A FRAMEWORK OF EDUCATIONAL METAPHORICAL INTERFACE DESIGN FOR LEARNER HYPERMEDIA NAVIGATIONAL PERFORMANCE

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Abstract

Hypermedia environments constitute the basis of e-learning environments. These environments have non-linear, dynamic and flexible structure. These features of Hypermedia provide a wide range of flexible navigation opportunities. Hypermedia also provides the ability to reaching the many different educational multi-media materials. However, this flexibility that allows learner control of hypermedia can negatively affect learner's navigation performance in the educational hypermedia. Some of these negative effects are disorientation, cognitive overload, divided attention and waste of time. To cope with this problem several recommendations are presented in the literature. In these suggestions, it is claimed that metaphors and their structures can provide important solutions. Because the metaphors can make understandable and memorable the environment functions to user by helps of familiar facts, habits, tasks and concrete objects. The purpose of this study is to provide a framework for metaphorical interface designs. For this purpose, results of a series of researches for three years between 2009 and 2013 conducted by researchers were analysed. As a result of the series of researches a metaphorical interface design framework was developed named EMMI (Educational content analysis, Metaphors, Metaphoric interface components, Interface Design) Steps. In this study, the structure and functioning of the EMMI Steps were presented with the pedagogical and practical implications.

Keywords: Hypermedia, Web, interface design, educational interface, cognitive load, disorientation, metaphors, navigation performance.

1 INTRODUCTION

Hypermedia gain a network structure by help of created connection between nodes [1]. Therefore navigation between nodes in Hypermedia network known as primary way of accessing information in many Hypermedia system. And this provide a flexible and free environments for learner. Here the flexibility emphasize learning opportunities that are independent from time, space and media [2]. But these flexible and free structure bring about some important problems. Because these environments also require a metacognitive effort. Disorientation, cognitive overload, destruction and lose of time are some of these problems which have negative effects on learner navigational performance in Hypermedia environments [3, 4]. In order to cope with these problems it is claimed that metaphors can be effectively used in interface designs. To support this thesis the results of researches conducted by researchers for four years between 2009 and 2013 utilised.

1.1 Literature

One of the first metaphorical interface example is e-World online service operated by Apple Inc. between June 1994 and March 1996. This service was an original metaphorical interface. e-World than lost rivalry with AOL, CompuServe and MSN. Than e-World service was terminated in 1996. To Erikson [5] metaphors allow us to get information from familiar and solid objects and act as natural models. So the use of metaphors in educational interfaces have a vital importance. To Lynch [6] a successful educational interface should be a simple system that does not leave users to learn and remember many rules and procedures. In their empirical study Lee and Hsu [7] fond that visual metaphors in interface improves students learning performance.

Metaphors have a wide range of use in our everyday life. But until 1980s metaphors discussed as rhetoric or technique of effectively using language. Metaphors are defined as metonymy or an art of using words outside of real meaning. In 1980, "Metaphors We Live By," were published by two cognitive scientist George Lakoff and Mark Johnson. In their study they assume that "If we are right in

suggesting that our conceptual system is largely metaphorical, then the way we thinks what we experience, and what we do every day is very much a matter of metaphor" [8]. And that shows that metaphor is in every area of life.

In educational Hypertext, Hypermedia and Multimedia can be utilized to understand new, complex or difficult things and facilitate get used to such surroundings. [4, 5]. Because metaphors have great potential on cognitive capacities and pedagogical features. Basically the essence of metaphor is understanding and experiencing one kind of thing in terms of another [8]. In this study it is claimed that metaphors and their structures can provide important solutions. Because the metaphors can make understandable and memorable the environment functions to user by helps of familiar facts, habits, tasks and concrete objects. The purpose of this study is to provide a framework for metaphorical interface designs.

2   RESEARCHS

The main purpose of conducted researches was develop, implement and evaluate an metaphorical interface design framework that help learners to cope with common Web navigation problems like disorientation, cognitive overload, divided attention and waste of time in educational Hypermedia environments. For this purpose, results of a series of researches for three years between 2009 and 2013 conducted by researchers were analysed.

Table 1. Details of conducted researches and publications

Authors	Dates	Titles	Publication informations
Fırat, M. & Kabakçı Yurdakul, I.	2010	Use of Visual Metaphors for Navigation in Educational Hypermedia: Effects on the Navigational Performance	Journal of Educational Multimedia and Hypermedia
Fırat, M. & Kabakçı Yurdakul, I.	2011	Metaphors in meta-communication	Meta-Communication for Reflective Online Conversations: Models for Distance Educations
Fırat, M. & Kabakçı Yurdakul, I.	2012	Determining the Variables of Instructional Hypermedia Navigation Performance.	e-Journal of New World Sciences Academy NWSA-Education Sciences, 1C0494
Fırat, M.	2012	Effects of Metaphorical Interfaces on Information Technologies Teacher Candidates' Navigational Performance in Educational Hypermedia.	Published PhD Thesis, Anadolu University, Institute of Educational Sciences, Eskisehir, Turkey.

In this study, different designs with various target audiences have been studied and some important conclusions are reached. In addition to research articles a book chapter entitled "Metaphors in meta-communication" published in "Meta-Communication for Reflective Online Conversations: Models for Distance Educations" book [9].

In the first study entitled "Use of Visual Metaphors for Navigation in Educational Hypermedia: Effects on the Navigational Performance" the effects of visual metaphors in educational hypermedia on learners navigation performance investigated [4]. In the study three different navigation performance measurement including disorientation, time and participants' own navigation performance evaluations. The results of this research show that the navigation performance of metaphorical interface student group was higher than navigation performance of normal interface student group.

In the other study entitled "Determining the Variables of Instructional Hypermedia Navigation Performance" the views of experts of information technology collected to determine navigation performance variables. In this purpose a survey form created by researchers used to collect the views of field experts. The participants of this study are 26 information technology field experts. According to

the results of this study field experts strongly support disorientation, cognitive load and time as clear variables of navigational performance in educational Hypermedia.

The most comprehensive study conducted by researchers is doctoral dissertation entitled "Effects of Metaphorical Interfaces on Information Technologies Teacher Candidates' Navigational Performance in Educational Hypermedia". In the scope of this three years researches the issue of using metaphors in educational Hypermedia interface was investigated in detail. Some important results were achieved from these studies [11]. To one of the most important results of the dissertation using metaphors in educational Hypermedia interface have "high" effect ($\eta 2$=.16) on learners navigational performance in educational Hypermedia.

3   EMMI STEPS

Within the scope of series of research a framework for the steps to be followed when creating metaphorical interface for educational Hypermedia environments considering developed metaphorical interface design process throughout conducted studies. Details of EMMI steps shown below in Table 2.

Table 2. EMMA Detailed Steps

Steps	Participants	Detailed Process of Steps
Educational Content Analysis	Target Audience	Proper Course / Subject Selection
		Examining the appropriateness of the content to create metaphors
	Field Experts	Determination of subtitles
		Classification of subtitles (expanding, narrowing)
Metaphoric Interface Metaphors Components	Target Audience	Metaphor research for edited content: Preliminary research (literature review)
	Field Experts	Views and suggestions of target audience and field experts
		Achieving content and subtitle metaphors
	Designer	Creation of a metaphor pool for determined content
		Selection of interface metaphors from the pool: Metaphors that are related to real life, tangible, can be visualized, have direct, clear and understandable meaning
	Target Audience	Combining interface metaphor groups for interface design
		Identification of verbal and visual interface metaphors
	Researcher	Deriving a composite interface metaphors from interface metaphor groups
	Designer	Combining composite metaphor and content: Determination of metaphorical interface components
Interface Design	Target Audience	Fieldwork: receiving target audiences' and experts' opinions
		Initial design of the metaphorical interface
		Coding and integrations for draft interface
	Designer	Pilot applications
		Improving interface
		Finalisation of metaphorical interface design

As shown in Table 2 EMMI Steps cover questions need to be answered, the steps to follow and sub-studies. Also in the Table 2 participants given for all steps.

EMMA steps not only used in the design of educational hypermedia produced for PC but also can be used as an effective method in current mobile technologies such as iPhone, iPad, mobile phone and

tablet computer. EMMI have four steps. Each stage provides a unity in itself and the output becomes the input of the next stage. So EMMI Steps have one complement each other hierarchical structure. EMMI Steps have abstracted below in Figure 1.
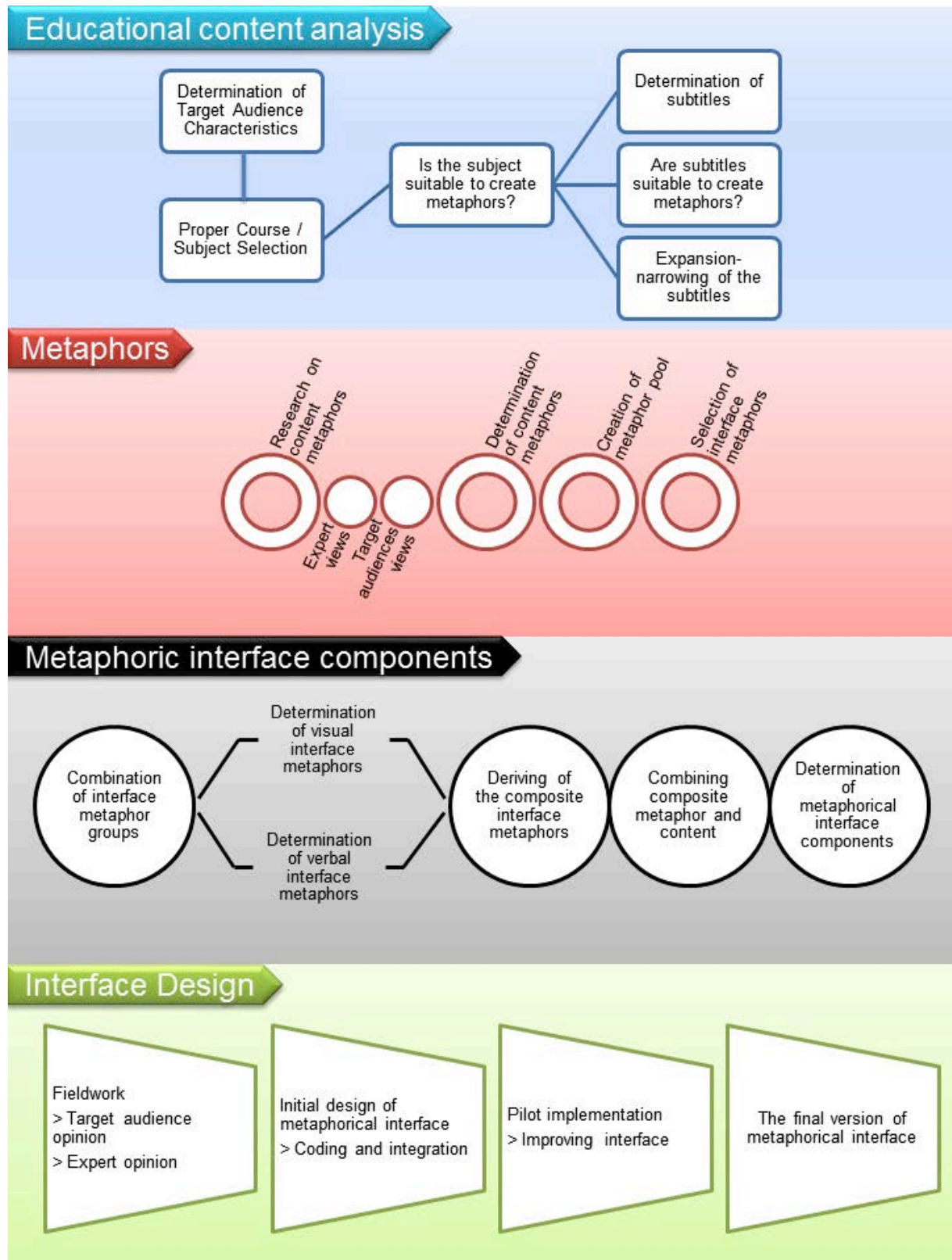

Figure 1. EMMI Steps

EMMI Steps have a critical structure that should be carefully followed. Because each step of EMMI can affect the next steps. These framework have a characteristic mature after several researches.

4   CONCLUSIONS AND SUGGESTIONS

Use of metaphors in education created the pedagogical background of EMMI Steps. Metaphors enables to benefit from familiar facts, habits, tasks and concrete objects. Thus, metaphors makes invisible functions of educational hyper texts, hypermedia and multimedia interfaces understandable and memorable to the learners. Well-structured educational metaphorical interface through EMMA steps;

- is based on familiar and solid objects
- is appropriate to the learner's cognitive abilities
- do not need rules and procedures for the use
- don't require prior knowledge or preparation for interface components functions
- is based on the learner's own life experiences and
- plays the role of advance organizer on the information provided

EMMA steps also can be used as an effective method in interface design of educational applications of current mobile technologies such as iPhone, iPad, mobile phone and tablet computer. In future researches comprehensive studies on use of metaphors in educational interfaces can be conducted to participants with different demographic characteristics. These studies can be on the features of metaphor that will be used in educational interfaces. Also these researches can be on participant characteristics that create differences.

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A FRAMEWORK OF EDUCATIONAL METAPHORICAL INTERFACE DESIGN FOR LEARNER HYPERMEDIA NAVIGATIONAL PERFORMANCE

at the 6th International Conference on Education and New Learning Technologies held in Barcelona, Spain, 7th-9th of July 2014.

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182