

# Mind map learning approach in e-learning environment using SCORM standards

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## Abstract

Although Mind map learning approach is widely accepted amongst educational and non-educational aspects, there is still little research on e-learning and teaching using this approach in developing course content. Moreover, SCORM now days become a widely used requirement for e-learning projects. However, still, there is a lot of confusion, especially within the instructional design community, regarding what it is and when it should be used [1]. Therefore, exploring other people work enables us to see our footsteps clearly, saves time, and eliminates any misunderstanding, while developing our similar projects. Therefore, this paper present an experiment of developing a course content taking the advantages of one of the most powerful approach in displaying information visually in learning and teaching environment using SCORM standards. This paper presents part of Ph.D work implementing mind map approach in teaching “C programming language” course.

## 1. Introduction

This paper describes the technical and educational aspects on part of a PHD project in progress. The aim of this project is to accommodate individual learning styles in an adaptive learning environment that teaches the “C programming language”.

People learn in different ways. Learning is a complex, interrelated system of accessing information, getting it into the brain, and processing that information to solve problems or support activities.

Understanding learning styles leads to success. Once you know what learning environment works best for you and what your preferred learning style is, you will see how you can use your preferred learning style to move information through the learning process and to learn new information more quickly and efficiently, remember new information for a longer period of time, and increase your ability to recall the information more quickly and completely for performance, discussion, or test taking.

There are many leaning style this paper presents Mind map approach as one of them. Mind map is a way of representing information graphically using keywords, links, and key images allowing a lot more information to be put on a page. Mind map work the way the brain works, which is not in linear matter. Any idea probably has thousands of links

in your mind. Because mind maps are more visual and depict associations between key words, they are much easier to recall than linear notes. Starting from the center of the page rather than top-left corner allows you to work out in all directions. Mind maps are easy to review. Visual quality of mind maps allows you to make key points to stand out easily. Mind map has been used in many fields such as Notes, Problem solving, Planning, and Presentations.

A SCORM standard is another aspect this project is using. SCORM now days become a widely used requirement for e-learning projects. Still, there is a lot of confusion, especially within the instructional design community, regarding what it is and when it should be used [1]. SCORM or the Sharable Content Object Reference Model provides a common technical framework for the development of reusable instructional objects for computer and Web-based learning. This paper presents the design and the implementation of developing course content based on mind map approach on SCORM standard base.

## 2. SCORM

SCORM is a model that describes a standardized way to design and develop learning materials [2]. The greatest advantage of implementing SCORM standard is makes it possible to integrate learning objects from different sources in a common environment. SCORM as model describe two main elements a (CAM) Content Aggregation Model, which describes the ways in which SCORM materials are organized and packaged so that can exchanged between different learning systems and a (RTE) Run Time Environment, which provides the means for the learning materials to communicate with the LMS and for the collection of data to track and monitor learners [2] [3].

### 2.1 CAM in Mind map implementation

The most important thing in this issue is how to package together a collection of learning objects, their metadata, and information about how the content is to be delivered to the user.

#### 2.1.1 Developing SCORM Content Package

For developing any content package the following steps should be followed:

- 1- Define the course root aggregation.
- 2- Develop a content package which, contain two main principals component must be developed carefully, first all the physical files such as: **Assets**: assets are any digital objects of media, text, images, sound, web pages or other data can be delivered to a web client, and **Sco**: a sco is a collection of one or more assets. Second a **manifest file**: which is a list of all the resources (scos and assets), the organization, sequencing rules, and all of the metadata.
- 3- Identified the metadata for each sco and the metadata for the entire content package by indicating the ownership, cost (if any), the technical requirements, and educational purposes.

- 4- Zip the content package together with the IMS files which is a standards communication specifies data model between LMS and sco [3].
- 5- Testing the package in any LMS to ensure it functions the way you had intended.

### 2.1.2 Mind Map course design

The “Programming and C language” course has been developed based on mind map approach as the following manner:

- 1 The root aggregation has been defined and all the physical files and their links have been developed.
- 2 The course main page has designed based on Mind map approach using only key words and whenever possible images emphasizing by color.
- 3 Starting from the center of the page and worked out making the center clear and strong visual image.
- 4 Creating the sub-center.
- 5 Put keywords on lines using lower case writing for more visually distinctive and better remembered than upper case, using color and arrows to show links between elements.

The testing tool has been used in this stage was TestSuite 1.3.3 ST from ADL. Figure 1 is a screenshot shows the user interface design of the main page of the course.

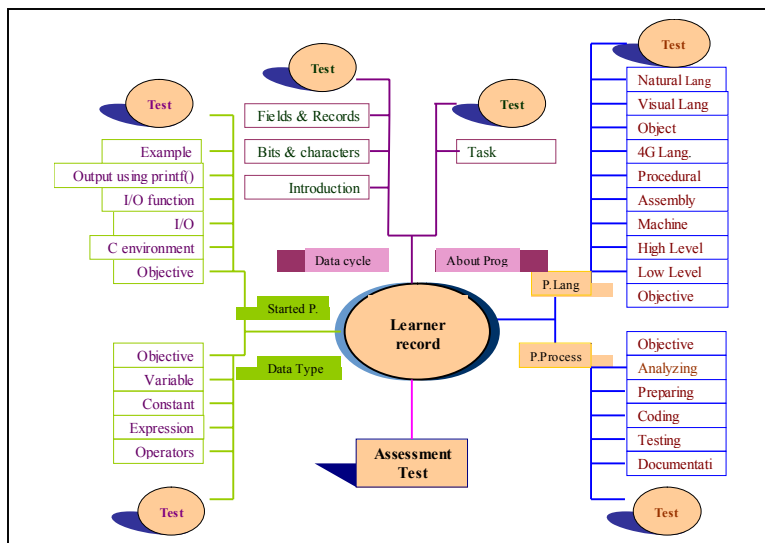


Figure 1: represent the course main page

### 2.2 RTE in Mind map implementation

Run time environment describes the LMS responsibility to launch scos based on requests from the learner and the sequencing rules of the content organization. Therefore the main requirements in this phase are: (1) to have Application Program Interface (API) which is a set of functions sits in the browser to achieve the communication between the course

contents and LMS. (2) Facilities to utilize details from manifest file this through set of data model. This data model enables the LMS to track learners' progress. [2][4]. The steps have developed in this phase as the following manner:

1. All the physical files in this course have been designed and developed using hyperlink, text, and images such as figure 2. All the course contents files has developed as assets (figure 3). Because of the nature of the mind map approach which; allow the learner jump through the links in the main page. Sco can not be implemented due to many reasons such as: (1) A Sco not allowed to contain hyperlinks to other Scos. (2) A Sco not allowed interacting with the runtime environment, except through the SCORM API. (3) A Sco not allowed creating additional windows, unless it can close them reliably when the Sco terminated. (4) A Sco should not contain hyperlinks to resources that may not be available when the Sco is run in different context than the original context [3].
2. The strategy of the course is jumping from section to section through the main page by the links. As shown in figure 3.

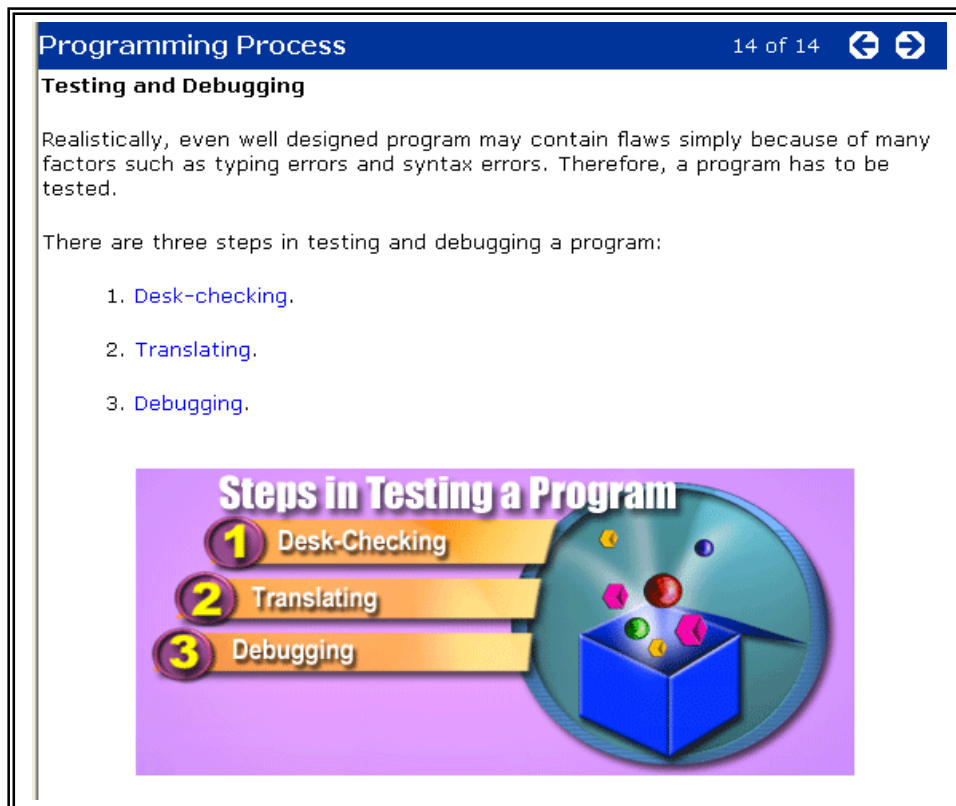


Figure 2: sample image

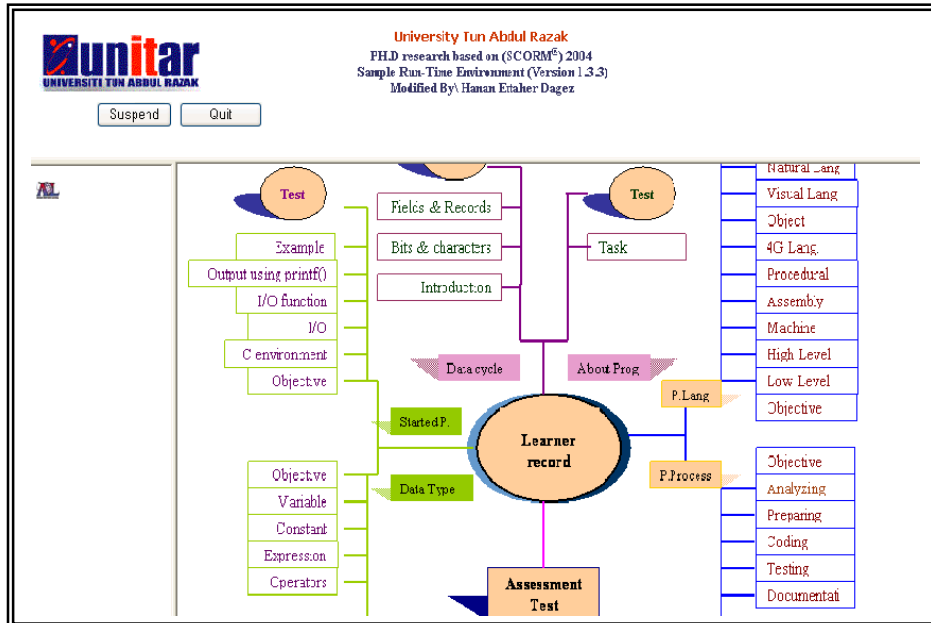


Figure 3: The course main page

3. The manifest file represents the course sequencing and navigation showing the structure of the course organization and all content resources using IMS Simple Sequencing, which is the specification, which describes three models: sequencing definition model, tracking model, and activity state model [5]. Manifest file also represents the navigation model which indicates how the content presented to the learner by controlling certain user interface devices that the content may wish to provide, such as Continue and Previous.

Because of the nature of the mind map only the following aspects in how SCORM sequencing definition model and navigation presentation has implemented:

- Sequencing control choice: This indicates that the learner is free to choose any activity in a cluster in any order without restriction, which contains a boolean (True/False) [6]. Therefore False was chosen to prevent the learner from browsing the course through the cluster instead of the map which is a heart of the mind map approach. Figure 4 shows how it was implemented.
- Sequencing control choice exit: This indicates whether a Choice navigation request can target activities that are not descendents of the affected activity, thereby causing the affected activity to terminate. This element contains a Boolean (True/False). The value True indicates that while an activity is active the learner has the ability to trigger Choice navigation requests that target non-descendent activities [6].
- The Continue and Previous devices has disabled to enforce the learner to navigate the content object through the map only. The sample shown in figure 4.

```

<adlnav:presentation>
  <adlnav:navigationInterface>
    <adlnav:hideLMSUI>continue</adlnav:hideLMSUI>
    <adlnav:hideLMSUI>previous</adlnav:hideLMSUI>
  </adlnav:navigationInterface>
</adlnav:presentation>
<imsss:sequencing>
  <imsss:controlMode choice="false" choiceExit="true" />
</imsss:sequencing>

```

Figure 4 sample of mind map sequencing and navigation

The tracking and activity state model is simplistic recording only progress and having no interest in user preferences or learning styles [5]. Therefore, implementing advanced function such as prerequisite or other pedagogy concepts are not easy to handle and in some cases impossible to implement.

## The course content implementation

This work is part of Ph.D research study and Sample RTE 1.3.3 from ADL has been modified and used as LMS to cope with this research. First the course must be uploaded and the prerequisite chapters identified by the administrator from the main menu to choose how many chapters this course contains as shown in Figure (5a) and then the prerequisite chapters for each chapter will be determined for the course as shown in Figure (5b). When a learner logged in into the system and register for the course the system allow him to view the content by displaying the mind map main page (Figure 3). Through the links the learner review the course and by answering the tests and the assessment test tracking progress will be kept recording the chapters he/she has failed answer their questions correctly. The learner in this case has to redo failure chapters with all the prerequisite chapters as shown in Figure 6. Even though the learner quit accidentally or not the course, when he/she gets back and click on the center “Learner record” list of the left chapters will appear to remind the learner to finish them to be considered he/she completed the course.

Figure (5a): Identifies the number of chapters

chapter2	chapter3	chapter4	chapter5	chapter6
<input checked="" type="checkbox"/> ch1	<input type="checkbox"/> ch1	<input checked="" type="checkbox"/> ch1	<input type="checkbox"/> ch1	<input checked="" type="checkbox"/> ch1
<input checked="" type="checkbox"/> ch2	<input type="checkbox"/> ch2	<input checked="" type="checkbox"/> ch2	<input type="checkbox"/> ch2	<input checked="" type="checkbox"/> ch2
		<input checked="" type="checkbox"/> ch3	<input type="checkbox"/> ch3	<input checked="" type="checkbox"/> ch3
			<input checked="" type="checkbox"/> ch4	<input type="checkbox"/> ch4
				<input checked="" type="checkbox"/> ch5

Figure (5b): Prerequisite chapters

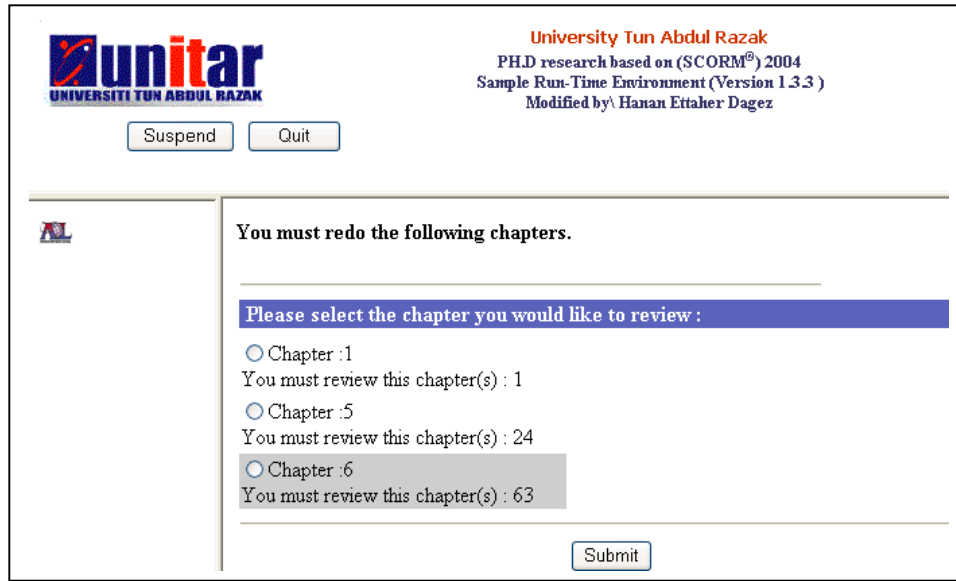


Figure 6: Prerequisite approach

### 3. Conclusion

Exploring other people work enables us to see our footsteps clearly, saves time, and eliminates any misunderstanding, while developing our similar projects. The aim of this paper is to share knowledge, experience and experiments of developing course content in e-learning based on Mind map learning approach using SCORM standards.

### References

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