

# **Design and Development process of PHP Basics**

**Final Report  
R547**

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## Introduction

The purpose of this report is to describe the design and development process that was used to create *PHP Basics*, an online tutorial students taking *R547-Computer Mediated Learning*, in the School of Education, at Indiana University. This report includes the learner analysis, context analysis, design decision, findings of the usability of the paper and online prototype. It also includes the changes that were made to the paper prototype, and the online prototype.

### Learner Analysis

The learners of this program are distance and residential graduate students who must take the prerequisite core classes *R521*, *R522*, and *R541* before taking this class. They should also be proficient in the following computer technologies that are core competencies set by the Instructional Systems Technology (IST) department.

- Familiar with Macintosh or Windows System
- Basic operating systems knowledge. "This includes launch or run an application, create a folder/directory, name a folder/directory/file, move a folder/directory/file from one location to another, rename a folder/directory/file, copy a folder/directory/file from one device to another, delete a folder/directory/file, initialize a disk, open a file, save a file, find a file, print a file." (*IST Masters program, 2002*, <http://www.education.indiana.edu/ist/programs/masters/dm/requirements.html>)
- Understand how computers work. This includes "understand the basic classifications for functional components for computer systems: Peripherals: input devices for humans, output devices for humans, secondary storage, communications devices; Internal components: RAM, ROM, CPU; information flows between and among these components; know basic functions of the operating system; know how computers execute programs (compiled vs. interpreted)" (*IST Masters program, 2002*, <http://www.education.indiana.edu/ist/programs/masters/dm/requirements.html>)

In addition, they should be able to do the following:

- Create a Dynamic WWW page.
- Use HTML (hypertext markup language).
- Access Macromedia's Homesite 5.0
- Access SSH

### Context Analysis

In the past an instructor teaching this class spent approximately six to eight hours teaching basic PHP concepts. The goal of the online tutorial is to increase learning efficiency. The learners can use this online tutorial and work at their own pace. While the tutorial is a self study, learners will have instructor support. The tutorial will be placed in a R547 folder, on Mentor and Veritas (servers used by faculty for their instructional courses). Students will have links to this resource through the following online discussion forums:

- SITESCAPE Forum (SSF) -a discussion forum, for students to easily access materials. There is no limit to the storage capacity of this site.

OR,

- Oncourse - a discussion forum that has a limited capacity of 50MB.

In addition, to create dynamic web pages, students will have access to the server *Mentor*, where they will be able to store their products. There is no limit on the storage capacity of this site.

### Instructional Objectives

Based on our meeting with our client, Dr. Ted Frick, the following objectives were outlined and agreed upon. The learners should be able to:

- Access Mentor server by using SSH
- Use basic UNIX commands such as *cd*, *pwd*, *ls*, *mkdir*, and *exit*.
- Change file permissions using SSH and UNIX command: *chmod 700 filename.phtml*, and with *SSH FTP* file properties.
- Use pico editor on Mentor for simple text editing.
- Use Homesite editor for HTML and PHP script editing.
- Change Homesite settings for Unix file format and PHP file types
- Identify the reasons if they receive a
  - interval server error in the browser while testing their pages
  - forbidden 404 error
  - parse error
- Use basic PHP scripting language to create elementary PHP applications as part of web-based instruction
  - Input and retrieve information from a html form, such as an online survey
  - Give feedback to the users after they submit the form , such as an instructional quiz
- Debug a PHP program that has syntax errors and when run, encounters error messages. The learner will be given a model example of what the program can do if it is working correctly.

### Design Decision

The design decisions for [the paper](#) and [online](#) prototype were based on Merrill's 5 Star Instructional Design Rating (See *Table 1*).

*Table 1: using Merrill's 5 Star Rating for Instruction of PHP Basic Prototype*

Merrill's 5 star Rating	Design Decisions for PHP Basic Prototype
1. "Is the courseware presented in context of real world problems?" (Merrill, 2001,pg 1).	<ul style="list-style-type: none"> <li>• The goal of the program is for learner to acquire PHP scripting skills, and be able to create a quiz, or an online survey in their instructional project.</li> </ul>
2 "Does the courseware attempt to activate prior knowledge or experience?" (Merrill, 2001,pg 1).	<ul style="list-style-type: none"> <li>• The goal of the tasks/examples are to reference the learners prior knowledge of HTML</li> <li>• Most programming languages tutorials allow the learner to type or copy and paste code and adapt it to the learner's needs, a similar approach is taken in this program.</li> <li>• The purpose of the site map is to provide an "advance organizer" (Driscoll, 2000, pg</li> </ul>

	<p>139). So that learners are able to have an overview of the instruction, and be able to determine what they already know, and focus on areas that are new.</p> <ul style="list-style-type: none"> <li>• The goal is to use navigation similar to a familiar and popular website such as <i>Amazon.com</i>. This familiarity may help learners easily navigate through the instructional content. If learners are not familiar with <i>Amazon.com</i>, they may be familiar with using paper tabs in their binders.</li> </ul>
<p>3. "Does the courseware demonstrate (show examples) of what is to be learned rather than merely tell information about what is to be learned." (Merrill, 2001,pg 2).</p> <p>4. "Do learners have an opportunity to practice and apply their newly acquired knowledge or skill?" (Merrill, 2001,pg 2).</p>	<ul style="list-style-type: none"> <li>• The goal is to provide demonstrations by providing screenshots and step by step instruction of what the learner should do to complete a task.</li> <li>• The goal is for the instruction to be clear and succinct, by using screenshots and bulleted text.</li> </ul> <p>The goals are:</p> <ul style="list-style-type: none"> <li>• For learners to have the opportunity to practice a similar problem right after they complete an example to reinforce learning.</li> <li>• Scaffold learning, if the learner encounter problems while trying to apply their new knowledge in their practice sessions, they should be able to review the "troubleshoot section" to overcome common errors in using PHP script in an IU environment.</li> <li>• To encourage learners to apply the programming code quickly. Learners are encouraged to type, and/or copy, and paste code. This is similar to the instruction of most other computer language programs, where the learner can see how it works, and then incorporate and adapt the code to their needs.</li> <li>• To help learners become familiar with the programming logic and be able to trouble shoot programming errors.</li> </ul>
<p>5. "Does the courseware provide techniques that encourage learners to integrate transfer the new knowledge or skill into their everyday life?" (Merrill, 2001,pg 2).</p>	<ul style="list-style-type: none"> <li>• The goal of the program is for learner to acquire PHP scripting skills, and be able to create an online quiz, an online survey, and be able to debug a program, and then use PHP scripting in their R547 instructional project.</li> </ul>

## PHP BASIC Paper Prototype Usability

### Learner Profile

In total, three subjects took part in the usability test. The subjects include one male and two female residential graduate students from Instructional Systems Technology, School of Education. The age of the users ranged from 24-31 years. One subject is a native English speaker, while the other two subjects are non-native English speakers. Subject One (S1) has novice programming language experience in HTML and BASIC. Subject two (S2) has intermediate experience in HTML. Subject Three (S3) has advance experience in HTML, and novice level experience in C, Perl, and ASP (See Table 2).

Table 2: Users experience in programming languages

Users experience in Programming languages			
	Novice	Intermediate	Advance
HTML	S1	S2	S3
C	S3		
Perl	S3		
ASP	S3		
Basic	S1		

All users have prior experience using web-based tutorials. Two users liked learning new programs using web-based tutorials, but one user did not like online tutorials. All of the users did not have experience using Macromedia Homesite.

All users were asked if they could perform tasks that were related to PHP prior to completing the usability (See Table 3). S1 had experience with accessing mentor server using SSH; using basic UNIX commands; and changing file permissions. S2 had experience with changing file permission. S3 had experience with all the tasks. However, our usability showed that S3 did not know tasks 5 through 8 (See Table 3).

Table 3: Users perception of the tasks they can perform

Users perception of the tasks they can perform	
Tasks	Subjects
1. Able to access Mentor Server using SSH	S1 and S3
2. Able to use basic Unix Commands	S1 and S3
3. Able to change file permissions	All users
4. Able to use Pico editor on Mentor for simple text editing	S1 and S3
5. Able to use Homesite editor for HTML and PHP script editing	S3
6. Able to change Homesite setting for Unix file format and PHP file types	S3
7. Able to debug scripting errors	S3
8. Able to use basic PHP scripting language to create online forms with feedback	S3

### Location and Length of Sessions

The usability tests were conducted in various locations. While the usability test was primarily paper based, the users did use the computer to complete practice sections in the lessons. One usability test was conducted at the residence of a design team member. This user connected to their IU accounts, using a 56kps modem. The other two usability tests were conducted in the School of Education, using UITS computers.

Due to time constraint, the usability test lasted 2 hours for each user. The users completed a pre-assessment, the instructional materials on PHP, a post-assessment, and a reactionnaire. Below are the findings of the usability test based on instructional effectiveness and satisfaction with instruction (See Table 4).

Table 4: Instructional Effectiveness and Satisfaction with Instruction

Instructional Effectiveness					Satisfaction with Instruction	
Subject	Pre-assessment Mastery Level (Total Score = 100)		Post-assessment Mastery Level (Total Score = 100)		Reactionnaire Mean Score	
S1	1		22		3.76	
S2	1		25		3.07	
S3	11		66		4.36	
Overall	mean	Standard deviation	mean	Standard deviation	Mean	Standard deviation
	4.3	5.6	37.6	24.5	3.76	0.65

From the means of the pre-assessment (4.3) and post-assessment (37.6), there was an increase in the scores. This shows there was some instructional effectiveness. In general all subjects were able to complete the first task in the post assessment, and S3 was able to complete task 2, create a quiz. The standard deviation of pre-assessment (5.6) and post-assessment (24.5) varied substantially. The standard deviation of the post assessment may be large as S3 scored a lot higher than the other subjects. This user had programming experience in C, ASP, and Perl, which may have helped S3 in understanding PHP code despite the design of the instruction. Overall all subjects performed better in the post test than the pre-test. But the difference was not very significant.

In terms of satisfaction with instruction, the mean was 3.76. This mean indicates that users felt the instruction ranged from "Agree" to "Undecided". The standard deviation was 0.65. One explanation for the mean and stand deviation, was that one user "strongly agreed" that the instruction met their goals and objectives, as this user was very keen to learn PHP. This user also had a background in other programming languages that helped in learning PHP. The other two subjects were novice programmers. S1 was some what satisfied with the instruction, but S2 was not satisfied with the instruction as a whole (See table 5).

Table 5: Reactionnaire Comments

Reactionnaire Comments			
	Subject 1 (S1)	Subject 2 (S2)	Subject 3 (S3)
1. Did you have any problems with this web based tutorial?	"Yes, there is a long pre-knowledge section (PHP at IU) before lessons on PHP are explained."	"Yes It was unclear to me when I was supposed to do activities vs. just reading. I made some minor coding errors that I would not have been able to fix without the help of the usability test implementers."	"Yes A little bit because I prefer simulation based tutorials instead of text based ones."
2. Which part did you like best in this web based tutorial? Why?		"I liked being able to practice the programming procedures on the spot because I usually learn best by "doing"."	"I liked the screen shots because I could see it in the real situation."
3. Which part did	" UNIX part is too	"I did not like having to re-	"Text parts, because

you like least in this web based tutorial? Why?	long."	type code, line by line when it was considerably long. I'd prefer to copy and paste long passages of code (maybe I could choose from multiple sets of code so I have to determine which is written correctly."	I had to read it through."
4. How can the instruction be improved?		".. Be clear when, using headings, when the content is meant to be read or if it's an activity. Find ways to avoid learner making small coding mistakes that are difficult to debug."	"Make lessons more simulation based."
5. Any other comments or suggestions?		"To motivate learner, give a clear explanation up front of why PHP is worth knowing and using and is better than the other common web programming methods (Dreamweaver, transform, etc.)"	"Good!"

### Instructional Process and Product Usability

Based on our usability test, below were the findings of our observations of our users' behavior towards completing the instructional paper prototype on PHP. Included were the apparent problem with the design and stated were the priority the design team felt for fixing the program (Refer to Table 6).

Table 6: Instructional Process and Product Usability

Instructional Process and Product Usability			
Activity Task	Observation of Subjects behavior and conditions	Apparent Problem with the Design	Priority for fixing the Design
All	The design worked well in areas where there were screen shots for the user to see and do, but not when the user had to read a lot of textual explanation.	Visuals, diagrams, were easier to understand. For web based instruction text must be clear and concise.	Must Fix
Home Page	The design did not allow the user to go back a page	Remove the back navigation arrow on the home page	Must Fix
PHP at IU	The design did not remain consistent in terms of stating when to practice and when to review the instruction. Users tried to anticipate when they should practice and complete a task. When	The design does not make it clear when to PRACTICE and when to just REVIEW the materials	Must Fix

	they could not find the practice, they felt frustrated.		
PHP at IU	In the design, the user was instructed to "exit" from mentor. This prevented the user from completing the next task of using the Pico editor.	Pg 20, Users can exit mentor, but were not able to go to the next task of using the Pico editor	Must Fix
	The design did not make it clear for the user to save the file using Pico.	Pg. 22 The design did not include instruction on how to save a file using Pico.	Must Fix
	The design did not make it clear how to save the file in the "www" directory.	Pg 23. The design did not include instruction on how to save the file in the "www" directory.	Must Fix
	The instruction for the screen shots were difficult to understand, users had a hard time figuring out that the alphabets related to the screen shot alphabets.	p. 28 The fonts that were used in the screen shots were different from the ones used in the explanation.	Must Fix
	The numbering of titles, practice sections were not clear.	The numbering system of titles and practice sections were complicated such as 2a.1.	Must Fix
	There was no overview explanation or "why" it is important to understand the content of PHP at IU. When the users tried to complete the practice sections, they had difficulties, and were not able to troubleshoot the problem.	The instruction at PHP at IU did not provide an overview of how PHP is used to create dynamic web pages. For the practice sections, users were referred to "Common Errors in PHP." But this was not consistently shown or referred too.	Must Fix Must Fix
	Users were not familiar with computer terminology that was used in the design.	Terms such as "execute" or parent directory, were not explained in the program.	Should Fix
	Typos in programming threw off some of the users.	Pg 22 in the Screen Shot </head> tag is missing	Must Fix
	Pg 23, Users spent time typing text for the phptest.phtml example.	Pg 23, The phptest, phtml example was text intensive.	Nice to Fix
	Pg 26 In the design, some users found the many ways to generate file permissions confusing.	Pg 26 Too many examples for file permissions (e.g. 777, 700, rwx, etc)	Should Fix
	Users felt that the PHP at IU section was too long. They spent an average 45 minutes to complete this section	The design repeats the materials on file permission for both SSH and Unix.	Nice to Fix
	In the design, users were not sure if they should "apply" changes to the file settings in Homesite	Pg 31 The design did not state to click "apply" on the Homesite File setting screen, for screen shot 3a.4	Should Fix
	Users found that the arrows used in some screen shots were different from other screen shots	Pg 28 Use of Arrows for all screen shots was not consistent.	Nice to Fix
	The design did not make explicit why the user should use Homesite over Dreamweaver Front page, etc	This piece of information was missing in the instruction.	Should Fix
	In the design, users were not clear how to go back to the "edit" mode in Homesite. Users were not able to switch between files as they were trying to create html and phtml files.	Pg 32. Pg. 32, Screen shot 3a.5, the design does not make it clear how to go back to the "edit" mode in Homesite. Also there is no explanation of the file buttons at the bottom of the screen.	Should Fix

Lesson 2 : Basic PHP syntax	Some users found Basic PHP syntax lesson to be too short.		Will be fixed when other...
	The design did not remain consistent in terms of when to practice and when to review the materials; this made it rather confusing for the user.	The design does not make it clear when to PRACTICE and when to just REVIEW the materials	Must Fix
	In the design, the users were not able to complete scenario 1 as the code did not match with the task.	Scenario 1 code did not match task 2.	Must Fix
	In the design, the outline for each lesson was confusing, learners were not sure if they could jump to that section.	The design did not underline the text, to show that they were hyperlinks in the paper prototype.	Fixed when other problems are fixed
	The design did not make it clear for the Users to know when a section ended.  The design did not provide all the steps for the users to complete the task on pg 37.	The design had the practice section and new topic on the same page.  Pg 37 The steps to complete this task "Create a file on IU campus" were not exhaustive.	Fixed when other problems are fixed Must Fix
	The design did not allow the user to be able to access the www directory to save their files.	Pg 37 When users access Mentor through Homesite, the "WWW" directory is not explained.	Must Fix
	The design did not allow the users to easily navigate between lessons.	The lessons are presented sequentially in the paper prototype.	Fixed when other problems are fixed
	The design did not state that the users should change file permissions for task on pg 43.	Pg 43 does not include instruction to change file permission.	Must Fix
	The design did not provide all the steps for the users to complete the task on pg 43.	Pg 43. The instruction in the practice is not explicit	Must Fix
Lesson 3: creating a Quiz and Survey	The design was text intensive. Users felt they were being tested for their typing skills, rather than their knowledge on PHP.	In the design, users were asked to type text, so that they could make sense of the code. This may be a complete re-design.	Must Fix
	In the design users were not able to complete the task on pg 45.	In the design, explanation of the script variables was not given. Such as \$first name \$ sign.	Must Fix
Common Errors	The design does not have examples in the common errors section.	The design does not have examples in the common errors section.	Nice to fix
Assessment	In the design there was no explanation on how to debug PHP code, yet there is a question in the assessment.	Additional instruction needs to be added on how to debug PHP. This instruction was missing.	Must Fix

Based on our findings, we suggested the following recommendations in the design (See table 7).

Table 7: Recommendations for fixing the design.

Priority	Apparent Problem with the Design	Recommendations for how to fix design
Must Fix	Visuals, diagrams, were easier to understand. For web based instruction text must be clear and concise.	Make the text clear and concise and use more visual representation such as screen shots.
Must Fix	Remove the back navigation arrow on the home page	Remove back
Must Fix	The design does not make it clear when to PRACTICE and when to just REVIEW the materials	Upfront explain the PRACTICE / REIVEW format in the introduction page, and then in each lesson.
Must Fix	Pg 20, Users can exit mentor, but were not able to go to the next task of using the Pico editor	Provide instruction on how to reconnect to mentor.
Must Fix	Pg. 22 The design did not include instruction on how to save a file using Pico.	Using screen shots provide step by step instruction on how to save a file using Pico.
Must Fix	Pg 23. The design did not provide instructions on how to save the file in the "www" directory	Include instruction on how to save the file in the appropriate directory
Must Fix	p. 28 The instruction for the screen shots were difficult to understand, users had a hard time figuring out that the alphabets related to the screen shot alphabets	Use the same font in the screen shot and in the instruction
Must Fix	The numbering of titles, practice sections were not clear	Use Roman numerals to identify the various lessons, and number titles and practice sections accordingly
Must Fix	The instruction at PHP at IU did not provide an overview of how PHP is used to create dynamic web pages. The design did not motivate the user to learn PHP.	In the introduction page, demonstrate the uses of PHP, to motivate the learner. Explain why it is important to learn this programming language.
Must Fix	For the practice sections, users were referred to "Common Errors in PHP." But this was not consistently shown or referred too.	Give a Help page for instructing how to use the website and refer "common errors in PHP" consistently
Must Fix	Pg 22 in the Screen Shot </head> tag is missing	Put </head>
Must Fix	Scenario 1 code did not match task 2.	Change task 2 in the test
Must Fix	Pg 37 The steps to complete this task "Create a file on IU campus" were not explicit.	Provide step by step instructions using screen shots.
Must Fix	Pg 37 When users access Mentor through Homesite, the "WWW" directory is not explained.	Provide instruction on how to save the files under WWW directory in Mentor using Homesite.
Must Fix	Pg 43 does not include instruction on how to change file permission	Give the instruction on how to change file permission. OR provide a link to the section on changing file permissions.
Must Fix	In the design, users were asked to type text, so that they could make sense of the code.	The user should be able to copy the html code, and only type the necessary script in the file.
Must Fix	Pg 45 There was no explanation for Variables	Explain the term Variables. Also place this terminology in the glossary

Must Fix	In the design, variables used in the script were not explained. Such as: \$first name, \$ sign.	Explain the variables used in the script
Must Fix	In the design there was no explanation on how to debug PHP code, yet there was a question in the assessment.	Provide instruction using a scenario on how to debug PHP
Should Fix	Terms such as "execute" or "parent directory", were not explained in the program.	Explain "execute" Also place this terminology in the glossary
Should Fix	Pg 26 Too many examples for file permissions (e.g. 777, 700, rwx, etc)	Delete redundant file permission examples
Should Fix	The design does not make explicit why the user should use Homesite over Dreamweaver, Front page, etc	Before the instruction on Homesite, explain why Homesite should be used instead of Dreamweaver.
Should Fix	Pg 32. Pg. 32, Screen shot 3a.5, the design does not make it clear how to go back to the "edit" mode in Homesite. Also no explanation is provided of the file buttons at the bottom of the screen.	Using Screen shots, explain how to go back to the "edit" mode, and explain how to access files at the bottom of the screen in Homesite.
Should Fix	Pg 31 The design does not state to click "apply" on the Homesite File setting screen, for screen shot 3a.4	Provide the instruction to click the "apply" button
Nice to Fix	Pg 23, The phptest, phtml example is text intensive.	Reduce the text, but maintain the purpose of the example.
Nice to Fix	The design repeats the materials on file permission for both SSH and Unix.	Repetition may be necessary.
Nice to Fix	Pg 28 Consistent Arrows for all screen shots	The arrows in the screen shots should be consistent
Nice to fix	The design does not have examples in the common errors section.	Give examples
Fixed when other problems are fixed	The lessons are presented sequentially.	This will not be the case when this is a web-based program
Fixed when other problems are fixed	The design did not underline the text, to show that they were hyperlinks.	This will be rectified in the computer based design
Fixed when other problems are fixed	The design had the practice section and new topic in the same page	This will be rectified in the computer based design

## PHP BASIC Online Prototype Usability

### Learner Profile of Test Subjects

In total, three subjects took part in the usability test. The subjects include two male and a female residential graduate students from Instructional Systems Technology, School of Education. All of these subjects are currently enrolled in *R547*. One subject is a native English speaker, while the other two subjects are non-native English speakers. The users self ranked their level of experience in programming languages. Subject One (S1) had intermediate programming language experience in HTML and novice experience in Java, Perl, and PHP. Subject two (S2) had advance experience in ASP, Basic, HTML, and SQL. S2 had intermediate experience in Javascript and is a novice in Java, Perl and PHP. Subject three (S3) is a novice in HTML (See Table 8).

Table 8: Users experience in programming languages

Users experience in Programming languages			
	Novice	Intermediate	Advance
ASP			S2
Basic			S2
C			
Java	S1, S2		
Javascript		S2	
HTML	S3	S1	S2
Perl	S1, S2		
PHP	S1, S2		
SQL			S2

While only two users have experience using online tutorials, all users stated that they wanted to use online tutorials to learn new programs. All of the users have some experience using HomeSite 5.0

All users were asked if they could perform tasks that are related to PHP prior to completing the usability. As they were taking the residential *R547* course, they had all attended the lectures on basic PHP scripting. S1 could complete all the tasks except debug scripting errors and create online forms with feedback. S2 could complete all the tasks except create creating online forms. S3 was not able to complete any of these tasks (See Table 9).

Table 9: Users perception of the tasks they can perform

Users perception of the tasks they can perform	
Tasks	Subjects
1. Able to access Mentor Server using SSH	S1 and S2
2. Able to use basic Unix Commands	S1 and S2
3. Able to change file permissions	S1 and S2
4. Able to use Pico editor on Mentor for simple text editing	S1 and S2
5. Able to use Homesite editor for HTML and PHP script editing	S1 and S2
6. Able to change Homesite setting for Unix file format and PHP file types	S1 and S2
7. Able to debug scripting errors	S2
8. Able to use basic PHP scripting language to create online forms with feedback	

### Location and Length of Sessions

The usability tests were conducted in the School of Education, using UITS computers. Due to time constraints, the subjects spent approximately 2 hours on the usability test. The users completed a pre-assessment, the instructional materials on PHP, a post-assessment, and a reactionnaire. Below were the findings of the usability test based on instructional effectiveness and satisfaction with instruction (See table 10).

Table 10: Instructional Effectiveness and Satisfaction with Instruction

Instructional Effectiveness					Satisfaction with Instruction	
Subject	Pre-assessment Mastery Level (Total Score = 100)		Post-assessment Mastery Level (Total Score = 100)		Reactionnaire Mean Score	
S1	34		64		4.14	
S2	42		90		3.71	
S3	0		30		4.50	
Overall	Mean 25.33	Std Dev 22.30	Mean 61.33	Std Dev 30.08	Mean 4.12	Std Dev 0.39

From the means of the pre-assessment (25.33) and post-assessment (61.33), there was a substantial increase in the scores. This shows there was some instructional effectiveness. In general all subjects were able to complete the first and second task in the post assessment. One subject (S2) attempted the debugging task. However, the other two subjects did not attempt the question on debugging, as they were not able to review the instructional materials due to time constraint. S2 may have been able to complete the task, as this user had advance programming experience in ASP, Basic, HTML, and SQL, which may have helped in understanding PHP code. It is important to note that as users were able to work through the examples and performed well in completing the tasks that they were able to review. As the tasks were scaffolded from simple to complex, users were able to go back and forth through the materials to complete more complex tasks.

In terms of satisfaction with instruction, the mean was 4.12. This mean indicates that users "Agreed" that they liked the instruction. The standard deviation is 0.39. It seems that the subject that was a novice learner of PHP liked the materials more than learners who had experience with PHP programming. (See table 11). The overall satisfaction score was affected by the S2, who was more experienced in programming languages than our target audience. S2 found the first part of the instruction lengthy too detailed. This subject expected more detailed and complex instructions for the later section PHP Scripting and Debugging. For the novice and less experienced users satisfaction and the overall comments during the usability was high. If we can compare test scores of the online usability with the paper prototype usability, the post-test mean score improved from 37.6 to 61.3 this is significant improvement for a limited usability results.

Table 11: Reactionnaire Comments

Reactionnaire Comments			
	Subject 1 (S1)	Subject 2 (S2)	Subject 3 (S3)
1. Did you have any problems with this web based tutorial?	Yes Need more explanation for survey task 3.		"Need more explanation of technical terminologies".

<p>2. Which part did you like best in this web based tutorial? Why?</p>	<p>Lay out and graphics</p>		<p>"The Sitemap is very clear to understand. It clearly explains the content of the website"</p>
<p>3. Which part did you like least in this web based tutorial? Why?</p>		<p>"I was told to copy and paste code and then it was explained to me. I perhaps would have preferred to see an example (shown through screen shots or a URL that I was pointed to), then have the parts of the code explained, rather than just copy and paste code which I might not understand at all".</p>	<p>"Using Homesite: I don't like to learn a new software for the same function when Dreamweaver can do the same job."</p>
<p>4. How can the instruction be improved?</p>		<p>"Shorten the "PHP at IU" part (or whatever it's called)--maybe turn it into a checklist of "how to create a file and prepare it for PHP execution", more like a job aid rather than extensive instruction. (I just think that is more appropriate to the type of content being taught in that section)".</p>	<p>"Use Flash or more graphics than lengthy text to make it easier to understand and learn how and what to do".</p>
<p>5. Any other comments or suggestions?</p>			<p>"I learned a lot from this instructional website about how PHP works".</p>

**Instructional Process and Product Usability**

Based on our usability test, below are the findings of our observations of our users' behavior towards completing the online prototype on PHP. It included the apparent problem with the design and stated the priority the design team felt for fixing the program.

Table 12: Instructional Process and Product Usability

Instructional Process and Product Usability			
Activity Task	Observation of Subjects behavior and conditions	Apparent Problem with the Design	Priority for fixing the Design
All	The design worked well in areas where there were screen shots for the user to see and do, but not when the user had to read a lot of textual explanation.	Visuals, diagrams, were easier to understand. For web based instruction text must be clear and concise.	Must Fix
Sitemap	Users liked the Sitemap, they felt it was clear and concise in providing an overview of the instructional program	None	None
Navigation	Users liked the navigation of the instructional program, they liked the option of using the "next" arrow, and the lower navigation bar.	None	None
	There was a large distance between the "next" and "previous" button. Users had difficulty finding the "previous" button.	The "next" and "previous" should be close together for ease of use	Nice Fix
PHP at IU	Users were not clear with the instructions statement "Do:" They were not sure if they should complete the task or read the activity. Also they felt the "Do" graphic was a button or a link.	For the sake of clarity, restate the instruction for learners to complete the practice section. Use another term instead of "Do" for learners to start the practice.	Must Fix
PHP at IU	Users referred more to the graphics and paid very little attention to the text.	Due to time constraint, users skimmed through the materials by relying heavily on the screenshots, so that they could get through the materials.	Nice to fix
	Pg 313, In the design there were abbreviations, such as "eg" for "for example."	Spell out all abbreviation.	Must Fix
	Users were not clear that the term "screenshots" refers to the images.	Restate the names of the screenshots to images.	Nice to Fix
	Pg 325 should be deleted	Pg 325 should be deleted	Must Fix
	Pg 317, For a novice user there was too much information in the "Note" section, this confused the user.	Pg 317, Do not include additional information in "Note" this confused the user	Must Fix
	Users were not familiar with	Terms such as <i>interpreter line</i> and the	Must Fix

	computer terminology that was used in the design. For example <i>file formats</i> , <i>interpreter line</i> . They just knew the actual code for the interpreter directive	code should be stated together. More definitions should be provided.	
	Pg316 Users were not clear how to copy and paste text into the Pico.	The design should include instruction on how to copy and paste into Pico	Must Fix
	Pg 316 Users were not clear why they needed to paste the text into the " <i>phptest.phtml</i> " file, they would prefer to see the code first, then copy and paste.	Pg 316 The design did not make explicit why users needed to paste the text into the " <i>phptest.phtml</i> " file. They should see the code first, then copy and paste it into the Pico editor	Must Fix
	Pg 317 Users did not know how to go back to their pico files	There should be instruction on how to go back to their pico file.	Must Fix
	Pg 331 The Homesite anchor should include a back link For the section on Working on Campus or using UITS computers	Pg 331 A separate page should be created for <i>Working on campus</i> or <i>using UITS computers</i> . So this problem will be resolved.	Must Fix
	Pg 331 As a user, the design should make the <i>Working on campus</i> for Homesite, on a separate page	Pg 331 The design should place <i>Working on campus</i> or <i>Using UITS computers</i> for Homesite in a separate page	Must Fix
	Users had problems using Homesite, the program kept crashing during the usability test. Test subjects had to use Dreamweaver, or save the files on the desktop and upload using SSH.	Homesite crashing on campus may be an UITS installation problem. <b>(This seems to be a UITS installation problem).</b>	Not fixing this problem for the moment
	Pg 333 The graphic that shows "Browse" is not clear	Create a box around the area "browse" on the screenshot in Pg 333.	Must Fix
	User's forgot to change the file permissions for the practice	After each example a reminder for changing file permissions needs to be added	Must Fix
Lesson 3: creating a Quiz and Survey	PHP Scripting page - Navigation button's name and title of the page were not consistent.	Title has to be changed from PHP Script to PHP Scripting.	Must Fix
	PHP Scripting page - Typo(Scriptiong)	Fix the typo from Scriptiong to Scripting	Must Fix
	Creating a Quiz - Wrong file name: <i>phpquiz.html</i> has a problem on line 12: there is a space between first and name.	Correct the file name. Get rid of the space between first and name.	Must Fix
	Creating a Quiz - File names are confusing ( <i>phpquiz.html</i> and <i>phpquiz.phtml</i> )	Users were confused by the similar names of files: <i>phpquiz.html</i> and <i>phpquiz.phtml</i> . Give a different file name to the phtml file. For example: <i>actionquiz.phtml</i>	Should Fix
	User's were confused with the different names used in the example and the screenshot	There were different names used in the example and the screenshot. Make them the same.	Must Fix
	Pg 411 Users did not understand the meaning of "\$name variable	In page 411 \$name variable is not clear	Must Fix

	In the design, users noticed that in pg 412 the example the "ul" tags should not be in blue but the incrementing statements should be in blue	Pg 412, In the example the code ul tags should not be in blue. However, the incrementing statements should be in blue	Must Fix
Troubleshooting	Users did not review this section	Users did not review this section	None
Assessment			
Resources	Users did not review this section	Users did not review this section	None

Based on our findings, we suggested the following recommendations in the design (See table 13).

Table 13: Recommendations for how to fix the design.

Priority	Apparent Problem with the Design	Recommendations for how to fix design
Must Fix for ALL	The design worked well in areas where there were screen shots for the user to see and do, but not when the user had to read a lot of textual explanation.	Visuals, diagrams, were easier to understand. For web based instruction text must be clear and concise.
Must Fix	For the sake of clarity, restate the instruction for learners to complete the practice section. Use another term instead of "Do" for learners to start the practice	Instead of using the term "Do", perhaps the instruction should state, <i>please perform the task below</i> . It should be just text and not a graphic
Must Fix	Spell out all abbreviation.	Spell out all abbreviation.
Must Fix	Pg 325 should be deleted	Pg 325 should be deleted
Must Fix	Pg 317, Do not include additional information in "Note" this confused the user	Pg 317, Do not include additional information in "Note" this confused the user
Must Fix	Terms such as <i>interpreter line</i> and the code should be stated together. More definitions should be provided.	Terms should be made explicit, and referenced in the glossary.
Must Fix	The design should include instruction on how to copy and paste into Pico	The design should include instruction on how to copy and paste into Pico
Must Fix	Pg 316 The design did not make explicit why users needed to paste the text into the "phptest.phtml file. They should see the code first, then copy and paste it into the Pico editor	Pg 316 The design should make explicit why users needed to paste the text into the "phptest.phtml file. They should see the code first, then copy and paste it into the Pico editor
Must Fix	There should be instruction on how to go back to their pico file.	Instruction should be provided on how to go back to their pico file.
Must Fix	Homesite crashed on campus during the usability test. This may be a UITS installation problem.	Homesite crashing on campus may be a UITS installation problem. Dr Frick has e-mailed UITS to inform them of the problem. It is hoped this problem will be resolved before this program is taught in a residential environment. At the moment, we will not explain the work around. <b>(This seems to be a UITS installation problem).</b>
Must Fix	Create a box around the area "browse" on the screenshot in Pg 333.	Created a box around the area "browse" on the screenshot in Pg 333.

Must Fix	Pg 331 The homesite anchor should include a back link.	Created <i>Using UITS computers</i> on a separate page
Must Fix	Pg 331 As a user, the design should make the <i>Using UITS computers</i> for Homesite, on a separate page	Pg 331 Created <i>Using UITS computers</i> on a separate page
Must Fix	PHP Scripting page - Navigation button's name and title of page were not consistent.	Title had to be changed from PHP Script to PHP Scripting.
Must Fix	PHP Scripting page - Typo(Scriptiong)	Fixed the typo from Scriptiong to Scripting
Must Fix	Creating a Quiz - code phpquiz.html has a problem on line 12: there is space between first and name	It is not working when they try to do phpquiz.phtml. So have to get rid of space between first and name
Must Fix	After each example provide a reminder to change file permissions. This was missing.	Added information for changing file permissions.
	For the examples user names were not consistent with textual explanation in the Screenshots	Changed the names and screenshots
	In pg 411 \$name variable was not clear	Gave an explanation of \$name variable
	Pg 412, In the example the code ul tags was not be in blue. However, the incrementing statements should be in blue	Changed the file names
Must Fix	Based on the design, the repetitive table of Contents were confusing in PHP at IU section	Remove the repetitive Table of contents, only have the exhaustive contents in the PHP at IU page and the Sitemap
Should Fix	<i>Creating a Quiz</i> - File names was confusing (phpquiz.html and phpquiz.phtml)	Gave different file names to the two phtml files For example: actionquiz.phtml
Nice to Fix	There was a problem about direction buttons (next and previous). It a long distance between next button and previous button in IU computer	Direction buttons(next and previous) were placed close together for ease of use
Nice to fix	Restate the names of the screenshots	Refer to screenshots as images

### Conclusion

In terms of using Merrill's 5 Star ID rating, overall we were able to apply the first four criteria. Based on the limited usability testing, we found that we needed to rework the examples to make them more clear and concise, and provide more explanations of terms and concepts to reduce learner's anxiety of learning new materials. However, we were not able to assess if learners were able to integrate the new skills into their lives. This will be based on more authentic usability testing where users are able to spend more time on the materials and complete all the tasks and the assessment, and then apply their knowledge into their own instructional products. Also we think that after fixing the problems which we found during the online prototype usability the learning will be more effective. We made changes to [our Web site](#) according to these findings.

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