The Practical Guidelines for Designing User Interface in Virtual Learning Environment

Mohammad Shojafar¹, Siamak Barzegar¹, Faraein Aeini¹, Hassan Rashidi², Aidin Haqparst¹
¹Computer Dept.QIAU(Qazvin Islamic Azad University), Qazvin, Iran
²Statistics, Mathematics and Computer Science Dept. Allameh Tabataba’i University, Tehran, Iran

Abstract - Designing User Interface (UI) has an important role in user satisfaction. Students working in Virtual Learning Environment (VLE), experience great difficulties and encounter consumes most of their time attempting to learn an incomplete system design by inexperienced UI designers. The VLE system may contain analytical function and features with poor UI facility, Hence the effective use of the system is hampered causing interaction frustration. These are due to the lack of familiarity of the designing with the basic principles of UI designs in VLE environment. Because of that, identification and categorization of these principles play an important role in promoting VLE system with UI domain. In this paper, identifying and categorizing UI design principles in VLE are investigated and comparison is made between various commonly used virtual learning systems on the web. The outcome of the conducted comparison studies provides a suitable guideline for designers of such systems.

Keywords: User Interface, Virtual Learning Environment, E-Learning, Human Cognition.

1 Introduction

Nowadays Design of User interface is important. UI must adopt user’s mentions. User satisfaction is the main purpose of UI design. This is why design principles are so important. Computer users should have successful experiences that allow them to build confidence in themselves and establish self-assurance about how they work with computers. Their interactions with computer software should be “success begets success.” Each positive experience with a software program allows users to explore outside their area of familiarity and encourages them to expand their knowledge of the interface.

Well-designed software interfaces, like good educators and instructional materials, should build a “Teacher-Student” relationship that guides users to learn and enjoy what they are doing. Good interfaces can even challenge users to explore beyond their normal boundaries and stretch their understanding of the user interface and the computer. When you see this happen, it is a beautiful experience. UI Designer Should understand and aware of the user’s mental model and the physical, physiological, and psychological abilities of users.

Designing the user interfaces for Virtual learning Environment must be in a way that users do not sense the lack of physical Attending of the Teacher. Designing an appropriate use interface will make it possible for virtual learning to be just the same as learning with other users in a class and with the presence of a Teacher and the expected efficiency will be just as same as what is expected in a real educational class. In order to make it possible for the users to achieve a more complete understanding of the designed system, For VLE Design, Designer should consider the physical conditions of the environment and spiritual conditions and the user’s capabilities.

In the second section of this paper, we study the general aspect of virtual learning and representing them in different websites. The purpose of virtual learning is creating a virtual environment which is completely based on a real educational environment for interactive learning and education. In fact, virtual environments provide a way to combine the best specifications achieved from the obtained information from the real environment in different places by real conditions and best specification for controlling environments, quicker searches, organizing and fast access to the resources. By using the help of virtual environment we would be able to use the data in one single and common direction and also to overshadow all the objects and opinions in the real world. We can spend more time on making and recognizing the objects and also less time on determining their functions which is discussed in the following sections. In the following sections a series of fundamental principles and regulations will be represented for a good user interface in virtual environment and virtual learning. These regulations are generally surveyed in different systems and are represented in detail in the third section of this paper and it will give the readers this instinct to benefit from more applicable and required principles in designing their appropriate system. In the fourth section we will compare few famous websites which represent virtual learning services to the users and in the fifth section a general conclusion is given.

2 Virtual Learning

Today, by expansion of new communication and information technologies, business methods and daily activities, relations, accessing the information and generally all parts of the human life have experienced a great evolution and learning and gaining knowledge is also not an exception. Although, human being has applied technology and its related tools in the service of education and its comprehensiveness from the past, but, education and comprehensiveness may
have been never conformed to great evolutions related to appliance of new communication and information technologies such as internet, compact disks and multimedia systems [1,2]. These technologies are mostly aimed to improve the quality of educational services and increasing the number of viewers, so that, they have made Teachers and educational institutes (and even companies and business centers) able to transfer the information and contents to students, customers or generally viewers, economically and in the least possible time [3].

Virtual learning is represented and performed in two independent environments which are complementary [4].

- **Learning Management System** is a system in which the teacher is the main actor of it. He can do all actions the same in real teaching class such as providing contents, designing tests, observing and responding different discussion, etc.

- **Virtual Environment** that students are the main actors of it. They do their actions in this environment. Some of these actions are listening lessons, asking questions and presenting the parts the lesson that they should do.

User interface in VLE shall be designed in a way that students and Teachers do not sense the virtualization of the environment and it should be really close to the real world. Nowadays, this realization can be done in different ways such as using three-dimensional glasses in a way that the presence of all the students in the class would be visualized, Dolby sound, and three-dimensional in a way that the movement of the Teacher can be sensed [5].

### 3 Fundamental Practical Guidelines and Regulations in UI Design

Good software will be viewed with an appropriate user interface. For designing an appropriate user interface we should consider a series of tested patterns, regulations and methods.

Here, we will represent some fundamental principles which have been studied and classified by skilled and professional software designers. Benefiting from these Practical principles is a selective matter for designers according to their requirements which depend on the specifications of the designing software. So, we will represent three Practical Rules in designing software [6, 7, and 8].

#### 3.1 First Rule: Place User as a Controller

The first set of Practical principles addresses placing users in control of the interface. In fact, the user who uses the software will control it and he controls the operation of the software considering its own requirements from the software. Users control designing principles and determine the conditions and limitations of the software considering their own requirements.

According to the represented descriptions, the principles extracted from the first rule can be considered as follows:

- **Use modes judiciously**

In designing the user interface, we should act in a way that we use recognized special modes and shapes in special places positions. For example, the user interface which is used for playing music or audios instead of writing the word PLAY uses a recognized shape such as ►. This will make easier readability for the users and will decrease the period of time required for thinking on the process of the operation. The reason is that; this shape has been used repetitively in software and tools as a symbol for PLAY and it has been to stamp on the User’s memory.

- **Display Descriptive Messages and Text**

Some of the users are interested to only use mouse for moving and working with the user interface and some of the other users are interested in both working with the keyboard and mouse. For giving more control to the users it is sufficient to make the possibility of special use of mouse and keyboard in the designed user interface to make it possible for the user to switch between these two types of accesses (Mouse and Keyboard). Thus, this possibility will make use it easier.

- **Provide Immediate and Reversible Actions, and Feedback**

Software should provide undo actions for users, and hopefully, also redo actions. Inform users if an action cannot be undone and allow them to choose alternative actions, if possible. Provide users with some indication that an action has been performed, either by showing them the results of the action, or acknowledging that the action has taken place successfully.

The lack of feedback in most software products forces users to double-check to see if their actions have been performed. In a command-line interface, whenever someone deletes a file using DEL, he/she usually uses the DIR command immediately afterward to list the directory to ensure the file was actually deleted. There is no feedback after he/she types the DEL command! This forces users to perform superstitious behaviors to comfort them since there is little or no feedback from the system interface.

- **Make the User Interface Transparent**

The user interface is the mystical, mythical part of a software product. If done well, users don’t even feel that it is there. If done poorly, users can’t get past it to effectively use the product. A goal of the interface is to help users feel like they are reaching right through the computer and directly manipulating the objects they are working with. Now, that’s a transparent interface!
The secret of a transparent interface is synchronizing up with the user's mental model. Users should be free to focus on the work they are trying to perform, rather than translating their tasks into the functions that the software program provides.

- Allow Users to Customize the Interface (making preferences)

Allow users to customize information presentation (colors, fonts, location, arrangement, view types), interface behavior (default actions, macros, buttons), and interaction techniques (keystrokes, shortcut keys, mnemonics, mouse button mappings). The rich visual and sensory environment of graphical and multimedia user interfaces requires users to be able to customize the interface. Users feel more comfortable and in control of the interface if they can personalize it with their favorite colors, patterns, fonts, and background graphics for their desktop.

According to our discussions an example of the site which has these specifications is represented in Figure 1. This site is OXFORD. By inspecting and observing this site more carefully we will discover that by entering this site the user will feel that he has this ability to specify the site according to his interests and this is exactly the first rule in designing the user interface.

3.2 Second Rule: Reduce User’s Memory Cognition Load

The ability of the users in recognizing the operation of the user interface is variant in different people with different decisions and cognition levels. In the user interface Design, we attempt to make the user think less for recognizing the user interface and working with it. Based on what we know about how people store and remember information, the power of the computer interface should help users from having to remember information while using the computer. We aren’t good at remembering things, so programs should be designed with this in mind. For this purpose some significant and effective principles have been studied in the following parts for decreasing the user’s cognition load. This rule includes a series of principles which are:

- Relieve Short-Term Memory

Short-Term Memory helps keep information available so you can retrieve it in a very short period of time. Users usually do many things at once, so computer interfaces shouldn't force them to try to keep information in their own short-term memory while they are switching tasks. Program elements such as undo and redo, and clipboard actions like cut, copy, and paste, allow users to manipulate pieces of information needed in multiples places and within a particular task. Even better, programs should automatically save and transfer data when needed at different times and in different places during user tasks.

- Rely on Recognition, Not Recall

User interfaces support long-term memory retrieval by providing users with items for them to recognize rather than having to recall information. It is easier to browse a list to select an item rather than trying to remember the correct item to type into a blank entry field.

So, Online aids such as messages, tooltips, and context-sensitive help are interface elements that support users in recognizing information, rather than trying to remember information they may or may not know or have learned.

- Provide Visual Cues

A necessary aspect of any graphical user interface (and of course, an object-oriented user interface) is that users must know where they are, what they are doing, and what they can do next.

Whenever users are in a mode, or are performing actions with the mouse, there should be some visual indication somewhere on the screen that they are in that mode. The mouse pointer may change to show the mode or the current action, or an indicator might toggle on or off. Test a product's visual cues—walk away from the computer in the middle of a task and come back sometime later. Look for cues in the interface that tell you what you are working with, where you are, and what you are doing.

- Provide User Interface Shortcut Key

In addition to defining both keyboard and mouse techniques for interface actions, determine ways to shorten the number of keystrokes or mouse actions users need to perform common actions. Shortcut key sequences reduce users’ memory load and quickly become automatic. There are two basic ways to provide keyboard shortcuts—mnemonics and accelerator keys. A mnemonic (also called an access key) is a single,
easy-to-remember alphanumeric character that moves the cursor to a choice and selects the choice. Mnemonics are used in menus (menu bars, pull-down menus, pop-up menus) and in lists to navigate and select an item in the list. Mnemonics speed up navigation and selection using menus and lists. To close the current window, users can key 'Alt' (an accelerator key to navigate to the menu bar), then 'F' (File pull-down), and 'C' (Close action). An accelerator (also called a shortcut key) is a key or combination of keys that users can press to perform an action. In the above example, Alt is a keyboard accelerator to move from within a window to the menu bar. Other common actions have standard accelerators, for example 'Ctrl+P' for Print.

- Using real simulation

Real simulation will enable the users to transfer the knowledge among different objects and works.

- Promote Visual Clarity

Apply visual design principles of human perception, such as grouping items on a menu or list, numbering items, and by using headings and prompt text. Think of information on the screen in the same way as information you would present in any other medium. The general principles of organization, continuity, gestalt, and so on should be followed. Most programs present too much information at one time on the screen. This results in visual clutter and users don’t know where on the screen to look for information. Information should be presented with some priority and order so users can understand how information is organized on the screen.

Thus, it is better to increase special facilities for the user by considering his profile and the type of his request. New interface technologies use wizards to help the users and increasing their facilities by representing them their required guidance.

According to the discussed issues an example of the sites with these specifications is represented in Figure 2. This site is IBM. Simple designing is clearly obvious in this site. The user who faces this site for the first time doesn’t spend a lot of time on thinking on menus and links. So, in fact this site has observed the second rule represented in designing the user interface.

3.3 Third Rule: Make the Interface Consistent and Stable

User interface consistency is a key aspect of usable interfaces. It’s also a major area of debate. However, just like all principles, consistency might be a lower priority than other factors, so don’t follow consistency principles and guidelines if they don’t make sense in your environment. One of the major benefits of consistency is that users can transfer their knowledge and learning to a new program if it is consistent with other programs they already use. One of the best advantages of compatibility is that users can transfer their knowledge and educations of a new program in case that they are compatible with the current software. This rule includes a series of principles which are:

- Sustain the Context of Users’ Tasks

Users should be provided points of reference as they navigate through a product interface. Window titles, navigation maps and trees, and other visual aids give users an immediate, dynamic view of where they are and where they’ve been. Users should also be able to complete tasks without having to change context or switch between input styles. If users start a task using the keyboard, they should be able to complete the task using the keyboard as the main interaction style. Context-specific aids such as help and tips on individual fields, menu items, and buttons, also help users maintain the flow of the tasks they are performing. They shouldn’t have to leave a window to find supplemental information needed to complete a task.

- Keep Interaction Results the Same

If by design, different results might happen than users expect, inform users before the action is performed. Give them a choice to perform the action, cancel the operation, or perhaps choose another action to perform. So, Consistency in interface behaviour is very important. If users experience different results from the same action, they tend to question
their own behaviour rather than the product’s behaviour. This leads to users developing superstitious behaviour, that is, they think they must do things in just exactly a certain way for the desired result to happen; otherwise they are not sure of the results.

- Provide Aesthetic Appeal and Integrity

A pretty interface can’t cover up for a lack of product functionality. Users question the integrity of a product if inconsistent colors, fonts, icons, and window layouts are present throughout the product. Just as a printed book has a predefined page layout, font, title, and color scheme, users should be able to quickly learn how product interfaces visually fit together. Again, utilize the skills of graphic designers on the design team effort.

4 Comparative Evaluation of Virtual Learning Systems for UI Design

Considering the discussed principles and rules in the previous section, here, three different virtual learning systems will be studied. These systems are Moodle, Claroline and ATutor which will be discussed in the following section [9].

- Moodle

Its official name is Modular Object-Oriented Dynamic Learning Environment (Moodle) which will be useful for the designers and programmers. This site is a Virtual Learning Environment which has been written by Martin Devaygsemnas, PhD student. The purpose of this site is to create an educational environment in the framework of social growth in web systems. This site has software which will enable the user to be virtually educated in different respects by downloading and installing it in his system. Installation process of this software is very simple. The required files will be transferred to the server via this software and it is possible to make some specified adjustments in its facilities and capabilities. Also the initiating files and appropriate structure for education will be transferred between the user and site. In fact, Moodle contains a software package which is used for representing and organizing the subjects in the original website. Moodle is open source software. This software can be used in any computer that supports PHP. It also supports different types of databases such as MySql.

Moodle specifications are as follows:

- Site layout can be specified completely by different users.
- The ability to adjust the number of students’ requests on special days.
- The ability to create a survey from the discussions of the Students.
- Primitive security specifications for limiting the customers’ access to special subjects.

- Moodle enables the Teachers to specify places and calculation scaling of the subjects even if this information is determined and symbolized by hand.
- Makes the students able to upload the educational files in the site and share them with other users.
- Existing of themes which enable the students and Teachers to specify the show type of the virtual environment without any need to new layouts.

A sample of the first page of this site is represented in Figure 3.

- Claroline

Claroline is a Virtual Learning site which has been prepared and edited in the University of France. This site contains software named Claroline which works in PHP environment and with MYSQL database. This is an educational tool that enables the Teachers to prepare and edit the related subjects in the web.

The specifications of this software are as follows:

- There are different ideas in this respect and educational subjects in the Virtual Environment will be divided into special sections and then they are placed in different parts of the site (informative sections, exercises, chats and sources).
- Classifying the specifications of the links both for the students and educational managers for managing URLs.
- The ability to chat for the students who use a simple system interface.
- This software let the students to upload their private pages in the system to be viewed repetitively by different people.
- A choice for the system to automatically process the registration and manual management.
- The subjects start with a few sources but there is no growth in the level of the complexity of the lessons.
- The ability to manage the subjects for assigning homework and specifying the maximum number of the subjects and their specifications.
The ability to upload video files for using in educational sources. A sample of the front page of this site is represented in Figure 4.

**ATutor**

ATutor is designed as *Open Source educational environment* in the University of Toronto in Canada and has been used in most of the universities around the world. This site contains software which makes it possible to move in the body of the user interface easily. ATutor specifications are as follows:

- Having a simple management interface
- Output specifications for the created subjects in the system environment (N.B system is the only system which has this specification which has been applied in this system).
- Using the HELP option in the body of the text which enables the subject’s managers to work easier and better with the subjects.
- Contains complete documentations and complementary regulations for guiding the users in movements and choosing subjects
- Video conferences in the site for online discussions and conferences between the users
- Contains tools for specifying subjects the users.

A sample of the front page of this site is represented in Figure 5.

In comparing these three sites considering the mentioned specifications from each of the virtual learning sites there are different advantages and defects which are as follows [10,11]:

- ATutor site is attempting to obtain standards which enable the users to have a better interaction with the software
- In ATutor and Moodle there is no need for additional information to access the contents and the duration of user cognition load will be declined considerably!
- ATutor is the only system which has the E-Mail system option which helps the users in choosing their lessons which is really pleasant for the users.
- Moodle works clearly on the interface section in its form entrance for creating the contents of the lessons. (The minimum human cognition load which is the same as the second law) and this will decline the data entrance time in this software’s form and the site.
- ATutor is more accepted by legal companies.
- ATutor software installation process in much easier in comparison with other software of the site.
- The beautifullness of the appearance of the Moodle and ATutor sites is better and much more readable in comparison with the Moodle site (the first rule).
- ATutor contains a complete and comprehensive editing window for determining the lessons, notes and additional information and this is much easier for the designers in entrance of the data and it also decease the need for coding.

Generally, comparison of the three sites is tested in Qazvin Azad University between 40 UI Designers (Web-Application) and 40 Teachers and Students that Review these sites in the University. We ask them to give Point (0-100) in each part of rules. Each Cell Shows average Points of all 80 People that gave points to each part of Rules.

This Experiment have been tested and registered on late September 2009 the period of this experiment is 3 month and
accrued in the summer of 2009. The results are represented in Table 1.

According to the above comparisons and the last Row of above Table, Atutor is much more accepted by the users in comparison with the other two educational environments and Claroline satisfied users less than the other two from the users’ point of view.

5 Conclusion

In this paper, the main principles and frameworks in designing the interface of a visual learning environment was described. Considering the results on comparisons between several famous systems, we can conclude that the issue of the user’s acceptance and easy working process of the software create a condition that the efficiency of the software and it’s selling rate will be increased.

Thus, those principles must be considered in designing the software in Virtual Learning System by taking into account the priorities and fundamental purposes of designing and representing the system to be a witness to the process of development, enthusiasm and expansion of the site in the internet world among the users with different interests.

6 References


<table>
<thead>
<tr>
<th>Rules/Sites</th>
<th>Rule group</th>
<th>Moodle</th>
<th>Claroline</th>
<th>Atutor</th>
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<td>Use modes Judiciously</td>
<td>First Rule</td>
<td>73.452</td>
<td>68.424</td>
<td>84.537</td>
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<td>Display Descriptive message and Text</td>
<td>First Rule</td>
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<td>Provide Immediate and Reversible Actions &amp; Feedback</td>
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<td>77.670</td>
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<td>Make the User Interface Transparent</td>
<td>First Rule</td>
<td>86.32</td>
<td>62.235</td>
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<tr>
<td>Allow Users to Customize the Interface</td>
<td>First Rule</td>
<td>69.240</td>
<td>42.432</td>
<td>89.231</td>
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<td>Relieve Short-Term Memory</td>
<td>Second Rule</td>
<td>83.765</td>
<td>59.325</td>
<td>93.520</td>
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<tr>
<td>Rely on Recognition, Not Recall</td>
<td>Second Rule</td>
<td>95.90</td>
<td>67.878</td>
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<td>Provide Visual Cues</td>
<td>Second Rule</td>
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<td>Using real simulation</td>
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Total Average 78.3892 60.4217 90.996