REUSABLE LEARNING

DESIGNING AND MANAGING FOR REUSE

The NSDL Reusable Learning Project

(nsdl@reusablelearning.org)

Presented on 26 July, 2006 to the MERLOT International Conference

ABOUT THIS PRESENTATION

TITLE:	*Designing and Managing for Reuse*
AUTHOR:	*Robby Robson*
CREATED:	*22 July, 2005*
LAST MODIFIED:	*24 July, 2005*
PRESENTED:	*26 July, 2005 (MERLOT International Conference, Nashville, TN, USA.)*
LOCATION:	*www.resuablelearning.org/workshops*
RIGHTS:	*http://creativecommons.org/licenses/by-nc-nd/2.0/*
COPYRIGHT:	*The NSDL Reusable Learning project (nsdl@reusablelearning.org)*
DESCRIPTION:	*Presents and illustrates guidelines and techniques for recognizing, evaluating and improving the reusability of digital learning resources. Discusses features that digital libraries and portals can incorporate to support reuse.*
FORMAT:	*PowerPoint (2003) with live.*
LEVEL:	*College, Graduate, Adult*
AUDIENCE:	*Authors and designers of digital educational resources; Designers and curators of educational digital libraries.*

About the Reusable Learning Project

- Goal: *Increase the value and impact of the NSDL by increasing the reusability of its content*
- Deliverables
  - Workshops ✓
  - Web site (www.reusablelearning.org) ✓
  - Reusability Guidelines ✓ (www.reusablelearning.org/guidelines)
  - Suggested policies for collections ✓
  - Impact through implementation ✓
  - Examples and best practices ✓
  - Learning content and opportunities ✓

Topics

1. Perspectives on Reusability
2. Reusability guidelines
3. **Metadata Guidelines**
4. **Rights Guidelines**
5. **Reusable Design**
   - **Context and Pedagogy**
   - **Structure and Presentation**
6. **Interoperability**
7. Resources
8. Discussion

PERSPECTIVES ON REUSE

Who are Reusers?
What are their requirements?

Definition of REUSE

USING OR MODIFYING A RESOURCE FOR USE IN A NEW CONTEXT OR SETTING

Some reusers **adopt** *resources, i.e. use them "as is".*

Others **adapt** *resources, i.e. alter them for new uses.*

Reusers

- Authors
  - Repurpose and integrate content into their own work
- Instructors
  - Reuse content for teaching
  - Assemble content from multiple sources
- Students
  - Access content for learning
- Collections (Digital Libraries)
  - *Support reuse*
  - *Support reusers*

Four Questions

Can I find it?

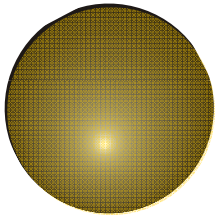
Is it useful?

May I use it?

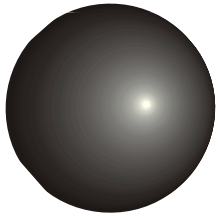
Will it work?

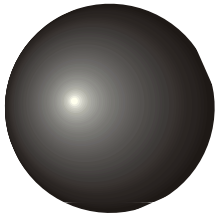
Can I Find It?

Metadata

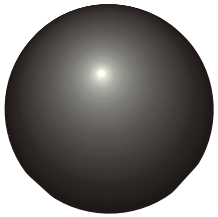


Is it useful?





May I use it?



Will it work?

May I Use It?

Can I find it?

Is it useful?

Rights

Will it work?

Will it Work?

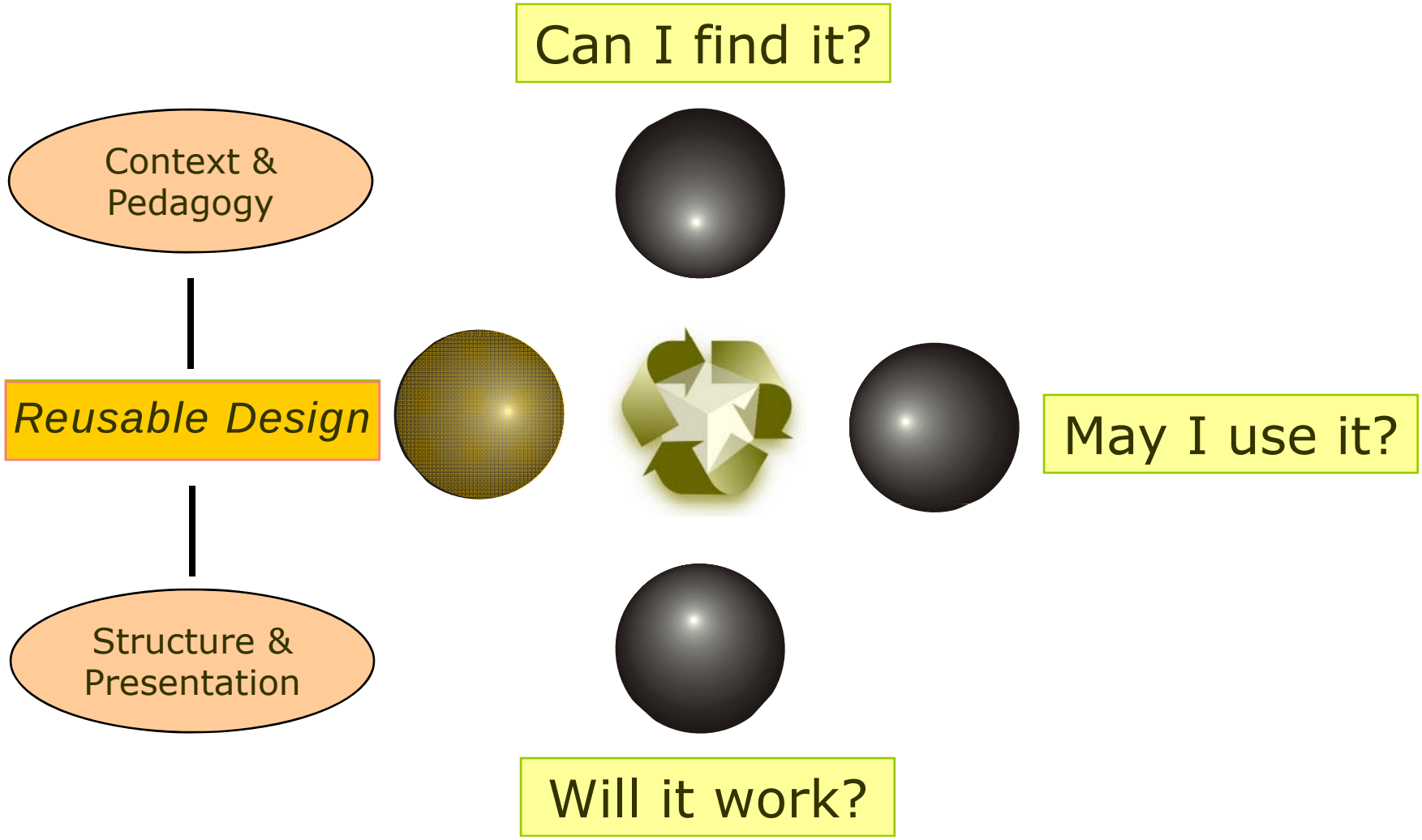
Can I find it?

Is it useful?

May I use it?

Interoperability

Is it Useful?



REUSABLE LEARNING

REUSABLE DESIGN GUIDELINES

TITLE
DESCRIPTION
EXPLANATION
PRIORITY
TECHNIQUES

Guidelines

- **For authors (developers, etc.)**

  Maximize reusability *by*

  - Informing authoring & design processes
  - Defining requirements for tools

- **For collections, digital libraries and librarians**

  Support reuse *by*

  - Informing policies and practices
  - Suggesting requirements for interfaces
  - Providing information for contributors

Structure of Guidelines

- **Patterned after Web Accessibility guidelines** (www.w3.org/TR/WCAG10/)

- **Guidelines:**
  - Statement of the Guideline
  - Guideline Explanation

- **Techniques:** How to apply the guideline

- **Priorities:**
  - **Priority 1**: Must be followed to ensure reusability. (P1)
  - **Priority 2**: Should be followed to increase reusability. (P2)
  - **Priority 3**: May be followed to enhance reusability. (P3)

Accessing the Guidelines

Full set of guidelines

www.reusablelearning.org/guidelines/ (Guidelines page)

www.reusablelearning.org/guidelines/guidelines.pdf (Latest version)

One page guidelines checklist

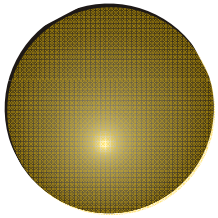
www.reusablelearning.org/guidelines/checklist.pdf (TBD)

METADATA

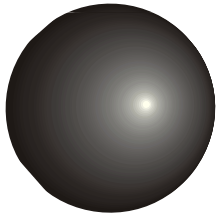
DESCRIPTIVE
CONTEXTUAL
TECHNICAL
RIGHTS
USAGE

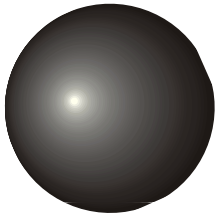
Can I Find It?

Metadata

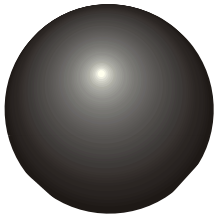


Is it useful?





May I use it?



Will it work?

Types of Metadata

- **Basic descriptive information** (Bibliographic Metadata)
  - Enables resources to be found.
  - Includes: title, author, description, identifier and keywords
- **Contextual information**
  - Helps find resources that present the right content in the right way
  - Includes grade level and intended audience
- **Technical information**
  - Enables resources to be used (technologically)
  - Includes format, platform requirements and software requirements
- **Rights information**
  - Enables resources to be used (legally)
  - Includes copyright information & terms of use
- **Usage information**
  - Enables resource to be used (practically)
  - Includes documentation and instructor / student / user guides

Metadata - Guidelines

Provide rich, searchable metadata for resources.

Explanation: Helps the resource to be cataloged, found and used.

GUIDELINES:

1.1 – Adopt a consistent means for expressing and exchanging metadata (P1) [Use a standard]
1.2 – Provide basic descriptive Information (P1)
1.3 – Provide basic contextual Information (P1)
1.4 – Provide basic technical Information (P2)
1.5 – Provide basic usage Information (P3)

Context is often missing in full text searches

EXAMPLE: Content Before ...

11th Grade Problem Solving

MR. MURPHY'S GARDEN OF MATHEMATICAL DELIGHTS

Hello!

This site contains some problems for Mr. Murphy's 11th Grade Math Class. None of the problems require using a paper or pencil or a calculator to solve - at least not if you look at them in the right way. The problems are listed on the next few pages. These are followed by some interactive applets that let you explore the problems. Hints and explanations come next and, just for jollies, there is a quiz at the end.

Examples available from www.reusablelearning.org/examples

Quit

And After …

WELCOME TO MR. MURPHY'S GARDEN OF MATHEMATICAL DELIGHTS

This site contains mathematics problems meant to delight and challenge students and enthusiasts. None of the problems require using a paper or pencil or a calculator to solve - at least not if you look at them in the right way. Each problem includes a problem statement followed by a solution and explanation.

There is also a quiz that is related to the themes of the problem.

Problems

1. High Jumping on the Moon
2. Tiling a Chessboard
3. The Monty Hall problem
4. Belt around the Earth

Interested in using these problems in your course? See instructions for downloading and modifying this site.

About this site (information about the author, purpose, educational objectives, technical requirements, etc.)

EXIT

SOME RIGHTS RESERVED This work is licensed under a Creative Commons License. Metadata

Usage Information

Contextual & Technical Information

Rights Information

Machine Readable Metadata

MACHINE READABLE METADATA


```
  <!--  METADATA FOR Mr. Murphy's Garden of Mathematical Delights  -->
  <!--  LOM record generated by Trivantis Lectora as part of the authoring process  -->
- <metadata>
    <schema>ADL SCORM</schema>
    <schemaversion>1.2</schemaversion>
  - <lom xmlns="http://www.imsglobal.org/xsd/imsmd_rootv1p2p1">
    - <general>
      - <title>
          <langstring>Mr.Murphy's Garden of Mathematical Delights</langstring>
        </title>
        <language>EN-USA</language>
      - <description>
          <langstring>Course generated to illustrate reusable design principles</langstring>
        </description>
      - <structure>
        - <source>
            <langstring xml:lang="x-none">LOMv1.0</langstring>
          </source>
        - <value>
            <langstring xml:lang="x-none">Hierarchical</langstring>
          </value>
        </structure>
      - <aggregationlevel>
        - <source>
            <langstring xml:lang="x-none">LOMv1.0</langstring>
          </source>
        - <value>
            <langstring xml:lang="x-none">3</langstring>
          </value>
        </aggregationlevel>
      </general>
    - <lifecycle>
      - <version>
          <langstring>1.0</langstring>
        </version>
```


Descriptive Metadata

Resource with Links to Usage Metadata

http://www.ship.edu/~deensl/mathdl/Joseph.html

The Josephus Problem: Background

In Herstein and Kaplansky's wonderful book *Matters Mathematical* (Chelsea Publishing, 1978), the following legend about the famous first-century historian Flavius Josephus is recounted:

n =

k =

Start Clear All

Set the parameters and press **Start** to see the elimination order when you start with ***n*** people and eliminate every k^{th} one.

Background Information Student Activities Instructor's Guide

Screenshot from April 15, 2005.
Copyright Doug Ensley. Available through MathDL.

Collection Examples

- ENCDL - www.encdl.org
- MERLOT - www.merlot.org
- DLESE - www.dlese.org/dds/index.jsp

Screenshot from April 15, 2005

enc.dl.org

Hold down the Ctrl key while clicking to select more than one value from a select list.

All of the Words in the Abstract
And
All of the Words in the Title/Series
And
All of the Words in the Subject

Search Catalog:
- Learning Matrix Digital Library
- Gender and Science Digital Library
- Innovation Curriculum Online Network
- FEDRL
- ENC

Grade Level: pre-K, Kindergarten, 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, 15, 16

Learner Level: Primary elementary, Intermediate elementary, Middle school, High school

Learning Time: only applies to small # of resources — No time limit, < 15 minutes, 15-30 minutes, 30-60 minutes

Interactivity Level: Very low, Low, Medium, High, Very high

Resource Type: -All Resource Types-, Professional development, -Classroom issues, -Education periodicals

Format: -Any Format-, Application/ms-excel, Application/mspowerpoint, Application/msword

Duration (for audio/video): only applies to small # of resources — No time limit, < 15 minutes, 15-30 minutes, 30-60 minutes

URL:

Cost for use: No, Yes, Either

Copyright Restrictions: No, Yes, Either

Submit search | Reset Form

Bibliographic Metadata

Contextual Information

No Usage Information

Technical Information

Rights Information

Screenshot
from April 15, 2005

MERLOT
Multimedia Educational Resource for Learning and Online Teaching

Search Materials: GO
advanced search | search more digital libraries | search tips

Hello, Robby Robson | Don't Remember Me

Home | Communities | Browse Materials | Contribute Material | Member Directory | Help

Advanced Search For Materials

Search Options

- General Search: Go!

Search for: all words / any words / exact phrase

Enter values for specific fields below:

Search

Subject Category: Any
Sub - Category: Any
Material Type: Any Type
Title or Name:
Content URL:
Description:
Primary Audience: Any
Technical Format: Any Format
Learning Management System Compatibility: Any
Language of Material: please enter the two letter ISO 639-1 code
Section 508 Compliant: yes
Cost for Use: no / yes
Copyright Restrictions: no / yes
Source Code Available: yes
Author's Name:
Author's Email:
Author's Organization:
Peer Reviews Available: yes
Minimum Panel Rating: (none)
Member Comments Available: yes
Minimum User Rating: (none)
Assignments Available: yes | advanced assignment search
Author Comment Available: yes What's this?
Restrict this search to the last 30 days.

Bibliographic Metadata

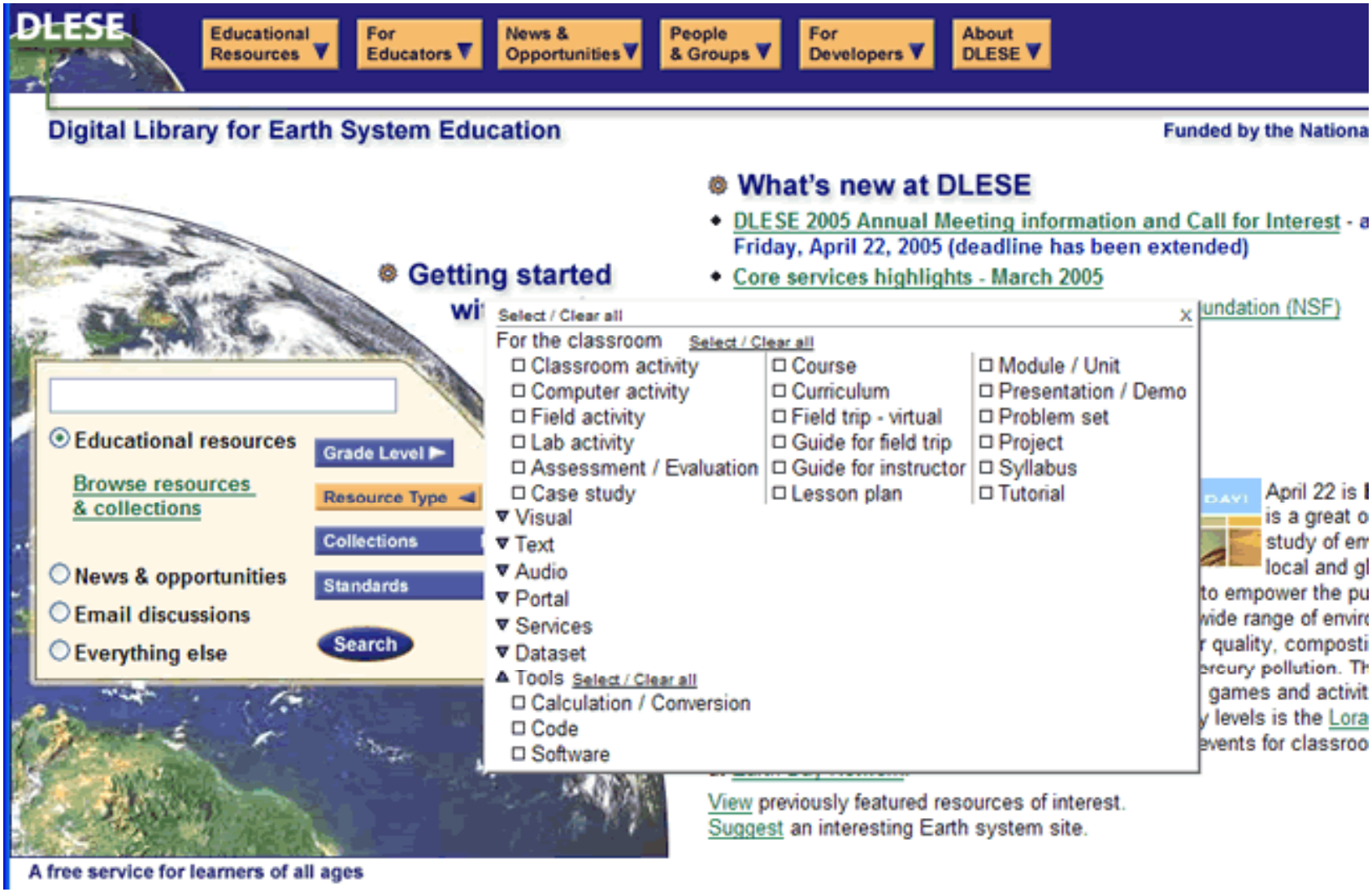
Technical Information

Contextual Information

Rights Information

Usage Information

Drop-down Metadata



Screenshot from April 15, 2005.

RIGHTS

COPYRIGHT

LICENSES

SHARING

May I Use It?

Can I find it?

Is it useful?

Rights

Will it work?

What Rights are Typically Granted?

- Rights that are granted or denied:
  - Right to view or use
  - Right to copy and distribute
  - Right to modify
  - Right to use commercially
  - Right to create derived works
- Conditions that are imposed:
  - Proper attribution
  - Payment
  - Restrictions on time and place
  - Restrictions on type of use (commercial / non-commercial)
  - Inclusion of the same terms and conditions

Note: Copyright is Tricky

- Most resources are copyrighted when created
- It is important to obtain permissions
- It is important to *grant* permissions
- Links are usually OK, but watch out for
  - "deep linking"
  - "framing"
  - "in-lining"
- Reference
  - Stanford Copyright and Fair Use Site (http://fairuse.stanford.edu/)

Note: Fair Use is Tricky

U.S. Copyright Law: **S. 108 - Limitations on Exclusive Rights**

… the fair use of copyrighted work … for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research is not an infringement of copyright. In determining whether the use made of a work in any particular case is fair use the factors to be considered shall include –

1. the purpose and character of the use, including whether such use is of a commercial nature or is for non-profit educational purposes;
2. the nature of the copyrighted work;
3. the amount and substantiality of the portion used in relation to the copyrighted work;
4. the effect of the use upon the potential market for or value of the copyrighted work.

- "Fair Use" is subject to limitations, interpretation and ambiguity
- *Clearly specifying terms and conditions eliminates the need for your audience to rely on fair use*

Rights and Permissions - Guidelines

Provide a statement of rights and permissions.

Explanation: A resource cannot be reused if doing so would violate the terms and conditions imposed by copyrights, licenses or contracts. A statement of rights and permissions tells potential users what they are allowed to do with a resource.

GUIDELINES:

2.1 – Provide a statement of Copyright (P1)

2.1 - State Terms of Use (P1)

2.3 - Adopt a Workable Licensing Policy (P2)

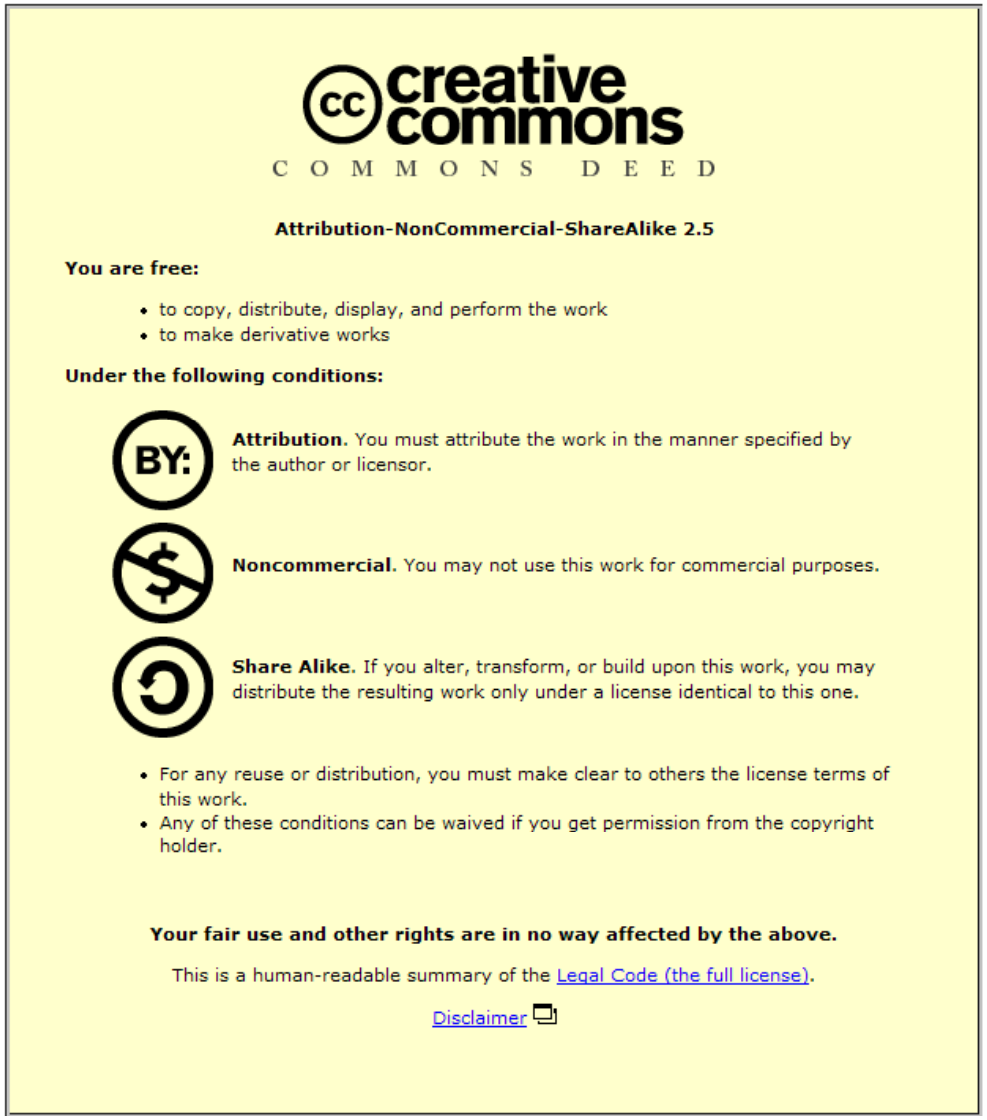
2.4 - Grant Modification Rights (P2)

Which Rights are Important to Grant?

- Important for reuse:
  - Use, copy, distribute
  - *Help the user by providing a license and contact information for obtaining permissions*
- Important for authors:
  - Modify & create derived works
  - *Help authors by providing source code and granting them the right to use it*
- Attribution is important
  - *Help the user by providing by providing a citation for attribution*

Creative Commons Approach

- Use a small set of standardized licenses
  - Backed by legalese
  - Available in plain English
  - Suitable for a community of practice
- *Licenses grant some rights and reserve others*
- *Licenses do not assign copyright*
- www.creativecommons.org



creative commons

COMMONS DEED

Attribution-NonCommercial-ShareAlike 2.5

You are free:

- to copy, distribute, display, and perform the work
- to make derivative works

Under the following conditions:

Attribution. You must attribute the work in the manner specified by the author or licensor.

Noncommercial. You may not use this work for commercial purposes.

Share Alike. If you alter, transform, or build upon this work, you may distribute the resulting work only under a license identical to this one.

- For any reuse or distribution, you must make clear to others the license terms of this work.
- Any of these conditions can be waived if you get permission from the copyright holder.

Your fair use and other rights are in no way affected by the above.

This is a human-readable summary of the Legal Code (the full license).

Disclaimer

Expressing Rights in Metadata


```
- <rights>
  - <cost>
    - <source>
        <langstring xml:lang="x-none">LOMv1.0</langstring>
      </source>
    - <value>
        <langstring xml:lang="x-none">no</langstring>
      </value>
    </cost>
  - <copyrightandotherrestrictions>
    - <source>
        <langstring xml:lang="x-none">LOMv1.0</langstring>
      </source>
    - <value>
        <langstring xml:lang="x-none">yes</langstring>
      </value>
    </copyrightandotherrestrictions>
  - <description>
      <langstring>http://creativecommons.org/licenses/by-nc/2.0/ </langstring>
    </description>
  </rights>
```

Expressing and Granting Rights in a Collection

MathDL
The MAA Mathematical Sciences Digital Library

The Mathematical Association of America

MathDL Homepage

Search :

Search MathDL:
Keyword
go

Welcome to the New MathDL!
About MathDL
Copyright and Fair Use Information
Privacy Policy
Contact Us

This project is supported by National Science Foundation Division of Undergraduate Education

National Science Digital Library

Home > Copyright and Fair Use Information

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MathDL Home | Convergence | Journal of Online Mathematics and its Applications | Digital Classroom Resources | OSSLETS
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Screenshot from April 17, 2005.

Providing Source Code & Modification Rights

OSSLETS

<< homepage

Home > What's an Osslet?

What's an Osslet?

Osslets bring the power of the open source movement from software development to curriculum development. For the casual user, osslets offer free, high-quality, ready-to-use, interactive curriculum materials. For progressively more adventurous users, osslets are open-ended and flexible. The curriculum materials accompanying each osslet are written in generally available formats – for example, Microsoft Word – and users are encouraged to modify them. There are only two rules – you must give credit to the original author and cite the source and you must agree to the open source philosophy – that is, you must provide permission for further use and modification.

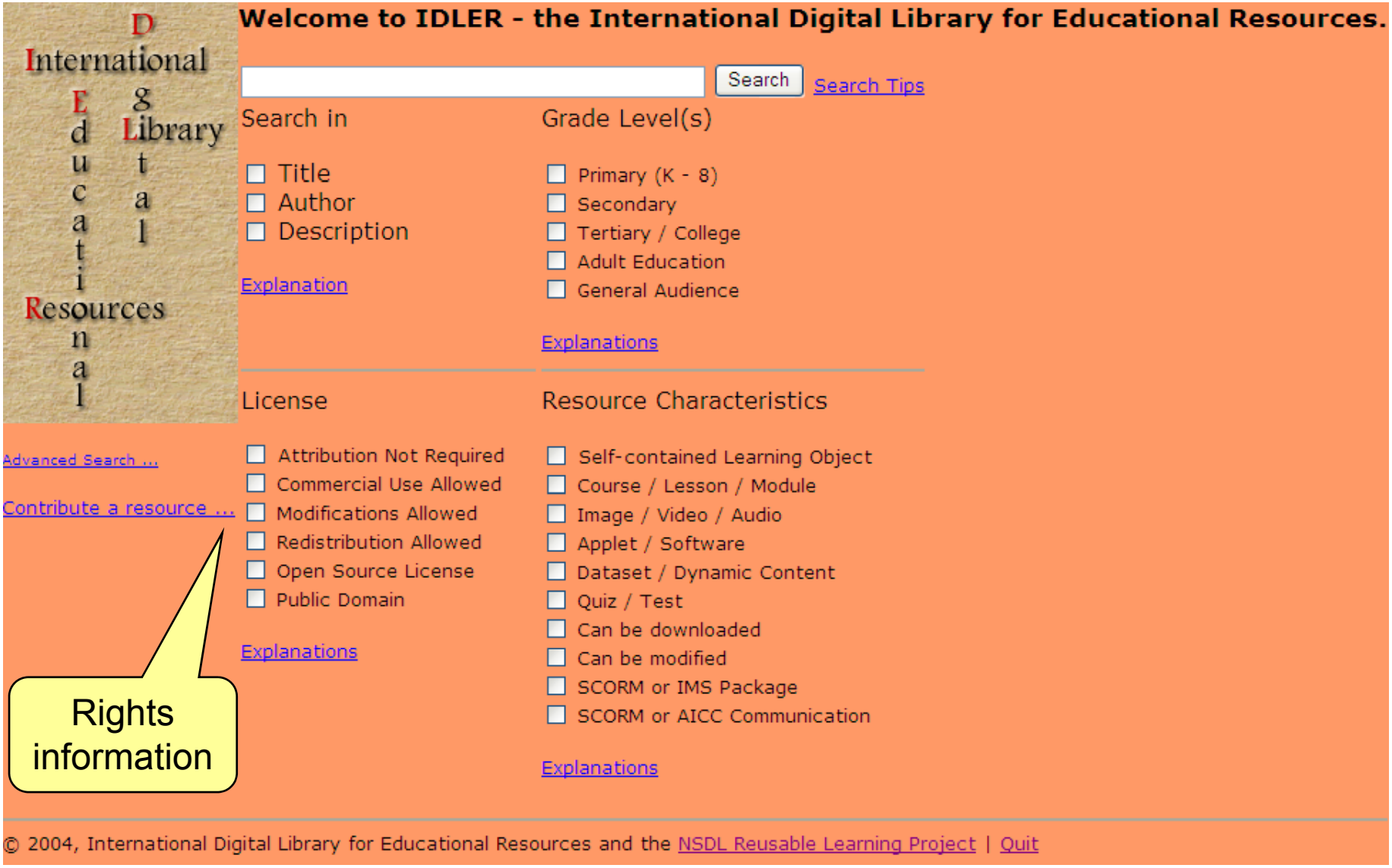
Each osslet also includes at least one interactive component. As of now, osslet interactive components are written in Java, Macromedia Director (Shockwave), or Macromedia Flash. The players for all these are free. These interactive components are written for flexibility. You will find that you can modify their behavior without knowing any programming. But, these interactive components are also open source and users are welcome to modify them subject to the same two rules above. Osslets include source code, complete documentation for use at various levels, and they explicitly include permission for re-use and modification. All the materials you need are included with the osslets.

Thus, each osslet includes all of the following:

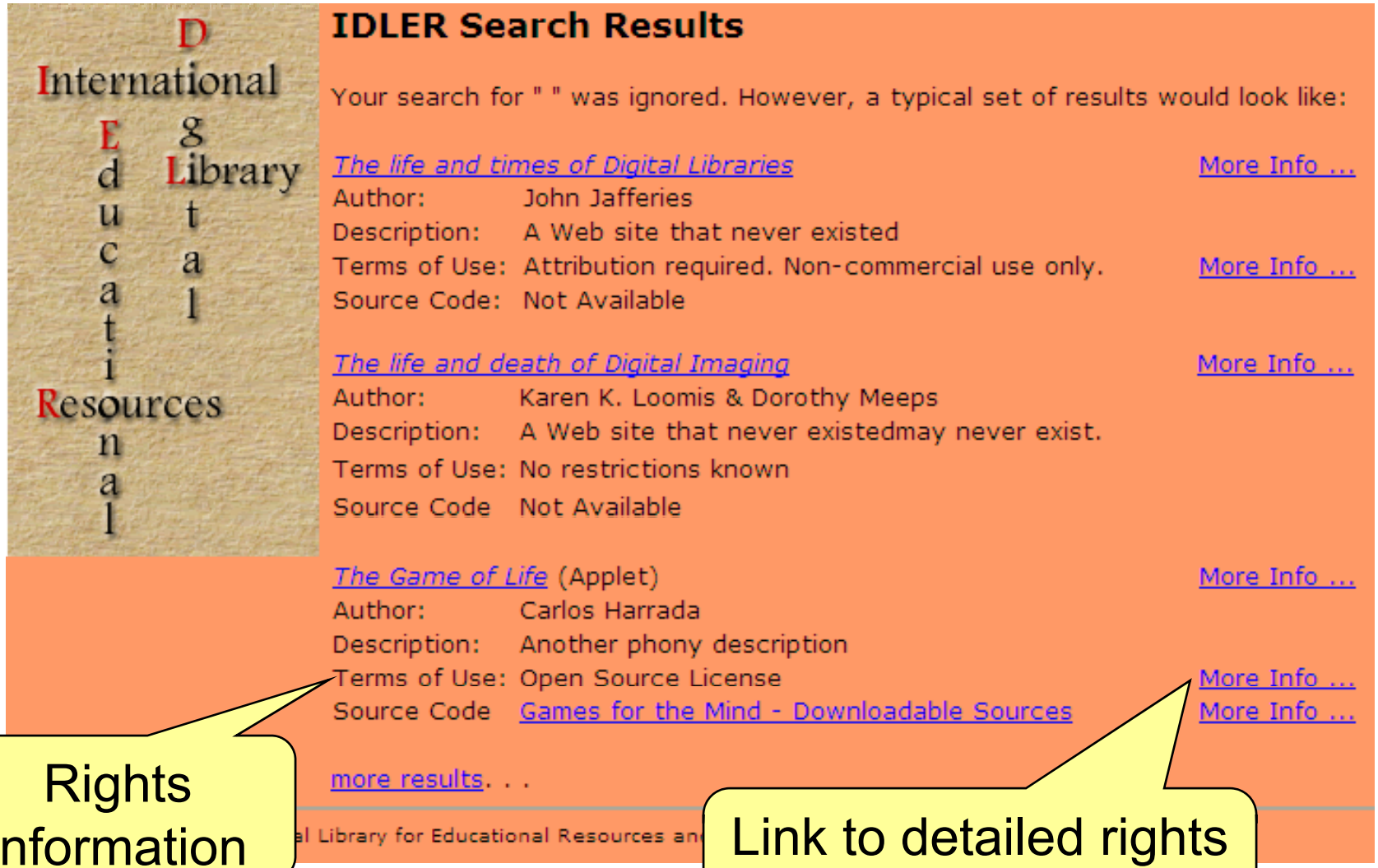
- An interactive component written in Java, Director (Shockwave), or Flash. The component is flexible and ready-to-use with no knowledge of programming. However, source code is also included for those who want to modify it.
- At least two ready-to-use curriculum units. The editable documents are included for those who want to make modifications.
- Several shorter examples illustrating the flexibility of the interactive component.
- Supporting files and documentation.
- Explicit permission for re-use and modification.

Screenshot from MathDL taken April 17, 2005.

Searching Using Rights



Rights Information in Results Set



Rights information

Link to detailed rights information

How Far to Go?

1. Creating Rights Awareness
   - Including and expressing rights information
   - Tracking usage and attribution
2. Engendering Rights Respect
   - Policies
   - Education
3. Implementing Rights Enforcement
   - Restricting access (authentication / authorization)
   - Document protection & watermarks
   - Persistent protection (e.g. RMS)

INTEROPERABILITY

"Plug and play" on different platforms
Modify using available tools
Exchange and correctly interpret data

Will it Work?

Can I find it?

Is it useful?

May I use it?

Interoperability

Two Approaches to Interoperability

"STANDARDS"

- HTML
- XML
- Learning Object Metadata
- SCORM
- IMS Questions & Test Interoperability
- MathML
- And many others . . .

COMMON FORMATS

- PDF™
- Flash™
- Java™
- MS PowerPoint™ / Word™
- TEX
- And many others . . .

Standards may exist within a small community – e.g. the British systems of weights and measures or TEX

Interoperability - Guidelines

Description: Ensure that content can run properly in as many computing and learning environments as possible. Support authors and developers by providing versions of content that can be edited and modified.

Explanation: Ensuring interoperability - primarily through the use of standards - will make it possible for the widest possible audience to adopt or adapt a resource.

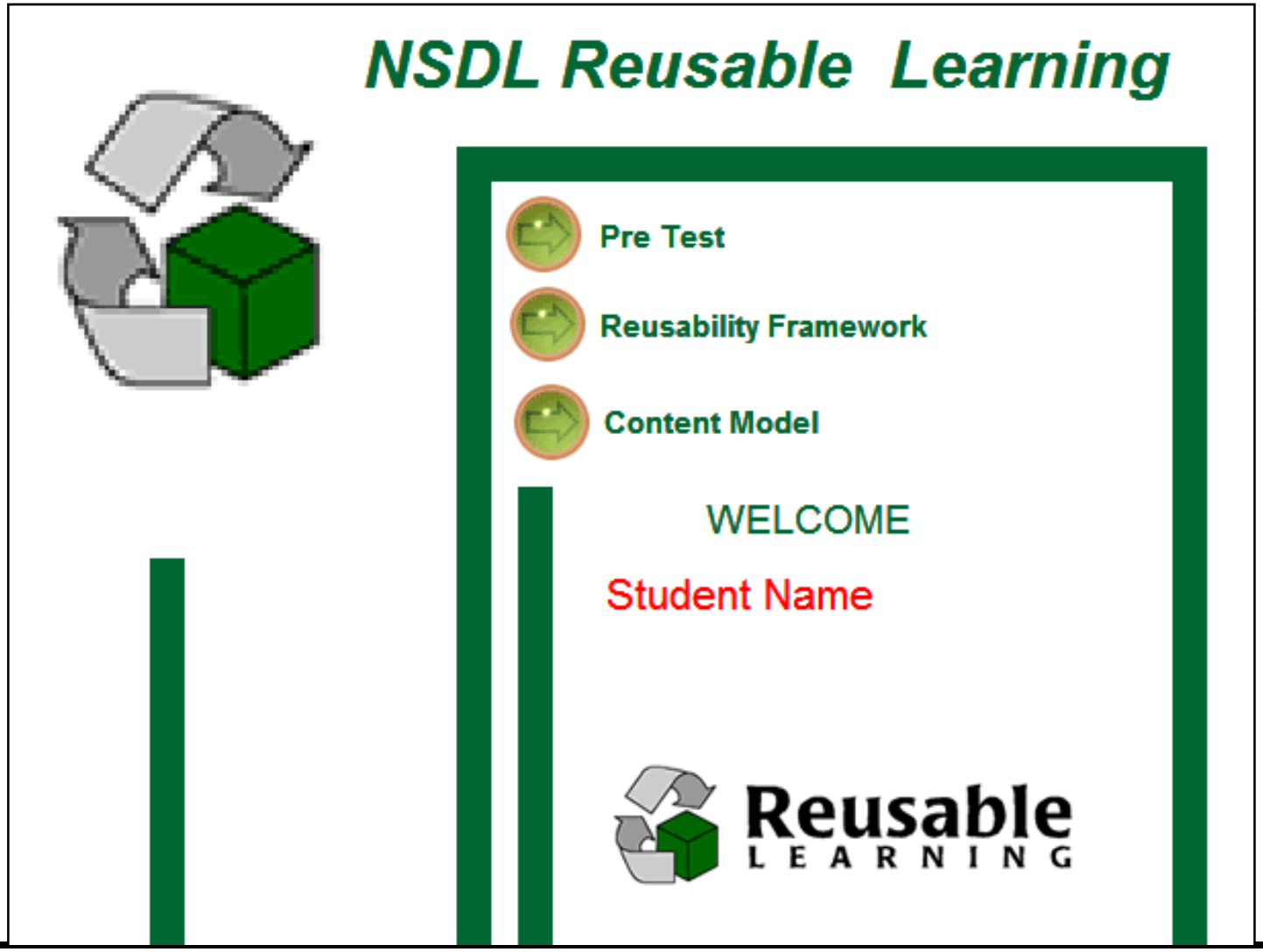
GUIDELINES:

- **5.1 – Use standardized and portable formats (P1)**
- 5.2 – Use standards for communication, sequencing and navigation (P3)
- 5.3 – Provide editable versions (P2)

Techniques & Tips

- Avoid proprietary formats
  - Content should not be tied to a Course Management System (Use "standards" like SCORM)
  - Content should not require specialized plug-ins or software
- Use XML
  - Can be converted to other formats even if proprietary
- Use tools that use standards
- Collections
  - Store or link to editable versions of resources
  - If needed, store multiple versions of the same content for use on different platforms or with different software. This includes archiving older versions.

Example: Content Created in SCORM Authoring Tool



Content exported to a SCORM package

Type of content package to export

Export destination

Publish SCORM Location

SCORM Options | Options | FTP Options | Proxies | Cisco CDN

Course Is: SCORM 1.2 Conformant

SCORM 1.0 Conformant
SCORM 1.1 Conformant
SCORM 1.2 Conformant
SCORM 2004 Conformant

Course Creator:

Course ID:

Course Title: NSDL Content Reusability

URL of Course Folder: (If Known)

Course Description:

NSDL Reusable Learning

Additional Keywords: (Comma Separated)

☐ The published course will report Question and Test Interactions to the Learning Management System (LMS).

☑ The published course will prompt to restore the last viewed location within the Learning Management System (LMS).

OK | Cancel | Help

Publish SCORM Location

SCORM Options | Options | FTP Options | Proxies | Cisco CDN

Publish

Destination Folder:

y Titles\NSDL Content Reusability\scorm\html

Choose Folder

◉ Publish Only Updated Pages/Resources

○ Publish All Pages/Resources in the Title

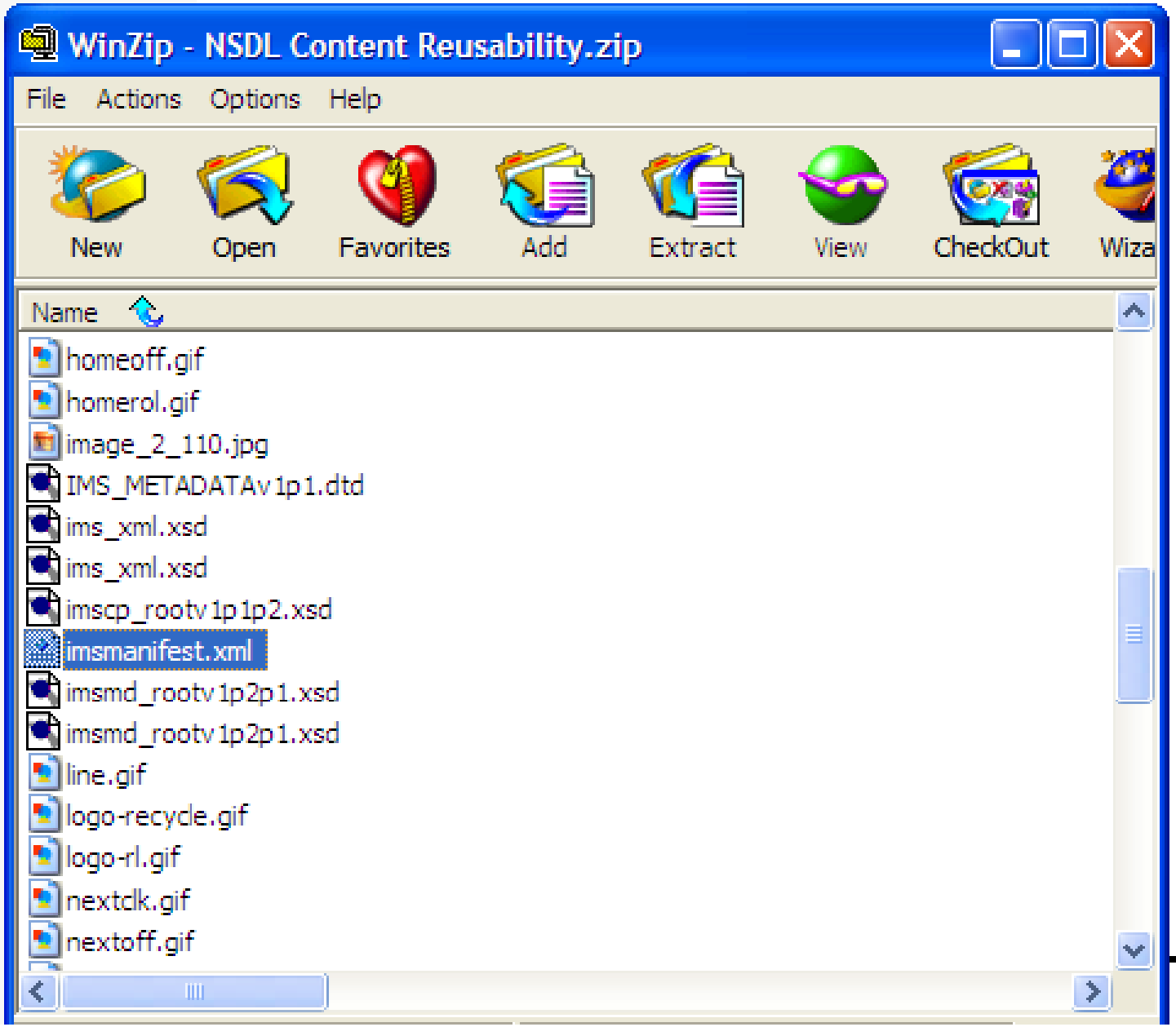
☑ Store Published Title in a Zip File

☑ Create ALT Tags for Images and Buttons

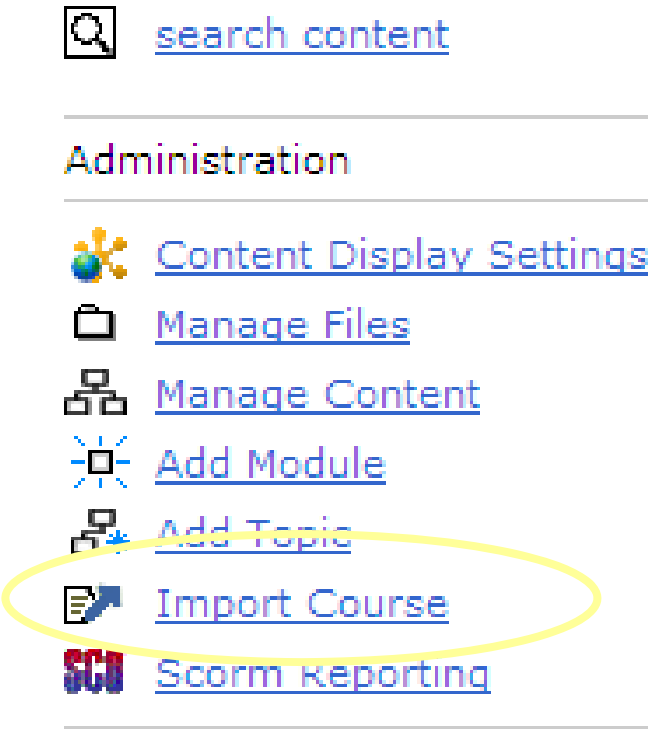
☑ Include Title Manager

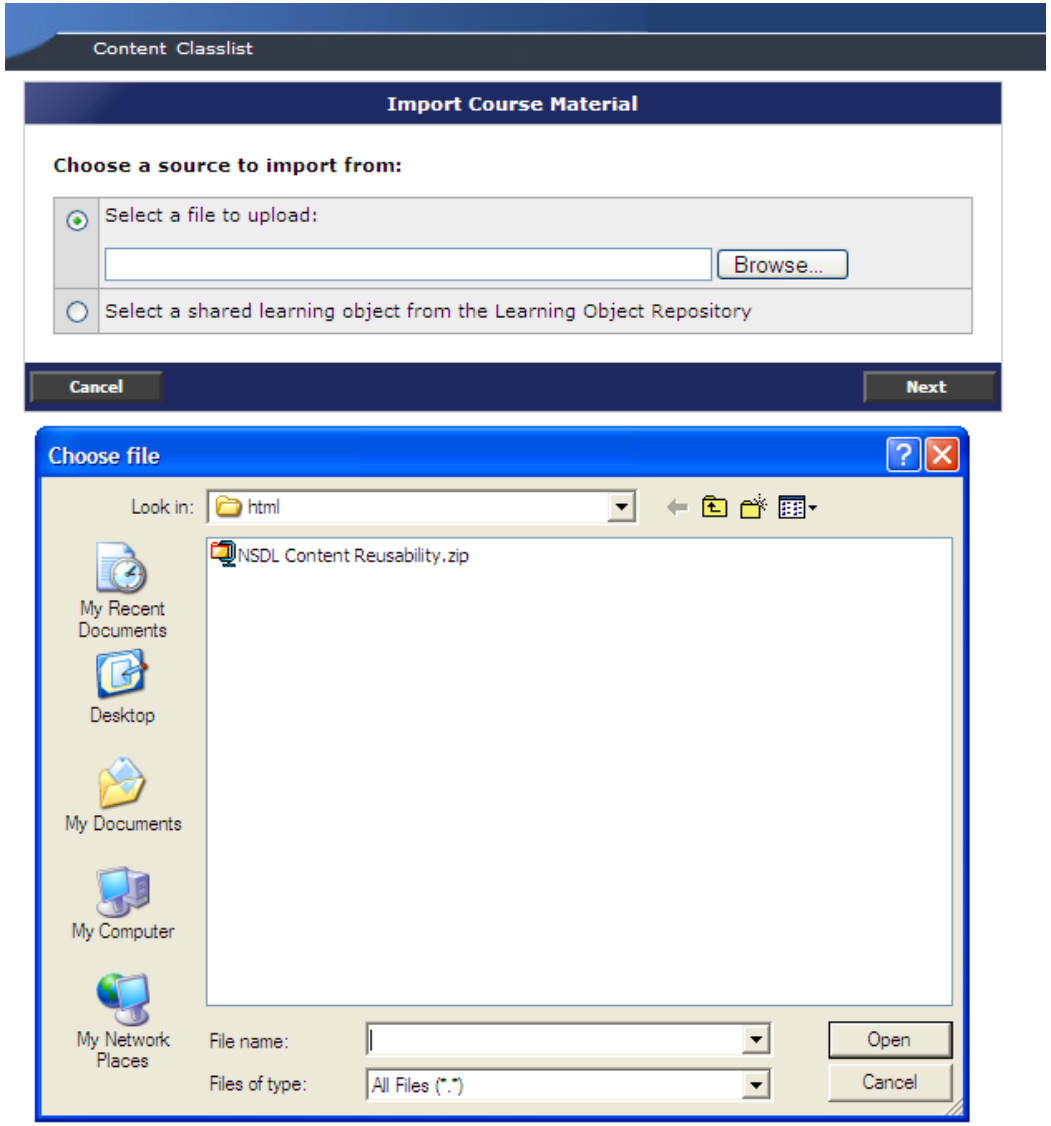
OK | Cancel | Help

Exported Content as a SCORM Package

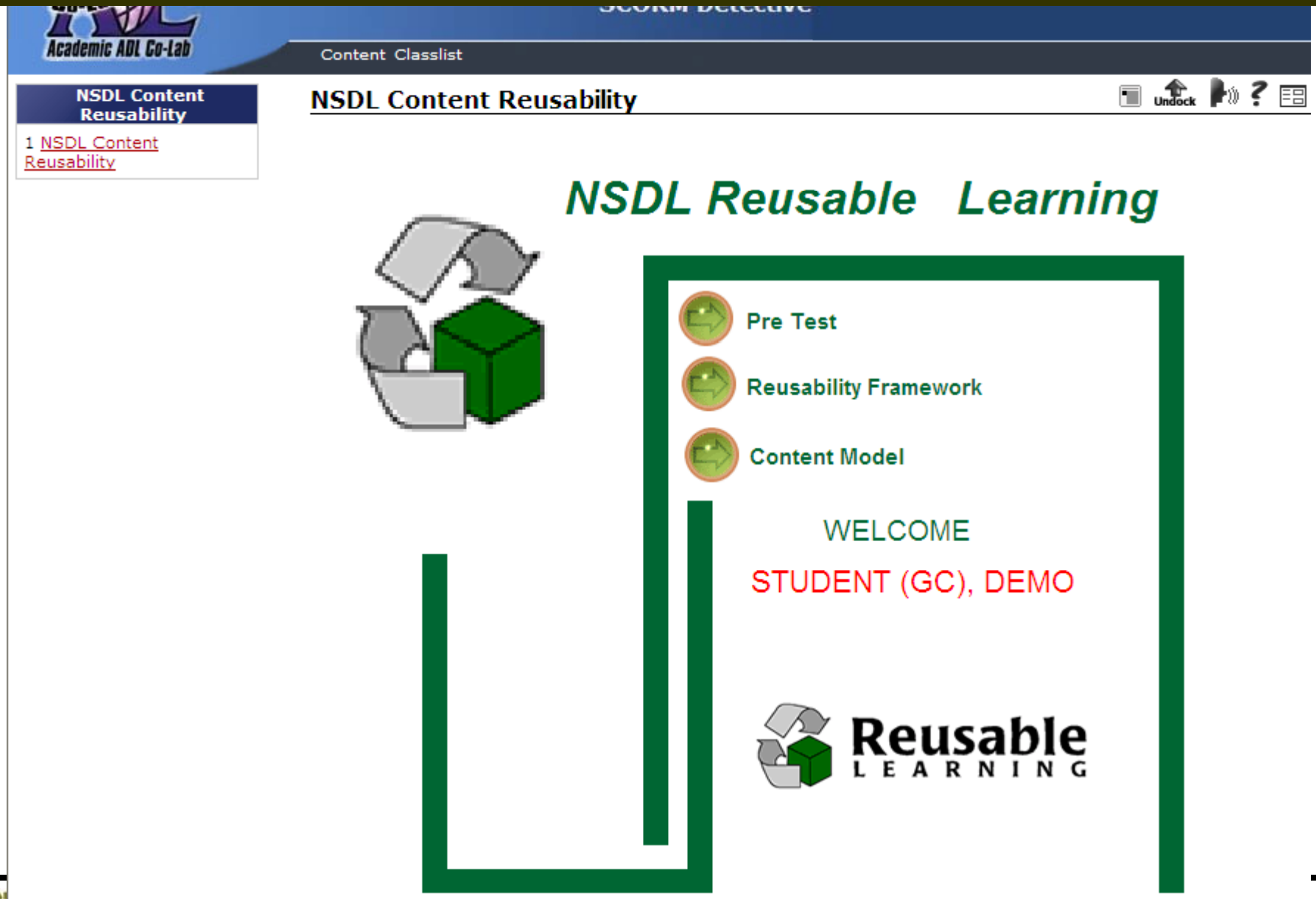


Sign on to LMS and Import Content





Launch Content : Student Name Comes from LMS



Status, Score, Accesses, Time – Sent to LMS

Status	Total	Percentage
	2/4	50.00%
COMPLETED	2/4	50.00%

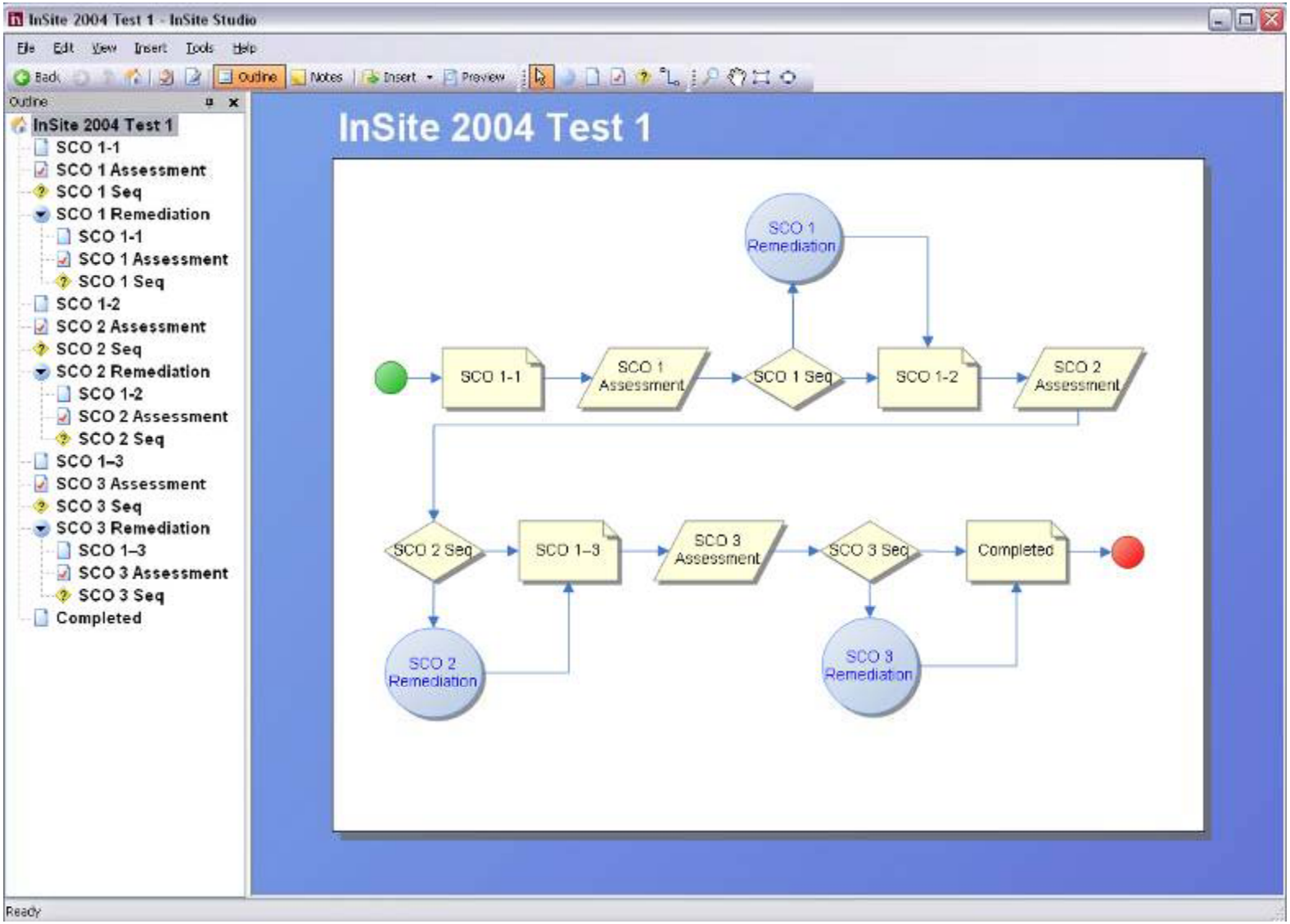
Single User Single Course for DEMO STUDENT (GC)

Course	Progess	Last Accessed	Completed	Score	# Accesses	Time Spent
SCORM Samples - 206470						
SCORM Detective	Completed	May 12, 2004 5:07:23 PM		50	0	0000:00:00.00
Flash Quiz Sample						
Course	**Progess**	**Last Accessed**	**Completed**	**Score**	**# Accesses**	**Time Spent**
Flash SCORM Demonstrator - 212594						
Flash SCORM Demonstrator						
Course	**Progess**	**Last Accessed**	**Completed**	**Score**	**# Accesses**	**Time Spent**
NSDL Content Reusability - 214141						
NSDL Content Reusability	Completed	May 13, 2004 11:27:54 PM		50	2	0000:01:37.00

Back Print

Back Print

A different SCORM Authoring Tool: InSite Studio

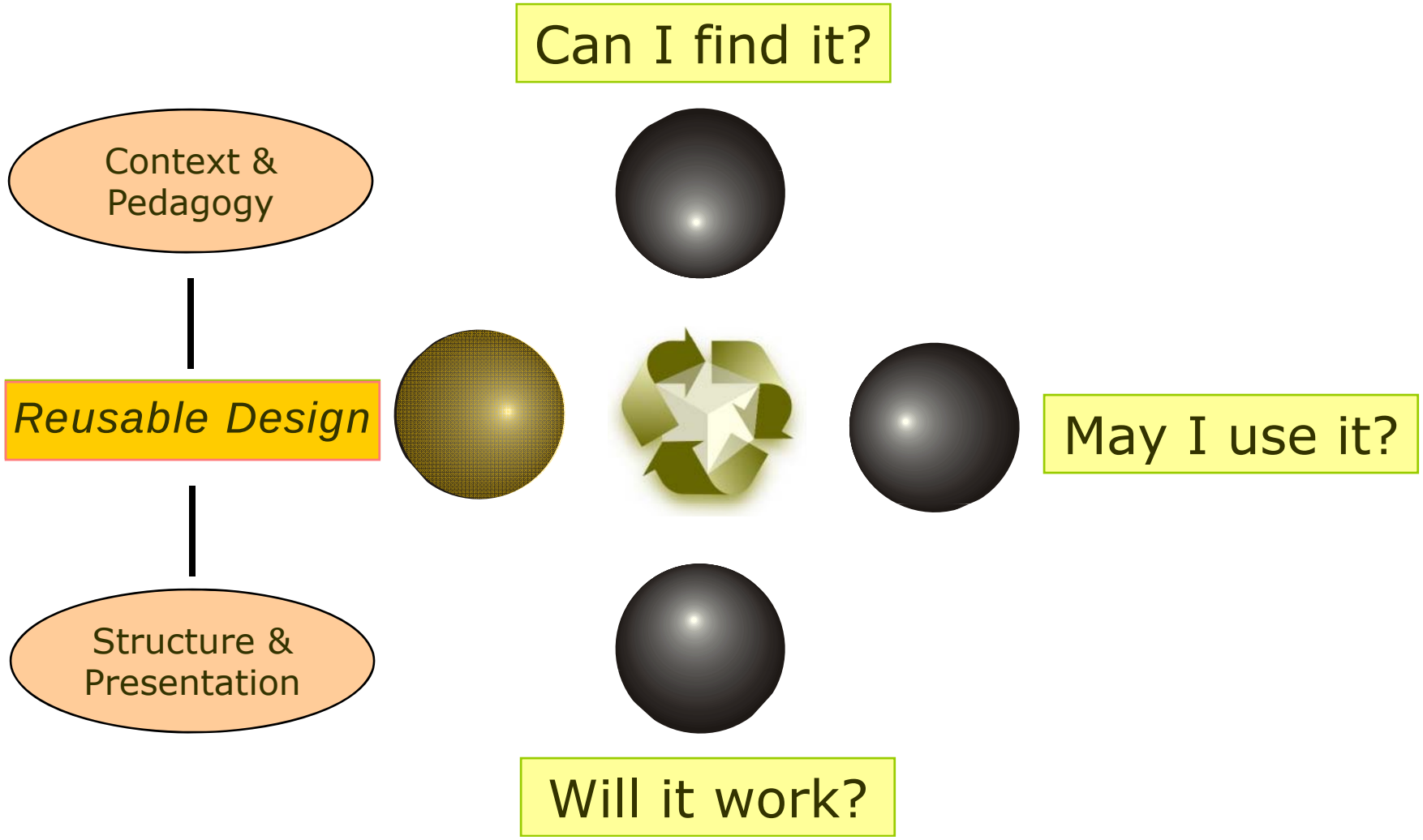


REUSABLE LEARNING

REUSABLE DESIGN

CONTENT
CONTEXT
PEDAGOGY
PRESENTATION
STRUCTURE

Is it Useful?



CONTENT IS AT THE CORE

- **CONTENT**
  - The **stuff** in the resource
  - The **meaning** conveyed by a resource and the **words and images** used to convey it
  - **Information** contained in a resource that is intended to affect a change in cognitive state

CONTEXT IS REQUIRED FOR UNDERSTANDING

- **CONTENT**
  - The **stuff** in the resource
  - The **meaning** conveyed by a resource and the **words and images** used to convey it
  - **Information** contained in a resource that is intended to affect a change in cognitive state
- **CONTEXT**
  - **Language**, **cultural knowledge**, **subject knowledge**, **relations to other learning resources** and other factors needed to properly interpret a digital learning resource

PEDAGOGY IS ABOUT TEACHING & LEARNING

- **CONTENT**
  - The **stuff** in the resource
  - The **meaning** conveyed by a resource and the **words and images** used to convey it
  - **Information** contained in a resource that is intended to affect a change in cognitive state
- **CONTEXT**
  - **Language**, **cultural knowledge**, **subject knowledge**, **relations to other learning resources** and other factors needed to properly interpret a digital learning resource
- **PEDAGOGY**
  - How a digital learning resource is used as part of a **learning strategy** or **instructional design**

STRUCTURE IS ABOUT ORGANIZATION & NAVIGATION

- **CONTENT**
  - The **stuff** in the resource
  - The **meaning** conveyed by a resource and the **words and images** used to convey it
  - **Information** contained in a resource that is intended to affect a change in cognitive state
- **CONTEXT**
  - **Language**, **cultural knowledge**, **subject knowledge**, **relations to other learning resources** and other factors needed to properly interpret a digital learning resource
- **PEDAGOGY**
  - How a digital learning resource is used as part of a **learning strategy** or **instructional design**
- **STRUCTURE**
  - How a digital learning resource is structured into **smaller units**, and how these are **navigated** or **sequenced**

PRESENTATION IS ABOUT HOW THINGS LOOK

- **CONTENT**
  - The **stuff** in the resource
  - The **meaning** conveyed by a resource and the **words and images** used to convey it
  - **Information** contained in a resource that is intended to affect a change in cognitive state
- **CONTEXT**
  - **Language**, **cultural knowledge**, **subject knowledge**, **relations to other learning resources** and other factors needed to properly interpret a digital learning resource
- **PEDAGOGY**
  - How a digital learning resource is used as part of a **learning strategy** or **instructional design**
- **STRUCTURE**
  - How a digital learning resource is structured into **smaller units**, and how these are **navigated** or **sequenced**
- **PRESENTATION**
  - How a resource is rendered and what visual and auditory elements will be used to render it

PRINCIPLE: SEPARATION OF LAYERS

Context

INSTRUCTIONAL DESIGN LAYERS

Pedagogy

- Recognize all five layers
  - *Content*
  - *Context*
  - *Pedagogy*
  - *Structure*
  - *Presentation*

Content

- Recognize them as separate
- Separate them to the extent possible

Presentation

LEARNING RESOURCE DESIGN LAYERS

Structure

REUSABLE LEARNING

REUSABLE DESIGN: CONTEXT & PEDAGOGY

Increasing Your Audience

How Context and Pedagogy Affect Reuse

- **Context is the friend of learning and the enemy of reuse**
  - Cultural dependencies, prerequisites and external references may aid learning but limit the audience
- **A learning resource is more reusable if it can be used in multiple learning environments**
  - In-class / Online / Mentored Study / Self-study
  - Dependencies on a specific environment limit reuse

Design: Context and Pedagogy - Guidelines

Description: Design resources for use by as wide an audience as possible.

Explanation: Unnecessarily restricting the audience limits reuse possibilities

GUIDELINES:

3.1 – Design for multiple Educational Settings (P2)

3.2 – Design for multiple Educational Levels (P2)

3.3 – Design for Multilingual and Multicultural Support (P2)

Design Tips & Techniques For Developers

- Reduce limiting physical and location requirements
- Separate learning experiences that require human intervention
- Writing style, graphical style and structure affect the audience
- Use tools that support multiple languages
- Use language, images, scenarios and examples that make sense in as many cultural contexts as possible.

- REAL-WORLD EXAMPLES:
  - www.mcs.drexel.edu/~crorres/Archimedes/contents.html
    - Can be used in many different ways
    - Does not assume a particular pedagogical approach
    - Fairly independent of the cultural background of the user
  - http://www.math.com/homeworkhelp/HotSubjects_fractions.html
    - Contains simple and complex topics
    - Separates topics for selective use

REUSABLE LEARNING

REUSABLE DESIGN: STRUCTURE & PRESENTATION

Reusable Learning Objects

Granularity & Reuse

	Asset Document, image, video, etc.	**Information Object*** Fact, concept, principle, process	**Learning Object** Self-contained, one objective	**Learning Component** Course, Unit, eBook
Author	Highly Reusable	Reusable	Reusable	Usually too big
Instructor	Sometimes Reusable	Reusable	Highly Reusable	Reusable if it fits the application
Learner	Sometimes Useful	Supports self-directed learning	Supports multiple learning modes	Useful if it fits; Useful in parts

Learning objects appear to be the most reusable for instructors and learners

Model adapted from *Learnativity* (www.learnativity.org)

*From work of Robert Horn

Design Structure and Presentation - Guidelines

Description: Create self-contained learning experiences that allow presentation and navigation to easily be revised. Follow accessible design practices.

Explanation: Instructors and learners wish to access just the parts they need. Navigation and presentation may need to change when a resource is used in a new context.

GUIDELINES:

- **4.1 – Structure content to consist of self-contained learning experiences, each addressing a single topic or objective (P1)**
- **4.2 – Separate Content from Presentation (P1)**
- 4.3 – Separate Content from Navigation (P2)
- 4.4 – Adhere to Accessible Design guidelines (P2)

TECHNIQUES FOR DEVELOPERS

- Organize content around learning objectives
- Structure content into sections
  - with the smallest logical granularity
  - with well-defined learning objectives
- Eliminate interdependencies among sections
  - Use a navigation section or frame instead of “Previous” & “Next” buttons
  - Isolate components that are used repeatedly
- Use styles, style sheets, and XML-based formats
- Use neutral styles and language whenever possible
- Use standards and specifications to encode the sequencing of content
- Follow published guidelines for accessible design

Separating content from other layers

Less Reusable

- Forcing a sequence through previous and next buttons (Ties content to structure of resource)
- Referring to a lab experiment throughout a resource (unnecessarily ties content to context)
- Elementary School Styles and Images (mixes content with presentation)

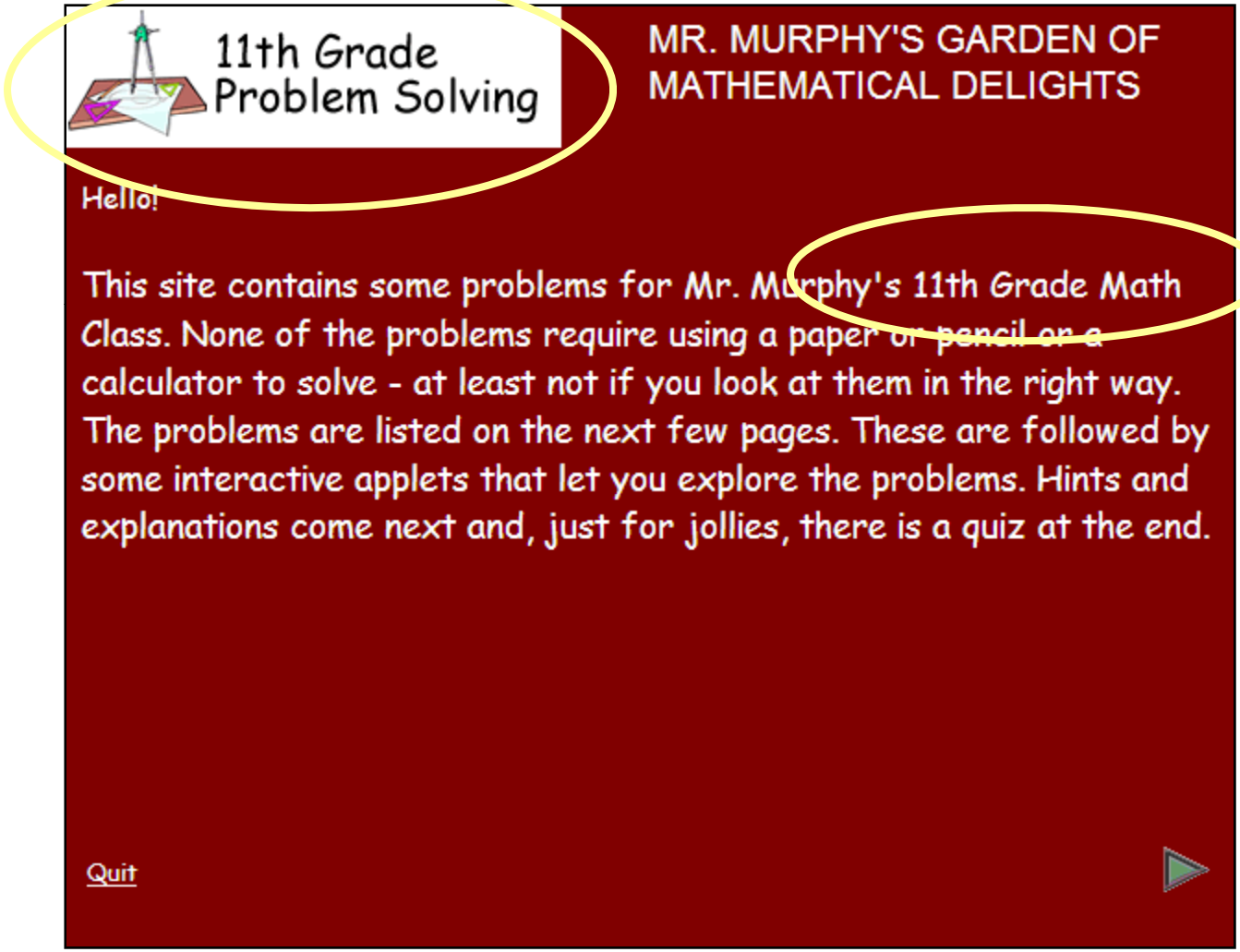
More Reusable

- External Sequencing & Navigation
- Isolating components that require specific educational settings
- Using neutral styles
- Using style sheets that allow styles to be easily altered

EXAMPLES

- Chemistry Coach - www.chemistrycoach.com/home.htm
  - Look at Stoichiometry 2 The Mole Ratio. The tutorial addresses a specific concept. It include concepts, examples, and practice problems. There are no 'hard-coded' links to other tutorials.
- Zen Garden" www.csszengarden.com/
  - Demonstrates the reformatting of presentation that can be achieved through style sheets, without touching the actual content. This separation allows designers to reuse the content of authors, and authors to reuse the work of designers.
- Ph Factor - www.miamisci.org/ph/default.html
  - Demonstrates direct navigation to different learning objects (as opposed to forcing navigation through the content in a pre-defined order.)

BEFORE – Graphics and text specific to an educational level



AFTER – More general terminology and graphics

WELCOME TO MR. MURPHY'S GARDEN OF MATHEMATICAL DELIGHTS

This site contains mathematics problems meant to delight and challenge students and enthusiasts. None of the problems require using a paper or pencil or a calculator to solve - at least not if you look at them in the right way. Each problem includes a problem statement followed by a solution and explanation.

There is also a quiz that is related to the themes of the problem.

Problems

1. High Jumping on the Moon
2. Tiling a Chessboard
3. The Monty Hall problem
4. Belt around the Earth

Interested in using these problems in your course? See instructions for downloading and modifying this site.

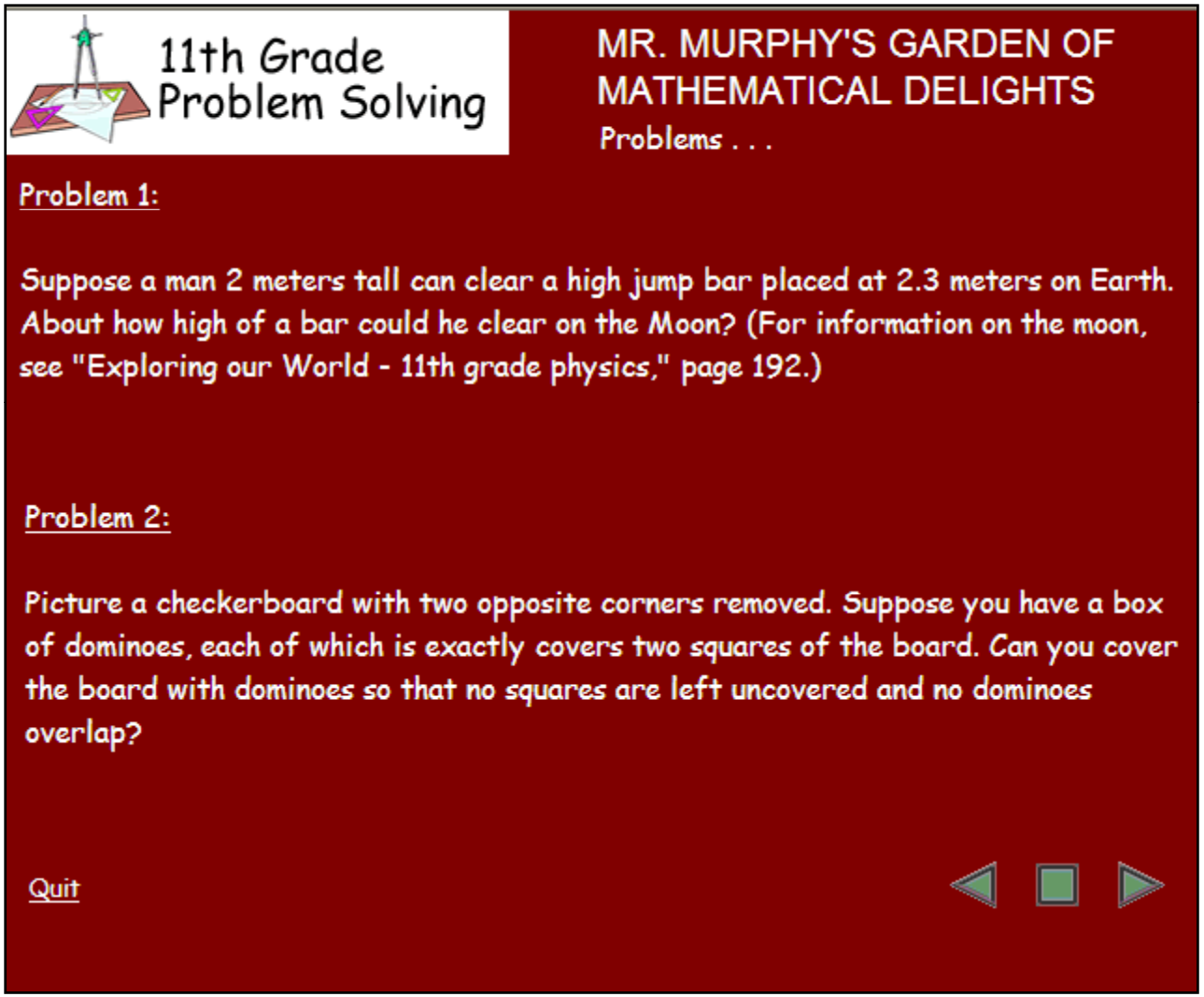
About this site (information about the author, purpose, educational objectives, technical requirements, etc.)

EXIT

BEFORE – Learning Objects Not Self-contained

Learning objects split over multiple, non-contiguous pages

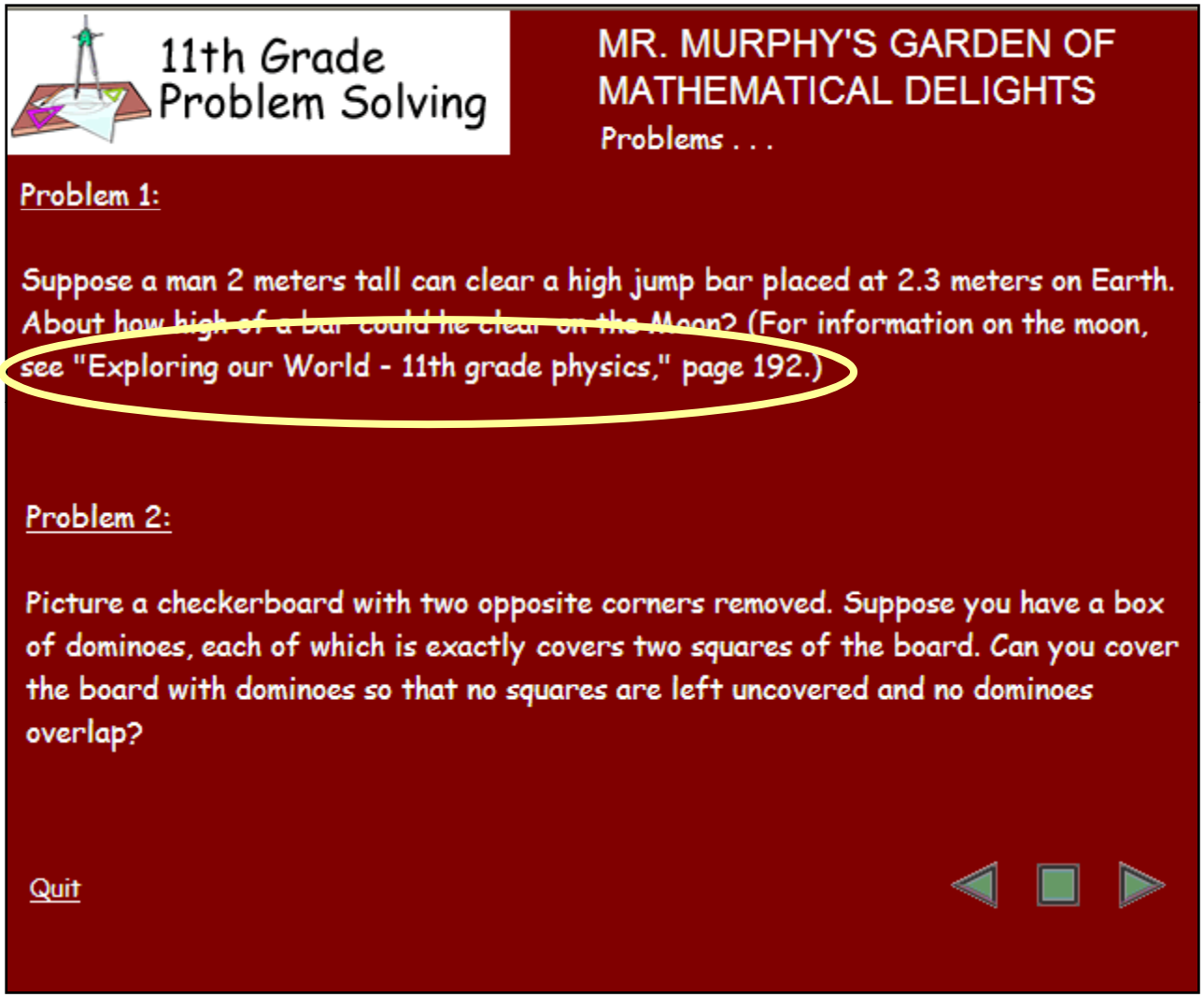
Two learning objects start on same page



BEFORE – Learning Objects Not Self Contained

Reference to an external text

Explanations and solutions not linked to problems.



11th Grade Problem Solving

MR. MURPHY'S GARDEN OF MATHEMATICAL DELIGHTS

Problems . . .

Problem 1:

Suppose a man 2 meters tall can clear a high jump bar placed at 2.3 meters on Earth. About how high of a bar could he clear on the Moon? (For information on the moon, see "Exploring our World - 11th grade physics," page 192.)

Problem 2:

Picture a checkerboard with two opposite corners removed. Suppose you have a box of dominoes, each of which is exactly covers two squares of the board. Can you cover the board with dominoes so that no squares are left uncovered and no dominoes overlap?

Quit

AFTER – Self contained learning object

Problems grouped with solutions and separated into problem-solution blocks

Problem 1: High Jumping on the Moon

Suppose a man 2 meters tall can clear a high jump bar placed at 2.3 meters on Earth. About how high of a bar could he clear on the Moon?

Information on the Moon from NASA

Solution on next page.

Direct link to reference information

Solutions and explanations linked to problems

Home Next

(Solution on Next Page)

Problem 1 Solution:

The Moon's gravity is about 1/6 that of the Earth's. This might lead you to believe that the man can jump six times as high. But when a person jumps and clears a high jump bar, it is the persons center of gravity that is being raised. If a 2 meter tall man clears a 2.3 meter bar, then his center of gravity has been raised approximately 1.3 meters*. In the Moon's gravity, the man could raise his center of gravity about 6 x 1.3 = 7.8 meters. It starts off one meter above the ground, so a better estimate of the height he could clear is 8.8 meters.

*Question: What assumption is being made and is it justified?

Back Home

BEFORE – Forced, embedded navigation

11th Grade Problem Solving

MR. MURPHY'S GARDEN OF MATHEMATICAL DELIGHTS

Problems . . .

Problem 3:

This is the famous "Monty Hall" problem. The problem comes from the game show "Let's Make a Deal" in which a lucky contestant would be faced with three doors. A great prize was behind one of them and non-so-great prizes behind the other two. The game, as it is often now described, goes as follows:

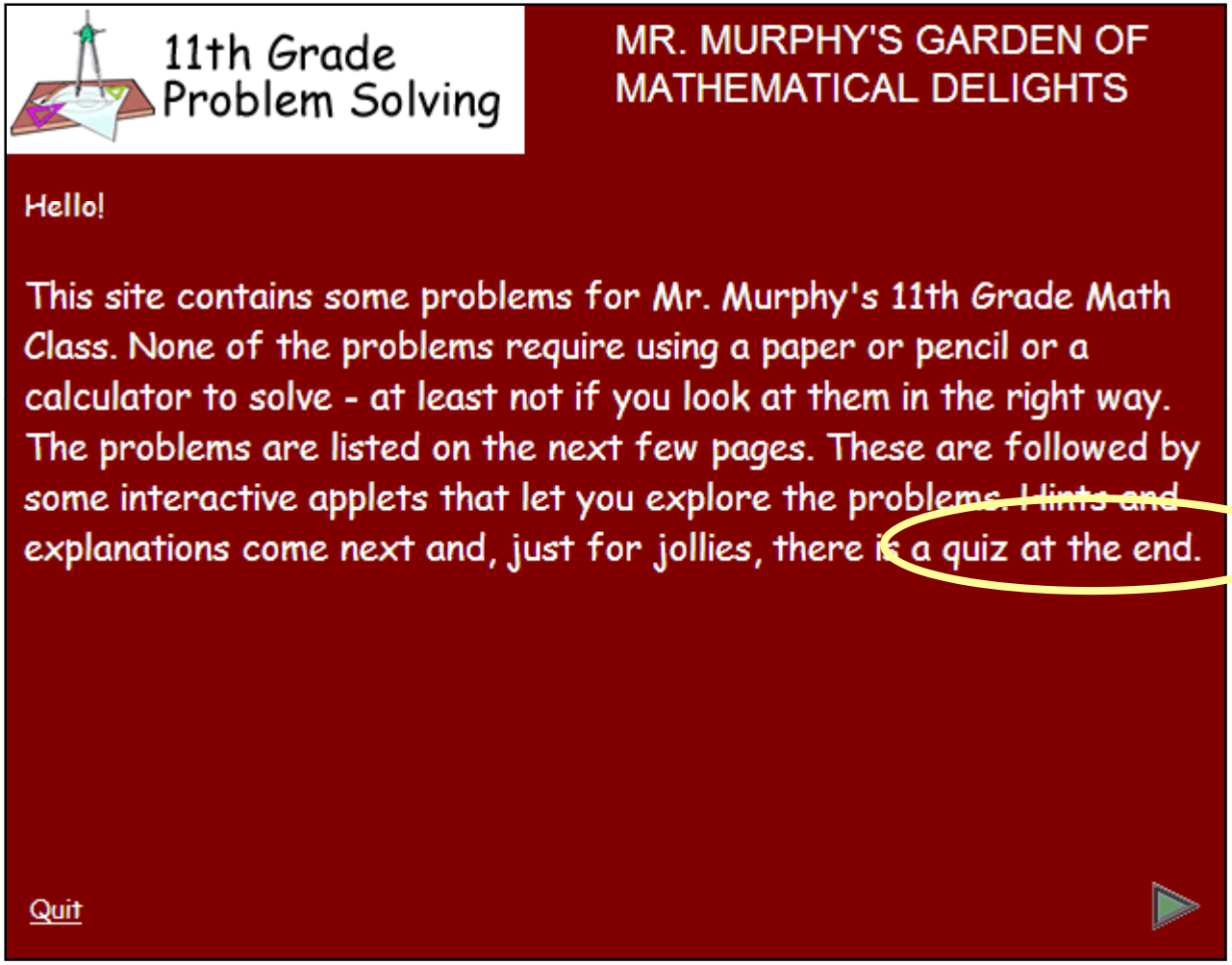
1. A contestant would be faced with three doors. Undesirable goats were behind two of them. A desire able car was behind one of them.
2. The contestant would pick a door.
3. The host (Monty Hall) would open a door the contestant had not picked, revealing a goat. Now there were two doors left, one hiding a goat and one hiding a car.
4. The contestant would be given the option of sticking with her original pick or switching.

Is it better to stick or to switch? How much better?

Quit

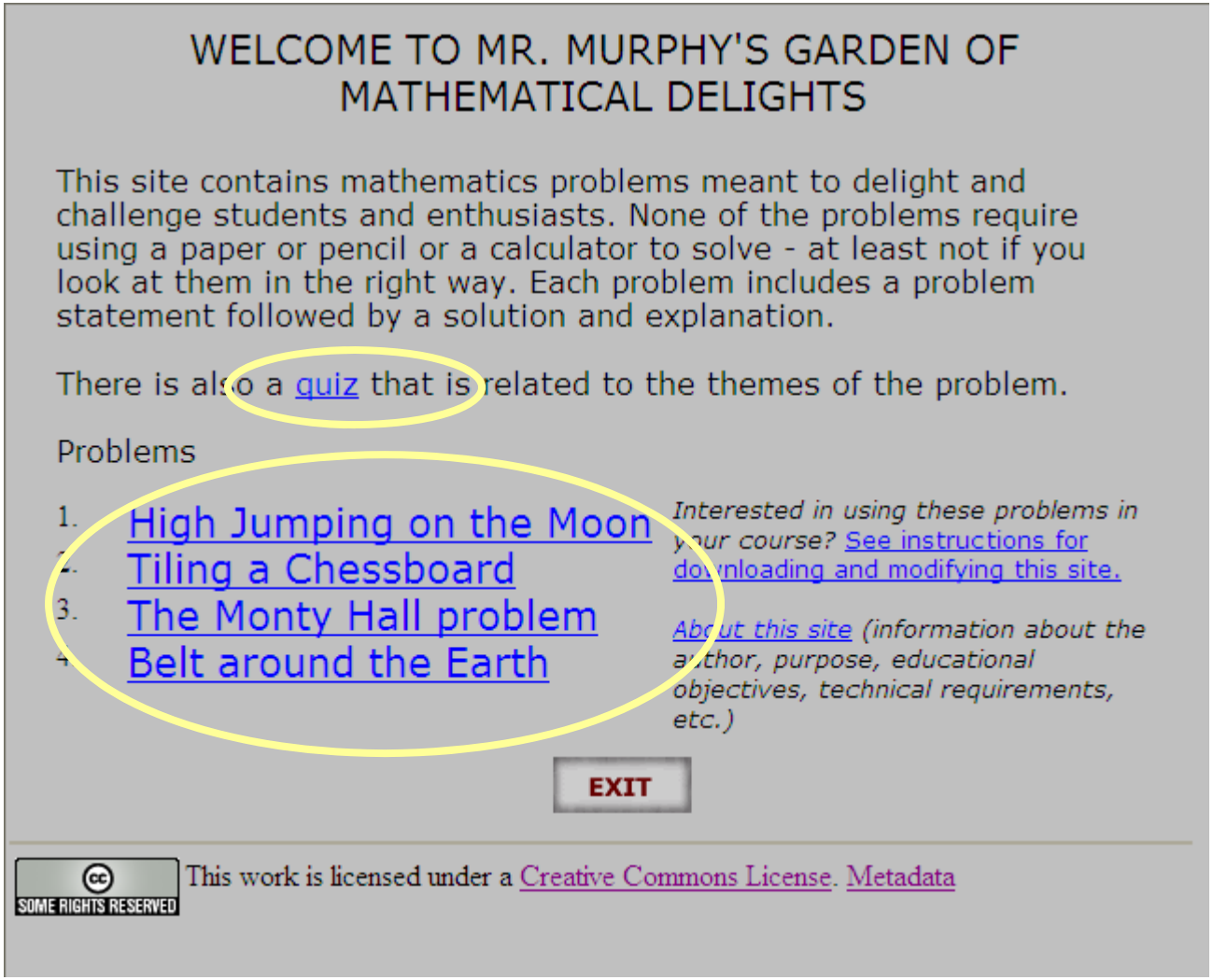
Page forward and back navigation only

BEFORE – Forced, embedded navigation



Quiz not available until the end

AFTER – User selects navigation path



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About this site (information about the author, purpose, educational objectives, technical requirements, etc.)

EXIT

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AFTER – User selects navigation path

Problem 4: A Belt around the Earth

Assume the Earth were perfectly round and that you had a humongous belt that fit snugly around the equator. Suppose you added one meter of length to the belt and that the extra slack were uniformly distributed around the Earth. What is the largest creature that could conveniently walk under the belt:

- *An Elephant?*
- *A grown person?*
- *A toddler?*
- *A cat?*
- *An ant?*
- *None of the above?*

Solution on next page.

Home Next

REUSABLE LEARNING

RESOURCES

From the Reusable Learning Site

Freely Available Resources

Design **Guidelines** and **Check List**	www.reusablelearning.org/guidelines
Presentations from previous (and future) workshops	www.reusablelearning.org/workshops
Paste-in Pop-up windows for portals and Web sites	www.reusablelearning.org/resources/MERLOT
Examples	www.reusablelearning.org/examples
Checklist for MERLOT reviewers	www.reusablelearning.org/resources/MERLOT
Other Case Studies (future)	ENC, BEN, MathDL …

Discussion

THANKS

nsdl@reusablelearning.org

www.reusablelearning.org

Next Scheduled Workshop:
E-Learn (www.aace.org/conf/elearn)
October 24, 2005
Vancouver, BC

Please feel free to contact us for workshops at your institution