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**PEERRS**  
**VOCABULARY ANALYSIS**

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## Executive Summary

In 2003, the University of Michigan implemented the online Program for Education and Evaluation in Responsible Research and Scholarship (PEERRS) system. For our SI 622: Evaluation of Systems and Services course, four graduate students conducted a thorough analysis of the PEERRS site. This report is an analysis of the vocabulary used to label both items and actions in this system to evaluate if it matches users' expectations.

The analysis was performed with the following goals:

1. Evaluate if the site's metaphors are appropriate
2. Evaluate if the site's language is natural and consistent for users
3. Evaluate the content for reading level and complexity

Three methods were employed to analyze the vocabulary used in this site: metaphor analysis, object/action analysis, and readability.

The following issues were identified as successful features of the PEERRS site. The rankings are based on the following scale of 0-3, with zero representing a success requiring no change while three represents issues requiring attention.

#	Issue	Rating	Ease of Resolution
1	"faq" as a Frequently Asked Question feature	0	Not required
2	The profile metaphor translates well into the "My Profile" feature	0	Not required
3	Test feature matches user expectations	0	Not required
4	Modules contain 0% passive sentences	0	Not required
5	faq classified as "plain English" with good Flesch Readability score	0	Not required
6	Exit function is consistent among all objects	0	Not required

In addition to the above successes, our analysis revealed a number of issues that require resolution.

#	Issue	Rating	Ease of Resolution
1	Significant variance in reading levels within the modules as rated on Flesch Reading Ease and Flesch-Kincaid Grade Level	3	Difficult
2	faq is not a good Help metaphor	3	Difficult
3	Module in not a good metaphor	2	Moderate
4	Forward and Back action not consistent between objects	1	Moderate

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## Introduction

Researchers at the University of Michigan are often required to complete online training modules about different aspects of conducting responsible research. The University of Michigan feels that this information is extremely important to the conduct of research, and therefore will withhold grant money from primary investigators who fail to complete the training. Because this training is required, it is imperative that the users of the system can successfully complete the tasks needed to receive certification.

This report examined the vocabulary used on the PEERRS website. The successful and unsuccessful use of vocabulary is presented in the findings section. Following each finding, the researchers provide recommendations on improvements to the system.

## PEERRS Description

The Program for Education and Evaluation in Responsible Research and Scholarship (PEERRS) online system was created to provide efficient delivery of information, training, and certification testing to the University of Michigan research community. It is specifically designed to inform, train, and test researchers in a variety of areas relating to responsible research practices.

The University of Michigan requires that all Principal Investigators (PIs) and Co-Principal Investigators (Co-PIs) in research projects with start dates of June 1, 2005 and later, be certified through the online PEERRS system. Individual schools and departments may have additional requirements. Furthermore, supplementary faculty, staff, and students *may be required* to complete PEERRS training and certification *as determined* by project PIs on an individual basis. UM PEERRS certification is valid for three (3) years and only for University of Michigan requirements. Research projects spanning additional universities may require researchers to be certified at those institutions, in addition to UM PEERRS certification completion. The PEERRS system begins sending automatic email notification of impending certification expiration beginning thirty (30) days prior to that date.

## Project Overview

The project for this course spans the entire semester. Throughout the course, we continually examined four main components of the PEERRS site. They include

- Registration
- Modules
- faq
- Test

Because the function of this site is to deliver content and testing on the content, we determined a vocabulary analysis was more appropriate than a visual analysis. The site was examined for consistency, completeness. A vocabulary analysis addresses the following questions:

- Do the words used to label functions work?
- Are the words used to label functions appropriate to the tasks users are trying to complete?
- Are these terms used consistently for similar actions used throughout the site?
- Do the metaphors used on the site match their real world counterparts?

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## Objectives

A website is easier to navigate when it has clear labels, consistent metaphors, and an appropriate and consistent reading level. With this definition, the PEERRS site was examined. The vocabulary used was analyzed to determine if it aided or hindered the user's understanding of the system. The following issues are considered throughout the analysis:

1. Evaluate if the site's metaphors are appropriate
2. Evaluate if the site's language is natural and consistent for users
3. Evaluate the content for reading level and complexity

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## Methodology and Analysis

In order to effectively examine the vocabulary of the PEERRS site, three methods were used. These techniques are metaphor analysis, object/action analysis, and readability analysis. Metaphor analysis is determining whether items, objects, and concepts used on PEERRS site accurately reflects their real-world counterparts. Object/action analysis determines whether both objects and actions are in the user's language, natural and consistent. Reading level analysis is used to verify if the content is accessible to the user.

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## Metaphor Analysis

### Profile

A profile is a standard form to capture user's personal information. PEERRS requires first time users to fill out a personal profile reflecting their role in research. This profile later determines which modules will be made available, and in some instances required, to the user.<sup>1</sup> Profiles are used in other settings to share pertinent personal information with other users or administrators. Overall the PEERRS Profile very closely matches the idea of a profile in other situations; a form to provide user's research information.

Real World Item – Create Profile	Transfer Patterns	Target Systems – PEERRS Profile System
<i>General</i>		
List of personal information about a user provided by the user	Positive	List of personal information about a user provided by the user
<i>Specific</i>		
Provides specific personal information	Positive	Provides specific personal information
Provides demographic information about a user to the administrators	Positive	Provides demographic information about a user to the administrators

### Modules

The concept of a module in PEERRS has strong transfer patterns mainly for the developers and maintainers of the site. Participants are not aware that the modules they see are different than modules other users might see.

A module is a self-contained component of a system, which has a well-defined interface to the other components; something is modular if it includes or uses modules which can be interchanged as units without disassembly of the module. (Wikipedia, 2006)

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<sup>1</sup> The profile metaphor is a positive transfer because the profile is consistent with what a profile is. In other reports, this team discovered the profile is not successful because the users are not aware of the significance their profile selections have on their assigned modules.

Real World Item – Modules	Transfer Patterns	Target Systems – PEERRS Modules
<b>General</b>		
Modules are self-contained, interchangeable components of system.	Negative	This metaphor does not transfer because users are not aware other modules may exist because the modules they are presented are dependent upon their profile.
<b>Specific</b>		
Self-Contained component that can be interchanged as a unit	Negative	Users understand the learning modules and test as one unit (a test applies only to one module). The term module implies they are independent sections.
Easy to add and remove from a system	Negative	Modules can only be added removed by making changes to a personal profile. Not feedback is provided for how changes will affect available modules

**faq**

The Frequently Asked Questions portion of PEERRS provides answers to common questions users might have.

Real World Item – FAQ list	Transfer Patterns	Target Systems – PEERRS FAQ System
<b>General</b>		
Frequently Asked Questions lists exist to provide a user with commonly asked questions and answers to those questions	Positive	Frequently Asked Questions lists exist to provide a user with commonly asked questions and answers to those questions
<b>Specific</b>		
Lists common questions	Positive	Lists common questions
Lists to answers to questions	Positive	Lists to answers to questions

As a list of frequently asked questions the PEERRS FAQ section strongly transfers from the users’ experience with other lists of frequently asked questions. Because of this we rated the FAQ section positive in the metaphor analysis. It is important to note, however, that in other contexts (e.g. a heuristic evaluation) the FAQ has been rated as highly problematic as described later.

Within the PEERRS site the FAQ acts as a de facto help system because there is no other help system available. In previous tests, users were unable to find help for their problems. A suggestion for improving this problem involved renaming the “FAQ” section as “Help”. Adopting this change will weaken the connection between the real world item (FAQ) and the item in PEERRS, but will better match the users’ need for “help.”

A possible solution to solve both of these issues is to add a fully distinct help section to the site.

**Test**

The test parts of the PEERRS system is used to test a user’s knowledge of an aspect of subject-based research. The PEERRS test section closely matches users’ experiences with tests in other situations

Real World Item – Test	Transfer Patterns	Target Systems – PEERRS Tests
<b>General</b>		
Questions designed to evaluate a person’s skill or knowledge of a subject.	Positive	PEERRS tests evaluate a user’s knowledge
<b>Specific</b>		
Tests specific knowledge by asking questions pertaining to understanding.	Positive	Tests specific knowledge by asking questions pertaining to understanding
Answers can be edited until the test is turned in.	Positive	Answers can be edited until the test is turned in
Answers cannot be changed on the test is handed in.	Positive	
A certain percentage of questions must be answered correctly for a user to received credit.	Positive	A certain percentage of questions must be answered correctly for a user to received credit
Serves to provide feedback about a user’s knowledge of a topic.	Positive	Serves to provide feedback about a user’s knowledge of a topic
Easy to see number of questions and determine progress to completion.	Positive	Easy to see number of questions and determine progress to completion.



## Object/Action Analysis

Object/Action analysis is used to evaluate the vocabulary of a site for consistency, grammar, and ontology (Olson, 2006). The objects and actions are presented in a table; The user’s vocabulary is represented in objects and actions while the system vocabulary is represented in the table’s contents. Through this analysis we can evaluate for consistency between user and system vocabulary.

Object	Action												
	Start	Open/Close	Browse	Search	Forward/Back	Skip	Take Test	Submit for Grading	Notification that it's Complete	Verify	Modify	Return	Exit
<b>Profile</b>	Click on <b>My Profile</b>	Open: click <b>My Profile</b> ; Close: click browser <b>Close</b> button or <b>File, Exit</b>	N/A	CTRL-F	Forward only, click <b>Continue</b>	N/A	N/A	N/A	Click “This is correct, proceed.”	Read, make a decision, click <b>Proceed</b> or <b>Modify</b>	Click <b>Modify</b> next to each section	Click on <b>My Profile</b>	Click browser <b>Close</b> button or <b>File, Exit</b>
<b>Module</b>	Click on <b>Start Module</b>	Open: click on <b>Start Module</b> ; Close: click <b>Exit Module</b> , click browser <b>Close</b> button or <b>File, Exit</b>	Drag scroll box in scroll bar, click on scroll bar	CTRL-F	Click <b>Previous</b> or <b>Next</b> link in page; click <b>Forward</b> or <b>Back</b> button in browser	Don’t open it	N/A	N/A	Read to the end of the <b>Conclusion</b>	N/A	N/A	Click <b>Return to Module</b> in “My Page” page	Click <b>Exit Module</b> , click browser <b>Close</b> button or <b>File, Exit</b>
<b>faq</b>	Open: Click “faq” tab	Open: Click “faq” tab; Close: click <b>Close</b> button for the window	Drag scroll box in scroll bar, click on scroll bar	CTRL-F	Drag scroll box in scroll bar, click on scroll bar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Click <b>Close</b> button for the window
<b>Test</b>	Click <b>Take Test</b> in “My Page” page, in module “Conclusion” page	Click <b>Take Test</b> in “My Page” page, in module “Conclusion” page	N/A	CTRL-F	Forward: click <b>Next</b> ; Back: click <b>Previous</b>	N/A	Click <b>Take Test</b> in “My Page” page, in module “Conclusion” page	Click <b>Submit</b> within test on last page	Click <b>Submit</b>	N/A	Click <b>Previous</b> , change answer, click <b>Next</b>	N/A	Click <b>Exit Test</b> , or click <b>Close</b> button for the window

There is little overlap in the actions for many of the objects. The actionable objects found in the PEERRS system represent unique functions of the site. Further, since large portions of PEERRS consists of static information that a user is not meant to modify many of the objects can receive only limited actions (close, search, etc)

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## Readability Analysis

Readability, or how easy text is to read, can be measured in several ways, including the Flesch Reading Ease score and the Flesch-Kincaid Grade Level. Both of these methods use the number of words per sentence and the number of syllables per word to evaluate how easy or difficult it is for a user to read a particular text. The index page, faq, and module pages of PEERRS were evaluated for readability. The following table summarizes the readability findings.

The Flesch Reading Ease measures the textual difficulty, or how easy the text is to read. The higher the Flesch score, the easier the text is to understand. The test developed by Rudolph Flesch, uses the average sentence length and average syllables per word to calculate the reading ease score. “As a rule of thumb, scores of 90-100 are considered easily understandable by an average 5th grader. 8th and 9th grade students could easily understand passages with a score of 60-70, and passage with results of 0-30 are best understood by college graduates.” (Wikipedia) Although the majority of PEERRS users may have post-graduate educations, certain populations of users may have only a few years of college education or less. This refers specifically to undergraduate students and staff members who may be required to complete the PEERRS certification process. The following table shows the translation between the reading score and readability.

Page(s)	Word Count	# Sentences	Words per Sentence	Passive Sentence %	Flesch Reading Ease (lower number is harder)	Flesch-Kincaid Reading Level (U.S. grade level equivalent)
Index Page	113	4	24	50	43.2	13.1
faq	3772	191	17.5	17	56.8	9.6
Sample Module: Foundations of Good Research Practice (Average of Pages) <sup>2</sup>	225	9.15	20.43	0	34.36	13.45

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<sup>2</sup> The reading levels for all of the modules are presented in Appendix B.

Flesch Reading Ease Scale	
Score	Readability
100	Very easy to read. Average sentence length is 12 words or fewer. No words of more than two syllables.
65	Plain English. Average sentence length is 15 to 20 words. Average word has two syllables
0	Extremely difficult to read. Average sentence length is 37 words. Average word has more than two syllables.

The Flesch-Kincaid Grade Level translates the Flesch Kincaid Readability score into a scale that corresponds to a U.S. grade level, making it easier for people to judge the readability of text. A score of 8 would indicate that the text was understandable by an average student in 8<sup>th</sup> grade.

Overall, the goal of the PEERRS site is to deliver content to users in order for them to have the knowledge to pass the certification tests. It is not surprising each module has a high word count in an effort to provide accurate and reliable information. Although the sentence structures are long, no passive sentences are used in the modules. These findings are further explored in the following Ratings and Resolutions section.

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## Ratings and Resolutions

In order to prioritize our findings and offer resolutions, a severity scale needed to be established. Using the scale created by a previous SI 622 team,<sup>3</sup> we based our severity rankings on the following four-point scale:

Severity Rating	Description	Explanation
3	Unusable	A severe vocabulary problem that is negatively impacting usability.
2	Severe	A vocabulary problem that is distracting but not interfering with the user experience.
1	Moderate	A vocabulary term that is understandable with a minimal amount of effort.
0	No Problem	A vocabulary term that is easy to understand and enhances the user experience.

In order to prioritize the issues to be resolved, the following ease of resolution scale was created:

<sup>3</sup> The team consisted of Noor Ali-Hasan, Amy Anderson, David Choi, Rasika Ramesh, SI 622, March 2005

Ease of Resolution	Description
Easy	Requires little labor or technical effort
Moderate	Labor intensive, though not necessarily difficult from a technical perspective
Difficult	Requires rearchitecting major portions of the existing site

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## Findings and Recommendations

Our findings are comprised of successes and areas for improvement. Below we describe each issue, its success rating or need for improvement, and the difficulty, if it exists, to make the suggested changes.

### Areas of Success

There are several areas in which the PEERRS site vocabulary matches the user's expectation of the term. The metaphors for *faq*, *profile*, and *test* are all successful. In addition, the modules do not use any passive sentences which increase readability.

#	Issue	Rating	Ease of Resolution
1	"faq" as a Frequently Asked Question feature	0	Not required
2	The profile metaphor translates well into the "My Profile" feature	0	Not required
3	Test feature matches user expectations	0	Not required
4	Modules contain 0% passive sentences	0	Not required
5	faq classified as "plain English" with good Flesch Readability score	0	Not required
6	Exit function is consistent among all objects	0	Not required

### faq as FAQ metaphor

This feature matches the user's expectation of what a Frequently Asked Questions feature should be. As a result, it receives a success rating of zero.

### Profile as profile metaphor

This feature matches the user's expectation of what a profile should be. As a result, it receives a success rating of zero, where zero equals no problem.

**Test as a test metaphor**

This feature matches the user’s expectation of what a test should be. As a result, it receives a success rating of zero, where zero equals no problem.

**Modules contain 0% passive sentences**

This aspect of the module content makes reading comprehension less difficult overall. As a result, it receives a success rating of zero, where zero equals no problem.

**Exit function is consistent amongst all objects**

This feature is consistent across all objects in PEERRS. As a result, it receives a success rating of zero, where zero equals no problem.

**faq classified as “plain English” with good Flesch Readability score**

The Flesch Reading Level of the “faq” page is 56.8, which is very close to “Plain English.” This means that a reader will have very little difficulty reading and understanding the information contained on the page. As a result, it receives a success rating of one.

**Suggestions for Improvement**

#	Issue	Severity Rating	Ease of Resolution
1	Significant variance in reading levels in the tutorial as rated on Flesch Reading Ease and Flesch-Kincaid Grade Level	3	Difficult
2	faq is not a good Help metaphor	3	Difficult
3	Module is not a good metaphor	2	Moderate
4	Forward and Back action not consistent between objects	1	Moderate

**Significant variance in reading levels as rated on Flesch Reading Ease and Flesch-Kincaid Grade Level**

The average Flesch Reading Ease score of the pages in the module “Foundations of Good Research Practice” was 34.36, which translates into an average level that is somewhat difficult to read. However, there was significant variance in the reading levels of the pages. There are some pages that are very readable, while others are very difficult to read. This range represents a large degree of inconsistency for the user.

The average Flesch-Kincaid Reading Level of the module pages is 13.45, which indicates a college sophomore is able to understand the content. However, the grade level within the module sections is inconsistent inconsistent. For example, in the Foundations of Good Research Practice module, the reading level ranges with a minimum grade level of

7.3 to a maximum grade level of 17.6 indicating that for a particular page, a reader would need the equivalent of a 2<sup>nd</sup> year graduate level education. Previous surveys of PEERRS users indicate that not all users of this system have attained this level of education, including undergraduate students and staff.

The PEERRS modules are designed to teach researchers about topics that are important to the research they do. PEERRS could likely do a better job of conveying the information contained in the modules if the reading levels were closer to plain English and at lower grade levels, requiring the user to spend less time cognitively processing the text.

This issue was assigned such a severe rating because it directly impacts users' ability to easily comprehend the material. The PEERRS user population is diverse and it should not be assumed that all users are able to comprehend English at a second-year graduate school level.

The site should be analyzed for reading comprehension levels by reading comprehension specialists to ensure that it is not creating a barrier to learning through reading-level difficulty.

### **faq as Help metaphor**

Because the PEERRS site is treating the faq section as a Help feature, the metaphor fails here. Users consistently failed to recognize faq as a help resource. There is no help resource in PEERRS. This results in the high severity ranking given. Rather than rename the faq tab, which would result in a breakdown of the metaphor at that level, it would be preferable to add a dedicated help section to the system thereby eliminating the current confusion experienced by users.

Traditionally, frequently asked question sections are not used to. In addition, PEERRS does not contain a search function. This is a significant failing of this system. If a user is answering the same question wrong in the quiz over and over, it would be useful to the user to enter in a key phrase into a help section or a search box to get help answering the question.

This issue was assigned a severe rating of three because of the cognitive burden it places on the user. As noted in the previous Usability Study, 3 out of 5 subjects were not able to locate help because they did not recognize "faq" as the term for "help."

### **Module as metaphor**

The term module reflects the developer's understanding of the system, rather than the users' understanding of the system. Specifically, users are unaware that the "modules" are in fact modular: different profiles result in different module requirements.

Different terminology would reflect users understanding of the system. For example, replacing the current module metaphor with a more universal metaphor like "chapters" or "topics" will allow faster understanding of how PEERRS content is presented. For this reason, it is assigned a rating of two.

The resolution of this issue is rated moderate. It will require diligence to find and rename the label of “module” in all of the PEERRS documents, but it is not necessarily technically challenging.

### **Forward and Back action not consistent between objects**

Although, the majority of the PEERRS site is consistent with the forward and back actions, it is inconsistent in faq and “My Profile” as revealed by the Object/Action analysis table. Notably, there is no back function in either. In the faq window, there is only a scrollbar for navigation. This is assigned a severity rating of one. This slows users’ navigation down, but does not prevent them from navigating the site.

Although this received a low severity ranking, it does receive a moderate resolution raking. This is due to the amount of work it would require to make this change

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## **Summary**

Through the use of metaphor analysis, object/action analysis, and readability analysis, the vocabulary of the PEERRS site was examined. It was found that several features were successfully implemented, while others presented obstacles of varying degrees. For these obstacles, they were prioritized for severity and level of difficulty to resolve the issue.

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## **Appendix**



<b>Reading Level Analysis per Module</b>				
<b><i>Module Name:</i></b>	Flesch-Kincaide Reading Ease Score	Flesch-Kincaide Reading Level Score	Range in Reading Level within the module	Severity
Foundations of Good Research Practice	36.1	11.2	6.5 – 16	Not Available
Research Administration	39.7	11.3	6.48 – 14.2	Not Available
Conflict of Interest	29.6	11.8	9.8 – 16.98	Not Available
Human Subjects - Biomedical Sciences	32.4	11.8	10.2 – 14.66	Not Available
Human Subjects - Behavioral Science	27.5	11.9	11.1 – 16.8	Not Available
Human Subjects - Health Sciences	28.1	12.0	11.7 – 17.0	Not Available
Animal Subjects	28.7	18.0	11.3 – 18.0	Not Available
Authorship, Publication and Peer Review	16.4	18.0	9.9 – 16.48	Not Available

**The Flesch-Kincaid Reading Ease scale:**

- 90-100 Easy to read for 5<sup>th</sup> grade
- 60-70 Easy to read for 8<sup>th</sup>-9<sup>th</sup> grade
- 0-30 Easy to ready for College graduates

Although overall reading levels of the PEERRS modules are within a consistent Flesch-Kincaid Reading Level Score range ( a range of 28 to 39), internal module sections range greatly. We recommend that the effect of this variance is studied further by a Reading Analysis expert and for this reason do not assign a severity ranking.

In addition, the following charts demonstrate the variation in the Flesch-Kincaide Reading Ease Score within each module.





