Determining the Cost/Benefit of Learning Objects

Vicki S. Freeman, Ph.D., Jean Brickell, Ed.D. University of Texas Medical Branch at Galveston

Learning Objects

Abstract

The fundamental idea behind learning objects (LOs) is the creation of instructional components that can be delivered over the Internet, accessed by a number of individuals simultaneously with minimal effort, and reused numerous times in different learning contexts. The power of this approach is that it will reduce the amount of time faculty members spend in developing instructional materials for their courses and be an efficient method of distributing content. However, this vision that these objects will be used by faculty to create individualized lessons, thereby increasing their productivity, has not been tested. This poster will show learning object examples, the cost and usage data being collected on each object, and how this data is then used in a cost analysis of each LO to determine cost efficiency.

- Creation of instructional components that can be reused numerous times in different learning contexts
- Delivery over the Internet and access by a number of individuals simultaneously, with minimal effort
- Reassembly by faculty into their own lesson format to support their individual instructional goals
- Efficiency and increased speed in instructional development and a decrease in faculty preparation time

Levels of Learning Objects

Learning objects are grouped into three categories based on their granularity.

- 1 – images, illustrations
- 2 – video, non-interactive animation
- 3 – interactive animation & activities

Progress in LO Development

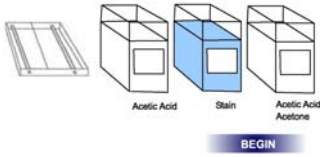
LO's developed as of Dec. 2006:

- Level 1 = 378
- Level 2 = 117
- Level 3 = 73
- "Public status" = 340

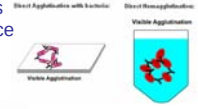
FIPSE Grant Goals:			
Level	Year 1	Year 2	Year 3
1	20	30	25
2	10	25	20
3	5	15	25

Examples of Electrophoresis

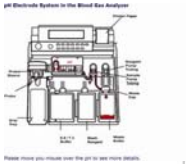
Animation Sequences



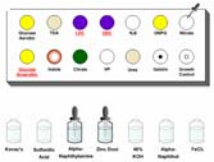
Agglutination tests detect the presence of antigens (i.e. bacteria, RBC's)



Short interaction of an instrument developed in Flash



Student drags and drops appropriate reagent dropper onto reaction well and reaction takes place



LEARNING OBJECT PROPERTIES

TITLE: pCO2 Electrode System
SUBJECT: Chemistry
FORMAT: Illustration
OBJECTIVE:
Discuss the principle of electrochemistry in the detection of CO2 in terms of composition of electrode pairs, types of selective membranes required, buffers that may be required and endpoint detection method.

DESCRIPTION: pCO2 Electrode System
KEYWORDS: pCO2 Electrode System, Blood Gas, Acid/Base Balance

INSTRUCTIONAL TEXT:
The modified glass electrode with a jacket containing bicarbonate buffer and a semi-permeable gas membrane measures pCO2. Barometric pressure is important in the calibration of the electrode and temperature is a critical factor in how the electrode detects the ions. Please move the mouse over the pCO2 to learn more.

CAPTION: pCO2 Electrode System
ALT TAG: pCO2 Electrode System

Database

A screen for each LO provides data about the LO and a data entry point.
The development and production teams enter their time and activities into the relational database for each LO.

Reports

The reports are generated to summarize the data that has been entered and to calculate the cost of the effort. Examples of these reports are as follows:

Effort Expended for Specific Learning Object

Learning Object Properties Detail

Learning Object Properties [Edit]

LO ID:	309
File Name:	ChemII2-309v3.swf
Subject:	Chemistry
Format:	Illustration
Level:	2
Preview Version:	3
Status:	Public
Created:	2/10/2005 1:59:58 PM (by Smith, Toby)
Last Updated:	3/4/2005 3:48:48 PM (by Larson, Carol)
Total Effort Expended:	225 minutes (3.75 hours) [Add Effort | View Effort]
Estimated Cost of Effort:	$ 90.14
Worklist:	View Worklist Assignments
Downloads:	8 (last download: 3/21/2006 9:49:02 AM)
Evaluations:	7 [View]

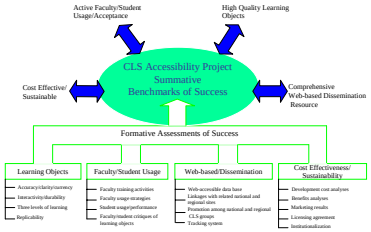
Effort Expended by Person	
Freeman, Vicki	210 minutes (3.50 hours)
Smith, Toby	15 minutes (0.25 hours)
Effort Expended by Phase	
Production	**225 minutes (3.75 hours)**
Production - Graphics	15 minutes (0.25 hours)
Production - Review	210 minutes (3.50 hours)
Effort Expended by Month	
Feb 2005	225 minutes (3.75 hours)

Effort Expended Detail

ID	Person	Month	Minutes	Phase	Comments
1034	Smith, Toby	Feb 2005	15	Production - Graphics	
1057	Freeman, Vicki	Feb 2005	90	Production - Review	
1066	Freeman, Vicki	Feb 2005	60	Production - Review	
1082	Freeman, Vicki	Feb 2005	60	Production - Review	

Evaluation

Items that are being evaluated relate to the LOs, usage of LOs, dissemination of LOs, and sustainability of the repository.



Summaries of Evaluation Data Collected From Users

1. Please rate this Learning Object on a scale of 5 (Excellent) to 1 (Poor) for the following qualities. (n = 214)

	Avg	Min	Max
Instructional Content	4.00	1	5
Interactivity	4.00	1	5
Usability	4.00	1	5
Reusability	4.00	3	5
Effectiveness	4.00	2	5
Overall Evaluation	4.00	1	5

3. Did this Learning Object save you time in any of the following areas? (check all that apply; (n = 214)

	# Responses	Percentage
Developing lesson or course	107	26.9%
Engaging learners	134	33.7%
Laboratory preparation	24	6.0%
None	17	4.3%
Other	10	2.5%
Presenting content	106	26.6%

5. Do you have any information on gains in student learning or performance skills that you can attribute to their exposure to this Learning Object? (check all that apply; n = 214)

	# Responses	Percentage
Content application	19	8.8%
Content comprehension	98	45.4%
No gains attributed to LO	19	8.8%
Other	6	2.8%
Unable to determine	74	34.3%

	How would you summarize the learner's response to your use of learning objects to enhance learning?	LO
1.	The interactive approach helped them understand the functions and reinforced the lecture material.	306
2.	Impressed with visual aspects	309
3.	They liked and enjoyed it	315
4.	About 1/2 the class better understood cellular process.	315

Evaluation – Comments

What did you like best about this Learning Object?
Simple, visual image to enhance student learning.
being able to show both pos and neg reaction at the same time, as to contrast what was happening in the test system
Presenting both positive and negative test at the same time, to highlight the differences in the test system
using animation to demonstrate this concept
It saved me time in laboratory - didn't have to grow my own demoplate.
Students and I enjoyed the interactive aspect of this learning object.
Visual example of interactivity simulating actual performance of working with culture set-up
Visual representation of how LOs can be used to show diagramatic sketches of instrumenatation.
Allowed students to see QC being performed on a blood gas analyzer without physically having on in lab
Simple yet contained necessary components
It provided a visual tool to help students understand the structure and function of the nephron.
Simple yet contained the necessary components
Allowing students to see inside a blood gas analyzer
The accuracy of the image and the animation
Allowed students to look inside a blood gas analyzer. Also showed students the components of a Clark electrode
Good illustration of the process
Picture (I didn't have to draw myself)
That it helps learners understand what is going on inside of the densitometer when the gel is being scanned.
The ability to go back and forth between the normal and abnormal patterns.

User Data

	User Specialty (users can select multiple options)	Count	Percent
1.	Chemistry	63	13.4%
2.	Hematology	60	12.7%
3.	Immunohematology	53	11.3%
4.	Immunology	56	11.9%
5.	Microbiology	99	21.0%
6.	Molecular Biology	25	5.6%
7.	Nursing	45	9.6%
8.	Other	70	14.9%
	Total	**471**	**100%**

Conclusion

The tracking system for the Learning Objects (LOs) Project collects data on numerous components including: General Qualities, Time Saving Qualities, and perceived Gains in Student Learning. Early outcomes of tracking system indicate that:

- The individuals who access the LO website were primarily CLS and CLT faculty members, but about 10% were students of these programs.
- Of the 214 respondents, 97% reported that they would use the LOs again and planned to use other LOs.
- 45% reported that the LOs helped students understand the content better.
- The amount of time saved through using LOs averaged one hour per user.
- 39 users reported that their students' content comprehension improved because of the LOs they used.

Project funded by Fund for the Improvement of Post Secondary Education, #P116B030983