CONNECT Platform

User Manual

Glossary

Table 1. Glossary of commonly used terms

Terms	Explanation
Rules	A complete set of properties describing interactivity. It is composed of: placeholder, object, actions and duration.
Actions	Actions refer to the actions of a mobile AR unit user which activate the display of an object in the mobile AR unit view
Conditions	Conditions are the situation which when true will cause the appearance of an Object to appear.
Durations	Duration is the part of a rule which specifies the time period (in seconds) an object will remain in the view of the mobile AR unit from the moment it appears regardless of whether the action which was triggered is true or not.
Placeholder	Placeholders are called the boxes on the picture of the exhibit held in the Canvas window, which indicate the approximate position of the object in space as well as the way it shown.
Object	Objects are containers of multimedia content. Valid media objects include: images, text, audio, video and 3D objects (3D shapes).
Reference Image	This image displayed in the Preview Canvas Window offers a workspace context for the placement of media objects and serves as a static preview.
Simple Content	Simple content are images, text, audio and video. They are two-dimensional, static and allow no interaction with the student. The Teacher provides them during design time.
Phenomena Representations	Phenomena representations are 3-D objects, which show visually the phenomenon and its mechanics being examined. They are dynamic in that they change with the changing state of the exhibit.
Variable Representations	Variable representations are meters showing the value of exhibit variables. These magnitudes are showing through arrows (vectors), cylinders (bars) and numerically (through text).
Educator	Any person taking it upon themselves to teach science to a learner
Learner	The learner is the person being taught via the EXPLOAR pedagogical process.

Abbreviations

Table 2. List of abbreviations

Acronyms	Explanation
CVD	CONNECT Visual Designer
Aug.	Augmentation
VTSP	Virtual Thematic Science Park
AR	Augmented Reality
CP	CONNECT Platform
EP	Educational Pathway

RR	Research Report
CP	CONNECT Platform

Common Conventions

Table 3. List of common conventions used throughout the documentation

Symbols	Explanation
Control Label	The labels of Visual Designer's controls are printed in italics
Control 1 → Control 2	→ Indicates a sequence of controls, which have to be, used in a particular order. In this case the user has to activate first Control 1 and then Control 2.
	Warning, please pay attention. Important information follows to the right.
	At this stage this functionality has not been implemented yet.
	This is note.

For proper use make sure you pay attention to abbreviations, glossary and common conventions as mentioned

Information for the General Use of the CONNECT Platform

This section of the User Guide (UG) provides general information regarding the CONNECT Platform (CP) as well as an introduction to the documentation.

The current CP release is available on the Internet at the following address: http://connect.iisa-innov.com . In order to use the CP, the user must utilize MS Internet Explorer 6.0 or later, Java VM, and sufficient Internet bandwidth (equal or more to 2 Mbps).

This manual assumes familiarity with basic computer / Internet usage. No advanced knowledge is necessary for basic operation. Manipulation of media, such as documents, image or video editing for media upload is not covered in this documentation. Users should consult the software manuals of their preferred document, image or video editor software. Moreover, the present documentation does not explain in detail the use of standard tools such as chat, forums or e-mail. This documentation focuses on the execution of educational activities using the CP through the use of pathways.

The remaining sections describe CP functionality in a task-oriented manner. It is not an exhaustive inventory of all available functionality. It aims to explain to the user how to specify the most fundamental components of an AR Scenario in a complete and detailed manner. The entire process is broken in smaller groups of activities accomplishing specific tasks. Images showing the tool's interface at its different stages accompany the task descriptions. Follow these guidelines for fast and satisfactory results.

Please take note that this platform is under constant development. We will always work hard to keep the documentation accompanying the CP up to date and complete. However, at the time you read this manual parts may be outdated or work differently than described herein. You will always be able to access Online Help to get the latest user information on changes, which have occurred since the writing of this manual.

In the event, you find a something not working as it is supposed or it does not meet your expectations please help us address it. Send e-mail to Nikolas.athanasiadis@intrasoft-intl.com explaining in what state was the system when you performed the action, what you did and then what were results. We will try to deal with issues as quickly as possible.

With kind regards,

The EXPLOAR Team

1 CONNECT Platform Introduction

The EXPLOAR project demonstrates an innovative approach that involves visitors of science museums and science centers in extended episodes of playful learning using advanced ICT. These advanced ICT tools are the mobile AR unit and the CONNECT Platform. The advanced learning strategies are explained in the pedagogical report while a chapter is dedicated to the mobile AR unit in this booklet. This document the focus is on how to use these tools that comprise the CP.

The CP is a web based application whose aim is twofold. It distributes information and organizes educational activities. It coordinates teachers, students and museum staff in the use of the innovative technology. This advanced learning environment is termed the CONNECT Virtual Science Thematic park (VSTP). The CP supports the mobile's AR system specifications and functionalities as well as materializes the VSTP's requirements and procedures by providing the following services over the web:

1. Registration and authentication services
2. Personalization services
3. Collaborative activities for on-line users
4. Advanced Messaging Services and Interactive activities
5. Content Management
6. Learning Systems Management

In the following sections, the document will provide general context in which the CP operates in and introduce its components. The following sections provide specific instructions for the operation of the VSTP and CP. There is a third section which addresses specifically the CVD which is part of the CONNECT Platform, since this is a major component of the CP.

1.1 CP Context

CP is an application and as such it operates within a certain process, which sets the context for the application and justifies its features. This section describes the business process in which the CP was designed to operate in. Moreover, we will attempt to briefly connect its features and modules to the needs of the project.

The process within which the CP operates starts with anyone waiting to teach science the "EXPLOAR way". This person is referred to as the **Educator**. The Educator can be any person. The project focuses on connecting formal curricula and informal learning, which places special attention on the K-12 teacher; hence in many cases Educator and Teacher become equivalent. Similarly, **Learner** is the person receiving the benefits of the education but for our purposes they are equivalent to K-12 students.

The Teacher's decision to utilize a novel teaching method to teach science in the classroom sets off the processes. They learn about EXPLOAR, how to use it pedagogically, what it can offer them, what museums and exhibits are available. If this informational part is successful, the educator will become excited for the process and will decide to use it. This is the VSTP module for the CP.

Once, the educator decides to use the system, they have to register with the system and acquire credentials. Upon, log in to the CP, they have entered the CP. The CP provides two types of facilities: the workspace and the toolbox. The workspace helps the educator to manage and guide through the education processes. The toolbox is a collection of tools provided to facilitate the educational process. It contains tools for managing the learners and their access rights, content search facilities, communication facilities (chat, forums and mail) and so on.

The educational process resembles a path called Educational Pathway (EP). Each EP is separated into four phases Preparatory, Pre-Visit, Visit and Post Visit. The educator's first task is to prepare the EP, which occurs in the Preparatory Phase. During this phase the educator creates user accounts for the learners, assigns them to the specific PE, uploading material for them as well as set up the following phases.

During the preparatory phase, the educator prepares a lesson plan and specifies the AR experience for their learners before they got to the museum. The lesson plan is just that a plan which describes what the educator will do in order to teach the specific scientific phenomenon or subject. Then, they prepare the AR experience for their students. These experiences are targeted to specific exhibits thus the educators will have to have made their decision regarding which exhibit at which museum to use before specifying the learner's AR experience. The decision will be based on two types of information provided by the CP:

- The presentation of the exhibits which appears during the creation of a pathway.
- The ability to read through the lesson plans, AR experience videos and educator reports of other educators who create pathways through the CP.

The CONNECT Visual Designer (CVD) provides the capability of designing the AR Scenario. It represents a novel approach to the specification of augmented reality experiences. It supplies a large amount of functionality, thus it is not in this manual. The specification produced with this tool is transferred to the mobile AR unit, which will reproduce the experience during the visit of the learner at the museum.

In the Pre-Visit Phase, the educator prepares the learners. They log in to the CP in order to communicate, share, explore and learn about the educational domain. Through research and communication, they are to develop ideas about how the phenomena they study work. The platform serves as a medium to this purpose.

During the Visit Phase, the learners visit the museum. The museum staff who administers the CVD at that particular museum will load the AR Scenario, the educator prepared in the preparatory phase, on the mobile AR unit. A learner will wear the mobile AR unit and go to the exhibit for which the AR scenario was developed. They interact with the exhibit and experience the AR scenario in order to test their ideas about the phenomena examined. They will collect measurements and pictures in order to substantiate their claims as well as communicates with learners in remote locations. The CONNECT platform grants the ability to remote classrooms to see what the learner wearing the mobile AR unit experiences.

During Post-Visit phase the learner will write a report. The platform will make available the data collected during the museum visit to the learners. They will include them into their final reports.

The figure below demonstrates the above discussion at a conceptual level.

Educator

VSTP
- Get information on CONNECT

CONNECT Platform
- Learn about the Exhibits read sample reports and video of the AR options the exhibit
- Read the lesson plans and final reports
- View video of past museum visits
- Construct Educational Pathways (Define Preparatory, Pre-Visit, Visit and Post-Visit activities)
- Upload, remove, share and view educational content
- Manage student accounts
- Communicate using Chat, Forums and E-mail to communicate

CVD
- Specify an AR Scenario
- Upload Simple Content
- Define Conditions
- Open, edit and delete AR Scenarios
- Publish AR Scenarios as well as send them to the mobile AR unit

The discussion so far has revolved around the main users of the CP: the educator and the learner. The system however requires users responsible for the maintenance and proper operation of the system. This is especially needed since CP is deployed in several locations which co-operated with each other. These users are the **Administrators** and their responsibilities include:

- Installation of the CP
- Educator account management and registration
- Making more exhibits available for AR Scenario authoring through the CVD
- Updating the content
- Issuance and collection of the mobile AR unit at the museums
- Upload of the captured data on to the platform
- And may be even content development

This document does not explain the CP features geared towards the administrator.

2 VSTP Tutorial Section

The VSTP is in an eye-catching interface, which introduces the features of the project to perspective users. It is divided into 3 areas. The interface is shown below.

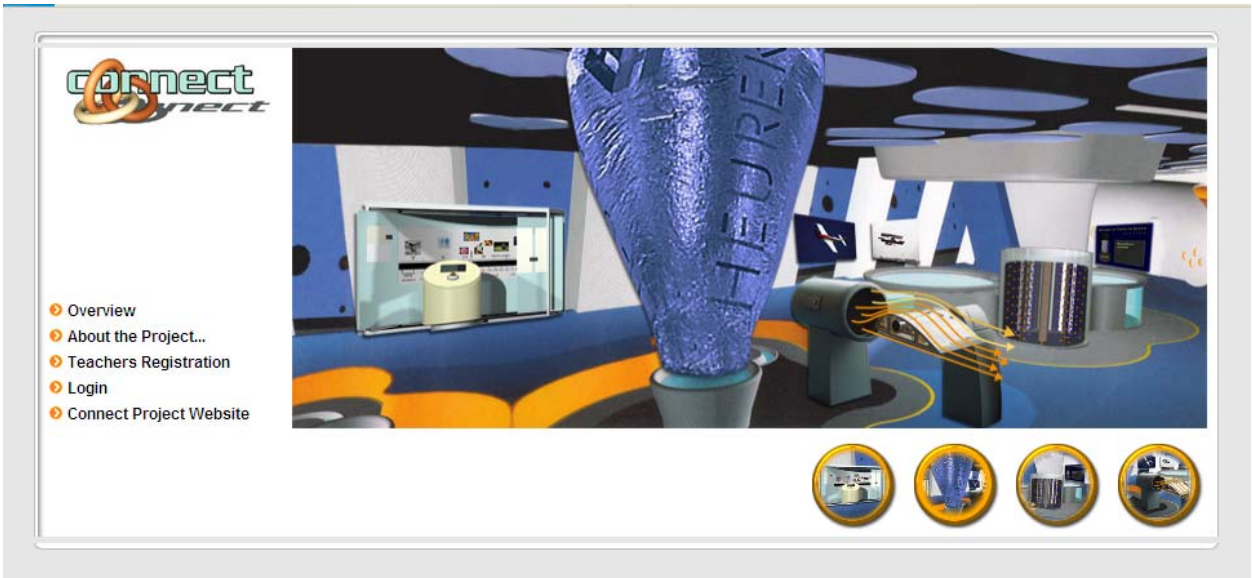

Figure 1: VSTP interface

On the left hand side, there are five links:

- Overview: This is an introduction to the educational objectives of the EXPLOAR project.
- About the Project…: The information here introduces the main work carried out within the framework of EXPLOAR project
- Teacher Registration: Potential users enter their information here in order to register themselves with the CP and receive a username and password.

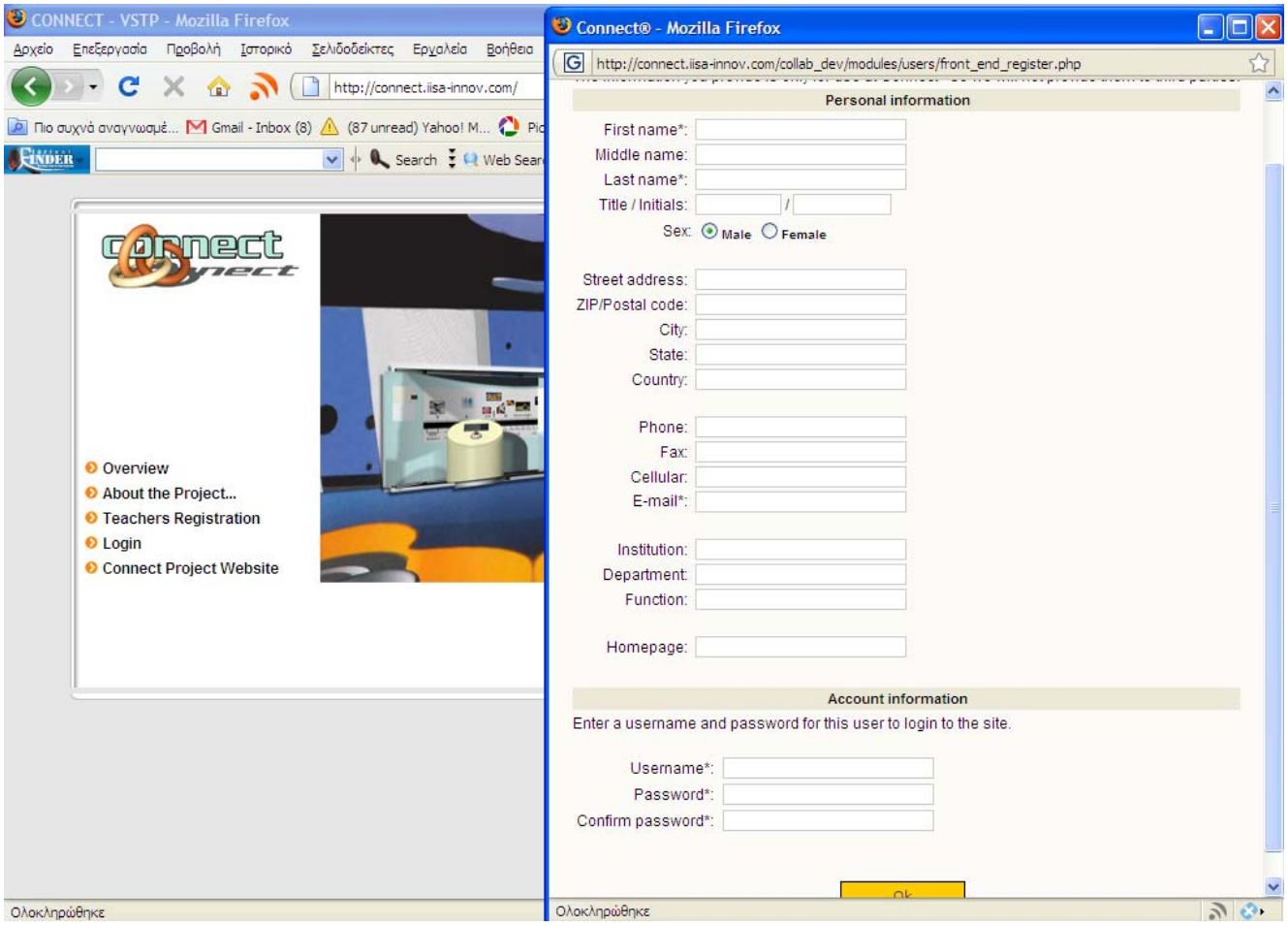

Figure 2: CP registration

- Login: users who already have credentials enter the system here.

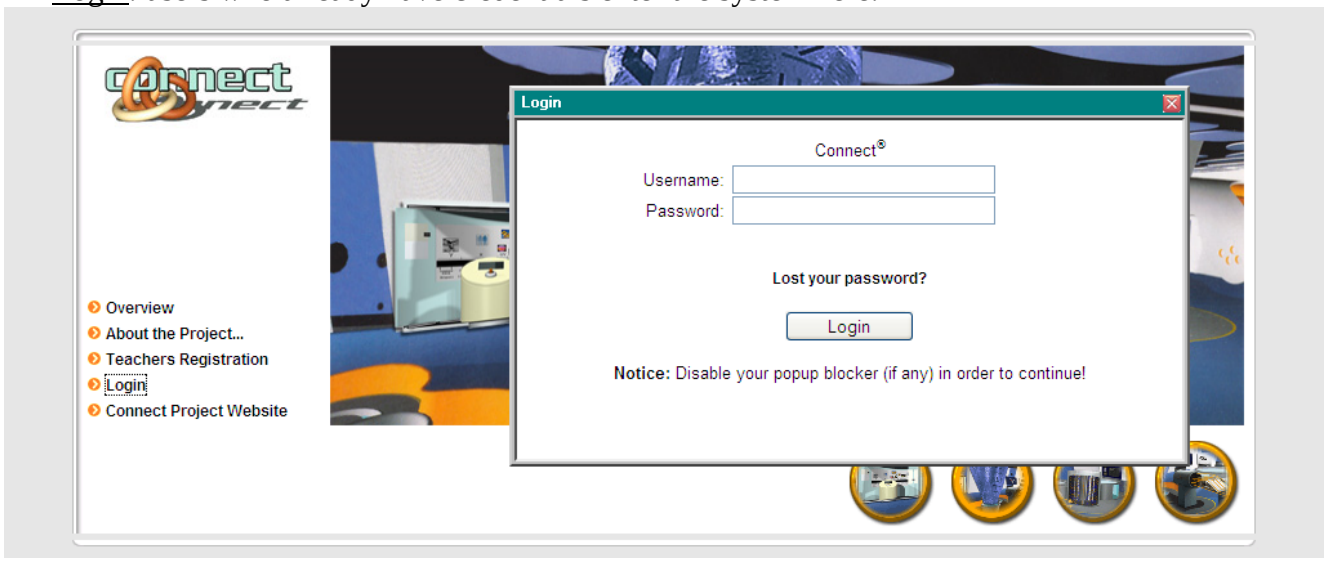

Figure 3: CP Log in interface

- EXPLOAR Project Website: Directs the user to the EXPLOAR Dissemination site.

The four buttons on the bottom right corner of the interface contain information regarding each of the 4 exhibits included into the system. These are:

- Airfoil at @Bristol
- Hot air balloon at HEURIKA
- Air track at Eugenidis Foundation
- Bio tube at Vajxo

Each of these buttons when clicked present information regarding the specific exhibit. These descriptions are available via clicking on the part of the image above depicting each of the exhibits.

3 CONNECT Platform Tutorial

The CP has been implemented to support the educator in setting up innovative educational pathways educational pathways (please also refer to scenario deliverable). In particularly, the software is modelled around *"standard visit pathway"* that any visitor may perform during a science museum visit and it is flexible in accommodating the "remote *visit pathway pattern"* which is one of the main implementation scenarios of the EXPLOAR project. This tutorial walks the educator through setting up a standard visit pathway.

We will start with a brief introduction to the organization of the activities necessary to set up an educational pathway. It will include the explanation of concepts to aid understanding. Then, the steps of the procedure will be described along with clarifying notes, cautions and warnings.

3.2.1 Pre-requisites

Before, we begin make sure your computer has Internet browser installed and has access to the internet. If your browser blocks pop-up windows, you will need to allow them when working with the CP. It is recommended that your display's resolution is adjusted to 1152x864. Basic familiarity with computers and how to browse the Internet will be adequate for completing this tutorial. However, it is strongly recommended you review the pedagogical reports accompanying this project and follow the recommendation therein.

3.2.2 Entering the CONNECT Platform

If you are ready lets proceed:

1. Make sure you are connected to the Internet.
2. Open Internet explorer.

Remember to access the tool with IE 6.0 +, enable pop-ups and have Java installed.

3. Direct your browser to http://connect.iisa-innov.com/.

   The browser should load the following screen in Figure 3: CP Log in interface. A username and password will be provided to you upon request but for the purposes of this training exercise we will use a default account "teacher" with password "123" (remove the quotations when typing in the username and password).

3.2.3 Introduction to the CP Interface

After entering in CP, the first screen encountered is the following.

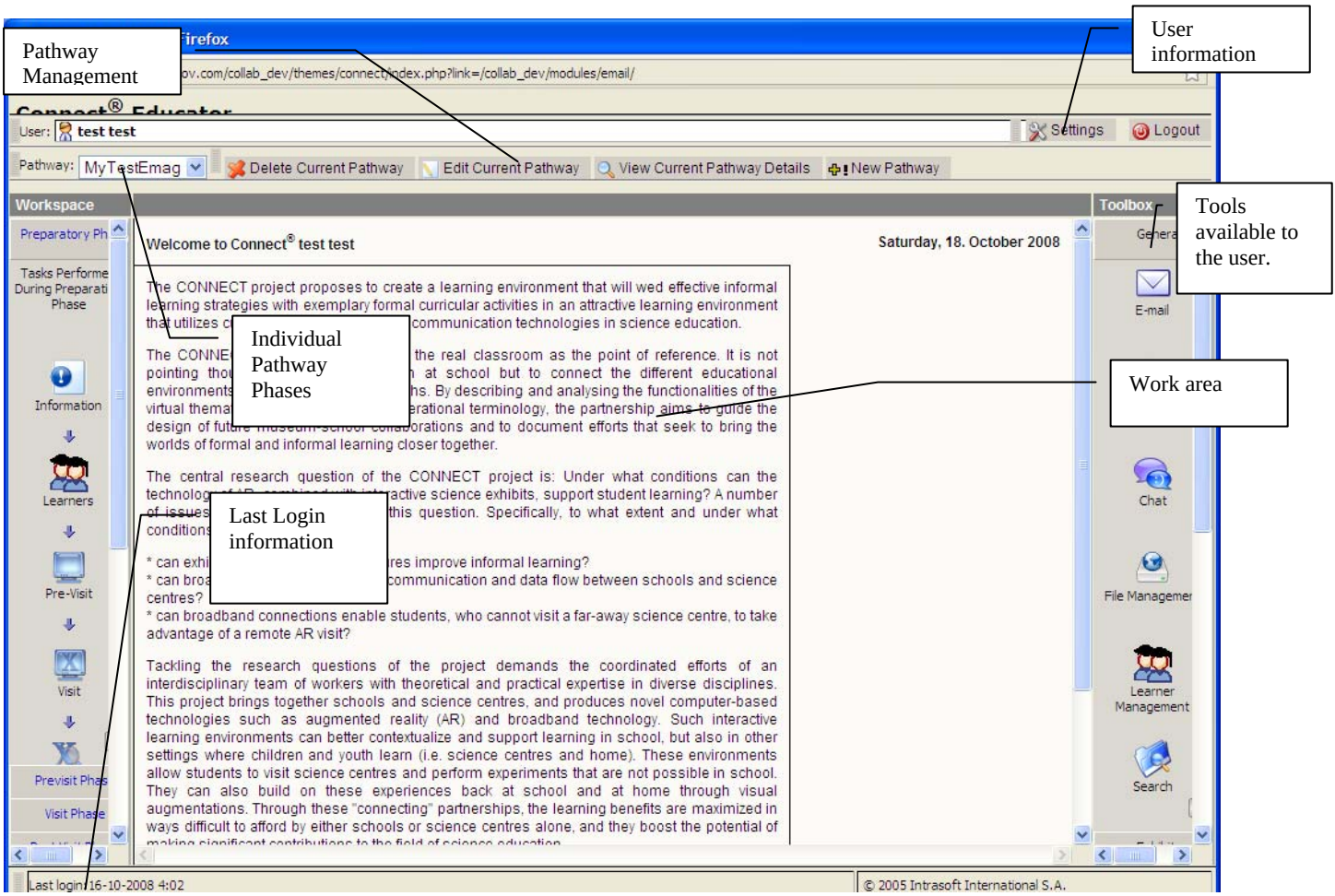

Figure 4: CONNECT Platform Interface Introduction

Upon entering in the CP, the system provides the user with a number of status information.

- Firstly, the "Title" field informs you in which mode the system is in. On the top left hand corner notice the label "Connect@ Educator" informing that the user entered as in the educator's i.e. Teacher's role.
- In the line below, the platform informs the user of the account name with which they are currently logged into the system.
- The "User Name" display is followed on the right by the *Settings* button, which allows the Teacher to personalize the tools and manage their own profile.
- The users can logout of the CP by clicking the *Logout* button at the end of the same line.
- At the bottom left of the window the user can view the last time s/he logged. This information may help the user identify authorized access to the CP with their credentials.

Further down, the screen is divided into three sections. The middle area, which is by far the largest, serves as a work area, while the areas to the left and to the right provide access to tools. On the left, the user can find a workspace assisting to set up a pedagogical pathway (see sections 1.1.4-8). On the opposite side (on the right), the platform makes available communication, collaboration and AR scenario tools used in conducting the pathway.

3.2.4 Manage a Educational Pathways

Every time, you would like to create another educational experience through EXPLOAR, you will have to create another Educational Pathway (EP). This concept is central in the CP because it organizes all information relating to the learners' educational experience. For example, it is used to group multiple participating students as well as relevant educational material. An EP consists of four phases, which occur sequentially: Preparatory, Pre-Visit, Visit and Post-Visit Phase. An educator can have multiple EPs running concurrently at differing phases.

Now, we will discuss how to create, delete, edit and navigate between multiple EPs.

To create a new EPs simply click on the *New Pathway* button. You will be asked to enter the following information:

1. Exhibit: You can choose the exhibit on which this EP relates to for the list of available exhibits as soon in the figure below:

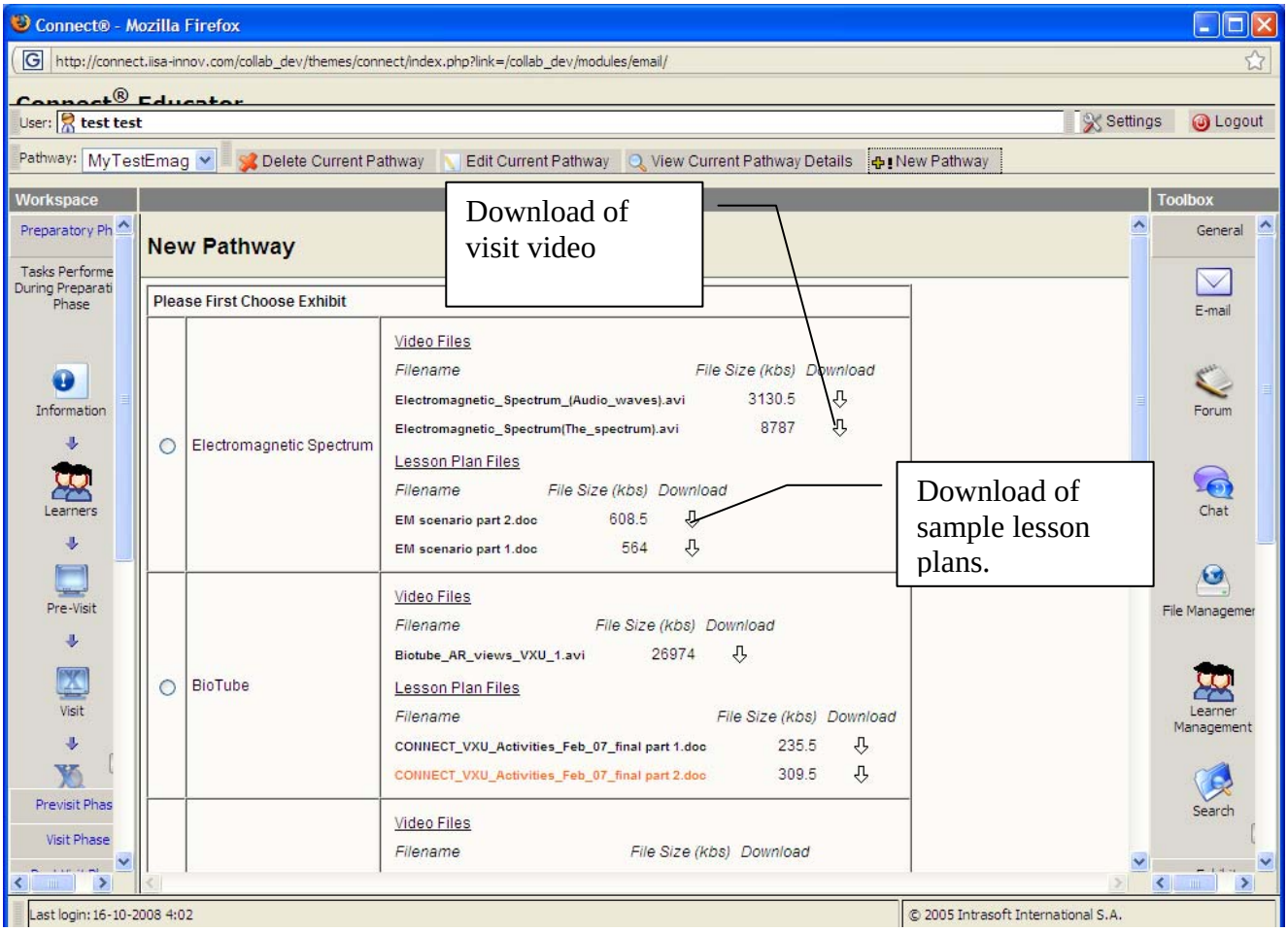

Figure 5: Exhibit selection

For each exhibit, the system provides videos of the AR experience which can accommodated by the system and the exhibit. Additionally, sample lesson plans are available for the teachers in order to understand what teaching options the exhibit offers.

Check the option on the left and click on *Next* at the bottom in order to confirm the exhibit selection.

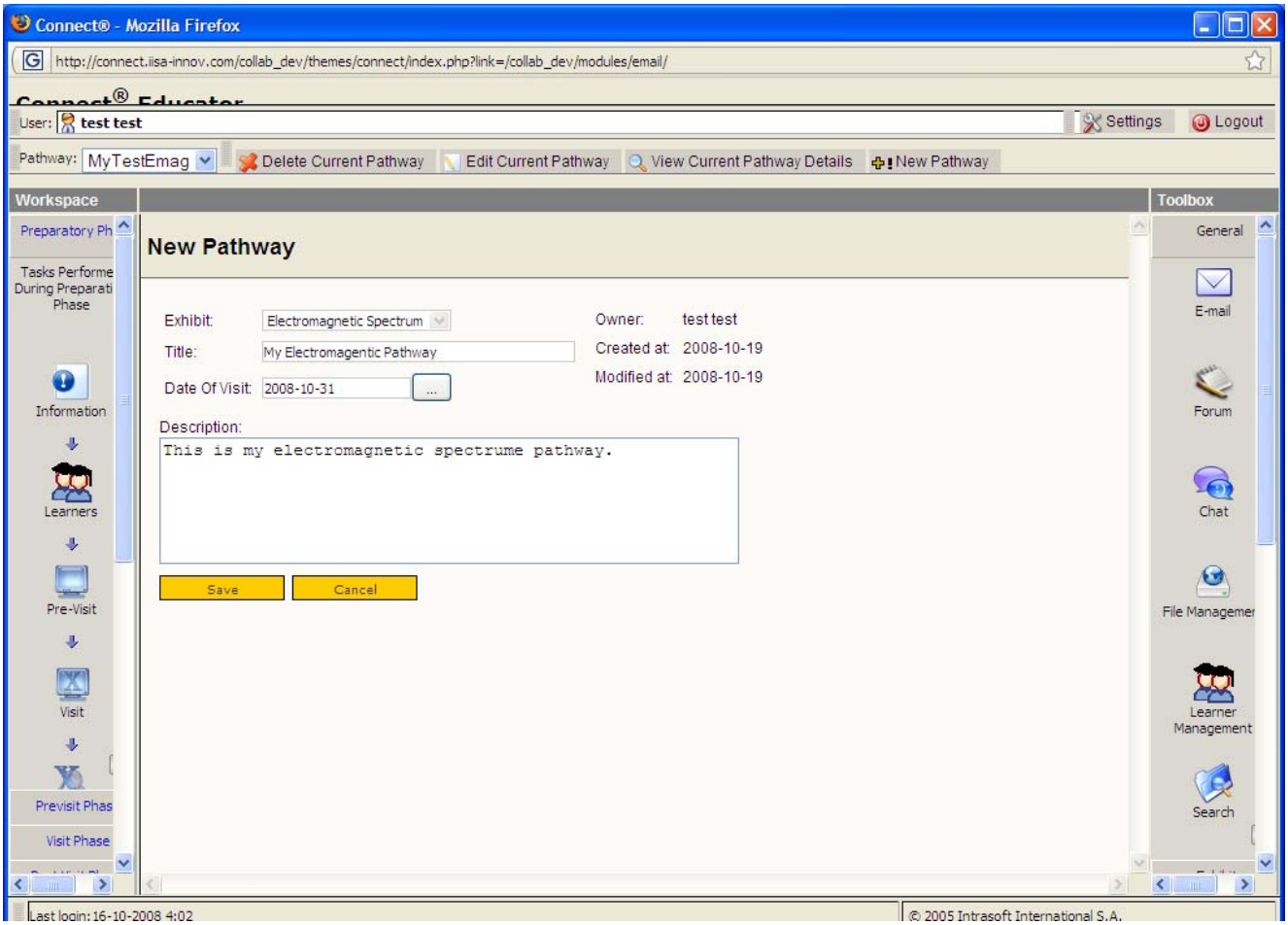

Figure 6: Creating a new pathway

The user can see which exhibit was selected and then they have to enter the following

2. Title: This is a simple pathway name.
3. Date of Visit: This is the date the learners are expected to visit the museum and have their AR experience.
4. Description: Here, a short description of the pathway is entered.

The VSTP will assist you with the determining the visit day while arranging for a visit to the museum is to be done entirely outside the platform. Also note, the CONNECT platform is oblivious of the phase pathway is actually on.

After entering the above information, click on the *Save* button to save or the *Cancel* button to cancel the creation of the pathway.

To navigate to an EP, you only need to use the drop down in Educational Pathway Management. The drop down allows you to select from the pathways available the one to make active. The pathway's summary will be brought to the screen.

Having selected an EP, you can delete it by clicking on the *Delete Current Pathway*. The system will inform you when it is deleted.

Selecting a pathway and then clicking on *View Current Pathway's Details* will generate a summary of rights and content per phase relating the selected pathway.

Finally, you can edit the pathway selected by clicking on *Edit Current Pathways.* This action will bring you to the same dialogue with the one presented during the new pathway creation process. The fields this time are populated and the information is editable. Pressing the *Save* button will save the changes while the *cancel* button will simply discarded them.

3.2.5 Preparatory Phase

Having created a EP in section 3.2.4, you have taken the first step in establishing an educational pathway. Currently, you are at the preparatory phase of EP. In this phase, as the educator you will need to:

1. View prior EPs, lesson plans, task reports and learning material associated with this type of EP. To do this navigate to the *Workspace* on the left and click on the *Preparatory Phase* bar to open it, if it is not already open. The first icon reads *Infomation* click on it.

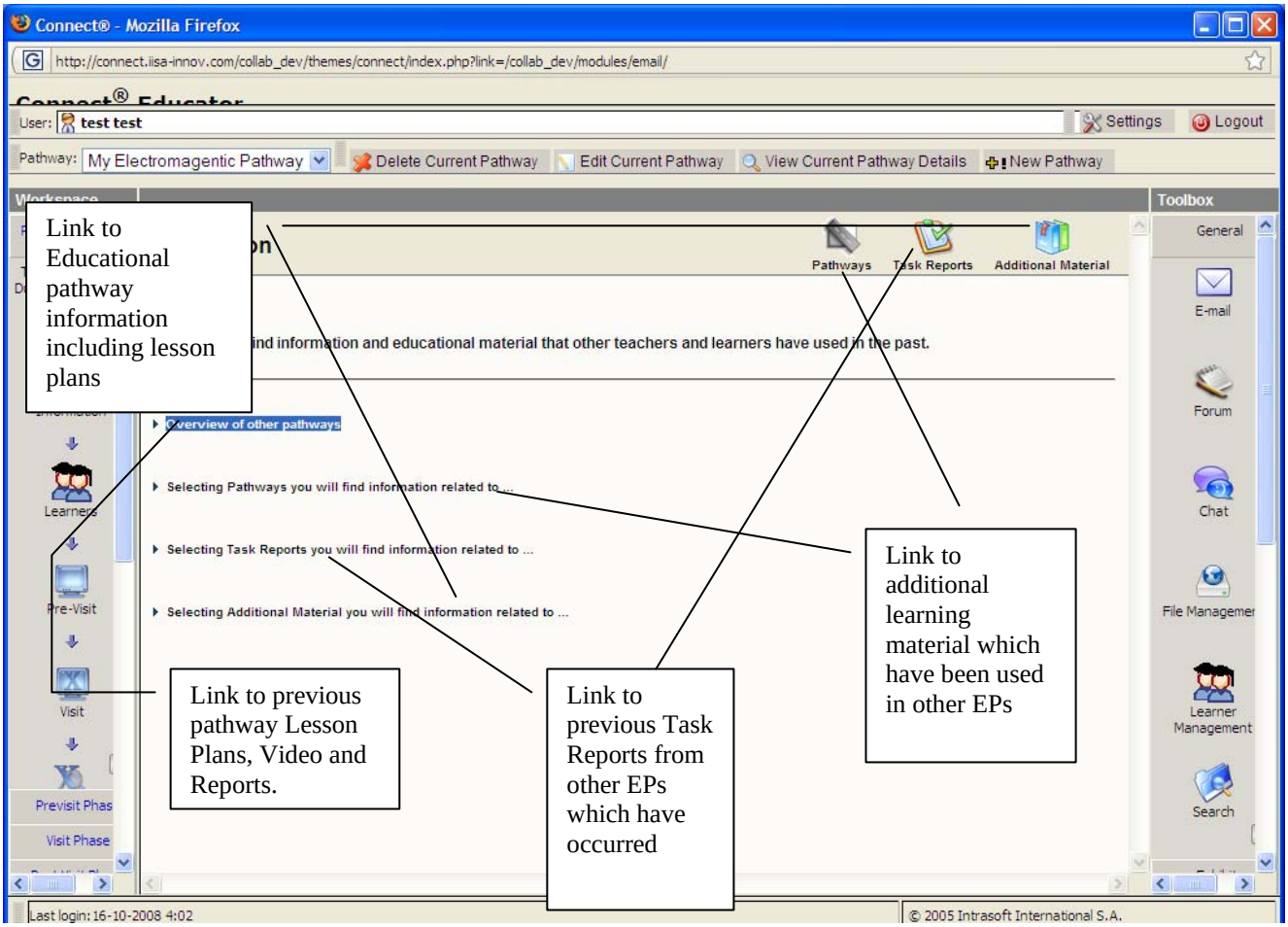

Figure 7: Screen for Preparatory Phase -> Info

During this stage of the Preparatory Phase, you are expected to research information regarding previous EPs, in order to develop a pathway fitting your students.

The figure below shows the CP display on previous pathway Lesson plans, videos from visits and educator reports.

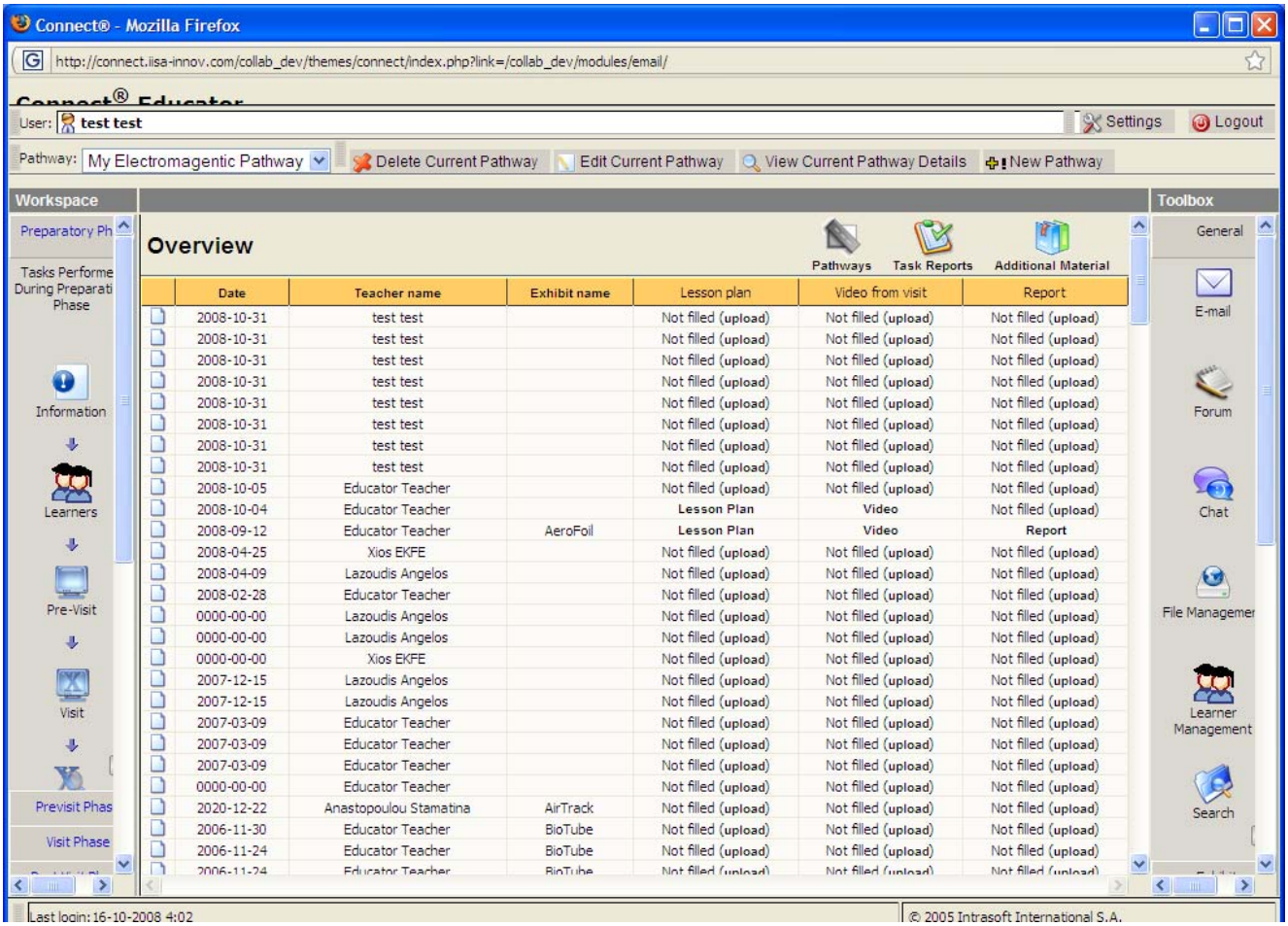

Figure 8: Overview of other pathways

These are documents uploaded by the educator on the CP. In the figure, many of these reports are missing because they were not requesting in the past. Moreover, they are not mandatory now. The educator is responsible to enter this information as the pathway proceeds. If a lesson plan, video or report has not been uploaded the entry on the table reports *Not Filed* and in parenthesis *upload*. Clicking on *upload* it will bring up the dialogue below which will ask you for the location of the lesson plan, its title and a description. In this case, you want to answer the questions "Is this the lesson plan" with a *yes* as shown below.

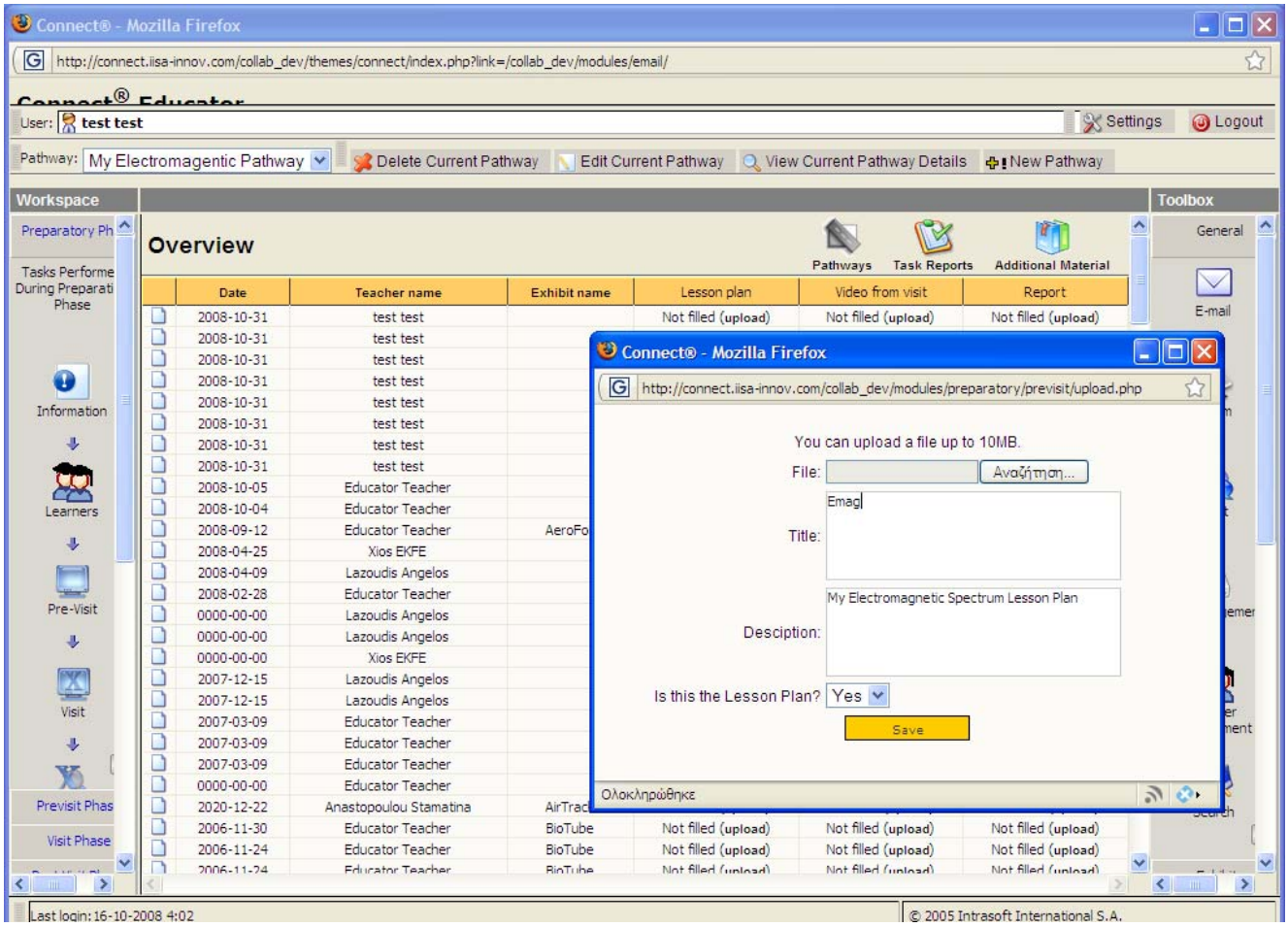

Figure 9: Uploading a lesson plan

2. Having researched Educational Pathway and evaluated its appropriateness for your own students, you will have to assign the students who will be participating in your EP. To do this click on the icon below the *Info* icon termed *Learners.*

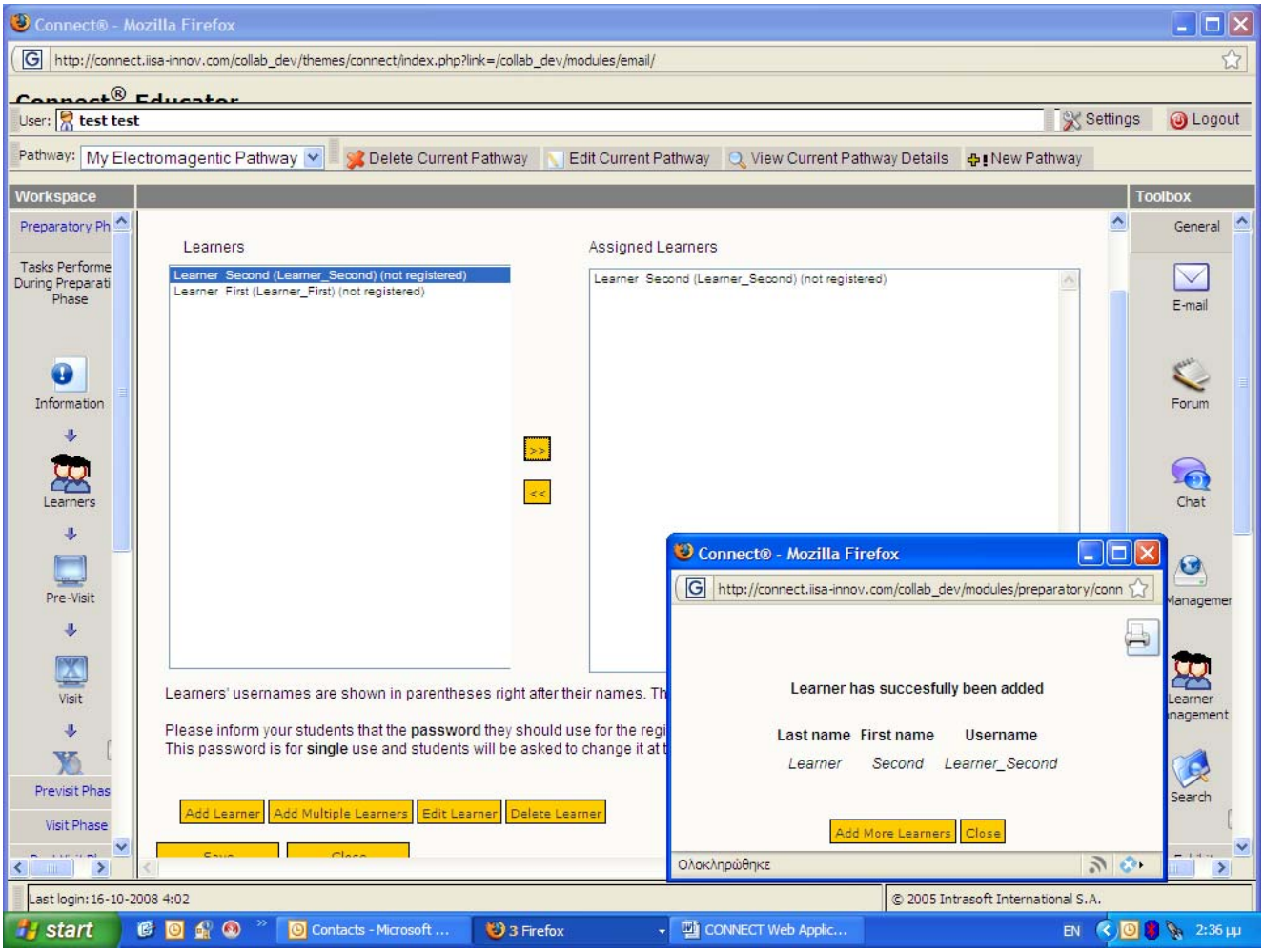

Figure 10: Screen for Preparatory Phase -> Learners

As you can see there are two lists of users the “Learners” and the “Assigned Learners”. The list of “Learners” contain all learners you have created accounts for into platform. You can select them and using the “>>” and “<<” buttons you can assign them to the current EP.

To add a new learner simply press the *Add* button. A dialogue will appear asking for the new learners first and last name (see figure 11).

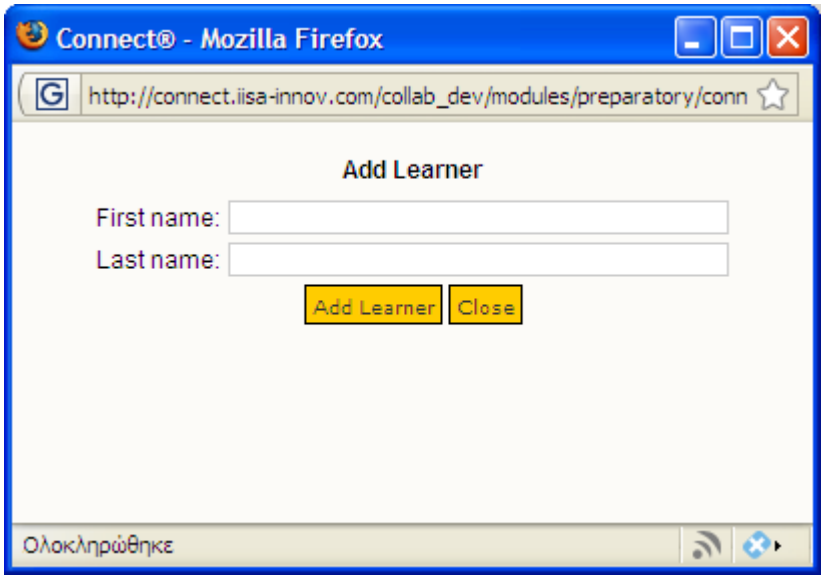

Figure 11: Preparatory Phase-. Users-> Add User

When you input their names press *Add Learner* to add the user or *Close* to cancel the process. In the event, you have a number of learners that you need to enter the system allows you to create them all at once by inputting in a text box comma separated pairs of last and first names.

You probably have noticed that some learners' names are followed by a "(not registered)" label. These learners have been inputted into the platform but since they have not attempted to enter the platform they have not registered and their accounts have not been activated.

In order to make any changes in the first or last name of a user you have just created, you only need to select their name form the "Learners" list and press the *Edit* button. An interface similar to the one in figure 11 will appear which will allow you to edit the user's names.

To delete a learner, select them from the learner's list box and press the *Delete* button. You will be prompted for conformation, press *OK* to delete and *Cancel* to cancel.

After, you have compiled the desired list of participants; press *Save* to save your selections.

3. Now, it is time to prepare the Pre-Visit phase. Click on the icon below the *Learners* icon called *Pre-Visit.* The figure below shows your current work area.

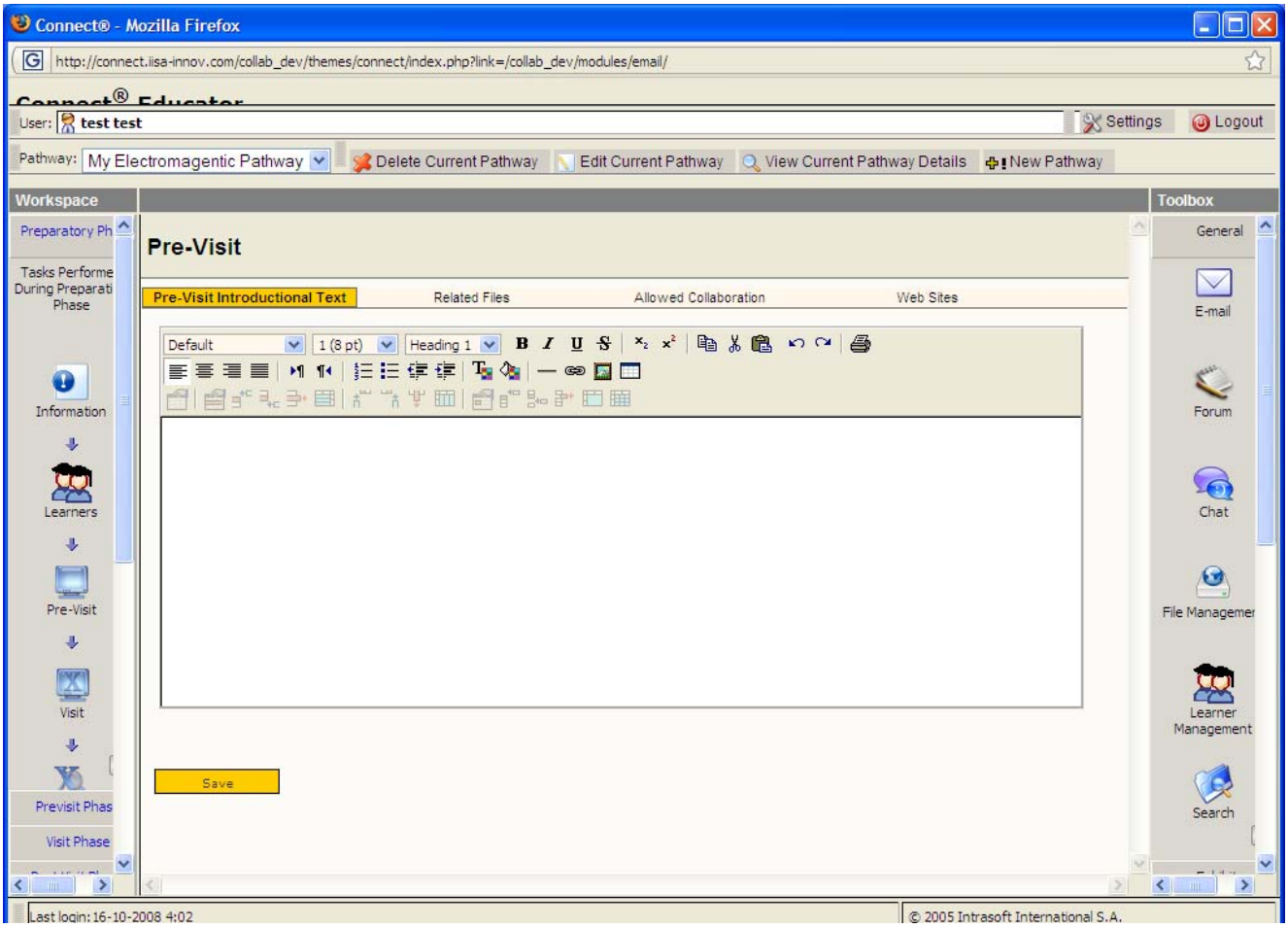

Figure 12: Screen for Preparatory Phase->Pre-Visit

There are four activities which you in the role of the educator can use to ready the Pre-Visit phase. From figure 12 it can be seen they are:

1. "*Pre-Visit Introductory Text*": Here, the platform makes available to you an editor where you enter and format text which will be presented to the learners assigned to the EP when the Pre-Visit phase is entered.

   You type in the message, you want them to see and save it pressing the *Save* button.

2. "Relat*ed Documents*": The educator can add documents or files they want their learners to see during this phase. In the figure below, you can see the work area for this option.

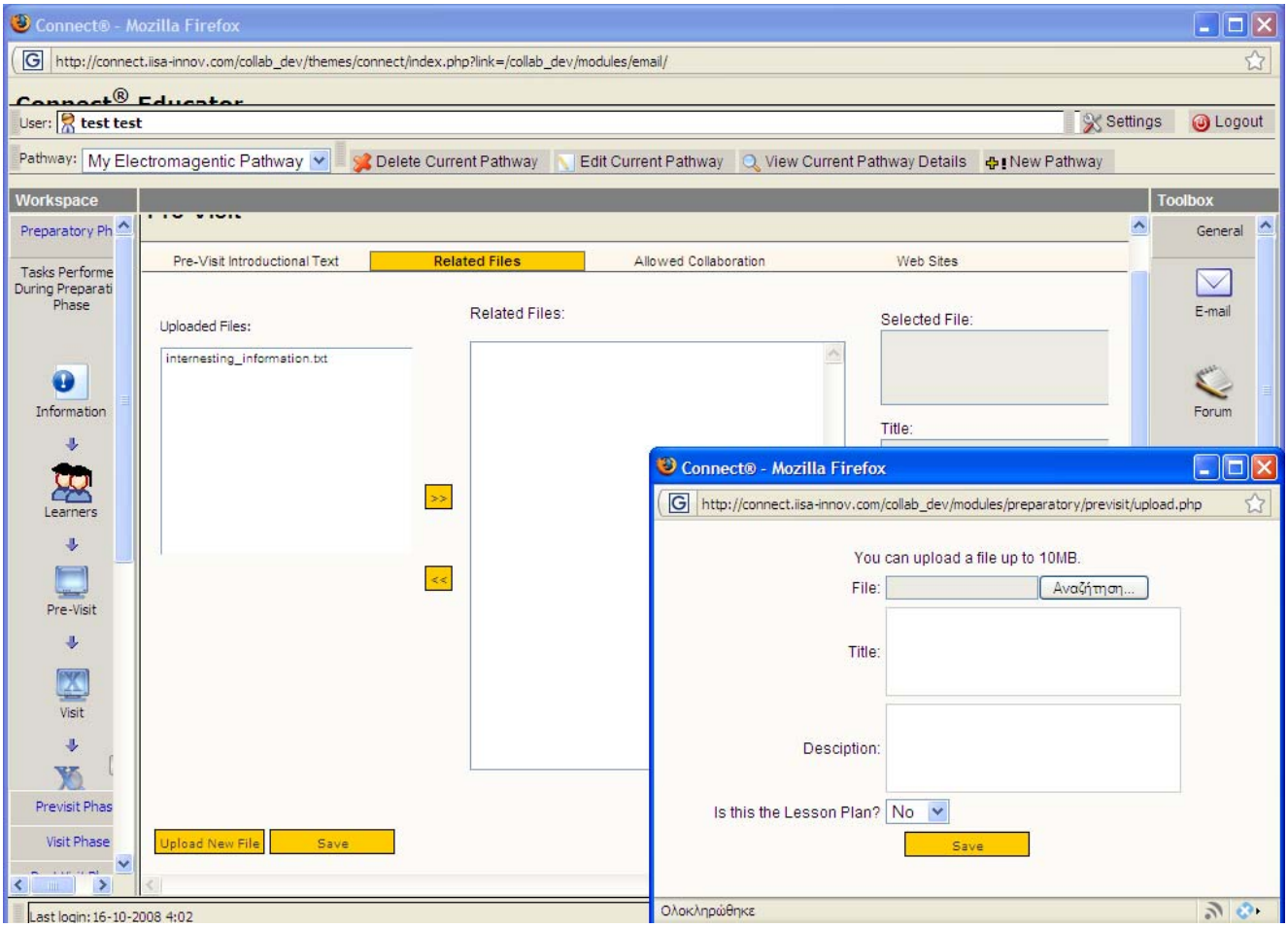

Figure 13: Preparatory->Pre-Visit-> Uploaded Documents

On the list box on the left, you can see the files uploaded on the CP and ready to be used. Selecting any of those files and using the ">>" and "<<" buttons will move them into the list box in the middle which shows the files selected to be shown to the learners during the Pre-Visit phase. Selecting a file in these list boxes will show you its name, title and description on the right.

If you want to include a file, which is not present in the list box in the left (show files available on the platform), pressing the *Upload New File* button. It will bring up a dialogue box allowing you to associate a title and a description with a new file and upload it on the platform.

In the dialogue which can be seen at the bottom right of Figure 13, it should be noted that in this case the answer to the question "Is this the Lesson Plan?" is "No". Selecting "yes" here will lead to storing the uploaded file as a lesson plan.

Once, you have selected all appropriate files for this phase, you can save your choices through the *Save* button at the end of the page.

3. "*Allowed Collaboration*": Provides a way for the educator to limit the learners' communication options as well as sources of information. The scope of these limitations is bound to the current phase. The available communication options are:
    a. Task
    b. Chat
    c. Forums
    d. E-mail to Student
    e. E-mail to Teacher
    f. E-mail to Expert

Check the options you would like to allow and press *Save*.

This is part of the platform is under construction.

4. "*Web Sites*": At this location, the educator can add links for his/her learners to visit. The links added here will be presented to the learners assigned to the current EP when the pathway enters this phase. Pressing the *Add Web Site* will bring up a dialogue that will allow you to enter the URL, its title and save it.

At this point, you completed all tasks necessary in order to prepare the Pre-Visit phase of an EP. To complete the preparation of the entire EP, you will have to conclude the preparation for the remaining phases. The activities and interfaces for following phases are the same with the above descriptions.

3.2.6 Pre-Visit Phase

The preparation for the pathway has been completed. You assigned the participating learners and have informed them of their user names and passwords. The learners take over. They start exchanging information, collaborating, researching, and learning always working towards producing their research plan. They will be uploading versions of those documents plus other content on the CP as they progress towards a final idea of what they will have to do in front of the exhibit wearing the mobile AR unit.

Upon entering the pre-visit phase, the reminder below appears:

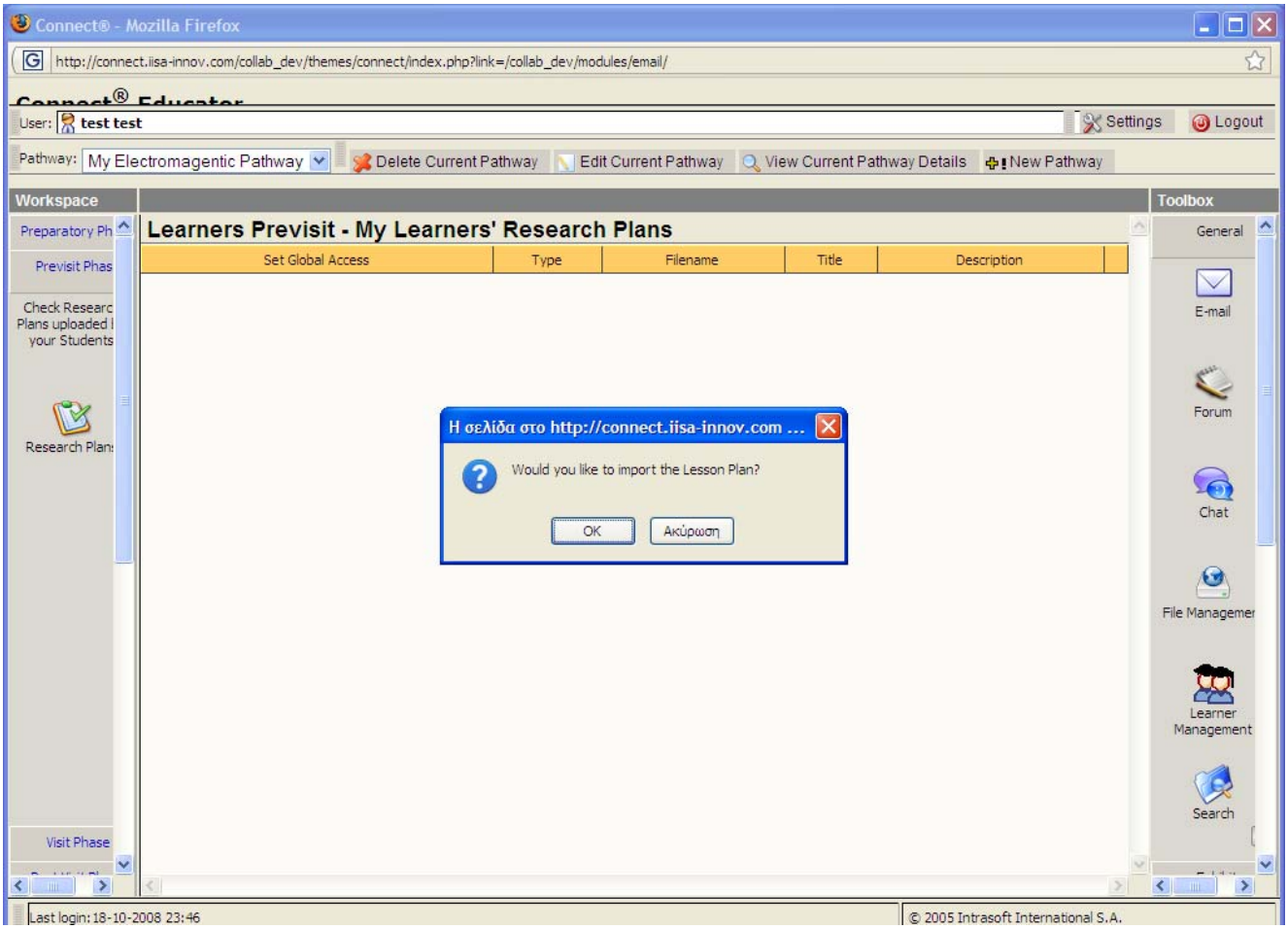

Figure 14: Entering Pre-visit Phase

This is to remind the educator that even though they are already entering the actual pre-visit phase they have upload their lesson plan. Clicking *OK* will lead to the upload dialogue. Cancelling will have no effect the educator can come back later and upload their lesson plan.

The platform makes the learner-uploaded files for the current pathway available to you, the educator. Navigate to the workspace tool bar *Pre-Visit->Research Plans*. The next figure shows the interface:

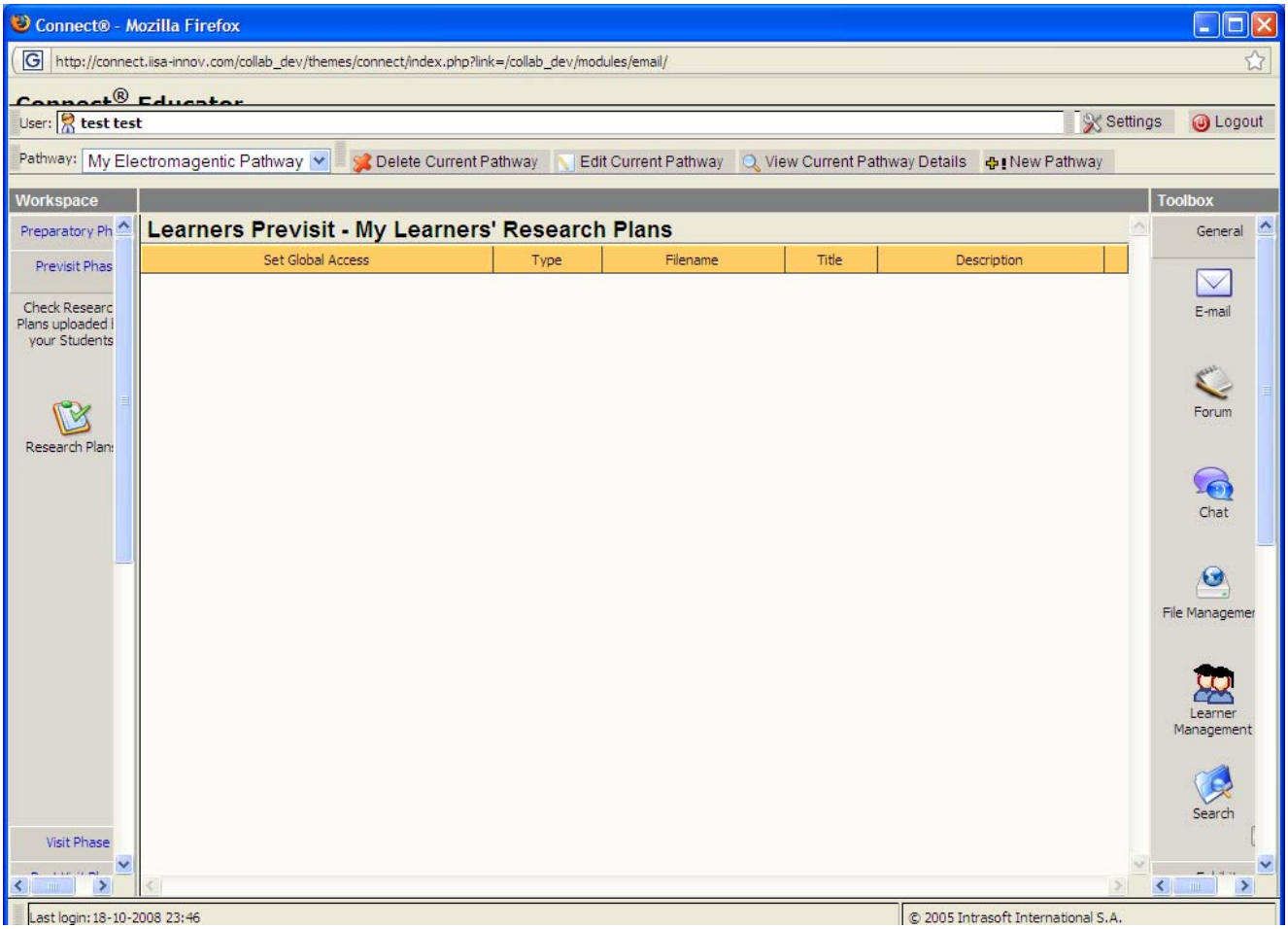

Figure 15: Pre-Visit Phase->Research Plans

All content listed for you in the work area with the following information about them:

1. Set Global Access: For each piece of content you have the right to make it available for viewing to the remaining platform users, if you so choose.
2. Type: It informs you what type of file is the one uploaded.
3. Filename: Displays the filename of the document.
4. Title: Shows the title entered for the file.
5. Description: Presents the description entered for the file.
6. The last column consists of arrows pointing downwards. Pressing on this arrow will initiate the download of the file to the computer you are working on.

The *save* button at the end of the page allows you to store the changes you may have affected on the "Set Global Access" column. In the figure above, students have not uploaded any research plans.

3.2.7 Visit Phase

The Pre-Visit was completed with the completion of Research Plans. It is time for the learners to visit the exhibit at the museum, wear the mobile AR unit and execute their plans. The pedagogical activities continue at the museum and off the platform. You, the educator, and the remaining classroom can follow the learners progress from the classroom as well as communicate with them.

At the workspace tool bar *Visit-> Monitor*, you can establish audio visual communication with learner wearing the mobile AR unit.

The audio-visual communication between the classroom and the mobile AR unit user is unidirectional.

3.2.8 Post-Visit Phase

The learner has returned from the museum visit. They experimented and collected data. It is time to author a Research Report (RR). The learners will upload image, videos, documents and other content in files of varying formats while trying to formulate their conclusions into the RR. The platform makes available these files plus the data collected during the museum visit to the educator.

Clicking on the *Post-Visit* button will bring up the following screen:

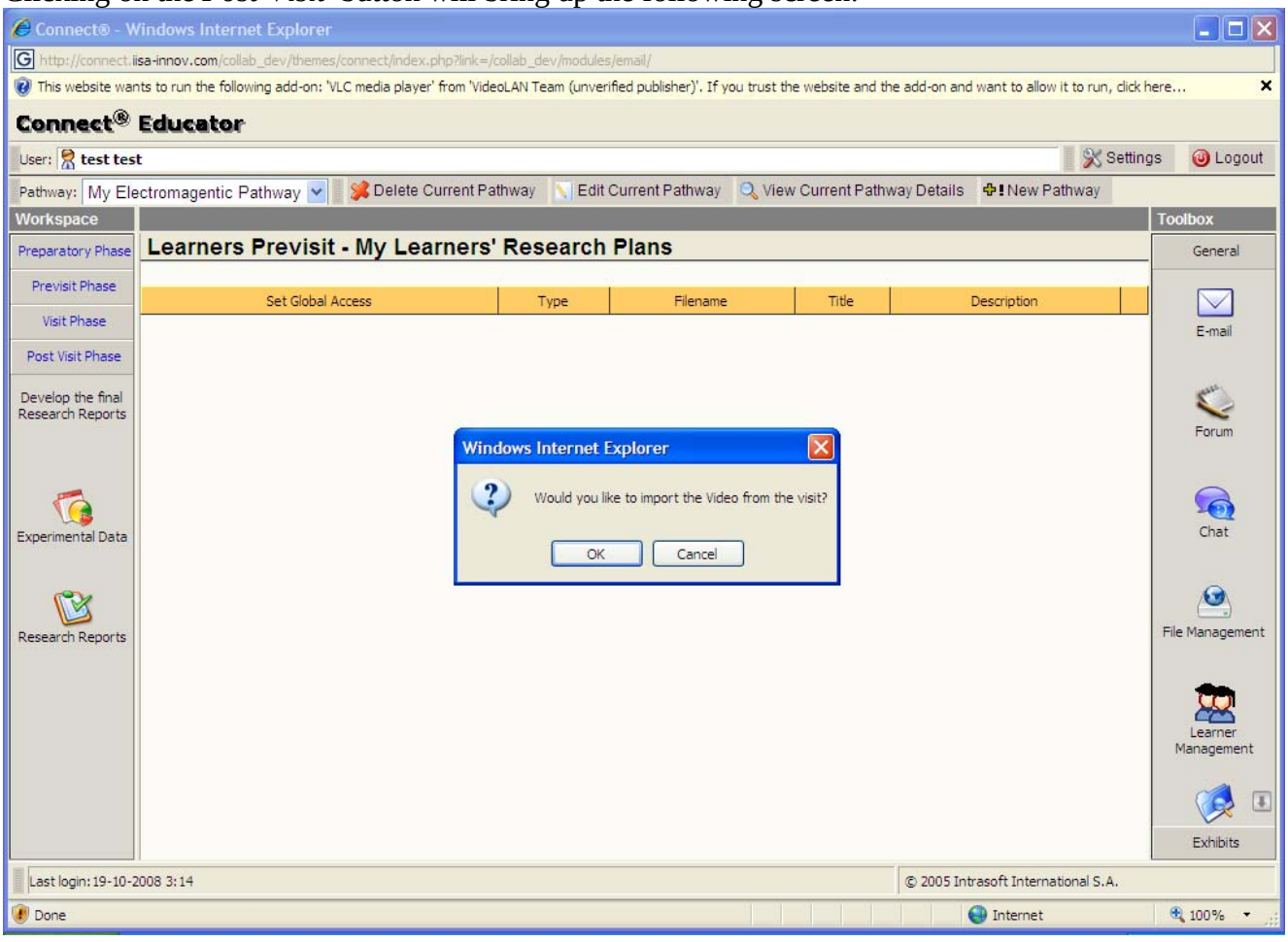

Figure 16: Post-visit Phase

In the workspace tool bar, pressing *Post-Visit-> Experimental Data* allows to bring in from the mobile AR unit the experimental data and video collected during the museum visit. They are made available to the learners who use them to create the research reports.

In the workspace tool bar, pressing *Post-Visit-> Research Reports* will present all the research reports students upload in this phase for the current EP. The interface is exactly the same as the one described in Figure 15 for the Pre-Visit phase content.

3.2.9 Toolbox

The Toolbox is a series of tools available for you to use at any point regardless of the stage any particular pathway is. They are pretty much standard in their features, thus descriptions will be restricted to places where specialized features exist.

The tools are organized in two groups within the Toolbox:

1. General:

   Overview: This is the overall list of lesson plans, video visits and reports from previous pathways.

   a. E-mail: The CP does not provide you with an e-mail system but rather with an interface to your existing mail. In order to set it up request assistance from your system administrator.
   b. Forum & Chat: These tools are self explanatory and their functionality is standard. Any moderately experienced Internet user will not have difficulty navigating their functionality.

   c. File management: The educator uploads a number of files containing content pertinent to the pathways they construct for their learners. All these files are accumulated and presented collectively under the *General->File Management*. The interface used to show the files they have loaded is shown below.

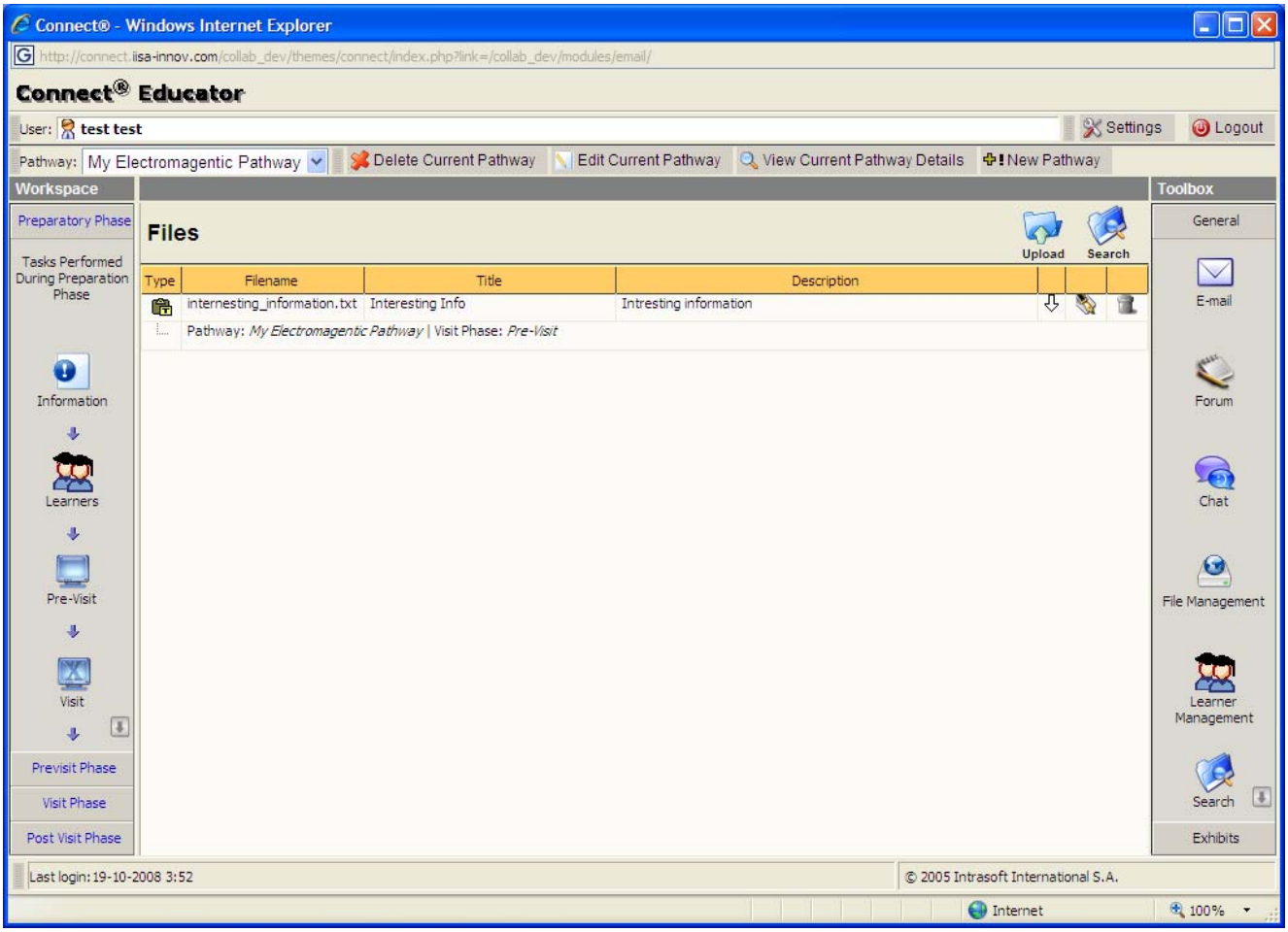

Figure 17: General->File Management

Each file is associated with the pathway it was uploaded for. Through here, new files can be uploaded and old files can be searched using keywords.

d. Learner management: The educator enters learners into the CP as part of the Preparatory Phase in order to assign them to EPs. All these learners can be managed from this option. Clicking on *Learner Management* will introduce the interface below:

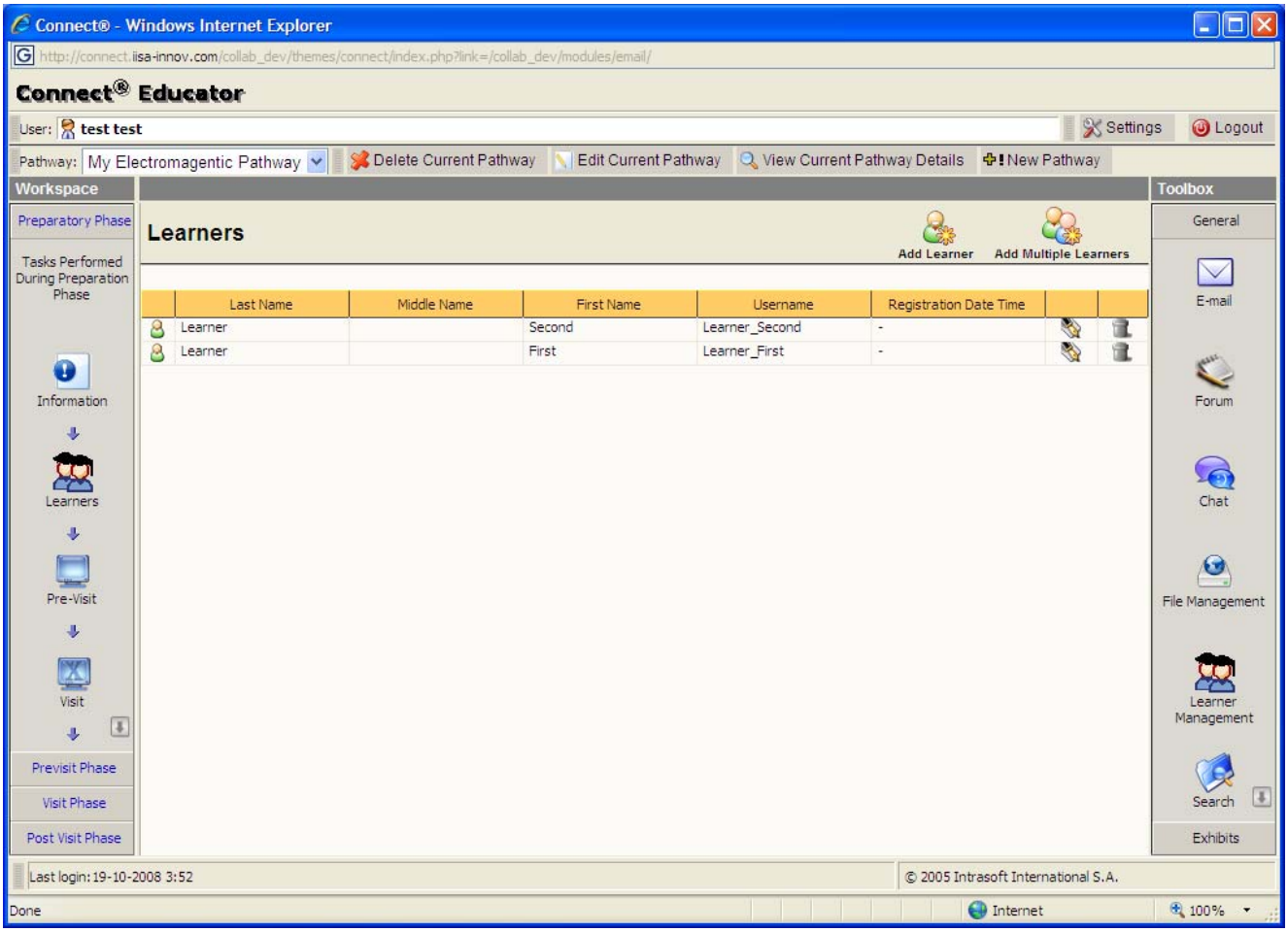

Figure 18: General->User Management

The information displayed here for each student does not differ much from the information shown in Figure 10. It is should be noted that here are displayed all the users entered over time. Therefore the system displays the pathway they are assigned to.

e. Search: Clicking on the *Search* icon introduces a simple keyword search tool. It is enough to enter a number of key words into the text box, optionally select how they are connected and where to search in then press the *Go* button. The system returns all documents containing the words you are searching by.

2. Exhibits: In this group currently, you have the option to only see a list of available exhibits. Thus, under the Toolbox clicking on *Exhibits->Exhibits* will present the following interface:

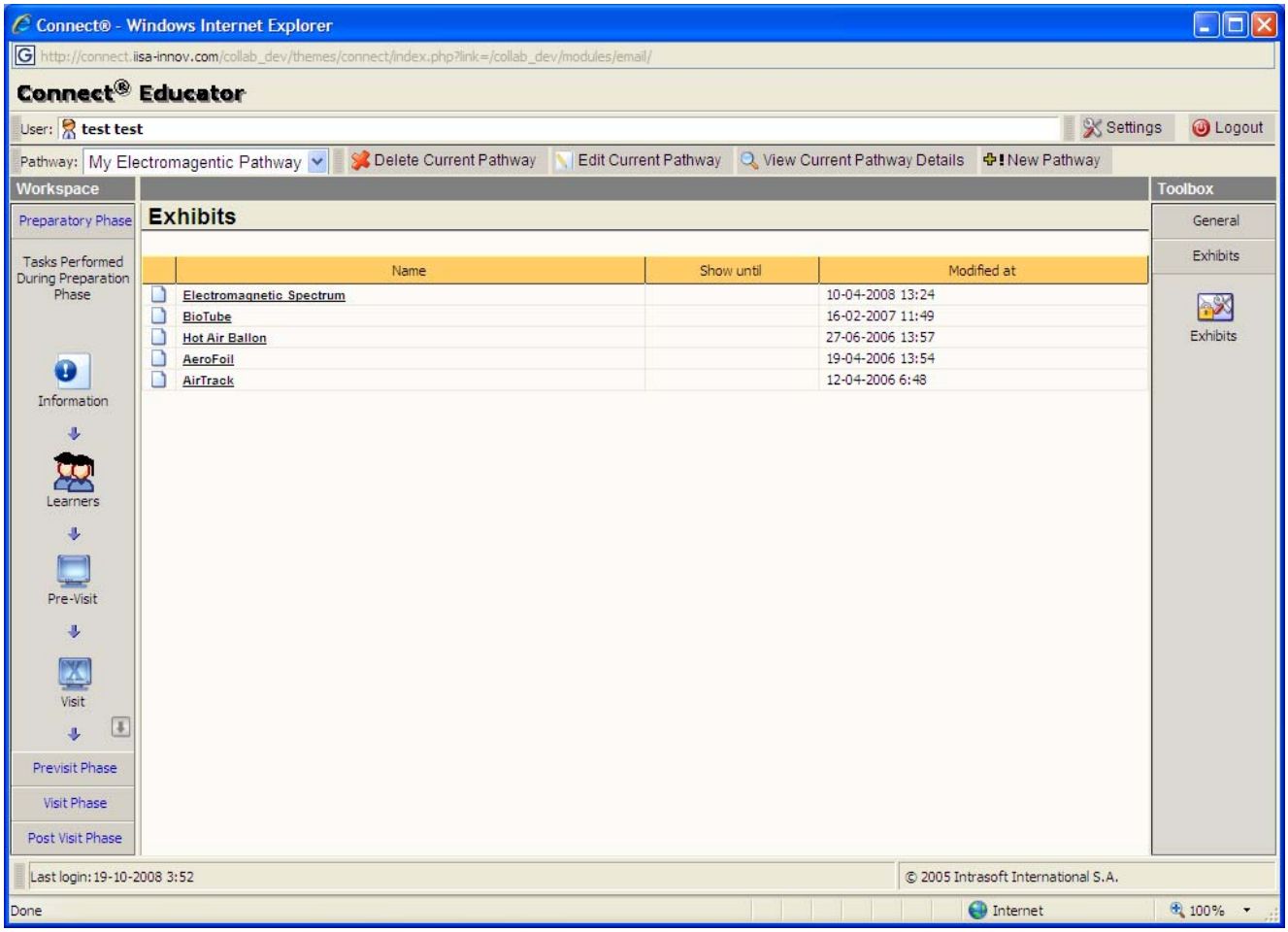

Figure 19: Toolbox Exhibits->Exhibits

Selecting of the exhibits will bring information regarding the exhibit.

CVD

User Manual

1 CVD Tutorial

This section will walk the user through the design of an augmented reality experience for a mobile AR unit wearer. After, the completion of this tutorial, the user will be able to utilize the Visual Designer to design such experiences.

We will start with a brief introduction to the organization of the activities necessary to create an augmented reality experience. It will include the explanation of concepts to aid understanding. Then, the steps of the procedure will be described along with clarifying notes, cautions and warnings.

1.1 How to design an augmented reality experience

1.1.1 Introduction

The EXPLOAR project implements an advanced learning environment. The learner visits a science museum, wears a mobile AR unit and experiences augmentations on museum exhibits. The pedagogical value of this experience is delivered from its personalised nature. The CVD focuses in allowing the educator to specify the interactions the learner can have with the augmented reality environment, effectively allowing the educator to configure the experience to the pedagogical needs of the learner.

The tool allows the designer to specify the interactions of the one wearing the mobile AR unit with the augmented reality environment. The CVD operator specifies a collection of rules, which specify what will happen when a learner performs one of a set of predefined actions. The learner's actions indicate to the system when to react. The reactions are presentations of multimedia content such as images, sound, video, text and 3-D objects.

The experience design is organized around **rules**. A **rule** consists of four parts:

1. **When**: it identifies a learner's direct or indirect action, which should be responded to. In other words, it identifies the time of appearance of an **object**.

   The definition of "when" is accomplished through **conditional statements**. For instance, "If the wing of the airfoil is between an angle 10 and 20 degrees". When, this statement is true then the object associated with it will appear in the mobile AR units view. When, the statement is false it will disappear.

   Multiple conditional statements can be connected together with logical operators to form **complex conditions**. Apart from the increasing complexity of the statement, it is no different for the conditional statements described above. The complex conditions is evaluated to true or false and the content is shown or not accordingly.

   Multiple **conditional statements** can be simultaneously true. For example, the wing angle on the airfoil can be within an angle range (first event) and the fan can be on or off (second event).

Possible conflicts are resolved in the following manner. Newer true **conditional statements** override older ones, even if they are still true.

2. **What**: it identifies what content should be presented to the mobile AR unit wearer. The general term used in this document for a piece of content is object. There are three types of content:
    a. **Simple Content**: Static images, audio, video, text and 3-D Shapes provided by Teachers during design time. They appear when a condition becomes true.
    b. **Phenomena Representation**: Dynamic 3-dimentional objects introduced into the CVD by the tool's administrators showing what is happening while the phenomena occur. The specification of conditions is not required for them to respond to actions performed on the exhibit. Teachers have no control over them. The Mobile AR Unit allows the Students to turn them ON/OFF during the visit.

At later versions, Teachers will have more control over these objects.

    c. **Variable Representation**: Objects representing the magnitude of physical quantities varying during the interaction with the exhibit. Variable representations can be arrows, cylinders or alphanumeric. They are already in the CVD but the teacher can modify their appearance.

3. **Where**: it specifies the location an **object** will appear as well as how it will be delivered to the learner. It is otherwise known as **delivery aim**. These locations are predefined and the user cannot add, delete or edit their position. There are two types of locations:
    a. **Placeholders**: Placeholders are projection areas, which the Mobile AR Unit materializes as virtual billboards or back wall projections. They hold **Simple Content** with the exception of 3-D Shapes.
    b. **Hotspots**: Hot spots are points in space which serve as origin for 3-D Shapes and Variable Representations.

4. **How**: **Objects** have properties, which affect their appearance. How refers to how content should be presented to the Student.

1.1.2 Goal

In the following sections, we will go through the procedure of how to design an augmented reality experience.

1.1.3 Pre-requisites

Before, we begin make sure your computer has Internet Explorer 6.0 installed and has access to the Internet. If your browser blocks pop-up windows, you will need to allow them when working with the CVD. Basic familiarity with computers and how to browse the Internet will be adequate for

completing this tutorial. However, it is strongly recommended you review the pedagogical reports accompanying this project and follow the recommendations therein.

1.1.4 Entering the CVD

If you are ready lets proceed:

4. Make sure you are connected to the Internet.
5. Open Internet explorer.

Remember to access the tool with IE 6.0 + and enable pop-ups.

6. Direct your browser to http://195.251.41.5/

The browser should load the following screen:

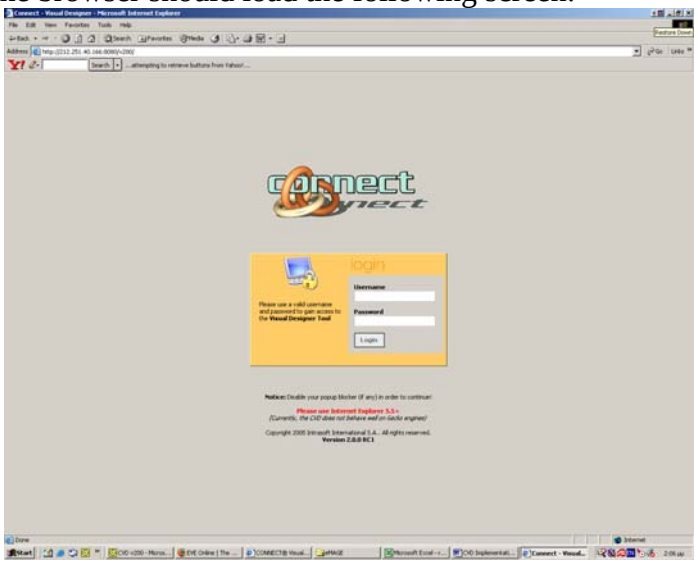

Figure 1: CVD log in interface.

A username and password will be provided to you upon request but for the purposes of this training exercise we will use a default account “test” and with the same password.

The Visual Designer’s Entry Page should appear:

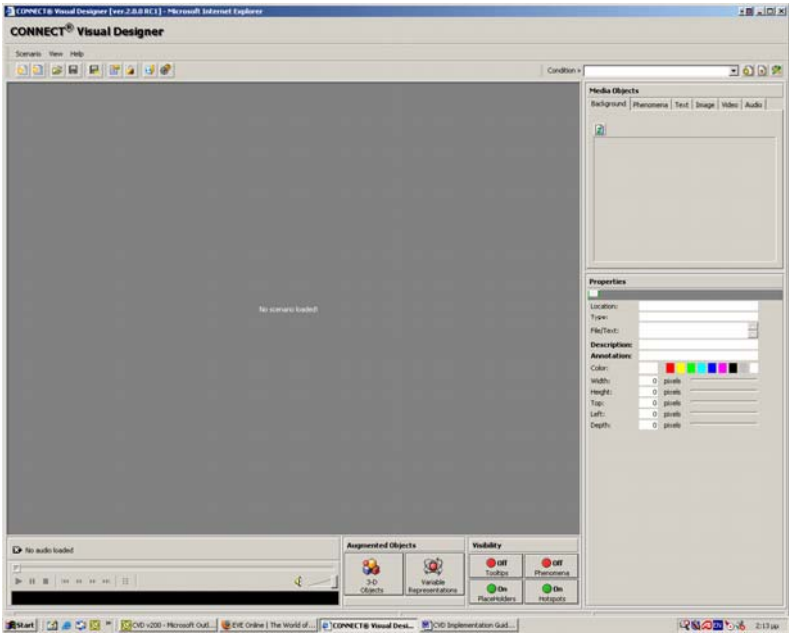

Figure 2: Entry page to the CVD

At this point, you have entered the tool. There is nothing loaded as of yet.

7. Next proceed to section 1.1.5 to create a new AR Scenario.

1.1.5 Create a New AR Scenario

When entering the CVD nothing is loaded into the tool. You can create a scenario from one of three different ways:

1. To create a new AR Scenario (Scenario -> New -> Templates). This is an empty Scenario, which can be used to create an AR experience for the student.

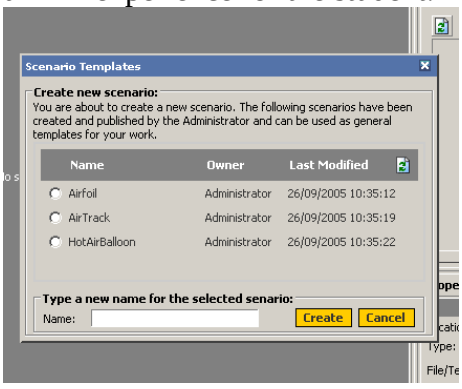

Figure 3: Create new scenario

Upon selecting this option the dialogue above will appear. In this dialogue, you can choose from the AR scenarios, which can be created for this museum. Then, you enter the name of your new AR Scenario and press *Create* to proceed with the design effort.

2. To open a Published AR Scenario (Scenario -> New -> Published). This is an AR Scenario previously created and made available to others for use. When opening a Published AR Scenario, you are taking a readymade AR Scenario which then you will modify and tailor to your needs.

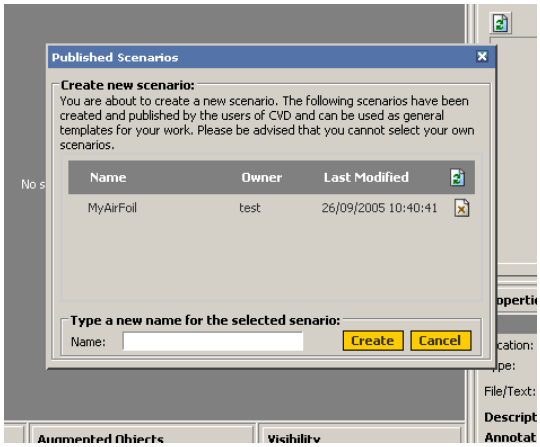

Figure 4: Open a Published scenario

Upon selecting this option the dialogue above will appear. In this dialogue, you can choose from the AR scenarios, which have been created published by another creator for this museum. You cannot choose from your own published AR Scenarios here. Your own published scenarios are available when opening your own AR Scenarios (see below). After, you select the scenario, you enter the name of your new AR Scenario and press *Create* to proceed with the design effort.

3. To open your own AR Scenario (Scenario -> Open). This is one of your own AR Scenarios, which was previously saved and you want to retrieve it in order to continue working on it.

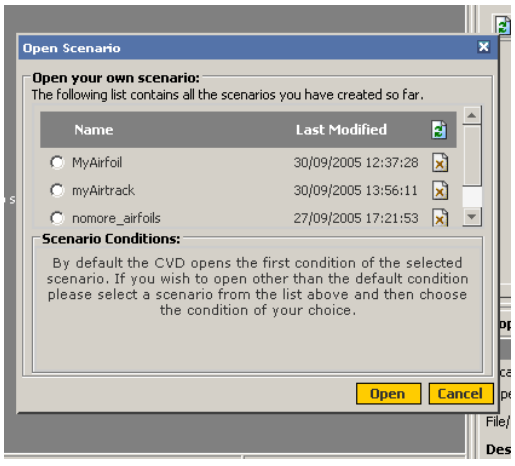

Figure 5: Open a saved AR Scenario

Upon selecting this option the dialogue above will appear. In this dialogue, you can choose from your own saved AR scenarios, even the ones you have published. After, you select the

scenario, select the specific condition in which you want to enter and then press *Open* to proceed with the design effort.

In all options, you are given the opportunity to abort the process of opening an AR Scenario by pressing the *Cancel* button. Moreover, failure to select an AR Scenario or entering a name will result in a warning, which will inform you of the lack of input and prohibit you from going further until all information is entered.

All options above follow the same design steps. For the sake of simplicity, we will create a new AR Scenario by choosing the first option.

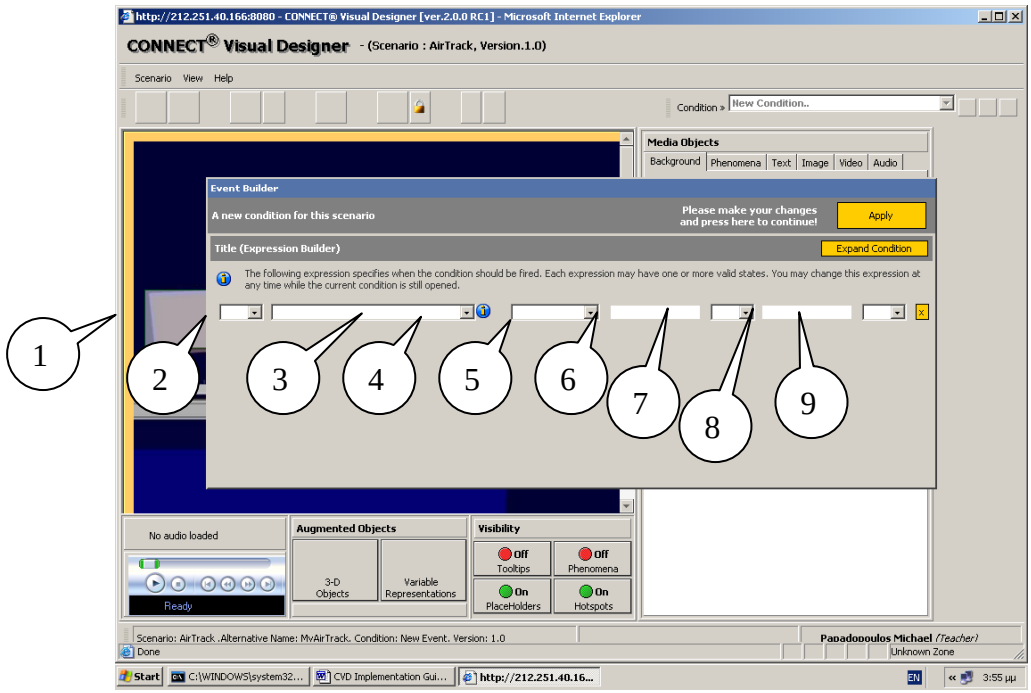

Figure 6: 1st Design Screen: Condition Builder. Elements are referenced by their position from left to right.

The above screen is the 1st screen, you will see when starting to create a new AR Scenario. At this point, before you can proceed any further you have to build a condition.

In the next section (1.1.6), we will start building conditions.

1.1.6 Building a Condition

A condition is a statement, which can be true or false. This is the **when** part of a rule as described in section 1.1.1. When, a condition is true the mobile AR unit will present to its user the AR content, you want them to experience. You build a condition in the dialogue box in figure 6. The dialogue box itself guides you in building the condition incrementally. The process is very similar to constructing the first part of a conditional statement in English. In more detail this is done in the following way:

1. Start form the 2nd cell in figure 6. This will allow you to select a variable on which to base your condition. In terms grammatical terms this is the subject and verb of the part of the conditional statement you construct. Choose “the item’s weight” from the drop down list.

2. Immediately the system pops up a message that informs you of the values the following boxes can take for the selected variable. Note that there is no explicit error checking at this point and therefore the system depends on you to follow this guideline. Click *OK* for the message to go away. Element number 3 in figure 6 will present you with this message again in the event you need.
3. In element number 4 select *"is"*
4. In element number 5 enter 1
5. In element number 6 select *"and"*
6. In element number 7 enter 2
7. Having constructed the statement, it is possible to choose its negation by selecting "*Not*" in element number 1. The content will be present to the mobile AR user when the statement is false.

Now you have completed the definition of a condition. You can string multiple conditions together, if you change the last drop down to *AND* or *OR* and then press "*Expand Condition*". This will add an additional row, which can be used to define another condition. The content is now going to presented to the wearer of the mobile AR unit when both statements are true in the event they are connected with an *AND* or when one of the statements are true in the event the two conditions are connected with an *OR*. To remove a statement, you just press the *X* button at the end of each condition. Finally, the condition is submitted when you press the *Apply* button. The system warns you that just because the condition was created it is not saved and that you will have to do manually by going to *Scenario -> Save Condition* or using the shortcut Ctrl-S.

The system will prohibit you for creating another condition or deleting the current one. When attempting either of the above, a message pops up informing you that you are in a new condition state and cannot proceed. You will only be able to edit the condition you have just entered until you save it. At which point attempting to create a new condition will be greeted by a confirmation request.

1.1.7 CVD Design Interface

Before, we proceed with the remainder of rule construction; we will explain how the tool interface is organized. To facilitate the discussion, an annotated image of the interface below is introduced.

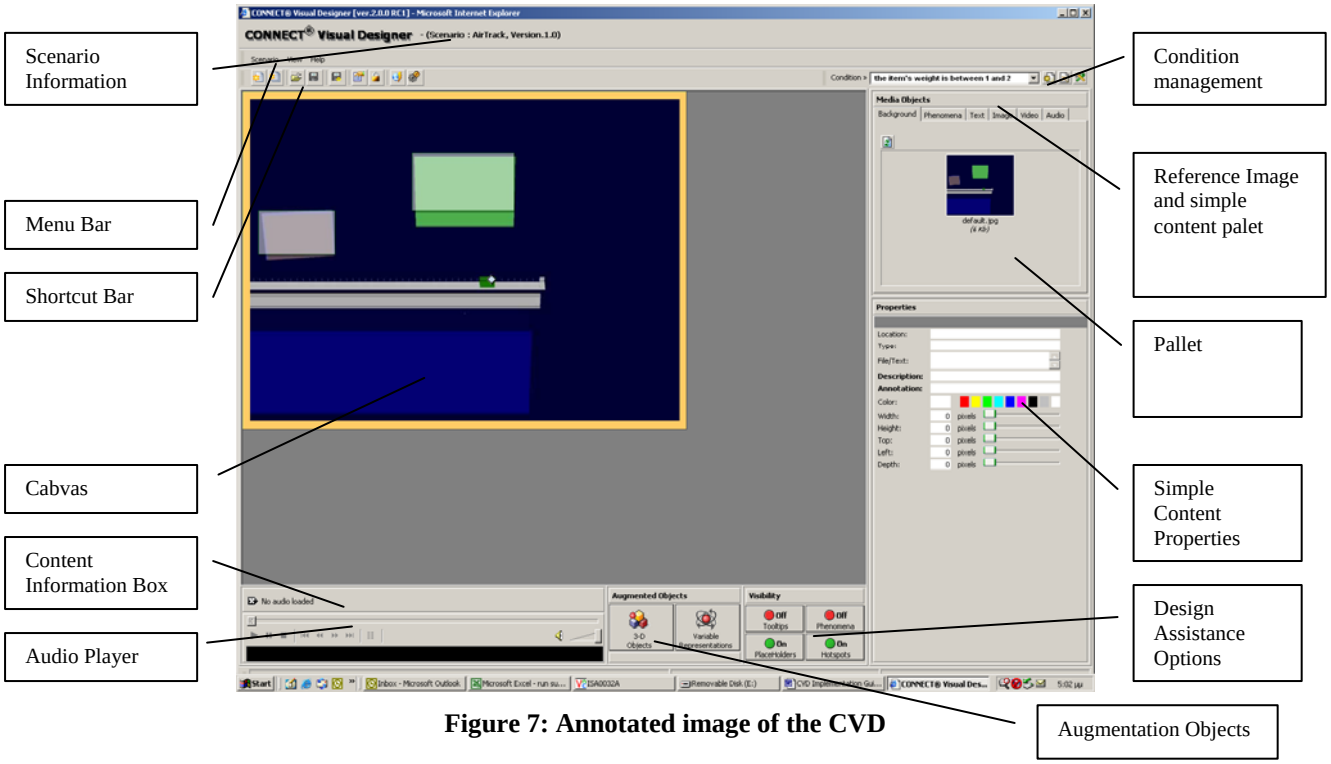

Figure 7: Annotated image of the CVD

The first step in constructing a rule is to build a condition. Conditions are central to the procedure because all information is organized and stored according to them. In the previous section (1.1.6), we showed you how to build a condition. On the top right of figure 7, there is a drop down box, which shows the current condition being worked on. From there, you can select which condition you want to work on. The buttons on the right of the drop down box allow creating, deleting and editing a condition respectively. Delete and edit are applied on the condition selected in the drop down box.

Reference Images accompany conditions. These are images that depict the exhibit as it would be, if the condition were true. Each condition has associated with it a default Reference Image. However, the user can change the Reference Image to an image they feel more appropriately reflects the condition they have formulated. To learn how to change the Reference Image for the condition you have defined read section 1.1.7.1.

Having built the condition, it is time to choose the content, which will appear during the event. The content is equivalent to the **what** while the placement of content is specifies to the **where** component of a **Rule** as explained in section 1.1.1. There are 3 types of content: *Simple Content*, *Variable Representations* and *Phenomena Representations*.

Phenomena Representations are included in all AR Scenarios by default. The mobile AR wears can make them appear or disappear from their view during visit time via a menu selection. The CVD provides a collection of design assistance tools to the educator. There the educator is able to view the phenomena representations applicable to the Reference Image used in order to have a better idea how to place other types of content. To find out how view phenomena representation and how to exploit other design assistance options read section 1.1.7.2.

Variable Representations show the magnitude of physical quantities relevant to the exhibit and the exhibit's education domain; hence they are specific to the exhibit. There are different types of Variable Representations available for each quantity. The educator can choose which representations to include in the AR experience. S/he also can affect the way they appear in the Mobile AR Unit's view. To find out how to specify a variable representation read section 1.1.7.3.

Simple Content is standard multimedia content. With the exception of 3-D Static objects, the educator uploads them into the tool. They create 3-D Static objects via the CVD interface. The process is very similar to the one described for Variable Representations. All Simple content objects have properties, which can be used to adjust their appearance during the AR experience. Objects, which have been widely used in scenarios for a particular exhibit, are loaded as default objects. The CVD operators cannot remove them but can use them to create AR experiences faster. To learn more about how to add content, please go to section 1.1.7.4.

At this point a rule has been create it. In order to add a new one, the educator needs to create a new condition as we have described above. Before creating a new condition you need to save or close the current on. This can be done via *Scenario-> Save Condition or Close Condition* respectively. It is imperative that the work performed underneath each condition is saved, in order to be able to retrieve it later on. Once all rules have been crafted, the AR Scenario is complete.

1.1.7.1 Changing Reference Images

In section 1.1.6, you specified a new condition. Now, you want to change its Reference Image. In other words, you want to change the background image in the canvas window. In order to accomplish this:

1. Navigate to the right side of the window in the Media Objects group.
2. Choose the background tab if it is not already chosen. See figure 8.
3. You see a pallet of available Reference Images. Press the redress button on the right of the pallet of images to make sure you have most recent collection.
4. View the images available and choose the one that best fits the condition you have described.
5. Drag and drop your choice on the canvas window. This will update the Reference Image to the one you chose.

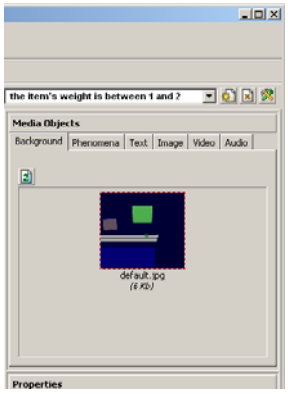

Figure 8 : Media Objects group

1.1.7.2 CVD Design Assistance

The CVD provides you with four functions, which aim at delivering a better sense of the environment the AR Scenario, will be experienced in. These four functions are placed together under the group *Visibility* at the bottom of the CVD as shown in figure 9.

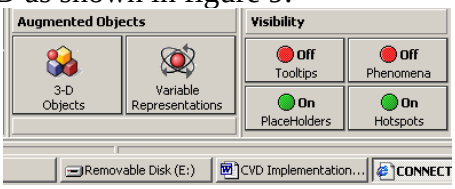

Figure 9: Augmented Objects and Visibility group

In the four buttons in the *Visibility* group are:

1. *Tooltips*: You activate or deactivate tool tips for the objects in the canvas window.
2. *Phenomena*: You can remove and replace on the canvas all available phenomena representations. The image showing the Phenomena Representations can be chosen from the Media Objects group from the tab called phenomena by dragging and dropping the image on the canvas window. A default is always associated with the Reference Image used.
3. *Hotspots*: You can remove and replace on the canvas all hotspots. The content associated with hotspots remains on the canvas.
4. *Placeholders*: You can remove and replace on the canvas all placeholders even if they are populated.

The above buttons when active they are green and red when they are deactivated.

1.1.7.3 Selection and Placement of Variable Representations

To add a Variable Representation to an AR experience, you need to:

1. Navigate to the Canvas window and locate a suitable hot spot. They are blinking rhombuses. Single click on the desired rhombus selecting it as the locations on which the object will be placed. A red dashed square will appear around it.
2. Then, navigate to the bottom of the CVD at the Augmented Objects group (see figure 10). The two (2) buttons allow access to 3-D static objects and Variable Representations. Clicking on the *Variable Representations* button.

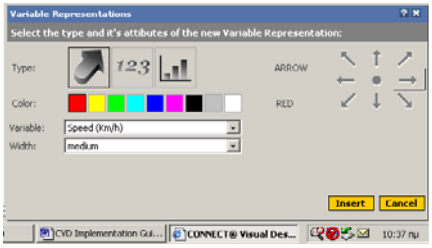

Figure 10: Variable Representations Dialogue

3. The above dialogue appears. Here, you can specify the propertied of the variable representation. As soon as, you click *Insert*, the variable representation will appear in the canvas window at the hotspot selected.
4. The properties which can be modified are:
    a. Type: There are three type of Variable Representations:

i. Vectors: They are arrow whose direction you can choose. Their length varies with the value of the variable they are associated with.
ii. Alphanumeric: This is a label whose direction is always horizontal. The numbers change according to value of the variable they are associated with.
iii. Diagrammatic: They are plots of pairs of variables changing together. They have one orientation as well.

b. Colour: You can choose the colour the Vectors, Alphanumeric and lines in diagrams will appear
c. Variable: You can choose with which variable each representation will be associated.
d. Width: Finally, you can choose the width of the representation.

3-D Shapes are simple content but utilize a similar specification methodology to Variable representations. Hence, we do not provide another design description. Instead, we point out their major difference. 3-D Shapes are static versus Variable Represent, which are dynamic. Therefore, 3-D Shapes are not associated with any variables and their height is strictly specified.

1.1.7.4 Selection and Placement Simple Content

You can add simple content such as text, images and video. The steps below are targeted for images but they are the same for text and video:

1. First select the placeholder the image should appear during the AR experience.
2. Navigate to the *Media Objects* group.
3. Clicking on any of the tabs images. You will see the images (or videos) available on the system for your use in the pallet as shown in the figure below:

Figure 11: Media Objects group, Images Tab, available images pallet

4. If the existing images are insufficient for your design goals, you can add an image by clicking on the first button from the left. In the dialog, which will follow use the browse button to find the image and press the Upload, button to make the image available.
5. A message will inform you that the image was uploaded successfully.
6. The right most button above the pallet is the refresh button. Click on it if you do not see the file you uploaded.
7. Finally, you can remove it from the system if you so decide by selecting the image and clicking the remove button above the pallet. The remove button is the second button from the left.
8. Dragging and dropping an image on to a placeholder will place the content on the canvas.

9. To remove content from a placeholder it is enough to select the placeholder and click on the *X* button that appears in it. A confirmation message will appear where you can cancel or confirm the action.

Images and text can be previewed directly in the placeholder they are placed in. Furthermore, double-clicking on the icon, which appears in the placeholder, can be used to preview videos. A video player will appear in anew window which will show the video.

Audio is handled differently because there can be only one audio file that can be associated with every condition. The audio player is set on the lower left corner of the CVD as shown in the figure below:

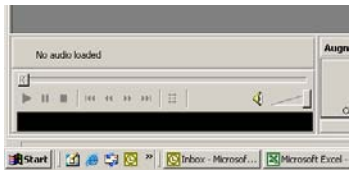

Figure 12: Audio player

It can be removed by clicking on the *X* button above the audio player or replaced by dragging and dropping a new audio file from the pallet.

For each type of content, you can adjust its properties and thus affect its appearance. As show in figure 13, the properties that cannot be changed are greyed out while the remaining properties are variable. The most interesting of all is Depth because it gives access to the Z component, which is not accessible in the 2D environment of a browser. Increasing the depth value it brings the component closer to the user and decreasing it takes it further away.

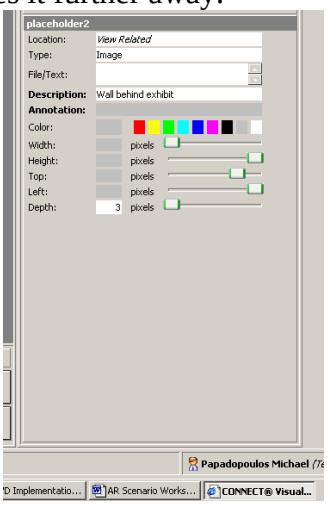

Figure 13 : Properties dialogue Save Project

Now, all the rules the educator wanted to establish have been defined. It is time to save the AR Scenario. To do this, navigate to *Scenario->Save As.* The system will request for a name. Clicking on *Save* will save the AR Scenario.

1.1.8 Publishing an AR Scenario and setting its Properties

An AR Scenario is published thought the *Publish* button in the *Scenario* menu. Before publishing the CVD will give the educator the option to describe the AR Scenario by answering a number of questions in the form or properties. These properties allow other educators to identify a published AR Scenarios, which may be useful to them. These properties are accessible from *Scenario->Properties* as well.