The Framework of Learning-in-Use: A Tool For Design Practitioners

The role learning plays in usage of an artifact has always been emphasized in importance in the creation of design principles for interaction design. Norman (2002) directly describes the role of learning in using interactive artifacts through the role of memory in the environment and the memory in one’s head. Memory in the environment can be described through constraints that guide action; it is very fast and very intuitive. Memory in the head is much slower and must be learned through practice. So, design research has a direct has made an impact on how much and what type of learning a user must engage in to use interactive artifacts. Further, learning is implied in Nielsen’s (2009) heuristics of user control and freedom, consistency, error prevention, recognition rather than recall, flexibility, minimalist design, and help and documentation; Raskin’s (2000) assertion that interfaces should be habituating; Tognazzini’s (2010) principle on learnability; and Shneiderman’s and Plaisant’s (2005) guidelines of consistency, prevention of errors, easy reversal of actions, and reduction of short-term memory load. Even though there has been much described on guidelines for designing for learning in interaction design, this study still has much to share with the field in terms of new ways of conceptualizing learning. Prior studies have emphasized the reduction of learning whenever possible and viewing learning as an impediment to use. From the standpoint of learning as knowledge gained, this perspective of learning makes sense. Once we have acquired the knowledge to effectively use an artifact, no further learning should be required. This standpoint however disregards the role of learning as a process for developing relationships with the artifacts, as a process for finding a role for an artifact in one’s life, as a process for making sense of the artifact we are using, as a way to apply the artifact in a constantly changing set of personal needs, and as a means to have fun and enjoy with the artifact. This study, which takes an *experiential* perspective on learning, can garner insight on these dimensions of use and feed these phenomena into design insight.

 In the previous two chapters, I described *learning-in-use* as a concept for learning that highlights such influences and effects of learning as part of use. First, learning was a means for participants *over time* to develop *personally meaningful relationships* with their artifacts. Second, learning becomes a *negotiation* between user and artifact to define the intention of use for both entities. The learning experience is co-shaped by both user and artifact intentions. Third, *motivations* and *opportunities for use* seem to have the biggest impact on the efficacy of learning to use interactive artifacts. These two factors seem to be the most important for shaping the environment in which learning takes place and can be beneficial to the user. Finally, I have observed four phenomena that structure the learning experience of *learning-in-use*. The first phenomenon of *grasping* describes passing through periods of familiarity and unfamiliarity as one learns a new artifact observed in the study through patterns of anticipation, brand identity, and reliance on default values. The second phenomenon of *situating* dealt with users’ finding the right fit for the artifact in their lives, as well as making a fit by allotting one’s time to learn to use the artifact. This was observed in the study through patterns of the social use of an artifact, the ecological factors between other artifacts, opportunism in learning the artifact, and intervening life circumstances. The third phenomenon was *perceiving-in-use* and dealt with the transformative and meditative nature of learning to use a new artifact. It was also implicated in the perceived control a user had over an artifact and the perceived quality of functionality for the artifact. This phenomenon was observed through the patterns of the structuring of the situation in learning to use an artifact, the structuring of the activity in learning to use an artifact, the filter of prior experience, and the instrumentality users exerted over an artifact. The fourth phenomenon of *making meaning* dealt with the process of consolidating experience into knowledge relying on the clarity of the artifact and the perceived complexity of the artifact by the user. This was observed in the study through the patterns of the multistability of the learning experience, demonstration of use, and application of knowledge to new situations.

 These findings, which add nuance to previous concepts of learning, should contribute to a new perspective of learning in interaction design practice as well. In this chapter, I will demonstrate the power of *learning-in-use* for understanding learning as a continuous process and as one that is fundamental to a user’s adoption and continued use of an artifact. In the next section, I will outline a *framework* for using *learning-in-use* as a tool for interaction design. In the following section, I will apply this framework to two instances of interaction design. These instances of design will include designing against standards and designing learning materials in interaction design. These three examples of design will provide a sample for applying this framework in interaction design work to make *learning-in-use* tractable for interaction design practitioners.

**Framework for *learning-in-use* in interaction design practice**

In this chapter, I present a framework that can be used as a tool in design for analyzing aspects of *learning-in-use* in artifact design. This framework will be used as a lens for highlighting

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**Figure 6.1. Framework of *learning-in-use* for design. This framework contains two dimensions that contribute to an overall learning experience: user’s dimension and designer’s dimension. The inner spiral of the designer’s dimension that expands as designers move from functions to situations show the increasingly indirect control that designers have for the various components in the dimension. Functions are what designers have the most control, while the situations of use are what designers have the least control over.**

aspects of *learning-in-use* that are crucial to making decisions about an artifact’s design for implications that may take years of use to unfold. This framework is in figure 6.1.

There are two dimensions to this model. Each dimension represents the contribution and role that the user and the artifact play in the process of learning to use an interactive artifact. The outer circle represents the user’s dimension of *learning-in-use*. The inner circle represents the designer’s dimension of *learning-in-use*. Each of these dimensions co-shape how learning of an artifact occurs for a user. Each dimension also breaks down what the user and the designer bring to bear on situations of such learning.

 The user’s dimension is composed of six factors that impact the learning of a user as they learn to use interactive artifact. The first factor of the user’s dimension is needs and desires. Needs and desires represent the same user needs at the foundation of user-centered computing (Norman, 2002). User needs in this context means that there is some reason for why a user would use a given artifact. Needs and desires will be fulfilled to some extent by what an artifact will offer in terms of functionality. The second factor is shortcuts and workarounds. Shortcuts and workarounds in use evolve over time as a user who has some experience with an artifact, yet cannot explain why certain things will fail in use for them. These users rely on alternative ways to accomplish their goals that have worked for them in the past using what they find available around them. Examples of such shortcuts and workarounds include using post-it notes for passwords, always leaving a device on or account logged in on a website, or memorizing a certain button sequence to perform the desired result on a television remote. These shortcuts represent feasible, if not always designer-intended, approaches to use that allow users to map familiar procedures to unfamiliar domains within artifact use in much the same way that metaphors are used to map domains. Metaphors, though, are designer-driven learning resources. The third factor is appropriated use. Appropriated use involves using an artifact in ways that seem most appropriate for the user, even if they clash with the originally intended uses by the designer. This kind of appropriated use emerges from everyday life and everyday interaction with these artifacts (Wakkary and Maestri, 2007). Examples of appropriated use that extends designer’s suggested use include using email as extra storage space, using video games to make movies for entertainment known as machinima, or using images to encode secret messages known as digital stenography. In the act of design, designers open a space of possibility with an artifact that even they may not completely comprehend. This space of possibilities means that creative users can take the artifact to fill other potential needs and desires.

 The fourth factor is skills and competencies. These skills and competencies are what users bring to bear on a learning situation. These skills and competencies may be based on one’s previous use of an artifact or prior version of an artifact, may be based on a domain in which an artifact could be used, or may be based on general ability with and knowledge of interactive technology. These skills and competencies will shape the way an artifact will appear available for use and what is possible through an artifact. Next, user meaning/intentention, the fourth factor of the user’s dimension, has been described at length in this dissertation[[1]](#footnote-1). The user meaning/intention about an artifact describes the personally meaningful relationship that a user has towards an artifact and orientation towards their use of the artifact as they use it. This intention shapes a user’s philosophy of use of the artifact, opinion about the artifact, motivation to use the artifact, and possibilities of use. The final user’s dimension factor is experiences. Experiences describe the artifact’s effects on use through learning. As described previously, experiences are composed of internal, subjective feelings in relation to external, objective conditions (Dewey, 1938). This final factor is the culmination of *learning-in-use* as it relates to the actual learning to use an interactive artifact. The experience of learning will be the metric by which users judge the merits of using an artifact and investing his or her own resources into learning it.

 The designer’s dimension of this framework of *learning-in-use* is the inner circle. A crucial difference between this dimension and the user’s dimension is that designers can affect change to the artifact towards the learning process. Just as McCarthy and Wright (2004) have argued that you cannot design an experience but rather can design *for* an experience, designers have the ability to design capacities and intentions into an artifact but cannot control the user’s learning experience. The *framework* is represented by a spiral as opposed to a complete circle because the factors increase in the indirectness with which designer’s can affect change. The designer can directly influence functions and resources; has some control over the suggested use; has a slight bit of control over the environment of an artifact and artifact’s meaning/intentionality; but has almost no control over specific use situations. This framework will allow designer’s to analyze the factors that they do have control over, but also hypothesize on the factors which they do not.

The designer dimension begins with functions. These functions are the actual elements of the design that describe how the artifact works. Functions are the factor that designers have the most direct control over. Aside from the end-user and the creation of new macros[[2]](#footnote-2), which also falls into this factor as well[[3]](#footnote-3), the way an artifact behaves is entirely prescribed by the designer. The factor of functions on the designer’s dimension correlates with needs on the user’s dimension because functions exist as a response to user’s needs. The second factor is resources. Resources are media that are created to be instructive or useful in the context of using the artifact. For this purpose, we would consider typical learning materials such as the manual, help menu, tutorials, and just-in-time help as resources supporting the use of an artifact rather than its functions. We could even consider the metaphors developed as ways to approaching the artifact, even though it is designed into the artifact, as a concept external to the artifact’s design. Furthermore, separate resources such as tutorials or walkthroughs written by other users can become resources in the learning process of artifact use. In terms of studies of learning to use interactive artifacts in the past, resources were the object (culprit) of most studies of learning that was either effective or ineffective towards the learning process. Resources correlate to the shortcuts and workarounds of the user’s dimension because of the resourceful way people approach such shortcuts and workarounds (e.g., whatever works can be generalized upon in use). The third factor is suggested use. Suggested use could be considered the officially supported way(s) of using an artifact as set out by designers. Designers can support various forms of use by the design of affordances and constraints limiting design, through the description of warranty-voiding actions, through descriptions of use in resources and learning materials, and by explicitly stating for what an artifact is designed in design documents, marketing materials, and public records. Suggested use describe designers attempts to project how and why this artifact will be useful. Suggested use correlates to appropriated use in the user’s dimension because of the relationship between how designer’s intend the artifact to be used in relation to how it is actually used.

The environment is the fourth factor of the designer’s dimension of *learning-in-use*. The environment is the use space opened up by the artifact. In textual terms, the environment is the diegetic space (Gennette, 1980) of an artifact. The diegetic space is the world, setting, space of possibilities enacted by an artifact. For example, Photoshop has a set of functions, resources, and suggested uses, but these factors also create a space of possible images a user could create with the tool and uses the user could engage with. For a game, such as World of Warcraft, the environment (or diegetic space) is the 3D world, narratives that structure one’s engagement with the world, and possible actions to be taken in the world that define the space of possibile uses of the game. The environment describes the depth and complexity of an artifact. Environment correlates with skills and competencies of the user’s dimension to engage the user in the world openned up by the artifact. The fifth designer’s dimension factor is the artifact meaning/intention. The designer influences an artifact by embedding scripts that shape the use of an artifact (Verbeek & Kockelkoren, 1998). These scripts are designerly world-views that are “’inscribed’ into the technical contents…products contain implict ‘manuals,’” (Verbeek & Kocklekoren, 1998, p. 34). However, the artifact also relies on the context of the situation to completely define the artifact’s intentionality. So, the designer only has partial control over how the artifact shapes the learning experience. Artifact meaning/intention correlates with user meaning/intention of the user’s dimension due to the co-shaping of experience due to coupled intentionalities. Finally, the sixth factor is situations of use. Situations are opportunties for an experience to occur for the user; hence, the correlation with experience in the user’s dimension. Situations are also the most outside of the designer’s influence.

This framework follows from the research on *learning-in-use* according to some of the characteristics of the various phenomena. The phenomenon of *grasping* describes the transition between familiarity and unfamiliarity in using an interactive artifact and the accompanying level of enjoyment with the artifact. On the designer’s dimension, this familiarity relies on what functions are designed into the artifact, on how the designers suggest how the artifact should be used that can be based on other similar artifacts or totally different, in the compatibility of the environment with previous experience, in the artifact meaning/intention and how users should orient towards the artifact in use, and finally through the situations that a user finds himself using the artifact. On the user’s dimension, familiarity or unfamiliarity will emerge in the kinds of shortcuts and workarounds users have for getting out of situations without that familiarity, on the skills and competencies on which users ground their use, and user meaning/intention developed from prior experience with technology. The phenomenon of *situating* describes the fit of a technology to a particular user and how that user allots his or her own resources towards learning and using an artifact. On the designer’s dimension, the fit of technology can be found in the functions of the artifact and what it can offer, the artifact meaning/intention and how the artifact is oriented towards use, and situations of use because of how all these factors are implicated in how a user decides to incorporate an artifact into his or her life. On the user’s dimension, the fit of technology can be found in the needs and desires of users as they use the artifacts, the appropriated use as users and how the artifact will make sense in their use, and user meaning/intention. The phenomenon of *perceiving-in-use* relates to how artifacts transform the user through use based upon the promise of a certain form of functionality and control over the situation. In the case of *perceiving-in-use*, the way both user and artifact co-shape the ultimate experience is supported. On the designer’s dimension, the transformative capacity of artifacts can be found in functions, resources, suggested use, environment, and artifact meaning/intention, which can all be important in shaping the way a user uses and learns to use an artifact. Any of these factors can change the way a user “sees” an artifact. On the user’s dimension, the transformative capacity of artifacts can be found in all factors because of the way that all factors may be shaped by use of the artifact or can emerge as in the case of appropriated use as a result of use. Finally, *making meaning* is a phenomenon that deals with the consolidation of experience into knowledge addressing both clarity in the artifact and perceived complexity by the user. *Making meaning* supports the environment and depth of possibilities of the artifact, the artifact meaning/intention that forms the meaning between user and artifact, and the situations of use on the designer’s dimension. On the user’s dimension, *making meaning* supports skills and competencies formed around use, user meaning/intention, and the experiences that form the basis for user learning.

At the beginning of the definition of *learning-in-use*, I established that *­learning-in-use* is formed through personally meaningful relationships with interactive artifacts and evolves over time. From the standpoint of *learning-in-use* as personally meaningful form of learning, the *framework of* *learning-in-use* for design separates the learning that users have in a user’s dimension. Designers can only influence this personally meaningful learning through the factors over which they have control (e.g., functions, resources, suggested uses, the environment, and to some extent the artifact meaning/intentionality). The connection of the user’s and designer’s dimensions, where specific factors of match between the two, also exhibits this personally meaningful relationship. Finally, the evolution of *learning-in­-use* over time exists as an apriori assumption of this *framework*. This *framework* exhibits this change through situations of the artifact’s use and the experiences accompanying those situations for users. These experiences then will filter through all other factors to alter the relationship that users have with the artifact.

This *framework* is meant to present designers with a lens by which they can analyze the way that *learning-in-use* occurs in the artifacts that they create. Both the designer’s dimension and the user’s dimension represent what designers can control and what designers can influence respectively. While this framework may not seem to be directly applicable to the design and evaluation of user interfaces yet, the next section will demonstrate on two different examples of interaction design where and how this *framework* can come into play. These examples will demonstrate the scope and typical use of this *framework*.

## Demonstrating the *framework for* *learning-in-use*

Based on this description of the *framework*, I want to explore ways in which this might be useful for design. To do this, I wanted to use examples that demonstrate the use of the *framework of learning-in-use*. The two examples I wanted to demonstrate the framework are designing against standards and conventions and designing learning materials for an artifact. Both of these circumstances are common issues that arise in the design of interactive artifacts and both have consequences and implications for learning to use interactive artifacts. A thorough understanding of the learning experience should lead to designs that are more effective, more enjoyable, and more meaningful for users over the entire time of their use of the artifact.

*Designing against Standards and Conventions*

In interaction design, we use standards and constraints to mitigate the need to relearn interfaces over again each time a new artifact is used. Krug (2005) describes that conventions/standards exist for designers because they are design strategies that work (e.g., they are successful in designed interfaces in the past). Norman (1999) describes conventions as cultural constraints to the use of a designed artifact. Unlike physical constraints though, these cultural constraints are weaker at forcing use in a certain way. He describes conventions as “slow to be adopted, and once adopted, slow to go away. So although the word implies voluntary choice, the reality is that they are real constraints on our behavior,” (Norman, 1999, p. 41). Jones (1992), speaking of design in general, also indirectly describes the role of standards and conventions in his description of the evolution of the dishing of wheels for a four-wheeled wagon. Current standards of dishing the wheel, a procedure for centering the movement of the wheel, for crafting such wheels came about due to small improvements to wheels designs over the course of history. Wheel makers may not even necessarily know why they dish the wheel, but it is just a convention of the task of crafting the wheel. Unlike in the design of physical objects though, as Norman (1999) points out, conventions and standards in interaction design are not required. In fact, by not following such rules, we can often get better standards to emerge. Such standards then, have great impact on the learning of an interactive artifact by its user.

 To apply the *framework of learning-in-use*, we use the framework as a lens into various design issues. The *framework of learning-in-use* applies to standards specifically in the functions, resources, and suggested uses, but has implications for all the factors in the *framework*. To work through this example, I will start with the example of implementing toolbars in a design and the implications we must think about as we work them into the design. Toolbars are an example of such standards.



**Figure 6.2. Image of Microsoft Word 2003 with all toolbars visible (Saffer, 2010, p. 23). Saffer points out how unmanageable this many toolbars becomes.**

Figure 6.2 shows an old Microsoft 2003 toolbar (Saffer, 2010, p. 23). Such toolbars are used because they provide an easily locatable block of functionality in which buttons in the toolbar were logically related to each other. Toolbars became standard components of almost all desktop applications because of their use in GUI Operating Systems that had some sort of windowing functionality. Toolbars are convenient because they play into what users expect. Table 1 in Appendix F shows how one might apply this framework to the situations of developing toolbars.

 From the standpoint about how functions and user needs and desires factors of the framework interact here, the standard of toolbars provide a quick alternative to digging into menus for the options they wanted. Toolbars allowed users to offload cognitively the resources for remembering where an artifact was. Problems arose in the case of Microsoft Word where so many different components had menus that to use the features it was not easy for users to reach features of Word they wanted according to Microsoft designers despite toolbars (Saffer, 2010). In this case, the standard interfered with users accessing the features that they needed or desired. Microsoft’s solution was to combine toolbars with another web/dialog box standard of tabs (Krug, 2005) to create ribbons.

 From the standpoint of how resources and workaround and shortcuts interact, there is not much that needs to be analyzed since toolbars exist because they are so common and so intuitive for users. Most users do not need external resources because such designs of this intuitiveness. Workarounds and shortcuts are not an issue either because standards and conventions are as Norman (1999) has stated cultural constraints that are ingrained in our use of technology. Conventions such as these are what allowed participants in the study to so easily pick up the iPod Touch and use even the emerging of conventions of multipoint touch interfaces like the iPod Touch. The danger designers face is knowing the difference between established conventions and conventions that are simply “emerging.” By “emerging” conventions, I am referring to many web conventions, iPhone conventions, and video game conventions or any conventions on a medium that are not quite yet universal. This requires a delicate balance of knowing the background experience of the target audience of the design, the technique for using the standard, and the context in which the artifact will be used. In cases such as these, external resources may be helpful for bridging the process. As an aside, it was in this case, it was using the external resource of metaphors that Nintendo designer Shigeru Miyamoto was able to make the Wii and the Wii-mote welcoming to a new breed of video gamers. Miyamoto was able to take the familiarity of other technological devices that mass markets were familiar with (e.g., television remotes) and provide a way for interacting with the game system that bucked the standards of other video game console designers (O’Brien, 2007). But, from the standpoint of toolbars, such external resources are not necessary. We see toolbars all the time and they should be well understood by almost any audience.

 From the standpoint of suggested use and appropriated use in the *framework*, toolbars are suggested to be used in ways that permit the quickest access to the most often used functions in an application. To this end, designers eventually allowed users to select what toolbars to include on the window as the number of toolbars available began to grow. Eventually, designers let users move toolbars around at the top of the window and eventually anywhere on the screen. Toolbars would then become detachable from the window itself. This shows how the suggested uses of the artifact necessitated changes to how the toolbar component was logically implemented as how users desired to use the toolbars changed and, over time, by the number and density of the toolbars was constrained by the features of the artifact. Early toolbars as well as early interfaces could not easily be altered and so appropriations were hard to notice. As designers permitted the ability to change the layout of toolbars, arranging one’s workspace became a side-effect of learning of the process of appropriating such interfaces. In the study, a few participants using Photoshop and WoW explicitly mentioned that they had arranged their interfaces in the study. As for the iPod Touch, altering the layout of the “toolbars” on the screen becomes important as a user begins to add more apps.

 For the standpoint of how environment and skills and competencies interact, designers build a space of possibilities and complexity for their users. Within this space of possibilities, users build up skills and competencies to competently navigate the space. For building skills and competencies, users will need to rely on the familiarity of standards to effectively use the artifact. However, as participant 3 from our study has shown anticipation is a key factor in what makes an artifact enjoyable. Anticipation does not equate to knowing exactly what will happen, but rather to having some chance of something unique and unfamiliar to happen. Without that anticipation, artifacts become dull and monotonous. The environment also relates to something that is complex and stimulating in its depth. In this sense, the environment can also relate to the aesthetics of an artifact as well as the numbers and types of features with which a user is unfamiliar. Standards and conventions can be intuitive and simple as well as complex and beckoning towards its functionality. Toolbars such as those employed by the iPod Touch can work in such a way because while they are really a series of buttons, they are also intriguing because of the aesthetics, the scalability, the customizability, and their relationship both to the apps that they call upon and the app store from which they are acquired. At the same time, these toolbars can leverage the point—with your finger—and click of all standard toolbars. Other toolbars tie into this same experience, but too often go unnoticed in our use of the artifact, not really anything to the experience except to be a proxy for a feature.

 For the artifact and user intention/meaning standpoint of the *framework*, we can consider the relation of not just meaning in the present, but meaning over time. Over time, as users learn increasingly more about an artifact, the relationship that users have with that artifact and the way that they understand it will evolve. It is changes in either the user intention/meaning through evolving life circumstances, needs, contexts of use and motivations or the artifact intention/meaning through new versions, new patches, and new functionality that allow this evolution to occur. In the study, participants who used a new patch for WoW noted how the patch transformed the game. The patch made the game from a task that they were completing for the study into something much more enjoyable by making it easier to complete tasks in the game. Standards are aspects of a design that people grow accustomed to and begin to depend on and trust that those standards will be upheld. In the case of the toolbars for Office 2007, there was some early criticism over the ribbon design, now finding its way into other Microsoft products such as Paint and WordPad, that was meant to evolve the toolbar, but forced users skilled in the old way of using toolbars to relearn many of the features of the software (Cummings, 2007). This goes beyond just simply relearning the knowledge of how to use such toolbars, but requires a “re-wiring” of habits and a re-orientation of how we relate to the artifact in order to arrive back at the same sense of stability we had with the artifact before. Now, however much of the criticism has died down as users have become accustomed to using the new Microsoft standard. The same could not be said for the Dvorak keyboard that has consistently showed improved performance over standard QWERTY keyboards in skilled typing tests, but present too steep a learning curve for many users to switch (Norman, 2002). There are two points for designers to realize about the artifact and user intention/meaning factor of the framework. First, artifacts must be viewed from the entire relationship that has been established between users and artifacts from the first version to the last patch created. People’s attitudes and experiences are established over the entire course of this product development. Second, there is great potential for influencing intention by introducing new versions of a product. While some changes may support the majority of a target audience, there are still users who may be negatively affected by such changes. These are users who have established workarounds and shortcuts, appropriated uses, skills and competencies, intention/meaning, and a body of experiences around a product, which services certain peculiar needs and desires. How will designers for users of these artifacts take these users relationships into account in any changes?

 Standards and conventions have been around to provide familiarity and comfort for users of software. Designers always have an opportunity to test the stability of a convention by using a new approach to interaction design. The *framework of learning-in-use* can provide a way to explore possibilities in design against standards and as a conceptual lens for analyzing the impact of a given standard to the learning experience required to learn it and the meaningful relationships of those to an artifact once they have already learned it.

*Designing Learning Materials*

In this next section, I wanted to deal with an aspect of design that is most often associated with understanding the learning process. This aspect involves the design of learning materials to supplement the learning experience. This topic has been addressed before by focusing on the training manual associated with training on word processors (Carroll, 1990; Carroll et al., 1985), by focusing on a separate training interface or set of tutorials (Carroll and Carrithers, 1984; Weidenbeck and Zila, 1997), and by focusing on the alternative methods to provide online documentation for users such as through a table-of-contents or search (Egan et al., 1989; Hertzum and Frokjaer, 1996). In many ways, focusing on these tangible components of a design reveals the clearest way to impact how easy it is to learn a system. As this study has shown, the learning that users go through is often very opportunistic. So, even though designers may have spent a great deal of effort in creating instructive learning materials to accompany the creation of a new interactive artifact, the user may never really benefit from them as well as muddling through a problem they may be having, talking to a friend, or finding a tutorial online. These learning materials often disrupt the use process and as such have a high cost associated with trying to solve a problem by searching rather than figuring it out on one’s own or asking someone else who might know. In the study, participant rarely used a resource provided by the designer except for a few cases when they might briefly open a help menu and then shut it again. When participants needed help, they would often search through a search engine for other users who have had similar problems or access an online community providing such resources like tutorials for Photoshop such as Lynda.com. In some cases, these resources did end up being supplied by Adobe (Photoshop), Apple (iPod Touch), or Blizzard (World of Warcraft), but the means through which they got there was part of an external process outside of the artifact.

 From the perspective of *learning-in-use*, the *framework* provides a perspective of learning materials not just as a location of information, but as a resource supporting the ongoing experience of the user. However, these learning materials may have implications for other aspects of the learning experience as well. Table 2 in Appendix F describes an analysis of learning-in-use with respect to learning materials, specifically tutorials, which became one of the most popular ways to learn while using the artifacts in the study. Tutorials are essentially a step-by-step explanation with varying degrees of specificity about how to accomplish a task using a particular artifact. Tutorials can be written by those who create the artifacts, but very often tutorials written by other more advanced users to explain how to accomplish a task specifically from a user’s perspective.

 Looking from the standpoint of the functions and user needs and desires end of the *learning-in-use* *framework*, tutorials are meant to help a user enact the functions of an artifact. While a tutorial, will not be able to directly connect the functions of an artifact to a particular user’s needs or desires, it may perhaps be able to a user a glimpse into what the possibilities underlying the functions are. This glimpse though can only be indirect, which can be constructed not through a single tutorial, but by a collection of tutorials exploring different functionalities through task descriptions. The main difference between a tutorial and a manual is that while a manual lists different functions specifically, tutorials will focus on tasks or activities that a user is focused on completing. Tutorials are labeled and organized in a language that is closer to the everyday language of users in their use of an artifact. Manuals are organized as more disembodied resource describing the purpose of various features and sometimes providing examples of typical use. By presenting the tutorials in a language akin to activities and functionalities, designers connect with these needs and desires more readily. Users can see what is possible and what they need to do to make that possibility a reality.

 From the standpoint of how resources and workarounds and shortcuts interact in the *framework*, tutorials are one component in a variety of different learning materials. Designers should understanding the context that a tutorial plays in the learning process in relation to other learning materials such as manuals, online help, contextual help, sandbox exploration environments, templates, metaphors of interaction, and customer service. The tutorial serves a very specific role and should not just be simply another version of another learning material. Furthermore, there are many more resources that tutorials can interact with to affect the learning experience of an artifact. These include online communities, seminars on the artifact, and online repositories of work. All of these are relatively social in nature, but can in some way be connected to the tutorial. If completing a tutorial becomes too difficult or is too unclear, then these social resources that encompass the tutorials might be a place for them to seek additional help or explanations. Tutorials can also be a gateway to participating in these social resources as oftentimes it is these communities that generate the tutorials. It is also important to point out that tutorials are external to the learning process and for them to be incorporated the user must be able to make sense of them. This means that tutorials must be reasonably well-written and clear as well as they must be connected with the tools and contexts available within an artifact. For example, users in the study would often start working on a tutorial only to get to a step that is not clearly specified or understandable. If the user could guess at what was meant (e.g., participant 4 did this a few times in using Photoshop tutorials), they can tentatively proceed with the tutorial. Otherwise, they might abandon the tutorial and look for another one to try.

 From the factors of suggested use and appropriate use in the *framework*, tutorials describe how an artifact is intended to be used. They are meant to give users ideas about common uses of the artifact. Tutorials, at the same time, will not be able to determine the use of a piece of software. While tutorials are step-by-step procedures for accomplishing tasks, the online communities of users who use these artifacts can also use tutorials for describing workarounds, shortcuts, or other appropriated uses that were never intended or potentially known by the original designers. Tutorials can codify appropriated use for other users to learn about the artifact. The language of tutorials are meant to expansive, not reductive, of the potential of an artifact. So, not only can tutorials support suggested use from designers, but can be used to communicate new, appropriated uses by an artifact’s community of users.

The environment and skills and competencies factors of the *learning-in-*use *framework* describes the possibilities defined by completing tutorials. Tutorials will also give an opportunity for users to practice the skills and competencies. In this sense, there is a direct connection between the design of the tutorial and the effect on the user for shaping the environment of an interactive artifact and the skills and competencies needed to manipulate and utilize the environment. There are two problems that can occur, however, between the design of the tutorial and the user. First, a tutorial may strongly influence the belief in user’s own ability or self-efficacy. For instance, participant 1 in the study attempted to complete several tutorials on Lydia.com in her only session in the study. The tutorials which were not well understood by the participant contributed to her asking to spend more time learning on her own instead of in front of me. Tutorials must effectively connect the simulated environment of the tutorial with the situations in which to use it. This is the second potential problem described in previous work (Ryan and Siegel, 2009) referred to as a scaffolding effect. This scaffolding effect found that skills and competencies generated in a tutorial must always relate clearly with their use in the artifact itself or may lead to a breakdown in the interaction of user and artifact. It is up to designers to ensure that a tutorial supports a user for transitioning back into using the artifact itself. Users who finish a tutorial and have great difficulty applying those skills into their use of the artifact may reveal a faulty relationship between tutorial and artifact. In this sense, tutorials should not only shape what is possible using an artifact, but connect these possibilities with the underlying skills and competencies necessary. While the environment will be supported by a variety of types and numbers of tutorials presented to a user and the kinds of activities involved, the skills and competencies will be supported by the connection each tutorial makes with use in the artifact.

The factors of artifact and user meaning/intention within the *framework* applies to tutorials through the way meanings emerge between user and artifact. As mentioned in the last paragraph on the interaction between the environment and the skills and competencies factors, tutorials and artifact are designed to be isomorphic. This means understanding the tutorial should lead clearly and directly to an equal understanding of the artifact. Tutorials role are to guide a user by revealing a way to isolate various components of an artifact. For example, a tutorial in Photoshop is meant to allow a user to ignore the greater majority of the functionality of the interface, so that it can focus on only the important elements to introduce sepia tone to an image, for example. The tutorial will give step-by-step instructions of which menus to select, which buttons to press, and which values to input into text boxes. It may also provide some rationale as to why certain steps are taken or values are provided, but it will rarely describe at a higher level why these tutorials are useful or what situations they will be useful for. This is usually left up to the user to decide, though sometimes the user will not be able to link them to any actual immediate activities they have going on in a particular artifact. Another example of meaning/intention in a tutorial is in World of Warcraft. The main tutorial is provide by the game—something that most games do to introduce new players to the environment. The tutorial introduces the basic combat, interacting with characters, managing inventory, and completing quests for example. The tutorial appears as a background process that pops up as a user completes an important step, such as being assigned a quest, killing a monster for the first time, or picking up a new item. In this sense, a good tutorial is not just a means to welcome a user into a game, to provide the user with basic skills using an artifact, and to mediate between the artifact and the environment underlying the artifact. It should also transform a user’s meaning towards that of the artifact’s. It should in this sense, immerse the user into using the artifact and make him or her forget they are learning, but rather learning-in-use.

The final factors from the *framework of* *learning-in-use* are the interaction of situations and experiences. Tutorials are excellent ways at preventing users from staring at a “blank canvas” of an interface. These tutorials make the artifact seem much more tractable and less intimidating and can be experienced in a way that welcomes the user to explore the artifact. Users may need to use these tutorials in a variety of different situations and under different circumstances. Some will use the tutorial because it is meant to be used first for figuring out how to use an artifact, or an artifact is designed so that the tutorial is the first thing the user interacts with about an artifact. Other times, a user may be at the end of their wits for trying to figure out some aspect of an artifact. In yet other circumstances, the user may be accomplished looking to push forward their understanding of the interface by learning a new technique using a tutorial. These examples several of the myriad underlying situations under which users may approach a tutorial based on a variety of different experiences. Designers of tutorials need to ensure that the tutorials that they create support this wide variety of situations under which a tutorial will be used and the variety of experiences users may be bringing to the table. Further complicating this picture, learning is again opportunistic meaning that there are no rules even when these situations or circumstances happen that a user will put the effort into a tutorial. Tutorials are generally conducive to this opportunistic flavor of interaction, though, as they are separated and always readily available.

 Tutorials are a way for designers or members of a community of use of an artifact to communicate know-how to users of an artifact as well as introducing and making tractable a novel interface. Applying this *framework* to tutorials, as with the example of standards above demonstrate the complex relationship between user, artifact, and designer and how a designer can begin to bridge the gap in support of the learning experience. Tutorials play an important role in the learning process for those of interactive artifacts. The focus on *learning-in-use* situates tutorial use with respect to artifact use and describes the tight interconnection that must be made between the two to effectively support the learning experience. While tutorials have been an effective part of interactive artifact learning as a way to transfer knowledge, more attention can be given to the role that tutorials play in the learning experience.

## Conclusions

This chapter has demonstrated a *framework of learning-in-use*. This *framework* is meant to be applied in design situations as a lens that highlights aspects of the learning experience and the role that designers, the designed artifact, external resources, and the user play in the learning experience for each user. While the previous chapters on *learning-in-use* were meant to deal with the conceptual issues of the learning experience, this chapter was meant to provide a more direct and applicable connection with design practice.

 I described two different dimensions to the *framework of learning-in-use*: a user dimension and an artifact dimension. These divisions follow the notion of the co-shaping of experience by both user and artifact (Verbeek, 2005). I described six factors for each dimension. Each factor within the dimensions align across dimensions. The first interaction between factors was that of artifact functions and user needs and desires. These factors were described by the functions and features that an interactive artifact supports and how those functions match various needs and desires of the user. The second interaction was between artifact resources and user shortcuts and workaround. Both refer to the external way that the artifact is used where resources stand as external supplementary materials and shortcuts and workarounds arise because users cannot figure out a standard way to use an artifact and users must creatively find a way to accomplish their goals. The third interaction was between artifact suggested use and user appropriated use. When an artifact is designed, the designer embeds suggested ways of using the artifact, which are the most directly supported by the designers, but through use, users learn to use the artifact in their own ways that may not follow the designers ways and appropriate the design and make it fit their own peculiar needs. The fourth interaction was between the artifact environment and the user skills and competencies. The environment describes the space of possibilities opened up by an artifact and the skills and competencies define the way that a user can navigate in that space of possibilities. The fifth interaction was the artifact meaning/intention and the user meaning/intention. The user and artifact meaning/intention define the role that each have in co-shaping the learning experience. These factors were where users will first look to for direction and meaning in their experience of an artifact. The final interaction was between artifact situations of use and user experiences. This defines the particular in-the-moment usage of an artifact and its relation to how a user is experiencing that artifact. From artifact functions to artifact situations of use, the artifact dimension progressively defines the levels of control of the designer. While a designer may have direct control over the functions and external resources, the designer has increasingly indirect control over the suggested use, environment, the artifact meaning/intention, and the artifact situations of use. Designers of artifacts should realize the ways that decisions they make about the factors they control directly affect the factors they do not directly control.

 Finally, I have demonstrated the use of this framework for two design situations including dealing with standards and conventions and designing learning materials. These two examples focused on the evolution and design of toolbars for standards and conventions and the design of tutorials for learning materials. Both of these examples are commonly in use and have been analyzed through traditional *cognitivist* and *constructivist* approaches, but the *experiential* approach provides a new way to look at their role for the artifacts in which they are embedded as well as their role in the design community as a whole. A worksheet detailing these examples as well as a blank worksheet can be used for future design practitioners can be found in Appendix F.

 With this chapter, I have concluded my analysis of the concept of *learning-in-use*. I will use the next chapter to summarize the concept as it was introduced in this dissertation as well as implications of this concept and future directions of this research.

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1. A more complete description of intention as the foundation of *learning-in-use* can be found in Chapter 2. [↑](#footnote-ref-1)
2. In games, this practice of creating macros, which is actually a very large sub-culture of gaming, is known as modding. [↑](#footnote-ref-2)
3. For clarity sake, we will consider user’s who are also developer’s as separate and unique cases of *learning-in-use* and one that is outside the scope of the current writing. [↑](#footnote-ref-3)