

Preliminary Report on Undergraduate Student Use and Perceptions of DLESE

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With the recent dialogue on the need for improving undergraduate science education, and the development of extensive digital libraries such as the Digital Library for Earth Systems Education (DLESE), educators and educational researchers would be remiss in not directing their efforts to exploring ways in which to take advantage of such resources. To date, there is little research examining effective ways to integrate digital libraries into education. This document reports preliminary findings of a current research study, situated in an undergraduate geology course, that explores the use of inquiry-based learning activities supported by access to, and use of, resources in DLESE.

The purpose of the study is to characterize the opportunities and obstacles presented by digital libraries for: (a) instructors attempting to create a technology-enhanced inquiry-based learning environment, and (b) students learning in a technology-enhanced inquiry-based learning environment. The research questions of particular interest are:

1. How do the features and functionality of DLESE support or hinder an instructor's efforts to create a technology-enhanced inquiry-based learning environment?
2. How can an instructor's use of DLESE for creating a technology-enhanced inquiry-based learning environment be characterized?
3. How can students' use of DLESE be characterized?
4. What are students' perceptions of the affordances or obstacles to their learning presented by use of DLESE?

Context and Participants

This research is being conducted in a geology course entitled Life and Ecologies of the Past. This course is an upper-level undergraduate geology course, which consists of 2 hours of lecture and 3 hours of lab per week. The course focuses on principles of paleobiology, including biostratigraphy,

paleoecology, taphonomy, and macroevolutionary dynamics. Students enrolled in this course are typically geology majors who have completed the introductory geology course sequence. There are a total of eight students enrolled in the course, seven of whom have agreed to participate in this study.

Research Design and Data Collection

This study utilizes a layered case-study approach, in which both the study of one macro-level case and case studies of several individuals (Patton, 2002) are being conducted to document the creation and implementation of a technology-enhanced inquiry-based geology curriculum. Data collection procedures consistent with case study research such as observation, document analysis, surveys, and interviews are being used to address the research questions of interest.

Preliminary Results of Interest

Preliminary results related to student (a) use, and (b) perceptions of DLESE are presented below. (See Appendix for supporting field notes and interview transcripts.)

Student Use of DLESE

Students have not made extensive use of DLESE during their class or lab periods. Their initial experiences with DLESE may be a strong contributing factor to this. The primary obstacle to students' use of DLESE appears to be the lack of useful results that students receive when conducting searches. The poor search results do not appear to stem from a lack of computer literacy on the part of the students. From observing students interactions with DLESE, they appear to have no difficulty navigating the website. Results from a pre-course student survey indicate that all but one student is comfortable or very comfortable using the Web. Thus, it does not appear that computer skills per se are an obstacle to student use of DLESE.

The problem may lie in the search terms associated with the DLESE resources. When students have entered specific scientific search terms such as "biogenicity criteria" or "komatiites" or "graptolites," they get very few or no results. When this occurs, students appear fairly quick to

either (a) give up searching, or (b) switch to Google to continue searching for the needed information.

One such example of a student who quickly switched to searching on Google after not finding what was needed on DLESE, is illustrated in the following observation (Please see Appendix for additional observation field notes):

Start: 12:57pm

Robin: are you all done with this? (to Karen - referring to the pc)

Karen – yes

Robin does search for “biogenicity criteria”

[no results]

Robin then searches for “fossil life criteria”

[no results]

Robin then searches for “life criteria”

[Gets 2 results]

12:59pm

Robin clicks on “Nova PBS site”

1:00pm

Robin [closes DLESE and goes to Google]

Searches for “biogenesis”

[no results]

Clicks on alternative spelling option provided “biogenicity”

[674 results]

Clicks on 1st result = [www. Astrobiology.com](http://www.Astrobiology.com)

1:04pm

Robin- back to Google search results

Searches for “biogenicity criteria”

[302 results]

Clicks on 1st link = spacedaily.com

1:07pm

Robin back to search results

Clicks on second link “Research” = <http://users.ox.ac.uk>

Robin: back to search results

Clicks on 3rd link

Back immediately to search results

Scrolls down page

Clicks on another astrobiology.com link

Back to search results

Scrolls down to end of good page

Hit next button

Clicks 1st link on 2nd page of search results = www.Doir.wa.gov.au

1:11pm

Robin closes websites. Closes all screens except for the Life on Mars site that Jake had left open on screen

END: 1:11pm

Student Perceptions of DLESE

During the fourth week of the semester, five of the seven participating students were questioned about their perceptions and use of DLESE thus far in the semester. Only three of the five interviewed students had actually made use of DLESE by that point in the semester, and their perceptions of DLESE ranged from “I love it” to “it was okay.”

In response to the question “Have you made use of DLESE yet this semester?” Jake expressed the following concerns about DLESE:

We accessed it for um our last lab – we needed the criteria for ‘what is life?’. We used an article from there to try to get some more input on what characteristics of life the scientific community would kind of agree upon. Umm... it was okay. Ummm...the way they have them sorted into different age groups or like levels I guess, I find that like totally inadequate. Because like you’ll get like, the file we were like looking at was life on Mars, and its like for every age range from like grad students to kindergarten kids, so we’re sitting here trying to (?) this article and we have to really like search this article to find the parts that are pertinent to like people on our level...

Jack, who had also used DLESE during class while working with Jake, had the following to say expressing a more positive perception of DLESE:

I have. Umm...More so in the lab than,, I mean um m yeah I’ve used it at home but uh not too much, I mean most of the stuff you know it will be in our book pretty much other than some maps and charts and things like that will be on the website that might not be in our textbook.

[Researcher: okay, can you tell me about your experiences using it thus far?]

Jack: Umm, it’s been pretty good. It’s pretty straight forward. It’s easy to get around on and umm.. I don’t really know what to say, it’s a good website. It’s very thorough, it’s got a lot of stuff.

[Researcher: Have you been able to find what you've been looking for?]

Jack: Definitely.

Finally, Karen, who has never made use of DLESE during class, reports having strong favorable opinions about the library:

Yes! I tell everybody about DLESE. I was in my Surface Processes class just now...like a couple hours ago and we had like a lab every week and umm he was like oh yeah look in these books if you know you want to look at this stuff, or look online – Google it – and I was like no – don't Google it because they could be wrong- use DLESE! And this guy behind me was like who's in the 4010 class was like Oh yeah thanks!

However, Karen did express some concern about the lack of results for searches she has conducted:

Like I use it – but sometimes it stinks because you only end up with like 2 or 3 responses to questions. But the responses like that I've gotten have been really helpful. I use it for – I probably use it less in the 4010 class – like I use it so much in other classes like for references and when I'm unsure about anything. So like yeah, I use it all the time. So I love it.

Future Research Directions

As mentioned at the outset of this report, these are only preliminary results and findings. Mid-semester interviews are currently underway, and thus should provide more insight on, if and how, students are using DLESE to support their learning. Additionally, these interviews will be used to gather more information on students' latest perceptions of DLESE.

Appendix

Student Use of DLESE: Classroom Observations**Context:**

September 9, 2004: Lab 2: Biogenicity and Earth's Earliest Life

Below is an excerpt from the lab assignment students had to complete for this day.

“One of the most pressing questions in paleobiology and astrobiology today is: What are the criteria by which we recognize life on earth? And, can these criteria for life on Earth be used to recognize life on other planets? In this lab, you will be using a variety of sources to help with this pressing question: fossils, Nature and Science readings, and the web site DLESE. You can also go googling for the latest information concerning early life on Earth.

The main questions that you will attempt to debate for this lab today are:

- 1) What are the biogenicity criteria by which you would recognize early life from ancient Archean Eon rocks?
- 2) Can these criteria you developed be used to recognize life on other planets?

I. Work Station No. 1. First, debate the biological criteria for life that you are most familiar with from your background and make a list of these criteria. Second, check your list with DLESE and/or google criteria for life and compare that information to yours. This would be present in tabular format with your list in the left column, and alternative sources in the right column. Determine which of the criteria you would use for the rest of this lab.”

While working at Work Station No. 1, the researcher observed the students do the following:

Start: 12:47pm

Jake, Jack, Karen & Melanie – working together to come up with criteria from their lecture notes; spend some time trying to figure out what is meant by preservation

Jake – okay now we need to check this with DLESE

Jake & Jack get up and go to PC

Jack- what's the website?

Jake: dlese.org

Jake: Type in “criteria for ancient life”

[gets no results]

Jake: try “characteristics for life”

[get 17 hits]

[they scroll for a while and finally select “Life on Mars” link; find criteria on 2nd page. All group writes down 6 criteria listed; Melanie & Karen at front of room now]

End: 12:50pm

The researcher observed another student's experience trying to address the same question using DLESE:

Start: 12:57pm

Robin: are you all done with this? (to Karen- referring to the pc)

Karen – yes

Robin does search for “biogenicity criteria”

[no results]

Robin then searches for “fossil life criteria”

[no results]

Robin then searches for “life criteria”

[Gets 2 results]

12:59pm

Robin clicks on “Nova PBS site”

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Robin [closes DLESE and goes to Google]

Searches for “biogenesisity”

[no results]

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1:11pm

Robin closes websites. Closes all screens except for the Life on Mars site that Jake had left open on screen

END: 1:11pm

During this same lab period, while working on a different question the researcher observed the following experience with DLESE for one student:

Start: 1:59pm

Jake goes back to PC and back to DLESE site

Searches for “Komatiites”

[no results]

Closes DLESE and goes to Google

Searches for “komatiites”

[3980 results]

Selects 1st result = www.mantleplumes.org/Komatiites.html

Goes back to search results

Clicks on 5th site = www.gsajournals.org

[still not what looking for apparently]

Jake returns to group and tells them there is nothing in DLESE on komatiites

Jake: We can't talk about them [komatiites] if we don't know what they are. What do u guys think?

Maybe it's veins are some sort of igneous material?

Karen: see on this side you can see some transitional color

Jake: are komatiites metamorphic rocks?

Karen: igneous, I think.

Jake: weren't they famous for {unintelligible} archea bacteria? Wasn't that the thing they were big for?

Melanie: [something unintelligible]

Jake: looks like volcanic materials but way too rounded

Karen [something unintelligible]

Jake: In the burrows?...DLESE is {something unintelligible}; Google's a crapshoot and there is nothing in our textbooks.

End: 2:06pm

One final experience that the researcher observed occurred during another lab period:

Context: September 30, 2004; Lab 4: **The Perils of Preservation**

Below is an excerpt of the assignments students had to complete for this day.

“One day, Lamarck was given an especially difficult task of not only trying to figure out the Phylum (or other grouping) of organism he was given, and the preservational state as well. Lamarck was given 30 samples to analyze by Cuvier. First, can you help Lamarck sort these groups into invertebrate phyla or other groups (e.g., plants, Phylum Chordata, or other category—perhaps sedimentary rocks, such as ooids). Second, for the groups you organized, figure out the preservational states present for that group and, if applicable, the sedimentary characteristics that the fossil is preserved in. Thus, you need to develop a data table with the important data to collect. What would be the most important data to collect to answer these questions? For example, what criteria from sediment analysis would you use? What data would you collect to distinguish the bauplane? And, what data would you collect to determine the preservational mode?”

In the end, you will be organizing your data into similar bauplänes and discuss how variable (or similar) their preservational states are. Therefore, you will need to do five baupläne (or groups) to appease Lamarck. Don't forget to include all examples of these organisms (use their name and sample number) and discuss their most common preservational modes and the implications of this preservational mode to how well represented you think these groups are in the fossil record.”

I observed one student's experience with DLESE during the lab:

Start: 12:47

Drake gets up to check pc for something; meanwhile Robin asking the Teaching Assistant if the oyster shell sample is weathered or preserved

Drake searches for “**graptolite**” on DLESE

[3 results]

Selects first link – goes to page on “The Silurian”

(<http://www.ucmp.berkeley.edu/silurian/silurian.html>)

Clicks to next page; scrolls

12:49

Drake walks back to group {appears he was unable to find what he was looking for}

...

Karen [to Drake]: Did you find any good pictures?

Drake: No

End: 12:50

DLESE Comments from Interview 1:

In response to the question: "Have you made use of DLESE yet this semester?"

Jake:

We accessed it for um our last lab – we needed the criteria for ‘what is life?’. We used an article from there to try to get some more input on what characteristics of life the scientific community would kind of agree upon. Umm... it was okay. Ummm...the way they have them sorted into different age groups or like levels I guess, I find that like totally inadequate. Because like you’ll get like, the file we were like looking at was life on mars, and its like for every age range from like grad students to kindergarten kids, so we’re sitting here trying to (?) this article and we have to really like search this article to find the parts that are pertinent to like people on our level.

I think people should try to like write articles that are for a little bit more of a discrete age group although that has nothing to do with DLESE I guess, it more has to do with the submitters. But we like have this huge range levels in articles that makes it more difficult to find what you are looking for. That’s like the only experience I have with DLESE so that’s pretty much all I can tell you about it. Ask me again later.

Jack :

I have. Umm...More so in the lab than,, I mean um m yeah I’ve used it at home but uh not too much, I mean most of the stuff you know it will be in our book pretty much other than some maps and charts and things like that will be on the website that might not be in our textbook.

[Researcher: okay, can you tell me about your experiences using it thus far?]

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[Researcher: Have you been able to find what you’ve been looking for?]

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Karen

Yes! I tell everybody about DLESE. I was in my Surface Processes class just now...like a couple hours ago and we had like a lab every week and umm he was like oh yeah look in these books if you know you want to look at this stuff, or look online – Google it – and I was like no – don’t Google it because they could be wrong- use DLESE! And this guy behind me was like who’s in the 4010 class was like Oh yeah thanks!

And then the TA came up to me and said – what’s the website – and I was like its DLESE!

Like I use it – but sometimes it stinks because you only end up with like 2 or 3 responses to like questions. But the responses like that I’ve gotten have been really helpful. I use it for – I probably use it less in the 4010 class – like I use it so much in other classes like for references and when I’m unsure about anything. So like yeah, I use it all the time. So I love it.

[Researcher: So your experience with it thus far has been...]

Krs: yeah its been good. I mean, I just type in what I need, I don’t even bother with like checking anything off, I just see what comes up then narrow it down from there....

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My mom's a teacher. I could totally tell her about that cause sometimes she deals with like earth science stuff, and that's what I like about it, it's only earth science.