learning theories that can serve as the basis of materials development. IMD calls on a broader base of knowledge, including varied learning theories and communication theory, and is not limited to only certain media.

Recently, IMD has reemerged in the literature. Bishop published two separate pieces: one covering the history of IMD, the other presenting a new way of framing the discussion around IMD and IMD research (Bishop, 2013a, 2013b). In the latter work, Bishop discusses a new framework (see Figure 1) to guide message design based on the redundancy principle.

Figure 1

Applications of Various Types of Redundancy to the Solution of Instructional Communication Programs

	Content redundancy Amplifies the content for message acquisition	Context redundancy Supplies the context for message processing	Construct redundancy Cues appropriate constructs for message understanding	Outcomes
<i>Selection</i> Encourages noise-defeating learner selection states	1. Message cues help learners direct attention	2. Message cues help learners identify patterns	3. Message cues help learners tie into previous knowledge	Learner is interested
<i>Analysis</i> Encourages noise-defeating learning analysis strategies	4. Message cues help learners focus attention	5. Message cues help learners organize information	6. Message cues help learners build upon existing knowledge	Learner is curious
<i>Synthesis</i> Encourages noise-defeating learner synthesis schemes	7. Message cues help learners hold attention over time	8. Message cues help learners elaborate upon information	9. Message cues help learners prepare knowledge structures for transfer to new learning contexts	Learner is engaged

Figure 1 Application of various types of redundancy to the solution of instructional communication problems. Reproduced with permission from “Reconceptualizing Instructional Message Design: Toward the Development of a New Guiding Framework” By M.J. Bishop, 2014, *Design in Educational Technology*, p.153, Copyright 2014 by Springer

Redundancy has been described as “that which is predictable or conventional in a message” (Fiske, 2011, p. 9). Greater redundancy in communication increases the predictability of the message. It impacts the decoding of the message. Increased redundancy in material development can reduce the impact of common communication problems by using a convention to increase accuracy and minimize errors, reducing the amount of noise in the message, and using context to clarify the nature of the message with the target audience. Bishop’s framework takes advantage of this principle to shape the way the content is communicated, seeking to reduce the amount of uncertainty that learners experience when using learning materials. Focusing on the first row, for example, if a developer’s goal is to hone learner interest in a particular “learning message”, the developer can support a learner’s focus by embedding cues

that direct learner attention to relevant (a) content (e.g., large, bold headers to direct focus), (b) context (e.g., consistent formatting throughout the document when transitioning from different types of information), and (c) prior constructs (e.g., examples and stories that help to connect with previously presented content or related content from previous learning) – and, avoid/remove any non-relevant cues that increase noise.

The following would be a brief illustration of redundancy principle as presented in Bishop's framework (2013b). In a workshop on course development, the facilitator could use a set of PowerPoint slides to present information. The slides would detail the process of creating objectives, determining assessments, and selecting appropriate activities to aid learning. A variety of cues can be included in the slides. Content cues could be the bolding of key terms or points on slides. Context cues could be using the same slide layout for similar types of information. Prior construct cues could be embedded questions to connect existing knowledge to upcoming content.

While the framework is based on earlier work completed by Bishop (2000) and Bishop and Cates (2001), it has not been packaged in such a way that it can be applied by novice instructional designers (IDs). Novice IDs and those lacking formal education in the process of developing learning materials may benefit from an operationalized version of the framework. Having a tool to use when developing materials can accelerate a designer's decision-making process while also ensuring that these decisions are grounded in a sound theoretical framework.

Need for the Study

With ID being an applied field, novice IDs, who would have limited experience can benefit from tools that assist them with ID tasks. As IMD is an area often not covered in ID training, novice practitioners may not address important IMD concepts when developing

instructional materials. This study focuses on providing support to novices when applying IMD principles, specifically the redundancy principle. The reason for focusing on the redundancy principle is to aid novice IDs with message design strategies that help learners focus on the most salient information in educational materials.

Purpose of the Study

The purpose of this study is to develop a decision support tool that novice instructional designers can use to incorporate the redundancy principle when developing instructional materials (Fiske, 2011). This study will employ a product and tool design and development research approach with the following three phases: analysis, design & development, and evaluation & revision (Richey & Klein, 2005). The tool development process is documented in detail. Three instructional design experts evaluated the tool and provided recommendations for improvement that were used as the basis for tool revision.

Benefits of the Study

This study contributes to the instructional design knowledge base by bridging theory to practice. A practical tool supporting the application of the redundancy can help novice IDs with the implementation of IMD. The study also contributes methodologically by using a design and development research approach, a promising but still relatively infrequent methodology documented in published instructional design research (Richey & Klein, 2014).

Organization of the Study

Chapter One provides background information and the need for the study, the purpose of the study, and anticipated benefits. Chapter Two presents a review of literature related to this study. It includes three sections. The first section presents an overview of redundancy in human

communication, including definitions and theoretical underpinnings. The second section provides an overview of IMD, including definitions and theoretical underpinnings. The third section describes the material development process of novice IDs. Chapter Three presents the methodological approach that will be employed in this study. It includes the research design and data collection methods. Chapter Four details the process of developing the tool along with the content that makes up the tool. Chapter Five contains the feedback from experts about the tool and its potential usage by novice IDs, discussion of the expert feedback and changes to the tool. Chapter Six includes a summary of the study, contributions of the study, and future research direction.

CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The purpose of this study is to develop a tool applying the redundancy principle that novice IDs can use to support the development of instructional materials. This study is informed by aspects of communications theory including the redundancy principle, instructional message design, and instructional design in practice.

The review begins with an overview of human communication theory including its origin and major paradigms. This section is followed by the discussion of the redundancy principle and its connection to instructional materials development. Following this section is an overview of instructional design including the role instructional message design plays. The final section provides an overview of novice IDs skills and experience when performing instructional design tasks & skills.

Human Communication Theory

Communication as a field is focused on the generation of the theory that deals with the effectiveness and understanding of communication activities (Berger & Chaffe, 1987). Within the field, there are different perspectives that influence the way communication is defined and researched. For example, DeVito (1986) stated that communication is “the process or act of transmitting a message from a sender to a receiver, through a channel and with the interference of noise; the actual message or messages sent and received; the study of the processes of the sending and receiving of messages” (p. 61). Whereas Gerbner (1967) asserted that communication is “interaction through messages. Messages are formally coded symbolic or

representational events of some shared significance in culture, produced for the purpose of evoking significance” (p. 430). The difference in definitions is because one being rooted in the transmission perspective while the other comes from the stimulus-response perspective.

Littlejohn and Foss (2011) further elaborated on this idea stating that there is not just one way of defining communication but rather a collection of perspectives. These perspectives, originating from work by Robert Craig, help to illustrate the different ways that you can approach research in communication. In total, there are seven different approaches: rhetorical, semiotic, phenomenological, cybernetic, sociopsychological, sociocultural, and critical. Littlejohn and Foss used these perspectives to examine different aspects of communication ranging from the message and the communicator to organizations and society.

Ultimately, Littlejohn and Foss (2011) believe that there should not be one definition but several stating that definitions are “tools that should be used flexibly” (p. 5), noting that different and conflicting definitions can be used depending on interest and research focus. For this review, I will be focusing on those definitions and approaches that would fall under the transmission/information theory /cybernetic perspective, from which the redundancy principle is derived.

The most recognizable transmission communication model, which came from the research of Shannon and Weaver (1949), depicts the following: A source encodes a message and transmits the message via a channel. A receiver decodes the message that was transmitted via the channel with the possibility of noise during the transmission impacting the accuracy of the message. The original model by Shannon and Weaver has influenced the development of many elaborations and interpretations. Two such examples would be the work done by Schramm (1954) and Berlo (1960).

Arguing that there is no such thing as one-way, linear communication as reflected by the Shannon and Weaver model, Schramm added a feedback process between the sender and receiver (Schramm, 1954; Schramm & Roberts, 1971). Berlo, however, sought to consider another variable that was not explicit in either model: the human. Berlo (1960) argued that each person brought his/her own knowledge, social system, attitude, and culture to every communication. Thus, communication cannot be reduced to a symbol system of the sender, receiver, message, and feedback. Rather, these four human characteristics must be included in a model of communication.

While each of these models of communication may prioritize different elements that can influence the transmission of information, all of them have similar components in the fundamental process of how messages are communicated. In light of these models, many principles have been developed to aid in the successful communication of messages by focusing on the human element, the components in the process, or the message itself. One principle that focuses on the message is the redundancy principle.

Redundancy

This section will discuss the definition of redundancy and its progression down two paths of inquiry: one focusing on redundancy and channel, and one focusing on redundancy and coding of content. These paths, reflected by the names of the researchers advancing the line of inquiry, can be seen in figure 2.1.

Figure 2.1

Two Pathways of Inquiry into Redundancy

Redundancy Inquiry	
<i>Channel</i>	<i>Coding System</i>
Shannon	Original channel redundancy model
Hsia	Within and Between channel redundancy
Lang	Application of both types of redundancy for AV development
Mayer	Application of redundancy in AV for education development
	Weaver
	Levels of channel model, different types of meaning
	Berlyne
	Entropy is equal to uncertainty in message meaning
	Fiske
	Uncertainty and certainty on continuum, apply redundancy via convention
	Bishop
	Use cues to create convention in message development

During the transmission communication process, there is the possibility of noise occurring. Noise, which can range from distractions when receiving the message to interruptions when trying to decode the message, can affect the quality of the message and thus the meaning that can be derived from the decoded message. To overcome the influence of the noise on the message, two methods were suggested by Shannon and Weaver (1949): use a proper coding system for the intended transmission channel or keep the entropy, that which is random or non-predictable, of the transmitted information equal to or lower than the channel capacity. A coding system is a shared process of converting a sender’s meaning to a transmittable signal. One way of applying these methods is by using redundancy.

Shannon and Weaver (1949) define redundancy as “the part of the message that is not determined by free choice but due to the nature of the symbol system being used to create the message”. (p. 104) Redundancy, while not needed for the meaning of a message to be still understood, would be applied during the coding process. By doing so, the likelihood that the

transmitted message is received and decoded in its best form is increased while the amount of information being transmitted is kept within the tolerance of the selected transmission channel. Coding in redundancy improves the odds of a receiver deriving the intended meaning.

While Shannon and Weaver both worked on the model, and are normally mentioned together, their approaches to the model differed. Shannon was only interested in the application of the model for signal transmission. He was aware of the potential application in a semantic capacity but was not interested in pursuing this direction. Weaver, however, would later conduct this work alone. Their research would spawn different directions of inquiry. Information Theory, which continued in the vein of work done by Shannon, looks at the application of redundancy in mathematical calculations for signal delivery. Whereas Weaver took a semantic approach to the model developing three layers of application that look at the signal transmission of the message, the interpretation of the message, and finally action taken based on the message. This then led to various applications of redundancy that focused on language.

This split in emphasis of the model can also be seen in the ways research on the application of redundancy has evolved over time. Figure 2.1 shows the development of applying redundancy over time. The roots of channel redundancy can be linked to Shannon due to his transmission focus, coding system redundancy to Weaver due to his semantic focus.

Channel Redundancy. The path of channel redundancy can be said to follow the development of communication technology over time. Hsia (1977) conducted research on redundancy exploring the differences between a single channel and multiple channels. The terms within channel redundancy and between channel redundancy would be developed during his research process. Within channel redundancy is the same as that discussed in Shannon and Weaver's original model; between channel redundancy focused on communications that could be

presented via two or more channels. Hsia contributed to research on the cognitive load of messages when being transmitted on multiple channels emphasizing that messages, when transmitted via multiple channels, could have negative effects if not planned for correctly with attention being split across channels instead of consolidated. Subsequent research would see an application of this idea in the AV industry and with the delivery of television programs. Lang (1995) for example, would use this information to determine the best ways to present redundant information via the channels available with television.

Another extension of channel redundancy work can be found in education. Mayer would build upon the ideas of Shannon, Hsia, and Lang when creating his Multimedia Learning Theory (MLT). In MLT, the channel redundancy approach is referred to as the redundancy effect (Mayer, 2005). The effect is defined as that which “occurs when additional information presented to learners results in learning decrements compared to the presentation of less information. The additional information, rather than having positive effects on learning has negative effects and, in that sense, is redundant” (Mayer, 2005, p. 160–161). Influenced by Sweller’s Cognitive Load Theory (CLT) and Pavio’s Dual Coding Theory, the point of Mayer’s redundancy effect is to ensure that when coding the message, the amount of information to be included is limited and appropriate for the multimedia channels being used to transmit the message.

Coding System Redundancy. The inquiry path of coding system redundancy is a bit more complex. Weaver asserted that the communication model could be used for more than just channel transmission (Shannon & Weaver, 1949). This led to the expanded three-level focus that included the semiotic meaning of the message and behavioral or cognitive change from receiving

the message. Much of the work focused on transmission. Berlyne, however, included a discussion on the meaning of the messages in addition to their transmission.

In his 1974 piece, Berlyne would make the connection between entropy, or the amount of choice that is in a system, and the uncertainty of a message when received by the other party (Berlyne, 1974). This led to the understanding that, by limiting the range of choices within a system, the uncertainty when receiving a message can also be decreased. Reduction in uncertainty will increase the likelihood of accurately comprehending the meaning of the message. Subsequent research by Fiske would keep with the meaning focus but fashion another way to think about the development of efficient coding systems.

Fiske (2011) was interested in being able to understand mass media and the media messages that were effective. Allowing for variation and personal flair, these messages would help to establish a system that could then be followed. In the work *Introduction to Communication Studies*, Fiske (2011) defines redundancy as “that which is predictable or conventional in a message”; thus, the higher the redundancy the more predictable the message (p. 9). As represented in figure 2.2, Fiske argued that entropy and redundancy are at two ends of message coding when discussing certainty and uncertainty. Like the ideas of Berlyne, uncertainty is reduced by the coding system approach to redundancy, but it is represented on a continuum. Thus, one can have varying levels of redundancy depending on the strategy used to code the message. The issue then becomes whether a strategy is used and how predictable the message is after applying the strategy.

*Figure 2.2**Application of Convention to Increase Redundancy*

Convention, or structuring a message per shared patterns, can help with the coding of more redundant messages (Fiske, 2011). Using convention when creating messages helps to increase the level of redundancy, moving further toward the certainty side of the continuum. By moving toward a convention system for message development, there is a possibility of creating messages that are more predictable which in turn are easier for the receiver to decode, increasing the chance of accurate meaning interpretation.

Bishop (2013) would make use of the works by Shannon, Weaver, Berlyne, and Fiske to create a coding system for instructional materials. The system would be based on cues to aid in the recognition, processing, and retention of information. Initially this system was intended for the use of sound in instruction but was later broadened to include all types of instructional media (Bishop, 2000; Bishop & Cates, 2001; Bishop 2013).

Summary

This section presented an overview of human communication as a professional field of inquiry with a long history and varied paradigms. Also discussed were the principle of redundancy and the two paths that have emerged in research on the application of redundancy.

Finally, the concept of convention as a way to apply the redundancy principle for message development was discussed.

Instructional Design

Instructional Design (ID) has been defined in a variety of ways over the years. Dick, Carey, and Carey (2005) define ID as a process for the design, development, implementation, and evaluation of instruction. Cennamo and Kalk (2005) describe it as “...you work with clients to translate their needs and desires into the design specifications that will yield a successful product” (p. 3). Richey, Klein and Tracey (2010) refer to ID as “the science and art of creating detailed specifications for the development, evaluation, and maintenance of situations which facilitate learning and performance.”(p. 3) One way to summarize would be to say that ID is the practice of looking at current performance, considering what the ideal would be, and creating interventions to guide a learner to that new state. This guidance does not always have to be in the form of creating a new course or developing new materials. However, that is often the case if the current iteration is lacking in regard to achieving the desired objectives. To perform ID work, a certain set of knowledge and skills are needed.

Most instructional designers follow a process that aids them in the development of educational interventions. One of the most recognized frameworks for this process is ADDIE. ADDIE, which is an acronym that stands for Analysis, Design, Develop, Implement, and Evaluate, serves as a core framework in ID and used to create performance-based learning products (Branch, 2009). Originally developed for use by the US military, this framework has been used as the foundation for many instructional design process models such as those developed by Gagne and Briggs (1974), Dick, Carey, and Carey (2005), and Morrison, Ross, and Kemp (2010). While the collection of steps and processes may vary from one model to the next,

each will have similar characteristics that are integral to the ADDIE process such as: the analysis of learners, content, and context, preparing objectives, developing assessments, creating content, and evaluating the learning and instructional design. While not always stated or depicted in certain representations, ADDIE is an iterative process that improves learning designs over time through assessment and evaluative feedback (Branch, 2009).

In addition to ADDIE, there are many different tools and frameworks used to support the instructional design process. Examples would include Keller's ARCS motivation model, Bloom's Taxonomy, and Gagne's nine events of instruction. There are also other areas that have full bodies of literature that align with and inform the different parts of the ADDIE framework used during the instructional design process such as educational assessment or evaluation. One area that aligns with and informs the design and development parts of ADDIE is Instructional Message Design.

Instructional Message Design

Instructional Message Design (IMD) can trace its origins back to the early 1900s through the likes of Dewey and Thorndike. In the introduction of the seminal work on IMD, Fleming and Levie included a quote by Glaser that called for the development of a "linking science" (1978, p. ix). This call was based upon prior statements by Dewey and Thorndike that asserted there was no clear method for applying theory to practice. With the increase in study and focus on cognitive psychology and, specifically, how people perceive information to learn, the time was right for Fleming and Levie to compile a volume dedicated to IMD and how the psychological research could be used to develop instructional materials.

IMD has been defined in many different ways since its initial development. Berry (1995) defined IMD as "that fundamental component of Instructional Design that brings together the

diverse areas of psychological theory, research findings, and technological development in a more comprehensive manner than most and other aspect of the design process” (p. 87). Fleming and Levie (1978) saw IMD as “the process of manipulating, or planning for the manipulation of, a pattern of signs and symbols that may provide the conditions for learning” (p. x). More recently, Bishop (2013) has stated that IMD “explores how various media and delivery systems might be used more effectively to help optimize instructional communications within context-specific instructional situations and learner needs” (p. 374). In essence, the term IMD denotes a problem-solving process with the intent to strengthen a learning experience by applying what is known theoretically and empirically about the communication of human messages to the development and delivery of information.

IMD offers a collection of research-based principles that can aid in the development of instructional materials. IMD draws from varied fields such as communication, educational psychology, graphic design, visual design, and information design. The works by Fleming and Levie (1993) were among the first to take results from different studies and group them in a manner that would be easy to understand and could help developers when looking for ways to present their content. Some examples would be work done on the understanding of perception and attention (Broadbent, 1958; Cherry, 1953; Treisman, 1969), usage of visuals and graphics (Levie & Dickie, 1973), and formatting of text (Hartley, 1985). Since then other books have been developed that focus on various aspects of development that can be used to support the materials development process; for example, *Information Design Workbook* (Baer, 2008), *Graphics for Learning* (Clark & Lyons, 2010), *Universal Principles of Design* (Lidwell, Holden, & Butler, 2010), *Creating Graphics for Learning and Performance* (Lohr, 2007), and *The Non-Designer's Design Book* (Williams, 2008).

When performing ID according to the ADDIE framework, there will come a point when decisions on instructional materials will need to be made. Whether evaluating existing materials or developing new ones, three areas need to be considered: content, form, and delivery. The principles of IMD can aid the instructional designer in making smart decisions in these three areas that will best support learners in acquiring the knowledge and skills identified in the course objectives. However, whether it is the ADDIE framework or some variation of it, deep guidance on how to apply IMD principles to materials development, improvement, and evaluation is lacking. As a result, the ID practitioner, especially the beginning practitioner, may be more inclined to make arbitrary decisions rather than decisions guided by research based IMD principles when engaged in the ID process.

Even though IMD does not show up in most ID models, researchers recognize its importance. Larson and Lockee (2013) identify IMD as part of the process, and Richey et al. (2010) distinguish it as part of the core theories contributing to the ID knowledge base. One model that does make mention of it is the Morrison et al. model (2010). That being the case, one has to wonder what the process is and what are the resources that instructional designers rely on when developing instructional materials and how do novice designers, in particular, learn how to develop materials grounded in IMD.

Summary

This section presented an overview of Instructional Design (ID); its definition and the core process model used in its practice. Also discussed was the sub-discipline Instructional Message Design (IMD), its origin, and its relationship to the ID process. Finally, an argument was put forth that, while IMD is an important support to sound instructional materials development, it is not well integrated into the ID process. As a result, instructional designers, and

especially novices, may lack the guidance to make informed decisions regarding materials that best support human communication and learning.

Materials Development

While the information that speaks directly to the development process of materials is difficult to find in the literature, information of the practice of ID and how this practice is different for novices and experts can be found. This information will be discussed in the following section to get a better idea of the challenges faced by novice instructional designers when developing instructional materials.

The Study of Instructional Design Practices

Early research on the practice of instructional design can be traced back to Zemke (1985) and Kerr (1983). Zemke focused on the systems approach and inquired into possible alternative approaches that professional designers might be using. Kerr focused on the decision-making ability of novice designers and investigated how they decided on actions to take when working on a project. These two studies led to others by Rowland (1992, 1993), Perez, Johnson, and Emery (1995), Perez and Emery (1995), and Wedman and Tessmer (1993). These studies would become some of the most cited studies, influencing others to ask questions about what designers do.

The literature on the practice of ID has been growing over the past 30 years. Several attempts have been made over the years to capture the essence of this research with a more recent attempt being done by Sugar (2014). Sugar's work collects primary research to provide a comprehensive analysis and summary. Using this, and the works being cited within, the following insights about novice instructional designers have been collected. For this review

novice instructional designers have been defined as those in a graduate degree program related ID or those that have recently graduated with less than five years of experience.

Novice ID Practice

Researchers have been attempting to better understand not only the nature of ID practice by professionals but also the differences between novice and experts, which can be observed by some of the initial studies done on ID practice (Kerr, 1983; Zemke, 1985). Most of the studies that have been done with novices can be divided into two groups: observing performance on a task or measuring the impact of the intervention on a task.

Observing performance. Kerr (1983) conducted research on how novice designers were making decisions on ID projects. In conducting interviews with students on their projects, he noted that students had issues with presenting design problems to themselves and to others. Also, the students had difficulty determining a reasonable stopping point for their development. Other researchers would report similar issues with the representation of design problems (Ertmer et al., 2009; Rowland, 1992).

Rowland (1992) performed a study that observed the different ways that novices and experts approach solving ID problems. The differences were split by problem identification/representation and solution considerations. Novices were observed to consider only surface elements when representing the problem. When making solutions, novices considered fewer alternatives before committing to a solution. Experts, however, considered more systemic influences for the problem and sought a more global representation. Experts also considered multiple solutions, and delayed decision-making until a better understanding and representation of the problem was achieved.

Perez and Emery (1995) and Perez et al. (1995) would come to similar conclusions as Rowland. The novices were found to focus primarily on surface issues, consider less additional information, and immediately start proposing design solutions. Experts would spend more time to understand the problem to be addressed before attempting to develop solutions.

Measuring the impact of intervention. The other grouping of studies would mostly be on measuring the impact of intervention on novice designers. Sugar (2001) conducted a study that measured how students respond to formative evaluation. Sugar noted that students would create simplistic solutions, target overt problems, and would have small amounts of knowledge of the users, or the potential use of the product being developed. Verstegen, Barnard, and Pilot (2006) would perform a similar study. In their study, students could seek out feedback for different iterations of their design project. Verstegen et al. found that the amount of feedback received, and the quality of the final product did not correlate. They would suggest that targeted interventions or triggers to prompt thought and decisions on design aspects may be more beneficial than general feedback.

Dabbagh and Denisar (2005) introduced two different structures for organizing information to help novices with ID problem-solving. The two methods were heterarchical and hierarchical. Both ways of organizing are also used in computer science. The hierarchical structure places items in a similar way as an outline while the heterarchical structure groups items by concepts like nodes. They found that by using the heterarchical structure, novice designers were able to produce more cohesive solutions and consider alternative solutions.

Verstegen, Barnard, and Pilot (2008) would perform another study on novice designers. In this study, the researchers were interested in how best to support novices while developing. Various types of support were offered while working on a design project such as design guides,

access to subject matter experts, conversations with other designers, and emails on changes. The results indicated that novices were able to solve complex problems with the aid of the provided support. Their recommendations were that design and process-oriented heuristics along with prescriptive ID models be provided to support designer work and that designer support be just in time and immediate.

Similar studies would follow that provided scaffolding guides or design aids to support novices when working on design projects (Boot, van Merriënboer, & Veerman, 2007; Ertmer et al., 2009; Kollmann & Hardre, 2013; Uduma & Morrison, 2007). Novices, it was found, were able to perform tasks at a similar level as experts when using the scaffolds and guides. Most such support aids helped novices with overcoming issues with problem identification or with translating ID model knowledge into applicable tasks.

Connection to materials development. The studies discussed lead to the conclusion that novice designers have difficulty with identifying the ID problems to be solved, considering alternative solutions, and making design decisions. Struggles in these areas can impact all parts of the ADDIE process including the development of materials. Since the process of applying IMD deals with selecting the appropriate strategies for developing materials to meet the learning need, if novice designers are not able to accurately identify the problem to be solved or make design decisions then the process of applying IMD principles also poses a challenge that can lead to a subpar performance in developing materials.

Summary

This section presented an overview of the study of ID practice and, in particular, the study of novice designers and the challenges they face when engaging in ID. The finding that just-in-time instructional design aids can lead to better ID by novices supports the argument for

the development of a tool to support ID practitioners in integrating sound IMD into instructional materials development.

CHAPTER THREE

RESEARCH METHODOLOGY

The study seeks to address the problems that novice IDs encounter while applying instructional message design principles. Novice IDs typically struggle to apply instructional message design principles due to a lack of knowledge about these principles, and difficulty determining the full scope and nature of problems. There are many principles that IDs can apply but here we are focusing on the redundancy principle found in Bishop's framework. While the framework does a great job in describing the principle and suggesting ways in which it can be used to address communication issues in instructional materials, it is still in a form not readily applicable by novices. Providing examples with decision support can help to guide the novice ID and aid in filling the gap of missing expertise. It is anticipated that this tool will aid novice instructional designers with applying the redundancy principle consistently and accurately. This leads to the creation of a convention for the learning materials which improves the clarity and receptibility thus reducing the noise and uncertainty in materials being developed. The tool may help to further research on instructional message design and the application of its principles.

Introduction to Study Design

This study will use a design and development research methodology. Design and developmental research (DDR), per Richey and Klein (2007), is "the systematic study of design, development, and evaluation processes with the aim of establishing an empirical basis for the creation of instructional and non-instructional products and tools and new or enhanced models that govern their development" (p. xv).

With the focus of the study being to create a practical tool that aids the novice ID in applying instructional message design principles, Design and Development Research (DDR) is an appropriate choice of research methodology since it “is a way to establish new procedures, techniques, and tools based upon a methodical analysis of specific cases” (Richey & Klein, 2007 p. 1). DDR has two main aims: “The study of the process and impact of specific design and development efforts” and “The study of the design and development process as a whole or of particular process components” (p. 7) These two aims lead to the development of the two main approaches in the methodology: Product and Tool research, and Model Research. Product and Tool research “is research conducted when developing a product or tool” (p. 9). Model research is the “development, validation, and use of design and development models” (p. 9). Product and tool research seeks to address a specific situation, while model research applies more generally.

This study aims to address the challenge novice IDs have with identifying areas of improvement in instructional materials and the lack of ability to approach problem-solving like more experienced IDs. As such, product and tool research were chosen. The study will be made up of three phases: analysis, design & development, and evaluation & revision. An overview of the study design and its phases can be seen in Table 1.

Table 1*Overview of Study Phases*

Model Phases	Development Tool for Noise Reduction through the use of Redundancy in Instructional Materials
Analysis	Perform Literature Search & Framework Breakdown
Design & Development	Develop Tool Based on Analysis & Develop Survey for Expert Review
Evaluation & Revision	Conduct Expert Review & Revise Tool

Study Design

Research designs are ways to describe the process and steps by which the research will be done. However, issues can still occur even when the best of plans have been developed. There are four main concerns with research design:

- Establishing the validity of the final conclusions.
- Establishing conditions that make causal inferences and assertions plausible.
- Facilitating generalization and interpretation.
- Anticipating problems that may arise in the course of conducting the research.

Richey and Klein (2007) have suggested several ways to account for these using DDR methodology. These strategies have been listed in Table 2.

Table 2*Research Methodology Strategies*

Research Design Concern	Strategies to Address Concern
Validity	<ul style="list-style-type: none"> ● Use experts with differing areas of specialization for tool review ● Include technicians on the design team to authenticate tool construction decisions ● Have participants verify reports of tool use ● Select designers with varying levels of expertise to test tool
Causal Inferences	<ul style="list-style-type: none"> ● Relate tool attributes to learner behaviors ● Determine tool's practicality ● Determine tool's effectiveness
Generalization and Interpretation	<ul style="list-style-type: none"> ● Conduct usability analysis ● Recognize "real world" constraints on tool use ● Plan for tool's independent use
Anticipating Problems	<ul style="list-style-type: none"> ● Consider cultural norms when analyzing student data ● Build data collection features into the tool

Research Participants

Purposeful sampling was used in this study to secure three expert reviewers (Merriam, 2009). The reason for purposeful sampling is due to the quality of information gained which is specific to the purpose of the study (Patton, 2002). There are many ways to conduct purposeful sampling, the approach used in this study was criterion sampling. Criterion sampling provides the opportunity to “...review and study all cases that meet some predetermined criteria of importance...” (Patton, 2002, p. 238). While the study only contained three expert reviewers, there is no upper or lower limit to the number of participants needed when using purposeful sampling. Rather, “...purposeful samples should be judged according to the purpose and rationale of the study: Does the sampling strategy support the study’s purpose?” (Patton, 2002, p. 245).

Expert reviewers were identified based on their expertise with instructional design practice, message design, and teaching/mentoring experience with novice instructional design students. The reason for selecting experts with experience in these three areas is because the expert evaluation requested feedback related to all three. The selection criteria for the different areas of expertise, which can also be found in Table 3, was as follows: 3-5 years of instructional design practice, 2-3 years of materials development experience, and 2-3 years of teaching/mentoring novice instructional designers. Instructional design practice is defined as a work experience contributing member on ID projects for a client, either internal or external. Materials development experience is defined as the professional contribution to the content and form of new or repurposed instructional materials intended to support a real learning experience. Experience with teaching/mentoring novice instructional designers is defined as formal responsibility for the educating/training of novice instructional designers in higher education or business.

Table 3*Expert Reviewer Selection Criteria*

Name	Years of Experience
Instructional design practice	3-5 years
Materials development experience	2-3 years
Teaching/mentoring novice instructional designers	2-3 years

Prior to identifying participants, the researcher submitted and obtained approval from the Institutional Review Board (IRB). This can be found in Appendix B. Potential participants was identified through professional networking. An initial email contact, Appendix C, verified that the relevant selection criteria was met and that participants were willing and able to take part within the desired timeframe. A second email, Appendix D, was sent to confirm participation, gain consent (see Appendix A), and provide participation instructions and materials.

Study Procedures***Phase One: Analysis***

The analysis phase included a literature review of instructional materials development. This review of the literature was to compile a list of cueing strategies. Cues, an “ordered set of perceptual elements”, are the building blocks of messages (Bishop & Cates, 2001, p. 7). These strategies can be used to support designing conventions or guide the evaluation of existing instructional materials. This collection of strategies aims to be illustrative rather than exhaustive.

The analysis phase also sought to identify a procedure model to use for the task of developing the tool, characteristics of similar tools that have demonstrated effectiveness, factors that have impacted the use of other tools in different situations, and factors that have impacted other tools' implementation and management (Richey & Klein, 2005).

Phase Two: Design & Development

The design & development phase took the information collected during the analysis phase to create a functional prototype of the tool. This phase focused on refining and packaging the tool in a way most beneficial to aid or guide designers in instructional materials development. The tool also helped novices determine if there were areas that can be improved in existing materials or as guidance on what to include when making materials. The tool showed how the principle can be applied in various forms of media to aid them in determining the approach that will be used to address the problem.

Phase Three: Evaluation & Revision.

The evaluation & revision phase of the study had three expert reviewers evaluate the tool. Once the experts were identified, the researcher followed up with an email explaining the process, securing informed consent, and providing a survey for review of the developed tool found in Appendix F and G. The experts had two weeks to complete the review and send back the rubric. A reminder email, Appendix E, was sent at the two-week mark. After reviewing the collected data, revisions to the tool were made based upon reviewer recommendations.

Data Sources/Instrumentation

The literature served as the primary data source for the analysis phase. This data was used to guide the planning, layout, and construction of the prototype tool in the design & development

phase. Feedback from the three expert reviewers via an online survey served as the data source for the evaluation & revision phase. See Appendix G for the rubric.

Data Analysis Techniques

The data sources generated both quantitative (likert scale responses) and qualitative (open & close ended question responses) data. The qualitative data was analyzed for consensus for the changes to be made as suggested by the expert reviewers (Richey & Klein, 2007). The changes were based on two out of three reviewers agreeing on the change to be made.

Table 4

Data Source and Analytic Techniques

Data Sources	Data Anticipated	Proposed Analytic Techniques
Experts	Quantitative: likert scale responses	For quantitative data: Descriptive statistics
Experts	Qualitative: Closed & open-ended questions in survey	For qualitative data: Consensus

CHAPTER FOUR

TOOL DEVELOPMENT

Introduction

The study sought to address the problems that novice IDs encounter while applying instructional message design principles. Novice IDs typically struggle to apply instructional message design principles due to a lack of knowledge about these principles and difficulty determining the full scope and nature of problems (Rowland 1992, Perez et. al 1995). To ensure that the tool would meet the needs of the target audience, novice IDs, a literature review was done to determine the needs of novice instructional designers when conducting instructional design tasks. Novices were able to perform similarly to experts when using scaffolds and guides (Boot, van Merriënboer, & Veerman, 2007; Ertmer et al., 2009; Kollmann & Hardre, 2013; Uduma & Morrison, 2007).

Chapter four will provide an overview and the steps to develop the tool documents. Afterward, there will be a discussion of the survey developed for expert feedback and a summary of the development process.

Tool Development Process

The tool development process consisted of six steps. These steps included selecting a process model to guide development, analyzing Bishop's framework, implementing the process, identifying cueing strategies, developing the tool packet, and constructing the expert reviewer survey.

Step 1: Process Selection

The findings from the literature review revealed that novice IDs struggle with several things when starting to practice instructional design: identifying problems, considering alternative solutions, and making design decisions. It also revealed how to overcome these shortcomings through various approaches: scaffolds & guides, process & design heuristics, heterarchical structures, or prescriptive models.

Allison Rossett is well-known in Instructional Design for her expertise in Job Aids and Performance Support. Performance support is "...a repository for information, process, and perspectives that inform and guide planning and action." (p. 2). Rossett and Lisa Schafer have published a book on said topic titled *Job Aids & Performance Support: Moving from Knowledge in the Classroom to Knowledge Everywhere* (2007). The book laid out a process for developing performance support. With support guides being one of the solutions to help instructional designers, this process was selected to create the tool from Bishop's framework to address novices' issues.

Step 2: Framework Analysis & Breakdown

Bishop's framework is a 3x3 matrix that combines communication meaning making from Shannon and Weaver with Cognitive Information Processing (CIP) from Atkinson and Shiffrin. The framework can be read in two ways: horizontally and vertically. The horizontal, or row, reading has the headers of the various levels of message meaning-making. At the end of each row are ideal outcomes, or meaning, for that level of the message received: the learner is "interested, curious, and engaged". The vertical, or column, reading has headers on CIP's different parts or stages for processing the message. The noise, or issues, occur at each of these different levels.

The principle Bishop utilized to overcome the noise in instructional communication was redundancy, or “that which is repeatable or conventional in a message” (Fiske, 2011, p. 9). This led to the development of three forms of redundancy: content, context, and construct. Content redundancy focuses on various dimensions of attention. Context redundancy focuses on various dimensions of information structure. Construction redundancy focuses on various dimensions of knowledge structures. Convention, or structuring messages per shared pattern, was used to operationalize the redundancy forms and apply them to instructional materials (Fiske, 2011).

Creating a tool that helps novice IDs either design conventions for the various types of redundancy or evaluate the presence of redundancy was the aim of the tool development; collecting cueing strategies for instructional material development was the approach used for operationalizing the framework. A search of the literature was conducted to compile a list of cueing strategies that could be used to support designing conventions or guide the evaluation of existing instructional materials. This collection of strategies aimed to be illustrative rather than exhaustive.

Step 3: Literature Search

The instructional message design strategies for cueing were grouped based on various media types. The media types were taken from Mayer's Handbook on Multimedia Learning (2009). In the handbook, Mayer defines multimedia as “presenting both words and pictures” (p. 2). Words and pictures are further broken down into verbal and pictorial form classifications of media. Verbal form includes spoken text (audio) and printed text, pictorial form includes static visuals (pictures, graphs, illustrations, diagrams, and maps) and dynamic visuals (video and animation) (p. 2). With these media types for multimedia, the individual categories of audio, text,

static visuals, and dynamic visuals were used to group the various cueing strategies for instructional message design.

The criteria for selecting the articles were based on the presence of an instructional message design cueing strategy and discussion as to how to apply this strategy. A variety of databases, such as APA PsycArticles, APA PsycINFO, ERIC, and Education Research Complete, were used to find articles that met the criteria. The following is a sample collection of search terms used:

- Instructional Audio AND Attention
- Audio AND Attention
- Audio AND Attention AND Education*
- Audio AND Attention AND Learn*
- Audio AND Attention AND Instruct*
- Auditory Information Processing
- Listening
- Animation AND Attention
- Video AND Attention
- Instructional Video AND Attention

Step 4: Applying the Process

Rossett and Schafer (2007, p. xi) laid out a process for developing performance support that includes four sections:

1. Clarify the Opportunity
2. Formats for Support
3. Consider Media and Technology

4. Embark on Development

The development of the tool followed this process. The following parts detail the answers to the questions in each section of the process (Rossett & Schafer, 2007, p. 119 - 47).

Clarify the Opportunity. This section has three main questions that need to be answered: Audience, Task, and Organization.

Audience: Novice Instructional Designers (IDs). This is defined as those still in a graduate program or those with less than 5 years of experience. Most will know of the ADDIE framework and have general knowledge of the ID profession. Some may have developed courses or instructional content, but this is likely to have been done under the guidance of someone more experienced. There should be familiarity with word processing, screen recording, and graphic design software. Developing materials is a common task all IDs perform, so there should be little to no resistance. Having the support as a reference sheet might be best since it can be brought up, downloaded, accessed, etc., when either developing materials or evaluating materials.

Task: This is much harder information to get as it is challenging to observe the target audience performing the task. However, some things can be assumed based on the literature review. Usually, when performing tasks or trying to solve problems, novices have a hard time truly identifying the issue. When working to evaluate the materials, it would be hard to consider all things related to the materials, thus not evaluating them accurately. Additionally, the task can be broken down into three parts: before, during, and after.

- Before: Novices need to have the materials and know the circumstances for when the materials will be used; having earlier iterations or detailed information would also be needed.

- **During:** The tool will be a guide while working, providing guiding questions and prompts to help implement the concepts from the framework.
- **After:** Depending on whether this was an original development or an evaluation to improve existing materials, an after-step may not be needed. If an evaluated area is weak or missing, it might have been identified that needs to be addressed.

Organization: This is asking about the context where the work will be done, if it is prepared to support the use of the performance support, and how the users will not be fully aware of the content contained in the performance support. Since the information is based on the framework, there is no need to know it. Showing how this tool can fit into an overall development process in various organizations can help encourage its use.

Formats for Support. There are several formats mentioned: step, tailored step, list, coach, graphic, quiz + decide, navigation, and search. These formats are grouped into three categories: formats that help do it, formats that help inform and decide, and lastly, formats that help locate information (Rossett & Schafer, 2007, p. 123 - 31).

Based on the descriptions listed in the book, a combination of several different formats was used. This approach was selected because one format is not enough to solve the performance problem. The combination of three formats was used to aid performance. The formats selected were step, coach, and list. The step format was used for the process through the three areas of CIP. The coaching comes in since each step will have additional information to guide users through applying knowledge. Lastly, list because of the annotated content that users will be able to refer to when using the tool to ensure accurate and effective usage.

Consider Media and Technology. The main thing to consider when thinking about the technology to be used according to the process was the “levels of smartness” along with a series

of questions to help determine if there is a need for multiple technologies. The levels are as follows: Information Only, Sequential Information, Decision Support, Tailored Decision Support, and Knowledge Questions & Targeting. Additional questions follow about the volume of information, how often the information changes, if it will benefit from automation, and considerations about the audience.

Based on the short descriptions for each level, the tool is at the Decision Support level, so there is no need for multiple technologies, but it would benefit from the inclusion of some. There is a decent amount, though not a lot, of information that will be a part of the tool. There is no reason to automate the process that a novice would be going through, as there are no calculations to be made. The size of the audience really cannot be determined, but there is a chance that they can come from all over the world. The information is not changing, nor is it something that is mission critical. Creating a website to house the tool should be sufficient for the users. In addition, making the worksheet downloadable would be beneficial as well.

Embark on Development. There are only two options to consider: develop in-house or outsource to a vendor. If this were a project in a company, then this may be something that would need to be done. However, as a much smaller team was working on this project, it was an in-house development process. Regarding the tools to be used, the following represent the tools needed: Google Docs, Google Forms, and Google Sheets.

Step 5: Tool Packaging

The tool was made to serve as a guide rather than a pure development aid. Prompts and statements are present to guide the learner, but the ultimate decision on how the forms of redundancy is represented in the materials is left to the novice ID. The final package of the tool consisted of three parts: an implementation guide, a supporting worksheet, and a dynamic matrix.

When planning for how the tool was going to be presented, the options came from Rossett and Schafer. The main information at the beginning of the implementation guide would be in a coaching format to explain what was being encountered and the intention behind it. Instructions were made with enough background provided based on the audience and task.

The implementation guide, appendix F, has sections for the user to work through in steps. First, review the background & guidelines, then move on to the worksheet before consulting the matrix for strategy illustrations, if needed.

The worksheet, Appendix F, was made to provide a way to use Bishop's guiding strategies to evaluate or assist when developing materials. There is the ability to track the approach (either evaluate or develop), the material type, and if the guideline is present. This should help the novice consider the full scope of the items to be addressed.

The illustrative strategies, Appendix F, were presented in the form of a list. Each strategy was tagged with the media type it was intended for and the part of CIP it was aiming to cue for. To aid users in finding the right strategy, the list was made so that it would be more dynamic. Users would be able to filter the strategies to only show the explanations for what they wanted to achieve. Because the focus of the tool is to support, being able to customize for the need was prioritized.

Step 6: Survey Development

The survey was built using the standards that are in Rossett and Schafer's book on what makes for good performance support:

- is tied to the achievements of important business objectives,
- helps users define, track, and achieve goals,
- focuses on what really differentiates great performance,

- recognizes and delivers the help that people need,
- helps people collaborate and look at their work from several perspectives,
- speaks in the language of the work and worker,
- provides what is needed, no more, no less,
- and helps people act smarter than they are (2007, p. 149 - 64).

Since the tool was made using the process from the book, the survey was created inspired by these standards from the book.

The survey comprised three parts: Tool Specific Questions, Overall Design Questions and Tool Application Questions. Each section had questions that were targeted toward the three parts of the tool packet: The implementation guide that explained all the information, the process, and had the guidelines; the dynamic matrix that contained the illustrative cueing strategies; and the support worksheet to track the development or evaluation decisions. The developed survey can be found in Appendix G.

Summary & Conclusion

This chapter provided the steps followed to create the tool packet and the survey developed to solicit expert feedback. Following a process for performance support made it so that the tool created would be in line with the recommendations found in the literature review. Those steps were: Process Selection, Framework Analysis & Breakdown, Literature Search, Applying the Process, Tool Packaging, and Survey Development. In addition, using the standards that go along with the performance support development process should ensure that the expert's feedback was focused on important aspects of the tool.

CHAPTER FIVE

RESULTS

This chapter focuses on the feedback from expert reviewers on the developed tool packet for Novice Instructional Designers (IDs). This chapter will present a profile of the expert reviewers. Afterward, there will be a summary of their responses to the evaluation questions, concerns that were mentioned, and how these were addressed.

Review of Tool Packet

Expert reviewers were identified based on their expertise in instructional design practice, message design, and teaching & mentoring experience with novice instructional design students. This would ensure the feedback would be well-rounded and consider all important areas relevant to the tool packet.

Three experts participated in the evaluation of the tool packet: Dr. Alicia L. Johnson, Director of Engineering Online for the College of Engineering at Virginia Polytechnic Institute and State University for her expertise with teaching & mentoring experiences with novice instructional design students; Dr. Marc Zaldivar, Director of Professional Development Network Curriculum and Assessment in Technology-enhanced Learning and Online Strategies at Virginia Polytechnic Institute and State University for his expertise in message design; and Dr. Samantha J. Blevins, Instructional Designer & Learning Architect in the Center for Innovative Teaching & Learning at Radford University for her expertise with instructional design practice.

The experts were contacted via email to request participation. Once the experts responded indicating their acceptance, a follow up email was sent containing the reviewer packet. This packet consisted of an explanation of the review process, informed consent information, the tool

packet materials, and a link to the evaluation rubric. Expert reviewers were given two weeks to review. A follow-up email was sent toward the end of that period. The reviewers needed an additional two weeks to complete the review.

Google Forms was used to collect the responses and feedback from expert reviewers. There was a total of 21 questions in the evaluation rubric. These questions were divided into three sections: tool-specific questions, overall design questions, and tool application questions. The tool-specific questions were further divided into three parts corresponding to the three parts of the tool packet: the implementation guide, development worksheet, and dynamic matrix. The questions used a four-point Likert scale. Removing the neutral option made it easier to interpret results. Each scale question was followed by a targeted closed ended question to provide the experts the opportunity to further clarify their response choice if needed. Finally, at the end of each section, there was an open-ended question so that evaluators could provide any additional feedback or recommendations. The following section will present the results from the evaluation rubric.

Results and Recommendations

Overall Expert Reviewer Perspective

Overall, the expert reviewers had a positive response to the tool packet. As can be seen in table 4, there was an overall 98% positive rating. The tool specific section was at 97%, with the overall design and tool application both being at 100%. While these are great numbers to see, that does not mean there were not areas that could be improved. The following sections will go over each of the sections in further detail.

Table 5*Summary of Survey Results*

	Tool Specific	Overall Design	Tool Application	Total
Agree	38 (90%)	4 (44%)	8 (67%)	50 (79%)
Somewhat Agree	3 (7%)	5 (56%)	4 (33%)	12 (19%)
Somewhat Disagree	1 (3%)	0	0	1 (2%)
Disagree	0	0	0	0

Tool Specific Questions

The expert reviewers found that the navigation was clear and easy to follow. They all either agreed or somewhat agreed with the questions on the various parts of the tool packet. There was an overall agreement that the information was clear. Also, they agreed that the layout and structure were good. However, there were some concerns and room for improvement.

There were comments on considering linking of the dynamic matrix and worksheet. One reviewer stated, “There is potential when jumping from link to link to get lost”. Another stated, “You might want to consider adding a bit more information for users to the dynamic worksheet, even a link to the airtable could be helpful”. This was addressed by adding a link to the Dynamic Matrix in the Development Worksheet.

Overall Design Questions

The expert reviewers somewhat agreed on the design of the tool packet. There was an overall agreement that there were sufficient details on the purpose and intention of the packet. Also, there was agreement that the instructions were clear, and the organization & format were

designed well. However, there was some concern about the design being text-heavy and the identification of the target audience.

One reviewer stated, “I think the guide's language is very clear. I think it was a lot of text, and it could be helped with a little document design, such as the incorporation of screenshots, tables, or other things to break up the paragraph structures.” This was addressed by including a screenshot of the Dynamic Matrix and Development Worksheet in the corresponding section in the Implementation Guide when discussing how they function. There were also concerns over mentioning who the target audience was in the tool packet. This was highlighted in the following statement: “Who do you believe the audience for this work will be: faculty and/or instructional designers/developers? This isn't clear from the materials I have reviewed.” This was addressed by including an explicit statement of the target audience in the instructions for the Implementation Guide.

Tool Application Questions

The expert reviewers agreed that the tool packet would be reasonable for novice IDs to implement. This can be seen in the following quote: “I like how the tool encourages purposeful design, tracking, and evaluation. This type of approach seems very helpful and encourages skill-building for the ID and better course design for the future end-user.” Even with that being the case, there were a few things suggested to help improve the implementation of the tool packet.

There was feedback on the naming being used for the various parts of the tool packet. One reviewer stated, “I think that the terms and the different links/documents/worksheets are a bit muddy (or they are for me). I would work on making that clearer for your user.” This was addressed by revising all the documents in the tool packet to have the same names. The names

were changed to the following: Implementation Guide, Development Worksheet, and Dynamic Matrix.

The expert reviewers also called for examples showcasing how the various strategies could be applied, believing that novice IDs would need them to comprehend the strategies; “Depending on the experience level of the ID, examples would be helpful.” This was addressed by including an example document that included several of the strategies. While this example does not include all the strategies listed in the Dynamic Matrix, it does help novice IDs review how these strategies can be implemented in materials they are developing.

Summary of Revisions Made to Tool Packet

Overall, the feedback from the expert reviewers was positive. The recommendations dealt with making things clearer for the target audience, making slight changes to the design, and providing examples of how the strategies could be implemented. These were addressed by revising the instructions for the implementation guide, adding links to the various documents in the tool packet, adding screenshots to the implementation guide, revising the names of the tool packet documents for consistency, and providing a sample document illustrating the implementation of several strategies. A website will be created to house the documents in the tool packet to make it easier for novice IDs to access and use in the future.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents a summary of the study. Afterwards are the contributions of the study, limitation of the study, and next steps.

Summary of the Study

Instructional Design as a field is focused on the systematic creation of learning experiences that bridge the gap between current and desired performance (Cennamo & Kalk, 2005; Larson & Lockee, 2019). In recent years, there has been an emphasis placed on novice IDs skill building and preparedness for the job market (Stefaniak & Reese, 2022). Job Aides & Performance Support tools are one way to support novice IDs when they enter the workforce. Developing such a tool was the focus of this study.

The study followed a design and development research methodology made up of three phases: Analysis, Design & Development, and Evaluation & Revision. The analysis phase consisted of determining what would support novice IDs. A literature review revealed that creating scaffolds & guides to support problem identification and solution generation would best support novices. The design & development phase used the results from the literature review to inform the tool packet development. A Job Aide & Performance Support development process was used to operationalize Bishop's framework and create a decision support tool packet. Experts were recruited to provide feedback on the developed tool packet for the evaluation & revision phase. The results and recommendations from the expert review were used to revise the tool packet.

Contributions of the Study

Practical implications

There has been growing interest in the field about the training of novice IDs. The Instructional Design Trainer's Guide is focused on the need to keep improving the training that graduate students are receiving before going out to the field (Stefaniak & Reese, 2022). While the tool that was developed is not something that can improve the training that instructional designers will receive it is something that will help improve their practice once starting to work. This demonstrates that the work done in this study is timely, as the field is looking to improve the quality of work and skills that graduates will have when entering the workforce.

Theoretical implications

Instructional Message Design (IMD), while important, is not an aspect of the Instructional Design process that is discussed frequently. Creating a tool that can help provide practical actions to apply the principle reduces the barrier to implementation for those who might not be as well-versed aspects of IMD theory. In addition, having a framework that presents a way for a principle to be applied is great for those who have a good foundation in the area and know where to find additional information to assist the implementation.

The design and development research methodology is one that is geared towards creating new tools and processes by following a systematic approach grounded in data (Richey & Klein, 2007). Operationalizing an existing framework to create a tool is not something that is seen often. This study can serve as an example of how the design and development research methodology can be used to support this type of work in practice.

Limitation of the Study

The main limitation of the study is that there was no pilot of the tool. Thus, the practical application of the tool cannot be determined at this time. While the tool was built based on findings from the literature review, there is always the possibility that some elements are missing that will benefit the implementation of the tool.

Next Steps***Future Research***

The results from the study present two options for future research. The first would be conducting a pilot study with the target audience, which will serve as a summative evaluation of the developed tool packet. The feedback from the expert reviewers helped to refine the tool, but implementation will help determine the tool's practicality and effectiveness (Richey & Klein, 2007).

The second would be replicating this study with another framework. The design and development research methodology is a way to connect theory to practice (Richey & Kelin, 2007). Replicating the process with another framework would help to refine further the operationalization approach used in this study.

Future Writing

There are two writing projects that can come from this study, The first would be to repackage the information into a research paper. The intention would be to provide important and relevant information in a shorter presentation. This can serve to broaden the reach of the expansion of the design and development research methodology to the large instructional design community.

The second would be a more general article covering lessons learned through the application of the design and development methodology. There have been many studies that have used the methodology since the publication of Richey and Klein's book. Presenting these in the form of a case study would benefit the instructional design community.

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APPENDIX A**INFORMED CONSENT FORM**

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
Informed Consent for Participants in Research Projects Involving Human Subjects

Title of Project: Development and Validation of a Tool to Reduce Novice Designer Uncertainty when Developing Instructional Materials

Investigator: Larry A. Cox II, School of Education, Virginia Tech
Advisor: Dr. Barbara B. Lockee, School of Education, Virginia Tech

I. Purpose of this Research/Project The purpose of this study is to develop a tool grounded in Bishop's redundancy framework that novice instructional designers can use to reduce noise and uncertainty in learning materials that they develop.

II. Procedures The researcher will send an email with an expert review packet to you. The expert review packet will contain the original tool, a letter explaining the review process, consent information and an evaluation rubric. You will have two weeks to complete a review and provide your feedback via the online rubric formatted in Qualtrics.

III. Risks There are no anticipated risks to you as a result of participating in this project.

IV. Benefits There will be no personal benefits to you for your participation in this study. However, there are larger community benefits. The results from this study can inform other educators, researchers and other instructional designers how to reduce noise in the creation of instructional materials. Your participation in this study will contribute to research that may influence the development of a tool to guide material development. You may contact the researcher at any time for a summary of the research study results once completed and available.

V. Extent of Anonymity and Confidentiality Participation in this study is confidential and your name will only be known to the study investigators. Every effort will be made to ensure your identity in this study will be treated confidentially unless you indicate another preference in writing to the investigator.

VI. Compensation There is no compensation to you for your participation in this study.

VII. Freedom to Withdraw You are free to withdraw from the research project at any time and without giving a reason. To withdraw, please inform the researchers (Larry A. Cox II or Dr. Barbara B. Lockee) or contact the IRB. Contact information for these individuals is available at the end of this document.

VIII. Participants Responsibilities I voluntarily agree to participate in this study. I acknowledge I have the following responsibilities:

- Give voluntary consent by returning a completed rubric to the investigator, Larry A. Cox II.
- Complete the online evaluation rubric.
- Submit my evaluation, once complete.
- (Optional) Indicate in writing if you would like to be acknowledged by name in the reporting of this research as an expert reviewer (otherwise, your name will be held in confidence).

IX. Contact Information

Investigator: Larry A. Cox II Phone: 540-514-1010 [lacox@vt.edu]

Faculty Advisor: Barbara Lockee Phone: 540-231-9193 [lockeebb@vt.edu]

Should you have any questions or concerns about the study's conduct or your rights as a research participant, or need to report a research-related injury or event, you may contact the Virginia Tech Institutional Review Board at irb@vt.edu or (540) 231-3732.

APPENDIX B

IRB LETTER



Division of Scholarly Integrity and
 Research Compliance
 Institutional Review Board
 North End Center, Suite 4120 (MC 0497)
 300 Turner Street NW
 Blacksburg, Virginia 24061
 540/231-3732
 irb@vt.edu
<http://www.research.vt.edu/sirc/hrpp>

MEMORANDUM

DATE: September 28, 2023
TO: Barbara B Lockee, Larry Alenda Cox II
FROM: Virginia Tech Institutional Review Board (FWA00000572)
PROTOCOL TITLE: Development and Evaluation of a Tool to Reduce Novice Designer Uncertainty when Developing Instructional Materials
IRB NUMBER: 23-111

Based on the submitted project description and items listed in the Special Instructions section found on Page 2, the Virginia Tech Human Research Protection Program (HRPP) has determined that the proposed activity is not research involving human subjects as defined by HHS and FDA regulations.

Further review and approval by the Virginia Tech Human Research Protection Program (HRPP) is not required because this is not human research. This determination applies only to the activities described in the submitted project description and does not apply should any changes be made. If changes are made you must immediately submit an Amendment to the HRPP for a new determination. Your amendment must include a description of the changes and you must upload all revised documents. At that time, the HRPP will review the submission activities to confirm the original "Not Research" decision or to advise if a new application must be made.

If there are additional undisclosed components that you feel merit a change in this initial determination, please contact our office for a consultation.

Please be aware that receiving a "Not Research" Determination is not the same as IRB review and approval of the activity. You are NOT to use IRB consent forms or templates for these activities. If you have any questions, please contact the Virginia Tech HRPP office at 540-231-3732 or irb@vt.edu.

PROTOCOL INFORMATION:

Determined As: **Not Research**
 Protocol Determination Date: **September 28, 2023**

ASSOCIATED FUNDING:

The table on the following page indicates whether grant proposals are related to this protocol, and which of the listed proposals, if any, have been compared to this protocol, if required.

APPENDIX C**EXPERT REVIEW REQUEST**

Dear Professor _____

My name is Larry A. Cox II, and I am a Doctoral Candidate in the Instructional Design and Technology program at Virginia Tech. As a recognized expert in material development, I invite you to evaluate a tool I am designing and developing as part of my dissertation work under the supervision of my advisor, Dr. Barbara B. Lockee (lockeebb@vt.edu). Your participation in this study is voluntary.

My study aims to develop a tool for guiding the development of instructional materials. The study employs a Type 1 development research design with the following stages: analysis, development and evaluation, and revision. The evaluation stage requires that the tool be formatively evaluated by three experts for recommendations for improvement. Additional study details can be found in the attached consent form. No signature is required. Rather, you will have the opportunity to indicate your voluntary consent to participate as an expert reviewer on the first page of the online document containing the evaluation rubric.

Should you accept this invitation, you will be provided with a rubric that can be used to guide the evaluation process of the tool. Also, you will be provided with the tool itself. I estimate that your participation would take approximately 2 hours over a two-week review period, beginning with receipt of the tool and the rubric. You will also be given the option of being acknowledged by name for your contribution as an expert reviewer or keeping your identity confidential.

Your expertise will help me to improve the tool before its dissemination as a development aid for designers developing materials. I hope that you can participate! If you have any questions, please do not hesitate to contact me.

Thank you in advance for your valuable time and expertise.

Sincerely,

Larry A. Cox II
lacox@vt.edu

Virginia Tech
Ph.D. Candidate, Instructional Design & Technology

APPENDIX D
EXPERT REVIEW PACKET

Dear Professor _____ ,

I would like to thank you for evaluating the framework I am developing as part of my dissertation work under the supervision of my advisor, Dr. Barbara Locke (lcokeebb@vt.edu), in the Instructional Design and Technology program at Virginia Tech.

The tool I have built is attached. I have also created a rubric for your use in evaluating the tool. The rubric can be accessed and submitted through the following link: [Evaluation Rubric](#).

I estimate your participation would take no more than 2 hours. Please ensure your feedback is submitted by 11/17/2023. If you have any questions, please do not hesitate to contact me.

Thank you again,

Larry A. Cox II

Virginia Tech
Ph.D Candidate, Instructional Design & Technology
lcox@vt.edu

APPENDIX E

EXPERT REVIEW EMAIL – REMINDER

Dear Professor _____

Recently, I contacted you to request your participation as an expert reviewer of a tool to reduce noise during instructional material development (see below for original email). If you have completed the expert review, I want to thank you for your time and participation.

I eagerly await your input if you have NOT completed the expert review yet! Please complete the review by 11/17/2023.

Thank you,

Larry A. Cox II

Virginia Tech
Ph.D Candidate, Instructional Design & Technology
ladox@vt.edu

APPENDIX F

TOOL PACKET

Instructional Material Cueing Strategies Implementation Guide

I Instructional Material Cueing Strategies Implementation Guide

Instructions

The following guide is intended to help you improve communication in instructional materials. The intended audience for this guide is Novice Instructional Designers, but anyone creating instructional materials can benefit from this information. The first section overviews what the tool addresses and how it is done. To jump straight into the tool, skip to section two. There, you will find guidelines to plan your instructional material development approach and tools to support that work.

Section 1: Introduction

Learners often struggle to determine the most relevant information in the instructional materials. Rarely are there clear signs or indications of what they need to know. Including cues in instructional materials can guide learners to relevant information and support them in connecting to previously learned information. This guide provides cueing strategies and guiding questions to assist in adding cues to materials. Using cueing strategies and guiding questions, developers can review current materials to determine if they should be added or plan how to incorporate them when creating new materials. The cueing strategies and guiding questions provided below are based on principles of educational psychology that have been shown to support learners' memory and recall.

So, what are cues? Cues are signs or prompts that can guide sensory input or cognitive function. Cues come from a branch of educational psychology called Cognitive Information Processing (CIP). The application of cueing can be broken down into three areas: Attention, Pattern Recognition, and Storage & Retrieval. Cues can be used to gain or focus attention on certain elements of the instructional materials. They can also be used to highlight patterns or provide structure to information. Lastly, they can be used to trigger memories of previously learned information. Cueing strategies were selected for each of the three areas of CIP. The strategies have been curated from empirical research and rephrased for application.

Section 2: Guidelines, Planning & Implementation Tools

Guidelines

These guidelines are based on the work originally done by Dr. MJ Bishop (Include citation and DOI). Use these guidelines when planning the development of or evaluating the need for changes to existing instructional materials.

Attention

Attention: Have cues been used to gain, focus and maintain attention over time? Only attracting once or without thought is not enough. Below are some examples that can be used in various media types. Questions to consider:

- Are attention-gaining strategies present? Are there prompts or indicators that direct attention to relevant information?
- Are these used throughout the entirety of the content?
- Are these used consistently? (the same method or a small collection of methods)

Pattern Recognition

Pattern Recognition: Have cues been used to help identify patterns and organize or elaborate information? Learners are unaware of relevant information or ways to structure new information. Below are some examples that can be used in various media types. Questions to consider:

- Are there structures present to indicate important or relevant information?
- Are there indicators or structures to help organize information?
- Are there indicators that connect relevant information to earlier information, either in current materials or earlier experiences?

Storage & Retrieval

Storage & Retrieval: Have cues been used to aid recall, build upon prior knowledge, or connect knowledge to new learning situations? Learners may not readily make connections to previous experiences or realize information can be used for new experiences. Below are some examples that can be used in various media types. Questions to consider:

- Are there connections or questions present to prior relevant information?
- Are there connections or questions that help show how information can be used for additional problems?
- Are there connections, questions, or statements that help to connect to prior experiences?

Planning & Implementation Tools

The tools provided are a tracker and examples of how to cue by media type. The worksheet below helps to track development plans. The dynamic matrix linked below includes a collection of cueing strategies that can be used to improve communication in instructional materials. This collection of strategies is not exhaustive. Rather, these provide scaffolding for when you eventually start creating your own strategies. Instructional materials can be developed in a variety of media. For ease of use, four categories have been identified for the various media types that can be used. The four media types are Text, Audio, Static Visuals, and Dynamic Visuals. Static Visuals include pictures, graphs, illustrations, diagrams, and maps. Dynamic Visuals include video and animation.

Planning

Use the linked [worksheet](#) to track the cueing strategy selected and the rationale for why it was chosen. When using the strategies, it's more important to be consistent on how things are cued rather than using many cues. An [example](#) of how the strategies can be applied is linked on the worksheet as well.

Strategy Name	Media	Strategy Description
Use Objectives - Place questions or tasks objectives at the beginning of the topic to increase attention and retention.	Text	
Write Specific Questions - Specific questions help drive learners' attention on relevant information plus it allows small portions.	Text	
Structure text - Use the appropriate and structure content to help improve retention.	Text	
Essential facts - When presenting audio, all facts are presented for retention. Focusing on only essential facts helps the learner to be focused on the presentation.	Audio	

Implementation Tool

The [Example Strategies](#) link leads to a dynamic matrix. Using the grouping or filtering features, the strategies within the database can be rearranged by either the media type or cueing purpose. Doing this makes it easier to discover the strategies targeting the particular need. Instructions on how to manipulate the database follow.

Strategy Name	Media	Strategy Description
Use Objectives - Place questions or tasks objectives at the beginning of the topic to increase attention and retention.	Text	
Write Specific Questions - Specific questions help drive learners' attention on relevant information plus it allows small portions.	Text	
Structure text - Use the appropriate and structure content to help improve retention.	Text	
Essential facts - When presenting audio, all facts are presented for retention. Focusing on only essential facts helps the learner to be focused on the presentation.	Audio	

There are several ways that the strategies can be arranged to support your work. At the top of the table, there are options labeled "filter," "group," and "sort." A filter can be used to create conditions that will only show the content that meets those criteria. For example, if I only wanted to see strategies for audio, I can create a condition that "media is audio" and that will filter out the other strategies. A

group can be used to divide the strategies up into collections that meet similar criteria. For example, if I wanted to see all of the strategies by cueing purpose, I could create a grouping according to their purpose. Lastly, sort can be used to create an alphabetical list or by order of entry in the database. For example, if I wanted to see all the strategies in alphabetical order, I could create a sorting that arranges all the strategies alphabetically. By reducing the visible items or arranging them into a particular sequence, you can focus on the most relevant cues for your particular need.

Development Worksheet

	A	B	C
1	Material Name		Dynamic Matrix
2			Airtable - Cueing Strategies Dynamic Matrix
3	Purpose		
4	<input type="text"/>		Strategy Application Example
5	Type		<input type="checkbox"/> Cueing Strategies Sample Strategy Application
6	<input type="text"/>		
7			
8	Guidelines	Present in Materials	If no, list strategy to include
9	Are attention-gaining strategies present? Are there prompts or indicators that direct attention to relevant information?	<input type="text"/>	
10	Are these used throughout the entirety of the content?	<input type="text"/>	
11	Are these used consistently? (the same method or a small collection of methods)	<input type="text"/>	
12	Are there structures present to indicate important or relevant information?	<input type="text"/>	
13	Are there indicators or structures to help organize information?	<input type="text"/>	
14	Are there indicators that connect relevant information to earlier information, either in current materials or earlier experiences?	<input type="text"/>	
15	Are there connections or questions present to prior relevant information?	<input type="text"/>	
16	Are there connections or questions that help show how information can be used for additional problems?	<input type="text"/>	
17	Are there connections, questions, or statements that help to connect to prior experiences?	<input type="text"/>	

Dynamic Matrix

Cueing Strategies Dynamic Matrix Sign up Airtable

Hide fields Filter Group Sort

Num...	Cueing Purpose	Media	Strategy
1	<ul style="list-style-type: none"> Attention Storage & Retrieval 	Text	Use Objectives - Place questions or strategy objectives at the beginning of the text to increase attention; place summaries objectives after the text to increase retention.
2	<ul style="list-style-type: none"> Storage & Retrieval 	Text	Write Specific Objectives - Specific objectives help direct learners' attention to relevant information plus increase recall performance.
3	<ul style="list-style-type: none"> Attention Pattern Recognition 	Text	Structuring text - Use the arrangement and structure of the text to signal important information to the learner
4	<ul style="list-style-type: none"> Attention 	Audio	Essential Audio - When processing audio, all inputs are processed for relevance. Focusing on only essential audio reduces what needs to be focused on and processed.
5	<ul style="list-style-type: none"> Attention Pattern Recognition 	Audio	Modify Speech - Changes in stress (emphasis), rhythm (cadence), or pitch (soft or loud) call attention to audio for learners
6	<ul style="list-style-type: none"> Pattern Recognition Storage & Retrieval 	Audio	Paint a "Picture" - Using direct, targeted language can help learners create imagery of the information being presented

APPENDIX G**EXPERT REVIEW SURVEY**

Rubric for Evaluation of Cueing Strategies Implementation Support

The following questions are about the Cueing Strategies Implementation Support Tool. Please provide as much feedback as you can. Feel free to direct questions to me (Larry A. Cox II, Virginia Tech, Ph.D. Candidate, Instructional Design and Technology; lacobx@vt.edu) any time throughout the review process. Your input in this endeavor is greatly appreciated.

** Indicates required question*

1. Email *

Skip to question 2 *Skip to question 2*

Tool Specific Questions

Implementation Guide

The following questions will be about the implementation guide

2. The information provided in the implementation guide seems to support the purpose of assisting instructional material development *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

3. If you did not respond agree, what comments do you have regarding the information provided in the implementation guide ?

4. The intent for the framework questions guiding the design or evaluation of instructional materials is clear *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

5. If you did not respond agree, what comments do you have regarding the intent for the framework questions guiding?

6. The implantation guide is easy to navigate *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

7. If you did not respond agree, what comments do you have regarding the implementation guide navigation?

8. The implementation guide is easy to access *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

9. If you did not respond agree, what comments do you have regarding the access to the implementation guide?

Development Worksheet

The following questions will be about the development worksheet

10. The information provided in the worksheet seems to support the purpose of assisting instructional material development *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

11. If you did not respond agree, what comments do you have regarding the information provided in the worksheet?

12. The intention of the worksheet to aid in tracking development is clear *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

13. If you did not respond agree, what comments do you have regarding the intention of the worksheet?

14. The presentation of the guidelines and tracking area in the worksheet is clear *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

15. If you did not respond agree, what comments do you have regarding the presentation of the guidelines and tracking area?

16. The worksheet is easy to navigate *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

17. If you did not respond agree, what comments do you have regarding the navigation of the worksheet?

18. The worksheet is easy to access *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

19. If you did not respond agree, what comments do you have regarding the access to the worksheet?

Dynamic Matrix

The following questions will be about the dynamic matrix

20. The information provided in the dynamic matrix seems to support the purpose of assisting instructional material development *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

21. If you did not respond agree, what comments do you have regarding the information provided in the dynamic matrix?

22. The presentation of the cueing strategies in the dynamic matrix is clear *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

23. If you did not respond agree, what comments do you have regarding the presentation of the cueing strategies?

24. The explanation for each cueing strategy is clear for the target audience *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

25. If you did not respond agree, what comments do you have regarding the explanation for each cueing strategy?

26. The dynamic matrix is easy to access *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

27. If you did not respond agree, what comments do you have regarding the access to the dynamic matrix?

28. The dynamic matrix is easy to navigate *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

29. If you did not respond agree, what comments do you have regarding the navigation of the dynamic matrix?

30. Please leave any comments you have regarding the Content of the tool. In particular, if you responded Disagree to any previous item, please offer specific recommendations for improvement.

Skip to question 31

Overall Design Questions

31. The tool packet describes in sufficient detail the tool's purpose and intended use *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

32. If you did not respond agree, what comments do you have regarding the tool packet description?

33. The instructions for using the tool is clear and sufficient *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

34. If you did not respond agree, what comments do you have regarding the instructions for using the tool?

35. The organization and format of the tool are well designed to support its purpose and use *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

36. If you did not respond agree, what comments do you have regarding the organization and format of the tool?

37. Please leave any comments you have regarding the Overall Design of the tool.

Skip to question 38

Tool Application Questions

38. The Implementation Guide seems reasonable to implement by intended user audience of Instructional Designers. *

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

39. If you did not respond agree, what comments do you have regarding the organization and format of the tool?

40. The Development Support Worksheet seems reasonable to implement by intended user audience of Instructional Designers

Mark only one oval.

- Agree
 Somewhat Agree
 Somewhat Disagree
 Disagree

41. If you did not respond agree, what comments do you have regarding the organization and format of the tool?

42. The Cueing Strategies Implementation Dynamic Matrix seems reasonable to implement by the intended user audience of Instructional Designers.

Mark only one oval.

- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree

43. If you did not respond agree, what comments do you have regarding the organization and format of the tool?

44. The tool packet will likely be effective in helping improve the quality of materials developed when used by Instructional Designers. *

Mark only one oval.

- Agree
- Somewhat Agree
- Somewhat Disagree
- Disagree

45. If you did not respond agree, what comments do you have regarding the tool packet helping improve the quality of materials developed?

46. Please leave any comments you have regarding the Overall Application of the tool.

47. What additional recommendations do you have to improve the tool?

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APPENDIX H

FIGURE PERMISSIONS



LA Cox II <lacox@vt.edu>

Permission to use Framework in Research

MJ Bishop <mjbishop@usmd.edu>
To: LA Cox II <lacox@vt.edu>
Cc: Jennifer Brill <jmbrill@vt.edu>

Thu, Oct 16, 2014 at 4:57 PM

Certainly! Thanks for checking and good luck with your project. Let me know if there are any other ways I can help.

MJ

MJ Bishop, Ed.D.
Director, Center for Academic Innovation
University System of Maryland
Office 301-445-1997 | Cell 610-390-4030
mjbishop@usmd.edu

From: LA Cox II <lacox@vt.edu<mailto:lacox@vt.edu>>
Date: Thursday, October 16, 2014 at 4:55 PM
To: MJ Bishop <mjbishop@usmd.edu<mailto:mjbishop@usmd.edu>>
Cc: Jennifer Brill <jmbrill@vt.edu<mailto:jmbrill@vt.edu>>
Subject: Permission to use Framework in Research

Hi Dr. Bishop,

I am currently working on my dissertation proposal and plan to work on developing a tool for novice instructional designers based in the framework that you developed and published in Reconceptualizing instructional message design: Toward the development of a new guiding framework. I believe Dr. Jen Brill, my chair, had spoken with you about this work over the summer. Can I have your permission to reproduce the image on p. 153 in my proposal and final dissertation document with appropriate credit given, of course?

Thank you for your time and consideration!

Best Regards,
Larry

--

L.A.Cox II, M.A. Ed.
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Graduate Assistant, School of Education
Instructional Design Support Specialist, Networked Learning Design and Strategies (NLDS)
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