Summary of Data: Student Testing and Observations (Chico, California)

Prepared for
The Smithsonian Center for Learning and Digital Access

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The Smithsonian Center for Learning and Digital Access (SCLDA) uses all the Smithsonian offers to empower learners to explore their interests and collaborate with others to bring ideas to life. The organization creates models and methods that make the Smithsonian a Learning Laboratory for everyone. Guided by the Smithsonian's mission of the increase and diffusion of knowledge, SCLDA was established to re-imagine and ultimately reinvent the way students, teachers, and lifelong learners interact with and use the Smithsonian's resources in the 21st century. Recognizing most will never visit Smithsonian museums, SCLDA set out to identify how it might best enrich education by making Smithsonian experts and collections accessible to everyone regardless of where they live.

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Background

Since 2011, the Smithsonian Center for Learning and Digital Access (SCLDA) has strived to better understand and address the needs of educators utilizing digital assets through a variety of research and user testing studies that have led to the creation of a new digital learning platform, the Smithsonian Learning Lab (SLL)[1]. The Smithsonian Learning Lab provides access to the digital resources from across the Smithsonian's 19 museums, 9 major research centers, and the National Zoo, to be used as real-world learning experiences. With a repository of over 1.6 million objects and a new resource being digitized and added every 6 seconds, the Learning Lab provides specialized tools to aid in the discovery and creative use of its rich digital materials. For students using the Learning Lab, it is designed to aid in building lasting knowledge and critical skills that take learners from simply finding resources to thoughtful selection, examination, organization, and creation of new resources.

The SLL, as it currently exists, was largely informed by the input and practice of diverse and effective educators.[2] Therefore the goal of these Student Testing experiences, as a piece of a larger research effort, *Understanding the Needs of Student Users of Digital Smithsonian Resources,* focuses on testing possible approaches to using the SLL in the classroom by students (based on the other components of this project: vols 1–5). While not intended to be a mere validation of SLL's features, the design for this review and summary report is to lend additional insight into how digital systems, tools, pedagogy and content, can be adapted to better meet students' learning needs. As educational psychologist Paul A. Kirschner[3] points out, "If the student is viewed as the end user… participatory design needs to include a more direct participation/contribution of the student in the design of (technology enhanced) learning environments". The overall project will assimilate the findings of Student Tests and Observations along with other research to address some key questions around methods or requirements for enhancing student motivation and engagement with digital content and tools.

1. What are the ways that students engage with digital content in academic settings?
2. What are the motivations for student use of digital content?
3. What are the interface requirements/scaffolds needed to enable and enhance student engagement with rich digital resources?

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[1] Milligan, D., and M. Wadman, M. 2015. "From Physical to Digital: Recent Research into the Discovery, Analysis . . ." <http://mw2015.museumsandtheweb.com/paper/from-physical-to-digital-recent-research-into-the-discovery-analysis-and-use-of-museums-resources-by-classroom-educators-and-students/>
[2] "smithsonian-digital-learning - Teacher Toolkit (Research Findings)." 2013. 28 Sep. 2016 <https://smithsonian-digital-learning.wikispaces.com/Teacher+Toolkit+(Research+Findings)>
[3] Kirschner, P. A. 2015. "Do We Need Teachers as Designers of Technology-Enhanced Learning?" <http://link.springer.com/article/10.1007/s11251-015-9346-9>

Testing Process Description

Assessing information from the Environmental Scan (Env. Scan), the Literature Review (Lit. Review), and Observations of Pilot in Pittsburgh, PA Classrooms (Pitt. Obsv.), targeted features were selected for further classroom prototyping and testing with students ranging from ages 13-17 years old in 8 separate classroom sessions at 3 diverse school sites. Below is documentation on the elements taken into consideration for testing and the various approaches that were used in each classroom.

Description of Classes Observed	
Group 1 **Class A & B**: **10th Grade - World Literature** (Comprehensive High School / 2 Classes) Learning Collection: Lord of the Flies - Relation to Totalitarianism http://learninglab.si.edu/q/ll-c/8YUt6uLGPhj16CYk	**Group 3** **Class A & B: 11th Grade - American Literature** (Charter High School / 2 Classes) Learning Collection: Transcendentalist Thinking http://learninglab.si.edu/q/ll-c/A2doj3Jgb7xYYhPV
Group 2 **Class A & B**: **10th Grade - World History** (Charter High School / 2 Classes) Learning Collection: Rise of Industrialism http://learninglab.si.edu/q/ll-c/KjPRhtKWnMn1o101	**Group 4** **Class A & B**: **8th Grade - US History/Science** (Charter Middle School / 2 Classes) Learning Collection: My Race to Space Collection - Space Race of 60's http://learninglab.si.edu/q/ll-c/JVbfHRJ4WdUkf1kJ

Main Elements Considered for Testing

Items 1-10 listed in the table below represent elements identified for potential testing as identified from the Literature Review (Vol, 1), the Environmental Scans (Vols. 2–3, and the Observations of Pilot in Pittsburgh, PA Classrooms (Vol. 5). We selected elements for testing that were largely dependent on the student's' interaction with the platform and content.

Conversely, those elements determined to be already under development or exclusively related to inputs of the teacher were avoided. We selected elements that could be adequately tested and observed in a classroom setting.

Target Element / Feature / Tool	Lit. Review	Env. Scan	Pitt. Obsv.	Already Being Developed	Largely Dependent on Teacher / Designer	Student Controlled / Focused Element	Can Be Readily Prototyped	To Be Tested
1. Learner ability to record information as notes / Share notes	X	X				X	X	+
2. Learner ability to monitor progress / expose progress to others	X	X				X	X	+
3. Students communicate and share work product	X	X				X	X	+
4. User provided modeling on how to best engage community		X			X			-
5. Guiding Questions / Inquiry Structure	X		X		X		X	-
6. Citation Tool	X		X			X		-
7. Students can work collaboratively on projects or assignments	X	X			X	X	X	+
8. Prefer access to print-based worksheets or digital version integrated in-system			X		X	X	X	+
9. Share resources to others outside of system		X		X			X	-
10. Core experience can be embedded in other environment / platform		X		X				-

Potential Test Elements Design Approach

The following table shows elements identified for testing, as referenced above numerically. In order to create as much flexibility as possible for diverse classroom testing environments, dual approaches were designed for each item to be examined. Texts in **BOLD** represent testing performed and approach.

Test Elements	Approach 1 (Lo-Fi)	Approach 2 (Hi-Fi)
1a. Document notes, findings, etc. for self-regulated reflection	**1. Notepad (paper / pencil) on desk** **2. Sticky notepad (stick on right or left side of screen)** **3. Post-It notes (organized on desks separate from device in some relational order)**	1. NotePad or TextEdit, digital word processor/text editor functionality, open on device oriented to where they want it to "stay" throughout work. Or **Google Doc to record notes or question responses. Could give them choice of minimize and toggle, or resize browser and make persistently visible either as side by side with learning resources/content or stacked, and show both and then observe and record what students end up selecting.** 2. We could add as open-ended question type of various resources and title as Notepad or Notes in addition to persistent Notepad app and see which they prefer to generate content into or just make it an additional option. (Key is that notes taken on a single resource, don't carry to other resources while moving forward)
1b. Document notes, findings, etc. for sharing with others (instructor, peers, community)	**At end of tasks, ask students to take option 2. and 3. Sticky notepad from above and have students select those they think would be interesting, useful, or represent their best thinking for audience of instructor, and then audience of peers and stick on board by question. (Use board in class for students to submit their responses)**	Since Hi-Fi options above conclude with students only having in-system or on-device digital documentation, we could have them categorize as Share to Teachers or Share to Peers with similar framing as that to the left of this and submitting via email. If we have classes in which students create Learning Lab accounts ahead of time, then we can have them respond to questions within the system.
2a. Progress Indicator available to student for self-monitoring	-If we want progress to be more privately documented, we can employ small sticky dots and have students move them from	-simple "been here" icon or shading for resources visited already. -simple "been here" icon or shading for

	one side of the laptop keyboard to the other as they complete each section of the task. **-or we can have them pull a small but visible sticker from a sheet and place on top of their screen.** **Tested this in unison with public sharing of progress using method in 2b.**	questions or info. Or hotspot tabs added to resource already visited by student. -simple progress bar that is persistent (perhaps at bottom), and merely renders as scaled incremental dynamically in relation to # of resources in collection and shows progress for # of resources already visited -complex progress monitoring that more granularly shows progress through percentage of questions answered.
2b. Progress indicator available to community for sharing	- Clear small cups on desk with skittles (2-3) in each correlating to each step in task. Students eat contents in sequential order probably in relation to tasks completed. This is visible to observers and others. (could incite competition, and maybe then become an alternative factor we aren't trying to look at necessarily, but i guess that is again, something we can determine is an outcome of visible indicators for below. **- Sticky tabs across tops of monitors for each segment of the learning activity (collection) the students are completing...students move a sticky tab over to opposite side of their monitor as they complete each segment.**	Won't be able to integrate this into digital environment for testing nor have comparable utility to achieve for whole class, in-system viewing.
3. User Sharing of findings or resulting work with others	-Students in teams of two and can share their work verbally or through shared writing pad. **-If findings are simple results, perhaps we can have students write findings on post-it notes and place in large area on board as they move through exercises.**	-Teacher "turns on" student response sharing on questions. Peers' responses can be shown to students after they submit their own response as an option. - Group discussion type response can be activated where all students contribute findings as part of a group dialogue
7. Users collaborating on work or performing tasks together	If students' deliverables include just formative and summative questions, the student teams can collaboratively answer. If students deliverables include development of a product in the form of a presentation, or a collection of their own, one student will need to create while other contributes.	**If students deliverables include just formative and summative questions, the student teams can collaboratively answer in a Google doc.**

	Can invite students to work in pairs or remain alone. Can observe where and how students engage in work cooperatively, or how they divide tasks, etc...	
8. Student use of paper materials over digital materials	**Provide sticky Notepads for students to record information on in addition to online form.** **Provide questions as paper handouts with room to answer questions in addition to digital means to review and respond to questions**	No Hi-Fi options available, so method were as follows: ● **Notepads will be stuck on each desk and students will be told that they may use them to jot down any information they need to during the tasks.** ● **Handout version of assignments/tasks will be made available for those students wanting one by way of stack at front of class.**

Synthesized Classroom Observation Notes

Site / Students	Item	Numbers	Positives	Negatives
Group 1 Class A 23 Students	Choose to Work Together	6	• Having the worksheet on my laptop was easier to use • I liked being able to put answers directly next to the video we were watching • Like the video, but not enough time, so need to watch again • Having the option of paper notes and online notes is good	• Not sure why google doc was separate from site • Not enough time to finish all the questions • Hard to get my account started • My computer kept going off the internet
	Paper Notes	9		
	Online Notes	14		
	Engagement Level	High		
Site / Students	Item	Numbers	Positives	Negatives
Group 1 Class B 29 Students	Work Together	15	• I like having online videos and questions instead of just worksheets • Cool to help out on a project for all the other kids in the US - System was cool • Like being able to work with a partner on the questions • Wish we had more time to look up more stuff from all the Smithsonian museums	• I wish we had headphones for the video, hard to hear with everyone else watching too • Need more time to finish questions • We should set up accounts like day before we start this
	Paper Notes	5		
	Online Notes	24		
	Engagement Level	High		
Site / Students	Item	Numbers	Positives	Negatives
Group 2 Class A 8 Students	Worked Together	4	• The 3d scans sound really cool and I look forward to seeing those • This experience really helped me with my note taking skills. It was way effective for me to look at the images and take notes of what I saw • Taking notes on doc while teacher is talking, seeing others responses while writing your own • There was nothing really bad it was pretty self explanatory and easy to understand	• Not a big problem - as far as getting to the set and making it your own it was slightly complicated • Difficult to find my collection again
	Paper Notes	2		
	Online Notes	6		
	Engagement Level			

| | | | ● I loved how easy it was to take notes while looking at the slide. It was easy to use!
● I liked how we could see the image on our own computers while we talked about it.
● The basic design and home page was very nice. The search engine was nice
● I really like the whole idea of being able to take notes online using technology and you guys are easy to understand | |

Site / Students	Item	Numbers	Positives	Negatives
Group 2 Class B 7 Students	Worked Together	2	● It was really easy to take notes online and hearing the teacher speak. As a visual and audi learner I like it. ● I liked how easy the note-taking was. It was easy to understand ● I like that I can have the powerpoint pictures and note outline right in front of me during the lecture. ● I loved the idea in theory as well as the clean and neat webpage overall. I did enjoy using pictures instead of text as well ● Good color scheme ● A charming home page that covers the three things (create, share, discover) that we expect to see. I really like the copying ability to be able to edit. The search engine is very precise. There is a large variety. ● Site is well optimised.	● I felt it was hard to select and label the boxes. As well as this I am not sure if my notes saved. ● Is there a next slide option? ● Unclear for viability with students using website to take notes. Are the copied collections synched with the teachers? This could be useful for better communication with the teacher and student. I like the indifference between teachers and accounts. We may need slightly more thorough spell checker.
	Paper Notes	4		
	Online Notes	3		
	Engagement Level - Med/High			

Site / Students	Item	Numbers	Positives	Negatives
Group 3 Class A 16 Students	Worked Together	4	● I found it very easy to use and liked having all the resources right there in one place ● The whole site (the format) was easily navigated to me. I had no problems.	● When I moved from the video to the cartoon, it didn't save my answers to the video. ● Despised how the quotations system worked. ● Add a search bar to
	Paper Notes	11		
	Online Notes	14		

	Engagement Level - Med/High		• Liked the simplicity of the lab. • I liked how I was able to pull up different things within the website easily. • I like how the youtube videos would be played on the site and resized when a side note was opened. • Heart the teacher's notes on pictures.It is very easy to use • Can easily navigate site.	search related topics/quotes. • Add transcripts for videos.
Site / Students	Item	Numbers	Positives	Negatives
Group 3 Class B 9 Students	Worked Together	2	• Easy to navigate • Having my notes and answers saved with our stuff helps • I like how the transcendental quotes were connected to media • Online material is more engaging for me at least • Liked working together on the assignment	• Video wouldn't play on my laptop, but did for my partner • Didn't know if my answers were submitted to my teacher or not • Searching brought up a lot of stuff unrelated to what I was looking for
	Paper Notes	2		
	Online Notes	7		
	Engagement Level - High			
Site / Students	Item	Numbers	Positives	Negatives
Group 4 Class A 25 Students	Create an Account	22	• I like that the site is easy to use and has lots of things on it • I like all the drawing that I can find. • You can see a lot of things that you wouldn't think were in a museum. • I liked how this website was so easy to use. • Good you can personalize your collection. liked looking at pictures of space. • I liked the simplicity. • I liked being able to make a collection of stuff that I liked about space.	• It should ask if you mis-spelled something like ask if this is what you want. • If you searched something and spelled it wrong it wouldn't come up with something wrong • One thing I did not like was how there was no autocorrect when something was spelled wrong. • If you spell something wrong it won't come up. • I didn't like making my own collections. It was really confusing. • I didn't like that you couldn't see the image before you added it to the collection.
	Copy a Collection	24		
	Add Resources	22		
	Share Collection with Someone	18		

Site / Students	Item	Numbers	Positives	Negatives
				● I did not like not being able to look at it.
Group 4 Class B 28 Students	Create an Account	25	● I liked how easy it was to use. ● I like how easy it is to search for different things. ● I liked how it was easy to find pictures. ● I loved all of the information on the site really cool. ● I liked that we got to experience this site. ● I like the website format. ● It was all pretty good. Thanks! ● Liked cool information and images. ● I liked how you can publish your collection to help other people. ● I like when you search something it gives all the most possible answers and shows a lot. ● I like how you are able to make your own collections and change your profile picture.	● There was no spellcheck. This would be very, very helpful. ● Didn't like that it didn't always show right results. ● I think you should be able to just click anywhere on an image to drag it. ● Mine took long to load. But I was almost done anyway. ● I think perhaps your "share" symbols should be changed. It was hard to find. ● It needed to be more direct to find your collection. ● I didn't like how when I share it via email it took me all the way to gmail. ● It's kind of confusing to search because so many things show up. ● I didn't like how once I searched for pictures outside of the earth and it showed me random people.

Observed Trends

The following list represents a summary of conclusions found as a result of the synthesis of this data.

Student-Use Trends Supported by Observations:

Test Items	Resulting Observations
1a. Document notes, findings, etc. for self-regulated reflection	+ Majority of students made use of digital note-taking tools when available.
1b. Document notes, findings, etc. for sharing with others (instructor, peers, community)	- Majority of students DID NOT take advantage of reviewing peers responses or contributions when provided access.
2a. Progress Indicator available to student for self-monitoring	* Students use of progress monitoring for self-tracking and/or as visual indicator to others was not effectively tested, nor was the duration of the tasks sufficient to model use-cases found in Literature Review in which students were engaged in projects that spanned multiple class periods up to multiple weeks of sustained coursework.
2b. Progress indicator available to community for sharing	* Students use of progress monitoring for self-tracking and/or as visual indicator to others was not effectively tested, nor was the duration of the tasks sufficient to model use-cases found in Literature Review in which students were engaged in projects that spanned multiple class periods up to multiple weeks of sustained coursework.
3. User Sharing of findings or resulting work with others	+ Majority of students were able to set up personal accounts to record information and submit to teacher when made available.
7. Users collaborating on work or performing tasks together	- Majority of students DID NOT opt to work collaboratively when allowed.
8. Student use of paper materials over digital materials	+ Majority of students preferred in-system questions and guidance instead of paper-based worksheet when both were available.