ABSTRACT

SCHANTZ, DANIEL JORDAN. Effects of Personalization and Willingness to Share on Training Narratives. (Under the direction of Dr. Eric Wiebe).

There is an increased use of eLearning systems to help industry professionals stay updated with knowledge about their field, but the content creators often do not consider ways to improve the learning process. The purpose of the current research is to investigate the effectiveness of personalizing eLearning tasks by populating a training narrative with personally relevant information to the learner. The research also investigates inconsistencies with previous personalization research by evaluating the impact of a person’s willingness to share personal information on learning. 387 participants were assigned to three groups; a control, a low personal relevance group, and a high personal relevance group. A Multivariate Analysis of Variance revealed that there was no significant differences in learning or intrinsic motivation between the three conditions. However, it was revealed, across all 3 conditions, that if a person is willing to share information, they will have lower workload scores. Implications for future personalization research is discussed.
Effects of Personalization and Willingness to Share on Training Narratives

by

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DEDICATION

This is dedicated to my loving wife for her continued inspiration and encouragement. I also dedicate this to my parents for their support and belief in me from as early as I can remember.
BIOGRAPHY

Daniel was born in Kings Park, NY and graduated from Kings Park High School 2006. He continued his education at the State University of New York at Fredonia, graduating magna cum laude with a Bachelor’s degree in Psychology and a minor in both Computer Science and Sociology. While in Fredonia, Daniel conducted his first Human Factors research, working for a company called Noobis Inc. where he improved the usability of social media apps. He enjoyed this experience so much that he went on to study Human Factors at North Carolina State University. Since then, Daniel has taught a Human Factors undergraduate course and is currently working at Lenovo on the User Experience and Design team as a Human Factors Engineer.
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INTRODUCTION

Industry professionals are continually asked to keep their skills up-to-date with relevant information for their field. This requires professionals to take certification courses or participate in short term training sessions that often can be completed via the Internet. The content creators for these materials typically focus on presenting the necessary content but do not make attempts at bolstering interest or learning. This can make it difficult for industry professionals to generate the motivation needed to achieve deeper levels of learning of this content.

Instructional researchers have increasingly been investigating ways to elicit interest and deeper levels of learning in computer based learning environments (Fulmer, D'Mello, Strain, & Graesser, 2015). They have been investigating features of tasks that will increase motivation while maintaining focus on learning goals (Przybylski, Rigby, & Ryan, 2010). In computer based learning environments, such as the certification courses mentioned above, it is important to consider motivational factors central to engaged learning (Heilman, Collins-Thompson, Callan, & Eskenazi, 2010; Szalma, 2014).

One of the motivational tools that researchers have adopted to increase interest while maintaining learning goals is personalization. This is evident in research on instructional texts from fields of medical practice (Ginns & Fraser, 2010) to computer science (Hang-Li & Chen-Shu, 2009). However, personalization is a research-based concept that is still in its infancy; it is broadly defined and often interpreted differently based on each field it is investigated in. Murthi & Sarkar’s (2003) conducted a synthesis of personalization research
in the fields of marketing, economics, IT, and operations research. They found that personalization was being investigated in isolation, and that much of the research was not backed by theory. Reichelt, Kammerer, Niegemann, & Zander (2014) found that in the pedagogical domain, there is an attempt to explain personalization theoretically, yet there has not been an accurate explanation that can account for all the findings or its effect.

Why is personalization being studied? The underlying assumption is that consuming personalized content is of higher perceived interest than traditional content. This assumption is an extension of the idea that people will put more attention resources on personalized information, much like the cocktail party effect (Cherry, 1953), and that personalized information will be processed at a deeper level (Moreno & Mayer, 2000). However, research studies that attempt to explain why, often fail to verify all of their assumptions (Ginns, Martin, & Marsh, 2013). Of the limited research that is guided by theories of personalization, there have emerged two major camps of explanation; social interaction and motivation.

Social interaction theorists typically measure personalization rather than try to manipulate it (Blom, 2000; Wells, 2000; Ensari, Christian, Kuriyama, & Miller, 2012). They focus on aspects of an environment or situation that cause a person to autonomously personalize a space or interaction with another individual. This is a difficult theory to apply to training tasks because social interaction theories focus on spontaneous personalization, by an individual, that is not focused at learning. However, there are certain aspects of social interaction theories, such as trust and emotional valence, which may help explain the success
of a personalized training system when accounting for individual differences (Schworm & Stiller, 2012).

Researchers that focus on personalization as a motivational tool usually manipulate aspects of a task to increase the feeling of relevance for a user (Murthi & Sarkar, 2003; Wogalter & Mayhorn, 2005). Motivational theories can be beneficial for developing online instructional environments, but continued research is needed to answer fundamental questions about how personalization can be better utilized for deeper learning. The focus of this research is to provide a method of personalization that can be used by industry training and other types of short-term, online instructional programs. A second aim is to continue to advance understanding on how a motivational framework can be used to ground personalization for future research.

**Defining Personalization**

The concept of personalization is studied in many different disciplines and is defined in many different ways. Social psychological research uses personalization as a means to describe intergroup contact behaviors and how people reference themselves when interacting with others (Brewer & Miller, 1984). In the management sciences, personalization is considered the act of “Using a customer’s information to deliver a targeted solution to that customer” (Murthi & Sarkar, 2003). Researchers in the field of user modeling consider personalization to be a process that takes preferences, knowledge, abilities, emotional states, and other individualized characteristics about a user to adapt and customize their experience with a system (Zimmerman, Specht, & Lorenz, 2005).
The best reference point for using personalization to improve Internet training courses is at the intersection of computer science and education research. Researchers applying artificial intelligence tools in educational settings use personalization as a tool to optimize learning through customization (personalization) of learning materials. By presenting material that reference’s characteristics specific to the learner, researchers theorize that they can elicit greater intrinsic motivation for completing a learning task (Heilman, Collins-Thompson, Callan, Eskenazi, Juffs, & Wilson, 2010).

Although defined in many different ways, the underlying agreement between the fields is that personalization has strong reference to the self, user, or individual engaging in a task and more importantly, that personalization is always assumed to be beneficial. For the purposes of this research, personalization is defined as the altering of a task, object, or space so that the user interprets it to be more relevant to, or representative of, themselves rather than the greater population. This definition is important because it is both agnostic to who does the altering (a computer system vs. the user themselves) and is agnostic to the scope of the personalizing, so it could be as inclusive as a gang symbol (group) or as exclusive as a picture of one’s child (Individual). This definition is also important because it focuses on the cognitive and emotional perspective of personalization; in that the user perceives it to be of, or relating to, themselves. Focusing on this definition for a training task, personalization is the altering of the learning environment and presenting it so that a learner internalizes the target content as being more relevant to themselves than the population as a whole.
Autonomous and Given personalization, and Information Sharing

Personalization is most often considered to be a manipulation. In other words it is something that is “Done,” yet, there is an important distinction between whom or what is “Doing” the personalization. **Autonomous personalization** is done by the user with all features to be manipulated, as well as the personal information, chosen by the person it affects. **Given personalization** is structured by an external person, or a system, that is manipulating a task or object for another person to use. For Given personalization, it is only necessary the individual or system that personalizes the task determines what will be manipulated. The information that is used to personalize can either be chosen by the giver, or the receiver of that content. An example of Given personalization is the customized search page results that is shown to a person based on their current location and previous browser history. In this example, the search engine provider has taken information about the person, then structured content specific to them for their use.

**Autonomous personalization.** Social psychological theories tend to focus on personalization that is truly autonomous. **Autonomous personalization** is done by the person that it affects, for their own use. It is not necessary for autonomous personalization to be done with the intent of altering the behavior of the individual or group doing it. For example, hanging a photo on a dorm room wall is not usually done with the intent of making the individual behave any differently, but a person may still feel intrinsically motivated to do it. However, autonomous personalization can be done with the intent of altering behavior, such as when an individual places sticker on the outside of their school locker so that they can
more easily identify it from a distance. Autonomous personalization can be shown through visual symbols, information, or even in verbal communication with others.

One of the most common studied expressions of autonomous personalization is Decorative personalization. This can be when a person places photos of family members around their office, or personalizing a social media page with images of something that interests them like cars. Researchers of decorative personalization try to explain why it is done and if it is beneficial to promote for both virtual and tangible objects, and environments. Wells (2000) defines autonomous personalization as “The deliberate decoration or modification of the environment.” This decorative form of personalization has been studied in hospital wards (Holahan & Saegert, 1973), dormitory rooms (Vinsel, Brown, Altman, & Foss, 1980), office spaces (Scheiberg, 1990), and even in polar stations (Carrere & Evans, 1994). Well’s definition is specific to appearance but it excludes the notion that personalization can be done for functional reasons as well. Blom (2000) defines personalization “as a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal use.” Blom has studied this form of personalization with a focus on the functional appearance of mobile phones (Blom & Monk, 2003), and web pages (Blom & Monk, 2001).

Although not strictly focused on learning outcomes, the above research focuses on social and psychological factors for personalization. These factors can be extended and used to benefit the system-generated form of personalization for instructional environments. For example, Miller (2002) discusses the psychological aspect of personalization for intergroup
communication. In the paper, he discusses the term self-disclosure which is the “Voluntary provision of information to another that is of intimate or personal nature. Acts of self-disclosure promote trust.” Miller (2002) also postulates the connection that, trust implicit in personalization will increase familiarity and positive affect, which would reduce cognitive overload from negative valence and promote better processing of information. Research conducted by Ensari et al (2012) showed that people who were asked to self-disclose information to others felt more favorably toward those others then people who did not disclose information. This voluntary provision of information can be utilized when designing learning tools. Asking if a learner is willing to provide intimate details such as their birthday, name, and peer group information could promote trust with a system, which in turn could lead to an increase in motivation for learning. However, this hypothesis comes from research in autonomous self-disclosure and forcing a user to disclose information could result in a negative valence toward the system.

For Internet and computer systems, the negative valence that stems from being unwilling to share information has been applied as a privacy risk. People feel a discomfort and are often afraid to divulge personal information because they are uncertain of what will become of it, and thus feel they no longer will have control over who sees it (Beldad, de Jong, & Steehouder; 2011). This is also true of providing personal information to government websites where users must feel a strong sense of trust in order to confidently volunteer personal information (Beldad, de Jong, van der Geest, & Steehouder; 2012). Premazzi et al. (2010) showed that even people with high levels of trust in a system can feel
undermined when offered compensation for their information. For personalized learning passages, where a system can populate the passage with information collected from the user, a person that feels a privacy risk may not be able to place as much cognitive resource on learning. When that person sees their personalized training passage, the discomfort they feel may actually hinder their ability to learn.

If a person has no reservations disclosing information, they may benefit from the personalization of a system. This “willingness to share” information can affect how the learner interprets the information to be learned. The present study will investigate the role of a user’s willingness to share personal information with an Internet training system. The goal is to determine if a willingness to share acts positively on personalization for users that are comfortable disclosing information, or negatively if users are uncomfortable sharing information.

**Given personalization.** Autonomous personalization is difficult to achieve in applied learning environments. Often there are strict criteria for learning and very specific, target information must be acquired. Therefore, a training system can never be completely autonomous for a learner. In order to use personalization to foster motivation for learners, instructional designers can give learners the opportunity to personalize certain aspects of a training task.

Many fields such as marketing (Peppers & Rogers, 1997), management science (Murthi & Sarkar, 2003), eLearning (Chorfi & Jemni, 2004), education (Heilman, et al., 2010), and human factors (Mayhorn, Nichols, Rogers, & Fisk, 2004; Wogalter & Mayhorn,
2005) use a form of given personalization. However, unlike with autonomous personalization research, the personal information did not need to be voluntarily given by the effected person. Many times personal information is data mined (Lee & Cranage, 2011). Data mining is the harvesting of information from the ongoing stream of data generated by system use, and then using that information, among other things, to manipulate virtual resources such as advertisements (Xu, Luo, Carroll, & Rosson, 2011), and search engine results (Stamou & Ntoulas, 2009). Data-mining methods for manipulating data are often obscured from the user. Since the goal of the current study is to try and make the user feel a positive valence and improve learning outcomes, the opacity of data-mining places it out of scope for this research.

**Personalization in Education and Knowledge Training**

In the education space, personalization researchers have focused on manipulating training content in ways that make it more relevant, and thus more interesting to the learner. The aim is to increase learner motivation through personal relevance. In this field, personal relevance is manipulated in two distinct forms, personal interest and situational interest (Schraw & Lehman, 2001).

**Personal Interest.** Personal Interest, or topical interest, is when a learner finds a topic particularly interesting regardless of the format in which it is presented. For example, a student may greatly enjoy the study of mushrooms and can therefore read a dense text document on mushrooms while still finding it engaging and worth learning. A student who does not find mushrooms particularly interesting may require more engagement through
images, interactive media, or teacher involvement to obtain the same level of cognitive engagement.

Heilman et al. (2010) conducted a study on personalization that represents a form of personal interest. They focused on teaching vocabulary. The researchers developed a system that would get ratings of topics based on learner’s interests. The system would then search a database of articles and match specific articles based on the learner’s topic ratings that had the necessary vocabulary words within the text. The researchers found that personalizing texts for a user based on their topical interests improves learning of vocabulary.

Unfortunately, there is often not good alignment between what a learner is asked to learn and topics that naturally interest them. It may be difficult to teach a student that is interested in automobiles about the civil war, or advanced chemistry. It becomes even harder when this student has interests that are dissimilar from other students being asked to learn this material. For this reason, personal interest may not be as efficient a tool as situational interest for online training programs.

**Situational Interest.** Situational interest arises when features of a task are altered to make learning material more intrinsically interesting for a learner. Eccles and Wigfield (2002) define situational interest as “An emotional state aroused by specific features of an activity or task.” This form of interest does not come from the self, past experience with the topic, nor is it specific to the topic of the content. As in the mushroom example above, providing pictures, video, or social interaction from the teacher are all features of the learning
that would affect situational interest. That is, the context in which the learning content is placed enhances interest and engagement.

The benefit of situational interest is that it can be applied to any domain or environment since it does not require topical interest of the learner to elicit cognitive engagement. For example, specific details about a learner, which is independent of the specific content, but may be embedded within the learning task, can be used to create situational interest. For this reason, the current study will focus on using situational interest methods for personalization of an online learning task.

An example of personalization through situational interest is a study conducted by Cordova & Lepper (1996). The researchers populated a children’s math game with personally relevant information about the child playing the game. They found that when personally relevant information about the fourth and fifth grade children (their name, their friends’ names, and birth date) was incorporated into the game, the children had an increase in motivation, learning gains, and perceived competency. The researchers showed that personalization through situational interest manipulation improved learning gains. However, this research has not been replicated for adult populations. Nor has it been tested using professional certification information such as job responsibilities and procedural information. The current research study will aim to close that gap.

Cordova and Lepper’s (1996) method of personalization could have been considered logistically difficult at the time for educators and researchers, since they needed to collect personal information for every learner in a program. Because of that, previous lines of
research have studied a personalization method to motivate learners in a way that does not require the collection of personally relevant information for each learner (Moreno and Mayer, 2000; Ginns and Fraser, 2010). However, the increasing power and flexibility of computing tools (e.g., Web 2.0 technologies) to acquire information and use it to personalize an environment makes such strategies much easier.

Mayer, Fennell, Farmer, and Campbell (2004) hypothesized that personalization leads to learning gains because the learner can increase interest by using the self as a reference point. A passage about the learner is inherently more relevant to the learner than one that is not about them, and will require less cognitive resource to understand. This encourages the learner to use available cognitive resources to actively process new, target information during learning. The researchers tested this hypothesis using the personalization principle, which is the changing of learning narratives to a conversational style that directs comments at the learner, compared to the more formal style that presents information in a way that is more matter-of-fact.

The genesis of the personalization principle may have stemmed from experiments conducted by Moreno and Mayer (2000) where the researchers tested the self-referencing effect (Symons & Johnson, 1997). They observed personalization in multimedia learning environments where a personalization group (P) was given a narrative that spoke directly to the learner compared to a group that received a normal narrative (N). For example, a learner in the P group would be told “Yes! You chose thin leaves” as the result of a correct answer to
a biology question. A learner in the N group would be told “The correct choice is thin leaves.”

In that series of experiments (Moreno and Mayer, 2000), the researchers found that self-referencing learning passages (the P group) did not always elicit greater learning gains on retention tests. Statistical significance for retention improvements were only observed in three of the five experiments. They did find that self-referencing consistently improved performance on problem solving transfer tests. The researchers concluded that the improved performance on transfer tests was directly related to the deeper processing of the learning material.

In research conducted by Mayer et al. (2004), the researchers state that their previous experiments on the personalization principle were “heavy-handed” with the treatment. That is, the researchers felt that changing all of the sentence structures to be more conversational in style, rather than a more formal style was not only time-intensive but also caused a significant structural changes to each sentence. However, heavy-handedness was not considered to be a contributing factor to non-significant results. For the next study they opted to take a more modest approach to personalization, which was simply the replacing of instances of the word “The” to the word “Your” in a learning passage. The researchers found that of the three experiments, there was no statistical significance for retention test by the personalization group. They did replicate the transfer effects of the previous study (Moreno & Mayer, 2000).
Even though Mayer et al. (2004) applied a heavier treatment to the first study, the researchers still did not find consistent significant results of personalization on learning. This may be because the researchers did not use personally relevant information about the learner, such as their name or birthday. Instead, they used a conversational style which learners may not have found as relevant since it can be applied similarly to anyone. For the second study Mayer conducted, the researchers changed the style in which they manipulated the passage (by changing “The” to “Your” instead of changing the whole sentence to be more conversational) but it still did not address the learner on an individual level, as it did not reference any personal information about the learner. A person will likely not identify with a learning passage that simply says “Your” as strongly as a passage that says their name (e.g., “Tom”) since they know that the passage with “Your” can be given to anyone else and still be interpreted the same way. A passage with “Your” does not address any relevant information about that learner directly.

It is interesting to note between the two Mayer studies that as the personalization treatment decreased from the first set to the second set of experiments, the ability to find statistical significance of personalization on retention tests also decreased. The focus of the current research is to compare these two approaches of the personalization principle to determine if personalization falls on a continuum of personal relevance (See Figure 1). The continuum represents the idea that as words in a narrative become more representative of an individual, the individual will feel an increased relevance of the content to them self. The present research will investigate if an increase in personal relevance will result in an increase
in interest. It will also investigate the effects of the different personalization styles for positive affect, cognitive load, and interest levels.

![Relevance Continuum](image)

*Figure 1. Relevance Continuum. As words in a narrative become more representative of an individual, that individual will feel an increased relevance of the content to themselves.*

Unlike Mayer’s studies, Ginns and Fraser (2010) actually did find retention benefits for the personalization principle. Ginns and Fraser did agree with Mayer’s postulation that the reason he did not see retention effects of personalization was because the material used in the experiments were small enough that the learners may not have exceeded their cognitive resource capacity. Ginns and Fraser tested retention of a 2000 word medical training passage. Although they found significant differences between personalized passages and normal passages, the study may have been so long that it caused no difference in interest ratings. The current research will provide participants with a smaller training passage in order to test that hypothesis.
Motivational Model of Personalization

Figure 2. Motivational model of personalization and how it fits into motivational models of learning

Motivational models typically follow a pattern shown in Figure 2. Aspects of a task affect the lens in which a learner interprets the information. That lens in turn affects how a learner processes that information, which results in what is learned. There are many aspects of a training task that can affect the outcome. Examples of those aspects are the environment such as distance education or classroom (Bernard et al., 2004), the attributes of the learner such as prior knowledge (Song, Kalet, & Plass, 2016), the way the content is presented such as using worked examples of open questions (Van Merriënboer & Sweller, 2005), and other variables like social media distractions (Gupta & Irwin, 2016). In this context, personalization is a manipulation of the training content, and how it will affect each other part of the model.
**Intrinsic Motivation.** There are many aspects of intrinsic motivation that can be manipulated to increase or decrease its effect, as supported by research in Cognitive Evaluation Theory (CET; Ryan & Deci, 2000a; 2000b). Competence, autonomy, relatedness, interest, relevance, and self-efficacy have all been identified as key factors in explaining variability in intrinsic motivation. (Ryan and Deci, 2000b; Bandura, 2006; Szalma, 2014). Personalization is a low cost way to address all of these aspects at some level for an Internet training task.

Personalization gives the user autonomy and relatedness, through choice of non-target information, for task oriented material such as training guides. This will likely result in the user generating information that is both related, if asking for the names of people they care about, and innately is relevant to themselves. Although this is not considered true autonomy, since the user may not be learning in their own way, giving the user the ability to choose certain content should satisfy some of the mechanisms that underpin autonomous choice (Ryan & Deci, 2000a; 2000b; Zuckerman et al., 1978).

Personalization should also affect a learner’s self-efficacy towards the learning passage. This is because the learner can more easily process the information by referencing their self and preexisting mental models (Moreno & Mayer, 2000; Mayer, et al., 2004) which increases their feeling of familiarity toward the material. The increase in familiarity should increase their self-efficacy ratings of the task. This increase in self efficacy along with the ability to control some aspects of the training should improve the feeling of competence because users are in more control of their task than if they had not been given the opportunity
to populate the training with their own information. CET research has shown that both competence and autonomy support is needed in order to bolster intrinsic motivation (deCharms, 1968).

Valence toward a personalized passage will be moderated by a “willingness to share” information (Miller, 2002). If a person is willing to share information, it should increase the level of trust they have for that system (Ensari, 2012). That increase in trust will promote intrinsic motivation for the learning task via higher self-efficacy and autonomy that the user feels towards the system. However, if a person is unwilling to share personalized information it may cause a sense of decreased trust, called a privacy risk (Beldad et al., 2012). When a learner is instructed to provide personal information by a system that they do not trust, they will feel less motivated to learn. A learner that is not as motivated to learn will not be able to devote as many cognitive resources to learning.

**Workload.** A learner that is intrinsically motivated to learn should have lower self-report workload scores for the same task as a learner that is not motivated to learn. If a learning passage is personalized, the learner will be able to reference them self and therefore be more intrinsically motivated to learn since it is more relevant to them. The self-reference effect will allow for deeper information processing which will result in lower subjective workload scores for personalized material (Moreno & Mayer, 2000; Mayer, et al., 2004).

**Current Research**

Personalization research has been conducted in many fields but often in isolation (Murthi & Sarkar, 2003) and with theories that have not been able to account for all of
findings (Reichelt, Kammerer, Niegemann, & Zander, 2014). The aim of this research is to investigate a more unifying theory of personalization that blends an intrinsic motivation model (Ryan and Deci, 2000a; 2000b) with aspects of Miller’s social psychological theory of intergroup communication (2002). Specifically, these research hypotheses are aimed at exploring the inconsistent findings of the personalization principle (Moreno and Mayer, 2000) by determining if personalization lies on a relevance continuum, the impacts of personalization on intrinsic motivation, and if a willingness to share information (Miller, 2002; Ensari, 2012) affects learning outcomes. It will help to shed light on deficiencies of previous personalization research and theory, as well as, provide direction for future personalization research.

Research Hypotheses

H1- As the personal relevance of a training narrative increases, learning gains will increase.

H2- Populating a training narrative with personal information will yield the highest learning gains, as long as the participant is willing to share personal information

H3- The willingness to share information will affect valence towards the personalized training, which will impact intrinsic motivation.

H4- The group that provides personal information will have lower self-report workload scores.
H5- The group that provides personal information will have higher scores for interest-enjoyment, and perceived competence as long as the participant was willing to share information.

**METHOD**

**Participants**

Participants were recruited from Amazon’s Mechanical Turk (MTurk) crowd sourcing program (Zax, 2010). A total of 387 people participated in the study. 59% were female, 41% were male, and all were currently within the United States (as based on selection criteria through the MTurk system). The minimum age was 18, the maximum was 76, and the population clustered around the mode of 30. They were each given $0.50 for completion of the study, which is an acceptable rate for a study of this length (Kim, Li, Kwon, & Yi, 2011).

Since the current research training material was focused around a Canine Search and Rescue training course, the researcher collected information about the participants’ feelings about dogs as pets. Figure 3 below shows that majority of participants (89%) were comfortable with dogs and considered them pets (n = 346). Another question asked participants if they had any prior training with Canine Search and Rescue (SAR) tasks. There were no participants that reported having prior SAR experience.
Figure 3. Participants’ Comfort Level with Canines and Feelings Towards Them as Pets.

**Design**

This study was a between subjects experimental design. Participants were randomly assigned to one of three groups (see Figure 1): A High Relevance group (HR), a Low Relevance group (LR), and a control group. The HR group was shown a training narrative that was populated with personally relevant information that the participants provided. The LR group was presented with a training passage that replaced many instances of the word *the* with the word *your*. The control group was presented with a standard training passage that did not apply any relevance treatment. Learning, intrinsic motivation, willingness to share, and workload were measured.

**Materials**

**Apparatus.** The entire procedure was conducted on an Internet website. The website was designed to maximize usability and minimize extraneous cognitive load. There were no
graphics in the training material and all text was in black on a white background. Data was collected using basic internet forms written in HTML, information was collected using PHP5 computer language, and answers were be stored securely in a MySQL database. The procedure was done on an Internet website in order to simulate the real environment a learner would be in when using eLearning material on their own computers, thus increasing ecological validity of the results.

**Training Material.** The training material was a written passage adapted from the Policies and Procedures of Coastal Carolina Search and Rescue Team. These procedures are representative of typical Search and Rescue material. It is used to train certified Canine Search and Rescue professionals for locating lost or missing people. The reading was created with an emphasis on procedures that have discrete and sequential steps. The format was specifically designed as an instructive written passage, in order to be representative of typical training materials such as textbooks, military documents, certification literature, and other learning aides. See Appendix A for an example training narrative.

The Policies and Procedures were useful because they allowed for the distinction between temporal knowledge acquisition, such as “What comes first, the following of a trail in an urban setting or a rural setting?”, and declarative knowledge acquisition, such as “What stage of training utilizes an urban setting?” They also allow for the testing of a real certification task that is focused at adult populations.

Participants in all three conditions were asked to give information about their own lives to populate the training passage. The information given by participants was the name
and sex of their dog, a favorite dog toy of that dog, the name and sex of a close friend, the name of a city they are familiar with, and the name of a park with a grassy field that they are familiar with. The dog and other personal information chosen by participants were allowed to be fictional. This was to allow participants who do not know a real canine, or do not want to give real information, to still be able to participate in the study group. The HR group was given the training passage with the information above included, instead of the traditional non-relevant wording that would be found in a training narrative. The LR group was given a training passage where the word “Your” took the place of the word “The.” The control group (C) was given a traditional style learning passage where wording like “The Canine Handler,” “The Canine”, and “The toy” were used. An example line for each group would read like this:

HR – In order to participate, *Snoopy* must be wearing an orange safety vest.

LR – In order to participate, *your canine* must be wearing an orange safety vest.

C – In order to participate, *the canine* must be wearing an orange safety vest.

**Dependent Variables.** Intrinsic motivation was measured using the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989; Ryan, 1982). All four subscales were used including the Competence subscale to specifically look at Self Efficacy and the Interest-enjoyment subscale to specifically look at Valence (Liu, Wang, Tan, Koh, Ee, 2009; Ginns & Fraser, 2010). The other 2 subscales, Effort-Importance and Tension-Pressure, were used along with the rest of the scale to calculate an overall intrinsic motivation score.
The effects of willingness to share were measured using a version of the Anxiety Using Computers scale (Barbeite & Weiss, 2004) adapted specifically for sharing personal information with a computer system. Items were rated using a 7-point likert scale from Strongly Disagree (1) to Strongly Agree (7). The scale included the 5 items below:

1. Sharing personal information for this task made me nervous
2. I got a sinking feeling when I shared personal information
3. Sharing personal information for this task made me feel uncomfortable
4. Sharing personal information for this task made me feel uneasy and confused
5. I was willing to share personal information for this task

Cognitive Load was measured using the NASA-TLX (Hart & Staveland, 1988; Hart, 2006). To assess learning gains, a post learning assessment was given. Items on the test assessed temporal, procedural, and declarative information from the learning passage.

**Procedure**

Once participants agreed to an Internet consent form, they were then randomized into one of the three groups. All three groups were then asked to give personally relevant information about the name of their friends, dogs, and places. Then they were given a demographic questionnaire and took a willingness to share survey. The High Relevance group (HR) was then directed to a webpage that populated the content with their personally relevant information. The Low Relevance group (LR) and Control group (C), were directed to pre-determined training material. The participants then read the training paragraphs. They
had an unlimited amount of time to read through the training narrative. Once they were finished, they were able to click a button at the bottom of the page to continue. Participants were then given a distractor task of the self-report workload measure, and questions about how they perceived the learning. They were also asked to give information about their personal feelings about dogs, as well as a participation check to signal whether or not the participants were actively reading the questions or if their answers were random selections. Participants that showed a random selection of answers, were not included in the results. Finally, participants were given the learning assessment and the Intrinsic Motivation Inventory.

RESULTS

A multivariate analysis of variance (MANOVA) was conducted to determine the effects of personalization and willingness to share on learning, workload, and intrinsic motivation. There were no significant effects for the hypotheses. However, the results did reveal that there was a significant main effect of willingness to share and workload \( F(6, 736) = 3.11, p = .005, \eta^2 = .025 \).

Results by Hypothesis

Hypothesis 1. Results from the MANOVA revealed that there were no significant effects of personalization. The hypothesis that as personalization increases, learning gains will increase, was not supported. A one way ANOVA confirmed this, \( F(2, 384) = 1.02, p = .362 \). The assessment scores, which are out of a total of 26 points, are shown in Table 1 below.
Table 1.

Assessment Scores by Condition.

<table>
<thead>
<tr>
<th>Condition</th>
<th>M</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Relevance</td>
<td>14.01</td>
<td>3.90</td>
<td>124</td>
</tr>
<tr>
<td>Low Relevance</td>
<td>14.32</td>
<td>3.93</td>
<td>127</td>
</tr>
<tr>
<td>Control</td>
<td>14.68</td>
<td>3.52</td>
<td>136</td>
</tr>
</tbody>
</table>

**Hypothesis 2.** Results from the MANOVA revealed that there were no significant effects of personalization and willingness to share. A univariate analysis of variance confirmed that the hypothesis of populating a training narrative with personal information will yield higher learning gains, as long as a participant was willing to share that information, was not supported, $F(4, 378) = 1.20, p = .309$. The assessment scores of the personalized training group are shown in Figure 4 below. The group that is willing to share information ($M = 14.33, SD = 3.36$) did not have significantly higher assessment scores compared to the group that was unwilling to share information ($M = 15.18, SD = 3.89$).
Hypothesis 3. Results from the MANOVA revealed that there were no significant effects of willingness to share on affective valence. The hypothesis that willingness to share information will affect valence towards the personalized training, was not supported. This was confirmed by a univariate ANOVA of willingness to share by condition on valence, F(4, 370) = .770, p = .545. The group that is willing to share information (M = 4.83, SD = 1.39) was not significantly more likely to have increased valence towards the task compared to the group that was unwilling to share information (M = 4.06, SD = 1.29). This is shown in Figure 5 below.
Hypothesis 4. Results from the MANOVA revealed that there were no significant effects of personalization on workload scores. The hypothesis that personalizing a training will yield lower workload scores, was not supported. A one-way ANOVA confirmed that there were no significant differences between the Control (M = 42.44, SD = 13.87), Low Relevance (M = 45.09, SD = 14.21), and High Relevance (M = 45.87, SD = 14.65) groups $F(2, 384) = 2.101, p = .124$. The group means are shown in Figure 6 below.
Figure 6. Workload Scores by Condition. Standard errors are represented in the figure by the error bars attached to each column.

**Hypothesis 5.** Results from the MANOVA revealed that there were no significant effects of personalization and willingness to share on the other dimensions of intrinsic motivation. The hypothesis that a personalized training will yield higher scores for interest-enjoyment, and perceived competence as long as the participant was willing to share information was not significantly supported. For interest-enjoyment, a one-way ANOVA confirmed that the group that is willing to share information (M = 4.83, SD = 1.39) was not significantly different from the group that is unwilling to share information (M = 4.06, SD = 1.29), F(4, 375) = .770, p = .545. A separate one-way ANOVA confirmed that for perceived competence the group that is willing to share information (M = 4.56, SD = 1.13) was not significantly different from the group that is unwilling to share information (M = 3.80, SD =
1.22), $F(4, 375) = .818, p = .514$. Figure 7 below shows the mean scores of interest-enjoyment and perceived competence subscales by participants’ willingness to share personal information, for the high relevance condition.

![Figure 7](image)

*Figure 7.* Interest-enjoyment and Perceived Competence Scores by Willingness to Share for the High Relevance Group. Standard errors are represented in the figure by the error bars attached to each column.

Although not significantly different, for the high relevance condition, participants that are willing to share personally relevant information trend towards lower perceived workload scores, higher interest-enjoyment scores, higher perceived competence, and higher intrinsic motivation. This indicates that there may be some benefits to personalization for participants that are willing to share information, despite not being found significant in this study. Table 2 below shows a summary of the high relevance group scores by willingness to share.
Table 2.

Scores of High Relevance (HR) Group by Willingness to Share Personal Information.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Workload</th>
<th>Interest-Enjoyment</th>
<th>Perceived Competence</th>
<th>Overall Intrinsic Motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willing</td>
<td>40.44</td>
<td>4.83</td>
<td>4.56</td>
<td>4.54</td>
</tr>
<tr>
<td>Unwilling</td>
<td>52.76</td>
<td>4.06</td>
<td>3.80</td>
<td>4.43</td>
</tr>
</tbody>
</table>

Further Analysis

A up one-way ANOVA was conducted to follow up on the significant results revealed by the MANOVA. The one-way ANOVA revealed significant main effects for willingness to share and workload, $F(2, 384) = 9.05, p < .000$. A post hoc analysis of Fisher’s LSD revealed that individuals that are willing to share information ($M = 40.36, SD = 12.59$) will have significantly lower workload scores than individuals who are unwilling to share information ($M = 49.88, SD = 15.10$). Figure 8 below shows workload scores by each willingness to share group.
Participants were divided into groups based on their willingness to share information. Participants that had a willingness to share score between 3.1 – 4.9 were considered *neutral* and were not placed into either group for purposes of analysis. There were more than double the number of participants in the willing to share group (\( n = 118 \)), compared to the unwilling to share group (\( n = 46 \)).

**DISCUSSION**

This study had two goals. The primary goal was to determine if personalizing a training narrative with relevant information would yield higher assessment scores through higher intrinsic motivation and lowered perceived workload. The results revealed that there are no significant differences for personalizing a training narrative. The secondary goal was to
reveal if the willingness to share information over the Internet would impact the effects of personalization of a training narrative. The results did not show significant differences between the conditions. The study did reveal that willingness to share information did affect workload.

For the primary goal, the results revealed that there were no significant differences for personalization of a training narrative, however, it is possible that there may actually be benefits for a personalized passage. The current study did not account for features about the participants’ dogs. Due to this, there may be salient inconsistencies between the participant’s dog and what their understanding of a Search and Rescue canine would be. For example, if a participant wrote down the name of their Chihuahua, it may be harder for the participant to focus on relevant information of SAR training compared to the distracting image of a Chihuahua being an SAR canine. The existing features about the dog may actually be working against the benefits of personalization and increase workload. The same issue may also arise if the participant does not have a dog or filled in the information with a fictional canine. Since this inconsistency was not controlled for, and the results revealed that there are no significant differences, there may still be an effect of personalization that would not have been measured in this study.

To account for the inconsistencies of features about the personal information, future studies should test the current hypotheses with groups of people that are already involved in a training course. The trainings should be populated with personally relevant information to that course. This would limit the possible inconsistencies when learning the new information.
Other studies may also account for this by populating job trainings about roles and processes using information that is already known to be relevant to the trainee.

Another possible reason that a personalized training did not yield learning benefits may be due to the novelty of the training. Participants may be distracted by the novel use of personal information compared to the control group which likely had much more experience with a non-relevant training narrative that is commonly found in most textbooks. Future studies should have multiple training narratives and examine the test results from the final narrative. This may help to reduce the novelty of a relevant training narrative and reduce distraction.

The secondary goal was to determine the effects of willingness to share personal information, and how that would affect a person taking a personalized training. There were no significant effects of willingness to share within each group, however, there was a significant effect of willingness to share information and its impact on workload overall.

A person that is unwilling to share personal information, but is forced to, may be a little more uncomfortable than a willing participant. The unwilling person may also be curious and question what the information is needed for, as well as, what could happen with it in the future. This discomfort and curiosity may be cognitively distracting which may have caused the increase in perceived workload. This is important, because many workload studies require demographic information to be given early in the procedure. For participants that are unwilling to share information, this increase in anxiety can affect the perceived workload scores. This is significant to researchers because the measured effects of a task or treatment
on workload may be muddied for participants that are unwilling to share personal information. Due to this, it may be beneficial to place the demographic or other personal information questions at the end of research procedures, as is recommended by some research guides (Dillman, 2000).

**Limitations and Future Research**

This research had some limitations that future personalization research should address. The most notable limitation was the small sample size of individuals that are unwilling to share personal information over the Internet. The study was conducted through Amazon’s MTurk which is an Internet crowd sourcing program. Intrinsically, the users of this site may be more comfortable with using the Internet and therefore more comfortable about sharing personal informing over the web. Future studies should consider recruiting based on the participants’ willingness to share personal information.

Another limitation was that this task was not a real training task. The participants were not expecting to conduct a learning until they opened the link to the study. In a real world training scenario, participants are going into the task with the expectation that they are going to learn from a narrative. They also have existing job roles and schemas about the training. Personalization may be more beneficial to people for this type of scenario. Future studies should use personalization as a treatment to an existing training.

A final notable limitation of this study is that personalization is a novel experience for many of the participants. The personalized group may not have shown a significant benefit in assessment or workload reduction because they were distracted by the novelty of the training.
Future studies should consider doing multiple training narratives, and then only look at the scores for the final assessment. This would control for the novelty effects.

**Conclusion**

The results from this study did not show that personalization had significant effects on learning, workload, or motivation when used with a training narrative. However, it did find that willingness to share personal information over the Web can affect self-report workload levels of a task. Future research methodologists should account for this problem when conducting studies by placing demographic and any other personally relevant questions at the end of a research task, when possible. Personalization research is continuing to yield mixed results. Continued research should be aimed at determining when personalization can be most beneficial to learning so that training developers can more efficiently increase learning gains for trainees.
REFERENCES


Appendix A. Narrative, Represented Using the Control Condition

A dog should not begin training for Search and Rescue (SAR) teams until it is about 10 weeks old. From that point, a typical dog will be ready for professional SAR work after around 12 months of training. It is common that dogs work on SAR teams until they are 7 years of age, when many retire.

Training should begin in the morning before any other people have walked where the dog will be trained. A grassy field with no obstructions, such as a park, is a suitable place to begin training. The trainer should harness the dog at the beginning of training and the dog should be given 25 feet of lead. If at a training session with multiple other dogs, the dog should be crated or leashed after the socialization to allow each dog to train individually. SAR dogs should be trained 3 times per day until they are field ready.

When the dog is extremely young, tracking training is treated as a game. Training begins by the trainer placing scent pads every 15 feet in a line. When the dog finds a scent pad, the dog should be rewarded with praise, a treat, or for beginner dogs, a toy. This reward should be given every time the dog completes a tracking task throughout all stages of training. After the dog is able to find the scent pads on a regular basis, a person should be included. The trainer lets the dog smell a scent article, which is an object that smells like the person, and allows the dog to pick up an initial scent. When the dog is able to reliably find a person on a straight path, the trainer should begin using a curved path. When the dog can reliably find them on a curved path, the dog should be trained using a person that they have not yet trained
with, such as a stranger, to increase task difficulty. When the dog is achieving repeated success, the trainer should increase task difficulty again by using a distracter, or a person that is used as a decoy, to make certain that the dog can scent discriminate. In advanced stages of training, the dog should be taught to perform clear and recognizable behaviors as soon as a person is successfully tracked and located as a way to signal to the trainer that they have found the target.

Once the dog has been successfully trained, they must still pass a certification test before they can be used professionally. Some SAR organizations may even require the trainer to go through a physical abilities test in order for the dog to receive a tracking and trailing certificate. The certificate requires completion of three stages, and each stage becomes progressively more difficult than the previous. In Stage 3 the trainer and the dog should be able to trail and locate a single stationary target that has traveled 3/4 mile with an aged track of 4 hours. The dog must be able to locate the target within 1 hour. Once the dog has done this, the first stage is complete. In Stage 2 the dog is placed in a wilderness setting in which they must track a stationary target that has traveled 1 mile with an aged track of 12 hours. This track will also have at least 1 cross track to increase the difficulty from the previous stage. The target must be located within 2 hours. The dog must then complete the same test again but in an urban setting, such as a nearby city, to completely pass this stage. In Stage 1, the final stage, the dog must again complete the task in both a wilderness and urban setting. They must locate a stationary target that has traveled 1 mile, with an aged track of 30 hours. The dog must complete this task in 3 hours to completely pass the certification test.