Report on the Usability and Effectiveness of SirsiDynix SchoolRooms for K-12 Students

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INTRODUCTION

SirsiDynix has partnered with INFOhio to develop SchoolRooms. SchoolRooms will be an online portal which will include resources selected by teacher-librarian teams which meet national and state academic content standards. It will also feature a federated or single-search capability which will simultaneously search library catalogs, electronic databases, websites selected by the teacher-librarian teams, and the web using a search engine.

SchoolRooms was tested this spring in the Shaker Heights (OH) Schools using the nine rooms which have been developed so far. However, INFOhio and SirsiDynix have committed to undertaking a project this summer involving approximately sixty teacher-librarian teams to complete the initial development of SchoolRooms by next fall.

From January 30, 2006 to February 17, 2006, a team of Kent State University researchers conducted usability testing of the SirsiDynix SchoolRooms web product. As part of an extensive study, 22 teachers in the Shaker Heights School District agreed to participate as pilot classes for a pre-release version of SchoolRooms. These pilot program teachers agreed to create an assignment that had students utilize SchoolRooms for some kind of information seeking. They also agreed to participate in the evaluation of SchoolRooms and give their feedback on "real-world" use.

In addition to the observation of students in the pilot program, the research team from Kent State University, in consultation with SirsiDynix representatives, developed five tasks for students to perform who where not in pilot classes. The interactions were captured by a capture and analysis software that recorded screen events, mouse clicks, keystrokes, audio and video of each subject's facial reactions while working. For some of the observations, eye-tracking technology was used to record the eye movements of the students as they proceeded through the tasks. Appendix A contains the non-pilot protocol and observations sheet. Appendix B contains the pilot protocol and observations sheet. The tasks developed for the non-pilot students focused more on basic interface issues identified by SirsiDynix. Because these tasks were controlled by the researchers, more generalizable results were obtained to address specific areas of concern in the interface.

Since each pilot class had different types of assignments, it is difficult to generalize across all of the students. Some assignments were highly scripted as to where the students should go in SchoolRooms to find specific information. Browsing and exploration were not necessarily encouraged. Analysis results from this type of interaction with SchoolRooms will be of limited value, except for comments and reactions recorded by SirsiDynix staff through surveys which were distributed to each student (separately available from SirsiDynix).

In the future, the KSU research team will identify classes whose assignments forced them to explore the SchoolRooms interface for more in-depth analysis of "real-world" use. We hope to still find some useful information.

The data presented in this report also include observations of 44 students who were not part of the SchoolRooms pilot classrooms. These non-pilot students were recruited for participation through the School Library Media Specialist at each school who identified either individual students or classes of students for participation in the study. Parental permission was required for each student's participation. These students had no prior exposure to School-Rooms before the observations where conducted.

The students who participated in the study were from the Shaker Heights School District in 2nd grade to 12th grade (Table 1). Overall, the KSU team conducted 135 student observations. Of these 135 observations, 97 students were video recorded using Morae® usability software while 38 students were eye-tracked using the Tobii® 1750 eye-tracking monitor. This monitor tracks the position of the subjects' eyes on the screen using an infrared camera built into the bezel of the monitor. "Hot-spot" images and screen capture video can be used to display the eye movements of the students over the web pages to indicate where the student was looking while performing a given task. Fixation and gaze data are visually represented in the hot-spot images in the Eye-tracking Analysis section.

Table 1: Pilot and non-pilot students by school

	Pilot students	Non-pilot students
High School	29	7
Middle School	49	6
Woodbury Elementary	9	24
Lomond Elementary	4	6
Fernway Elementary	--	1
Total	91	44

RESULTS FROM NON-PILOT STUDENTS

Sample and Tasks

Concerning sample size, there is some variance in the number of subjects reported in "time on task" data, and the number of subjects reported in survey results. This discrepancy is due to the fact that some of the recordings from which time-based data were taken developed certain technical problems and we were not able to obtain the time on task data. So the number of subjects for which time on task data are available is fewer than those for which survey-based data are available (this data was collected on paper). In other cases, students either dropped out or the researchers ran out of time to ask all questions. Therefore, this original total of forty-four subjects is not always represented in the results to follow.

In addition to performing the assigned tasks, subjects were asked a series of questions about their interactions with SchoolRooms. After each task, we asked the following three questions:

1. Finding this information was:
   - ☐ Easy
   - ☐ Hard
   - ☐ Mixed

2. Trying to find the information just now, I felt:
   - ☐ Confused
   - ☐ Pretty much knew what I was doing
   - ☐ Mixed
3. Compared with what you expected, this task was:
   - ☐ Slow
   - ☐ Fast
   - ☐ Medium

Researchers also noted whether each task was successfully completed by the subject and whether the subject was aware of successful or unsuccessful task completion using the following matrix:

	Subject was:	
Search was:	**aware**	**unaware**
successful		
unsuccessful		

Following the completion of the five tasks, we asked a series of twelve questions regarding the overall quality of their interaction with SchoolRooms. Finally, we posed six demographic questions that included items about overall Internet behaviors of the subjects. Responses to these questions are summarized below.

The questions were carefully designed to elicit specific behaviors from subjects that would indicate user preferences for certain SchoolRooms features and the effectiveness with which students use these features. Specifically, the questions were ordered to see whether students would choose to search or browse using "Explore a Subject." Also, if students were told to search or browse, we wanted to see how well they could do so in SchoolRooms. In order to get that information, we ordered the questions in the following way:

1. The first question was not prescriptive as far as search method. Subjects were left to choose between searching and browsing the "Explore a Subject" hierarchy.
2. In the second question, subjects were asked to *search*.
3. In the third question, subjects were asked to *browse*.
4. The fourth question was similar to the first in that subjects were allowed to choose between searching and browsing.
5. The fifth task was different from the rest in that subjects were asked to identify the types of output. Since SchoolRooms searches produce several types of output (e.g. library materials, database output, materials from other libraries and web sites), we wanted to see if subjects were able to identify these various materials in the search results.

The number of tasks (five) was chosen so that subjects would not experience fatigue. It was also thought that five tasks would be sufficient to address questions posed about School-Rooms by its developers. If subsequent study is needed, alternative tasks may be created and given to subjects.

Subjects' Choices Between "Search" and "Explore a Subject"

In Tasks 1 and 4, subjects chose between search and exploring. For those tasks, we present which was chosen first, whether subjects switched to another strategy, and whether they switched back to their original strategy. Some subjects switched more than three times, but that was rare. We deemed it informative enough to present the original choice and two changes. For example, if a subject started Task 1 by searching, and then switched tactics to "Explore a Subject," and then switched back to the search box, this sequence would be recorded as follows in the tally (Table 2).

Table 2: Sample of student choice table

	Search	Explore	Other	Total
Started with	1			1
Switched to other choice	1			1
Switched Back	1			1

This recording would hold true even if the subject switched tactics subsequently, which rarely happened.

While observing subjects in tasks 1 and 4, it became apparent that some of them would choose paths other than "Search" or "Explore a Subject." For example they may choose to click something in the "How do I…" list. They might click on one of the images that are links in the left column. We called these alternative paths "Other."

For Task 1, in raw numbers, students chose Search over Explore by a margin of 13 to eight. However, eight students chose an alternative method to start their search as shown in Table 3. So while it appears that searching was the preferred method for these students, it was apparent that a slight majority of students did not choose searching as their first strategy for completing the task. Switching was relatively rare, except where students chose alternative paths, in which case five of the eight switched. It is not clear why they chose to switch at a high rate in this category, but it could be that they did not feel they were on the right path, that they didn't see the Search or Explore when they began, or simply because it was their first opportunity to use SchoolRooms.

Table 3: Task 1- Subjects' choices and actions in accomplishing the task

	Search	Explore	Other	Total
Started with	13 (45%)	8 (28%)	8 (28%)	29 (100%)
Switched to other choice	1	2	5*	8
Switched Back	1	0	0	1

*Of the 5 who switched from "Other," 3 went to "Search" and 2 went to "Explore."

The purpose of Task 4 was similar to Task 1 in that it was intended to evaluate how students chose between searching and browsing. The main difference between Task 1 and Task 4

(besides the content) is that students had been forced to search and browse in the previous two tasks respectively, therefore exposed to both choices.

What is interesting to note in this task is that after their experiences in the first three tasks, twice as many students chose to explore as those who chose the search box (see Table 4). 22% still chose a means other than Search or Explore and this may be due to the screen real estate given to other options on the landing page.

In addition, while students reported feeling confident in performing this task, they were evenly spread in their responses to the questions regarding the ease and the speed of completing the task. 66% of them were successful in the search and knew they were (Table 4).

Table 4: Task 4 - Subjects' choices of "Search" or "Explore a Subject" in Task 4

	Search	Explore	Other	Total
Started with	6 (26%)	12 (52%)	5 (22%)	23 (100%)
Switched to other choice	2	6	4*	8
Switched Back	1	2	0	1

*Of the 4 who switched from "Other," 2 went to "Search" and 2 went to "Explore."

Data Analysis of the Five Tasks

In the following sections, we present the results of the data collection of the first four tasks. Further analysis of the fifth task is required because of the complexity of the results—they are forthcoming in a separate document. In each of the four sections below, we present:

• The amount of time subjects spent on each of the tasks (both in aggregate and by grade level)
• The results of the three questions asked after each task
• The judged success or failure and the subjects' awareness of their success or failure for each task
• Satisfaction

Task 1: Find information that tells you how to identify different types of clouds (cirrus, cumulus, stratus, etc.).

The purpose of this task was to provide subjects with an opportunity to choose between "Explore a Subject" and directed searching. We wanted to find out which mode of searching students without any orientation to SchoolRooms would choose. Also, we wanted to find out how long it took for students to accomplish the task both in aggregate and by grade, how successful students were, and their reactions to the task.

The average time it took all subjects (regardless of grade level) to complete Task 1 was 3 minutes 57 seconds. Table 5 shows the average times overall and for each grade. There appears to be an anomaly with the second graders who clearly completed the task significantly faster than the other grades. We can only conclude that this was due to the assistance of the adults present.

Table 5: Average times to complete Task 1

		Grade Level			
	Overall	2	5 & 6	8	10 & 12
Average Time	3:43	2:15	4:36	3:05	2:57
Standard Dev.	2:32	1:10	2:16	2:30	1:18
n	37	6	19	6	6

Figure 1 shows the range of times recorded for all grades. Grades 5 and 6 showed consider-able variance with a standard deviation of 2:32 as can easily be seen in the scatter plot in Figure 1. The sample from the other groups was small enough that descriptive statistics don't reveal much significant about the process, but they might be used to suggest further study.

Figure 1. Task 1 time on task for all subjects by grade level (n=38)
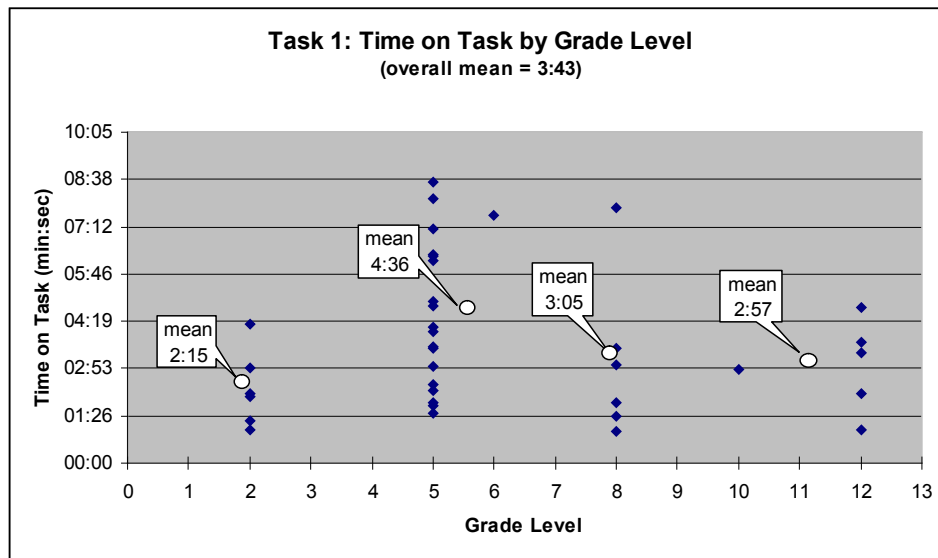
In addition to noting the time it took subjects to complete tasks, it was important to note whether they successfully completed each task, and whether they were aware of the fact that they had completed the task successfully or unsuccessfully. This is one possible measurement of the task outcome of each task. For Task 1 (see Table 6), 66% of the subjects successfully completed the task and were aware of their successful completion. 16% were unsuccessful and knew they were, but 18% were unsuccessful and were not aware they had not found the information requested in the task.

Table 6: Task 1- Subject success

	Subject was:	
Search was:	aware	unaware
successful	29 (66%)	0 (0%)
unsuccessful	7 (16%)	8 (18%)
Researcher could not determine	0	

The three survey items asked after each task served as a measure of user satisfaction based on subjects' perceptions of the ease with which information was found, how they felt while searching or browsing, and the degree to which the speed of the search matched their expectations.

For Task 1, as shown in Table 7, 89% of subjects found the task easy to do or somewhere between easy and hard to complete (47% and 42% respectively). Only 12% reported the task to be "hard" to do. 85% of subjects felt confident or in between confident and confused while working on the task (40% and 45%) respectively. 47% of subjects felt the task went faster than they expected while only 23% felt it went slower than expected with 30% in between. It is safe to say that this task went well for students overall. However, in the re-searchers' debriefing after data collection, it was widely noted that many students reported they "pretty much knew what they were doing" when it was clear that they did not. It seemed students were eager to give the answers the researchers wanted, and so the self-reporting data gathered from the survey is to be taken in that spirit. We have no quantitative data to sup-port this notion, but it was observed nonetheless.

Table 7: Task 1 - Survey items

Question 1

Finding this information was		
	Percent	Count
Easy	47%	20
Hard	12%	5
In-between	42%	18
Total	100%	43

Question 2

Trying to find the information just now, I felt		
	Percent	Count
Confused	14%	6
Pretty much knew what I was doing	40%	17
In-between	45%	19
Total	100%	42

Question 3

Compared with what you expected, this task was		
	Percent	Count
Slow	23%	10
Fast	47%	20
In-between	30%	13
Total	100%	43

See Appendix D for breakdown by grade level.

Task 2: Using the Search box, find a book on the Civil War.

The goal of Task 2 was to see if students would use the search box effectively. Using time on task as a measure of search effectiveness, we can see that times are much faster than they were for Task 1 (see Table 8 and Figure 2). It is not, however, a reliable measure of effectiveness to compare these tasks because the degree of difficulty is so different among them. Yet, if we also look at satisfaction and success, we can see that students were generally positive in their satisfaction ratings in the three survey questions (see Table 9).

Conversely, when the success rate and awareness is factored in, we see a slightly different story. 36% of the subjects were successful and aware of their success, but 27% were unsuccessful and unaware of their failure, as shown in Table 10. In addition, researchers were unable to determine the success or failure of subjects in 18% of the cases. This last finding may indicate some difficulty with the task itself. For example, it could be that researchers were not always able to determine if a book fit the criteria for a "book on the Civil War." This finding may also indicate a difficulty with the way search results were displayed. It is not always clear that items in the library are books, websites or some other material.

Table 8: Task 2 - Average times to complete

		Grade Level			
	Overall	2	5 & 6	8	10 & 12
Average Time	2:44	2:19	2:56	2:31	2:29
Standard Dev.	1:58	0:59	2:38	1:04	0:33
n	37	6	19	5	6

Figure 2. Task 2 - Time on task for all subjects by grade level (n=37)
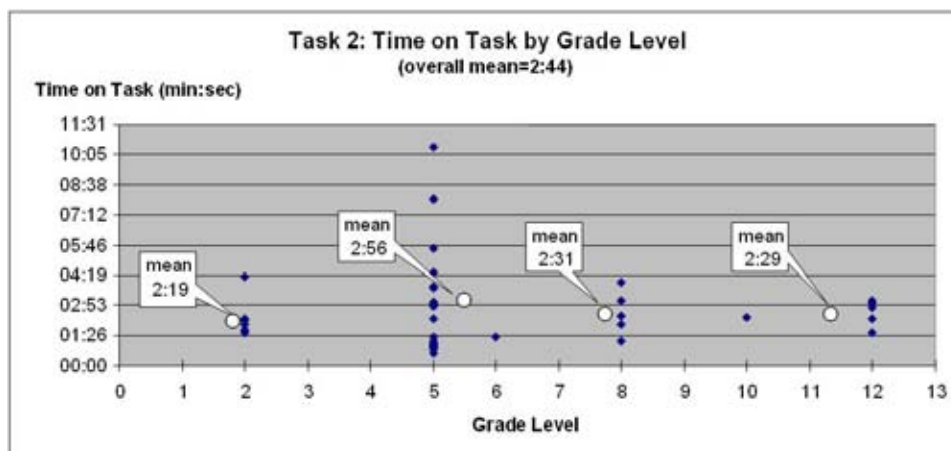
Table 9: Task 2 - Survey items

Question 4

Finding this information was

	Percent	Count
Easy	48%	20
Hard	24%	10
In-between	29%	12
Total	100%	42

Question 5

Trying to find the information just now, I felt

	Percent	Count
Confused	19%	8
Pretty much knew what I was doing	52%	22
In-between	29%	12
Total	100%	42

Question 6

Compared with what you expected, this task was

	Percent	Count
Slow	29%	12
Fast	44%	18
In-between	27%	11
Total	100%	41

See Appendix D for breakdown by grade level.

Table 10: Task 2 – Subject success

	Subject was:	
Search was:	aware	unaware
successful	16 (36%)	1 (2%)
unsuccessful	7 (16%)	12 (27%)
Researcher could not determine	8 (18%)	

Task 3: Using "Explore a Subject," where might you locate information about the causes of World War I?

The purpose of Task 3 was to determine the effectiveness with which students used the browsing capability in the hierarchical system provided as "rooms." This task took longer than the search task (Task 2) but again, this is not a reliable comparison. There was one outlier in the grade 10 and 12 group that took almost 14 and one half minutes to complete the task. The next slowest time was half of that (see Table 11 and Figure 3).

Students reported much more ambivalence about this task than for searching. 43% reported the task to be "hard," while 36% and 21% reported the task to be "easy" or "in-between" respectively. Students were evenly split on how they felt during the task, and were nearly evenly split in their perception of the speed with which they completed the task (see Table 12). However, a majority of them (48%) completed the task successfully and were aware they did so (see Table 13).

Based on researcher comments after data were collected, it seemed that students were not quite as confident as they traversed the hierarchy. At times it seemed they were not sure what to click next. This could have been due to the fact that they had higher cognitive load as they navigated the structure because they had to evaluate their next move at every step. If that is so, this would account for their less than positive feedback, but the fact that they were so successful also indicates that the browsing was better at leading them to a successful result.

Table 11: Task 3 - Average times to complete

	Overall	Grade Level			
		2	5 & 6	8	10 & 12
Average Time	3:43	3:39	2:54	3:58	6:07
Standard Dev.	2:32	1:56	1:42	1:59	4:10
n	35	6	18	5	6

Figure 3. Task 3 - Time on task for all subjects by grade level (n=37)
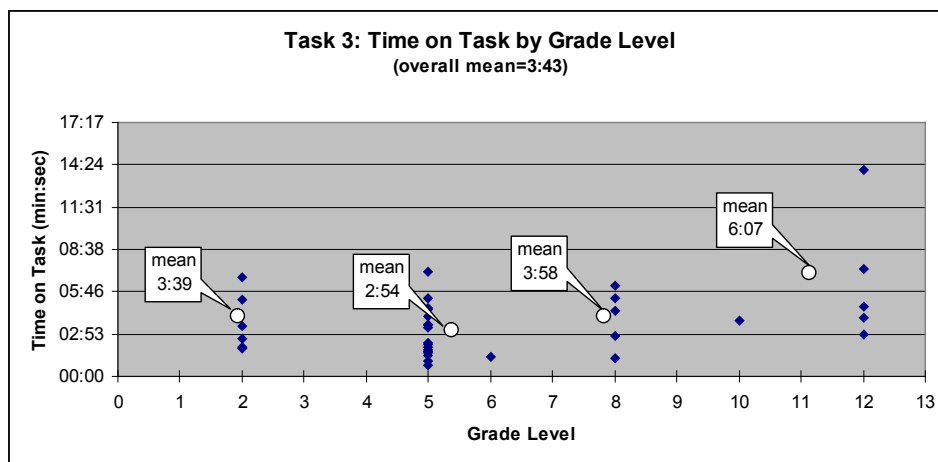
Table 12: Task 3 - Survey items

Question 7

Finding this information was

	Percent	Count
Easy	36%	15
Hard	43%	18
In-between	21%	9
Total	100%	42

Question 8

Trying to find the information just now, I felt

	Percent	Count
Confused	33%	14
Pretty much knew what I was doing	33%	14
In-between	33%	14
Total	100%	42

Question 9

Compared with what you expected, this task was

	Percent	Count
Slow	31%	13
Fast	36%	15
In-between	33%	14
Total	100%	41

See Appendix D for breakdown by grade level.

Table 13: Task 3 - Subject success

	Subject was:	
Search was:	aware	unaware
successful	21 (48%)	1 (2%)
unsuccessful	12 (27%)	8 (18%)
Researcher could not determine	2 (5%)	

Task 4: Where could you find battlefield maps of the Civil War?

The purpose of Task 4 was to see whether students would, after their experiences with the previous three tasks, choose to search or to browse with "Explore a Subject." The discussion of these choices is shown in a previous section before the results of the individual tasks are presented. For review, however, there was a shift toward "Explore a Subject" in Task 4. In Task 1, subjects tended to search more than to browse and this trend turned around in the present task.

In comparing the time on task between Task 1 and Task 4 (which again, may not be a fair comparison), we found that the overall mean time for completion fell in Task 4 from 3:43 to 3:05. Mean times for Grades 5 and 6 fell dramatically while all other grade levels' mean times rose, however. Furthermore, it can be seen in Figure 4 that times for the 5th and 6th graders were more tightly clustered than the other. Grade 8 contained one outlier that took a long time to complete the task or else their mean times would have been lower.

Table 14: Average times to complete Task 4

| | Overall | Grade Level | | | |
		2	5 & 6	8	10 & 12
Average Time	3:05	2:42	2:46	3:38	3:51
Standard Deviation	1:51	1:24	1:27	2:56	2:20
n	34	6	17	5	6

Figure 4. Task 4 - Time on task for all subjects by grade level (n=37)

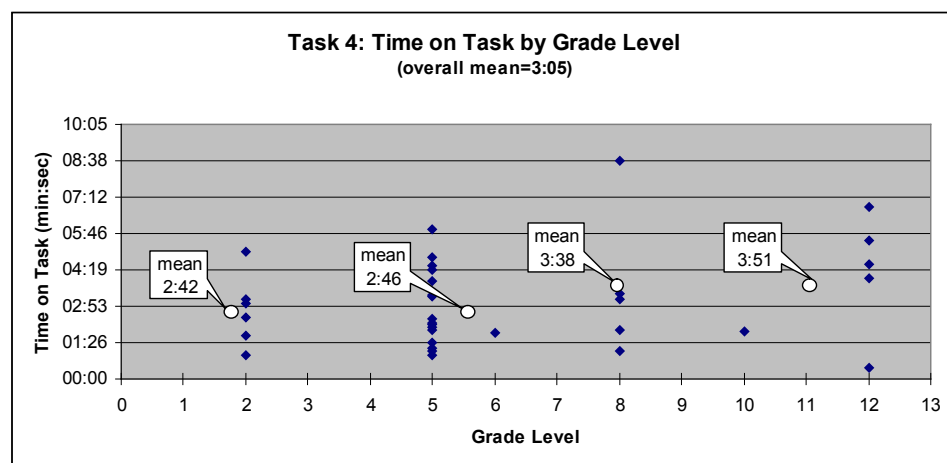Questions 10-12 that were asked after the completion of Task 4 revealed that while students felt somewhat confident completing the task (see Question 11 in which 80% rated their experience as either knowing what they were doing or in between that and being confused), there was even distribution on whether the task was easy/hard, or slow/fast. This reflects some

ambivalence about completing the task despite a tendency to express confidence. However, despite any difficulties, 66% of subjects completed the task successfully and were aware they did so (see Table 16).

Table 15: Task 4 - Survey items

Question 10

Finding this information was

	Percent	Count
Easy	32%	13
Hard	39%	16
In-between	29%	12
Total	100%	41

Question 11

Trying to find the information just now, I felt

	Percent	Count
Confused	20%	8
Pretty much knew what I was doing	46%	19
In-between	34%	14
Total	100%	41

Question 12

Compared with what you expected, this task was

	Percent	Count
Slow	28%	11
Fast	38%	15
In-between	35%	14
Total	100%	41

See Appendix D for breakdown by grade level.

Table 16: Task 4 - Subject success

	Subject was:	
Search was:	aware	unaware
successful	29 (66%)	3 (7%)
unsuccessful	4 (9%)	4 (9%)
Researcher could not determine	4 (9%)	

Task 5: Use the Search box to find information on the solar system.

Circle all the books with your mouse (Don't click!!) Is that all?
Circle all the websites with your mouse (Don't click!!) Is that all?
Circle all the magazine articles with your mouse (Don't click!!) Is that all?

The purpose of Task 5 was to determine whether subjects were able to distinguish among the types of results that occur from a search. The types of results that can occur include the following:

• Library materials
• Other Libraries (i.e., Cuyahoga County)
• Web
• Databases
• Best of the Web

The results are presented in boxes below the search box and each type of result is loaded as the searches under each type are completed. The library materials results are typically loaded first, then the next group is loaded as it becomes available, and so on. While they are being compiled, a message indicates they are being compiled. If there are no results in a certain result category, this is also indicated.

Although an analysis on Task 5 similar to the ones done on the first four tasks is more difficult to perform (primarily because time on task figures are not very helpful), it is useful to compare the success results among the three types of results discussed above. According to Tables 17-19, the success rate with awareness for books and web sites was very good. Yet, the success rate for magazine articles falls off considerably. In addition, there seemed to be confusion in finding magazine articles as evidenced by the unsuccessful/unaware percentage—the highest in that matrix. This is probably due to the "databases" label on that output. Students may not be able to associate magazine articles with databases.

Table 17: Task 5 - Subject success rates for Books

Books		
	Subject was:	
Search was:	aware	unaware
successful	19 (86%)	0 (0%)
unsuccessful	0 (0%)	3 (14%)
Researcher could not determine	0 (0%)	

Table 18: Task 5 - Subject success rates for Web

Web		
	Subject was:	
Search was:	aware	unaware
successful	17 (77%)	0 (0%)
unsuccessful	1 (5%)	4 (18%)
Researcher could not determine		

Table 19: Task 5 - Subject success rates for Magazines

Magazines		
	Subject was:	
Search was:	aware	unaware
successful	8 (36%)	0 (0%)
unsuccessful	3 (14%)	10 (45%)
Researcher could not determine	1 (5%)	

Post-Search Questions

Students generally liked the SchoolRooms product. There was a sense that resources available were "teacher-approved" and would save them time and effort over Google or other general search engines in completing their school assignments. In general, they liked the product and would like to use it again. Tabulated results are shown in Table 20. Note, totals may not equal 100% due to rounding. See Appendix D for breakdown by grade level.

The following questions were asked of each student after they had finished the 5 tasks. Results are shown in the tables below. Here are a few highlights from this data:

• 88% of students said they would like to use SchoolRooms again for another assignment.
• More than half (51%) said they preferred SchoolRooms over other search sites (e.g., Google, Yahooligans!, etc.) and only 24% indicated that they liked other search sites better.
• Nearly half (49%) felt like they got more work done with SchoolRooms and only 16% indicated that they didn't get much done using SchoolRooms.
• 58% said that using SchoolRooms was "fun" and none found it boring.
• Both "Explore a Subject" (58%) and the search box (70%) were judged to be easy to use and only 7% indicated that SchoolRooms was hard to use.
• 70% of the students thought that SchoolRooms looked "really good" and only 2% indicated that they thought it looked "really bad."
• While 53% found the pictures and graphics to be helpful in finding things they needed, 40% indicated that these images did not have any effect at all. This finding is especially crucial given SirsiDynix's extensive efforts to acquire and make available pictures and graphics from major commercial suppliers of such materials.
• Speed of response time was a major issue. While 42% found the response time to be "fast," 59% indicated that pages loaded either slowly or in-between fast and slow. Students quickly became frustrated when they experienced slow response times.

Table 20: Post-search session questions

Question 26		
The text on the screen was		
Easy to read	74%	32
Hard to read	0%	0
In-between	26%	11
Total	100%	43

Question 27

Using "Explore a Subject" was		
Easy	58%	25
Hard	7%	3
In-between	35%	15
Total	100%	43

Question 28

Using the search box was		
Easy	70%	30
Hard	12%	5
In-between	19%	8
Total	101%	43

Question 29

The way SchoolRooms looks is		
Really Good	70%	30
Really Bad	2%	1
In-between	28%	12
Total	100%	43

Question 30

The pictures and graphics in SchoolRooms		
Helped me find the things I needed	53%	23
Didn't help me find the things I needed	7%	3
Didn't have any effect at all	40%	17
Total	100%	43

Question 31

When I clicked on things in SchoolRooms, the next page loaded		
Fast	42%	18
Slow	19%	8
In-between	40%	17
Total	101%	43

Question 32

Using SchoolRooms was		
Fun	58%	25
Boring	0%	0
In-between	42%	18
Total	100%	43

Question 33

When I used SchoolRooms, I felt like		
I got a lot done	49%	21
I didn't get much done	16%	7
I got about the normal amount done	35%	15
Total	100%	43

Question 34

If I compare SchoolRooms to other search sites (Google, Yahooligans!, MSN, etc.)		
I like SchoolRooms better	51%	21
I like the others better	24%	10
In-between	24%	10
Total	99%	41

Question 35

Would you like to use the SchoolRooms website again for another school assignment?		
Yes	88%	36
No	10%	4
In-between	2%	1
Total	100%	41

Student Comments

Students were asked a series of open-ended questions at the end of their non-pilot session. The questions and summary of student comments for non-pilot students and for pilot students are below. The full list of comments can be found in Appendix C.

What did you like best about SchoolRooms? Why?

There were 33 responses to the question. Among the things students liked best about School-Rooms, most relate to the site's overall design, look, and functionality:
- Search system/categories (8)
- Colors, style, arrangement (5)

- "Explore a subject" (4)
- Information and text (2)
- Variety of options (2)
- Games
- Graphics (4)

Some showed appreciation of the contents of SchoolRooms:
- Variety of sources (5)
- Result list/links (3)
- Database
- Map

Among the reasons why students liked SchoolRooms, some comments relate to the overall use and feel of the site:
- Easy to use/navigate (5)
- Helpful (2)
- Inviting
- Fun

Some commented on the information they found from the site:
- Specific/narrowing (5)
- Accurate/filtering

What did you like least about SchoolRooms? Why?

There were 30 responses to the question. Among the things students liked least about School-Rooms, most are about the site design and look:
- Poor link detail (2)
- Poor organization (2)
- Poor colors/style (2)
- Drop downs
- Poor graphics

The specific reasons that students mentioned why they did not like certain aspects of the site include speed and overall usability related concerns:
- Slow loading (5)
- "Explore a subject" (4)
- Search system (3)
- Too many links to follow
- Difficult to use

Responses revealed concerns based on students' specific search experience:
- Poor information
- Too general
- Too specific (2)
- Too technical

Overall feeling while using the site:
- Confusing (2)
- Frustrating
- Overwhelming

Demographic and General Questions

In the sample of students used for analysis in this report, results are skewed towards the 5th grade perspective which comprised 52% of the subjects observed. Therefore, it is difficult to draw generalizable conclusions about the behavior of any specific age group. However, trends are suggested by the data which would warrant further study.

In response to the question of how often they go online, results ranged widely. Some students were online several times a day (21%) while others reported only going online once every week (14%). Most students reported that they usually go online from home (89%). The demographic and general Internet use questions are reported in the pie graphs below (Figures 5-10).

In general, based on the initial analysis, there are no significant differences between those who search online frequently or not as often. Similarly, there are no major differences between students who primarily search at home or at school. However, further analysis of these two demographic issues is required. Further investigation must also be undertaken to analyze possible differences based on age, gender, grade, or race.

Figure 5. Grade Distribution (n=44)

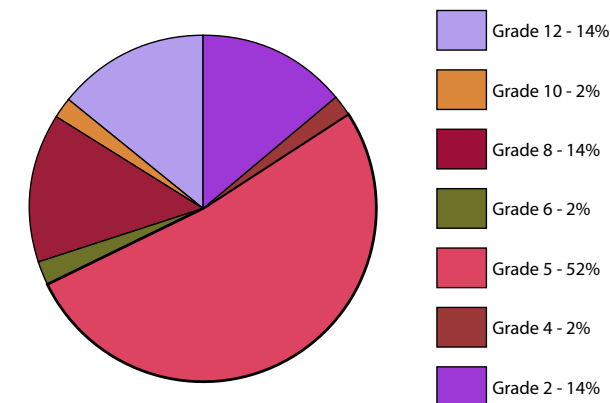- Grade 12 - 14%
- Grade 10 - 2%
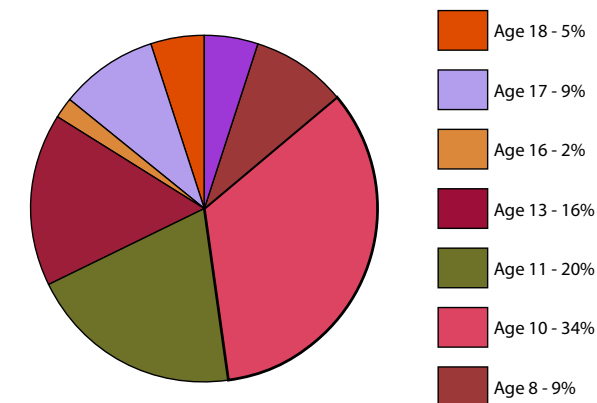- Grade 8 - 14%
- Grade 6 - 2%
- Grade 5 - 52%
- Grade 4 - 2%
- Grade 2 - 14%

Figure 6. Age Distribution (n=44)

- Age 18 - 5%
- Age 17 - 9%
- Age 16 - 2%
- Age 13 - 16%
- Age 11 - 20%
- Age 10 - 34%
- Age 8 - 9%

Figure 7. Gender Distribution (n=44)

Female - 57%

Male - 43%
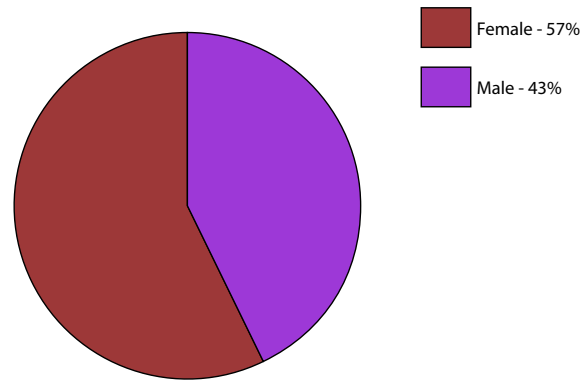
Figure 8. Racial Distribution (n=44)

African-American - 39%

White - 52%

Asian - 9%
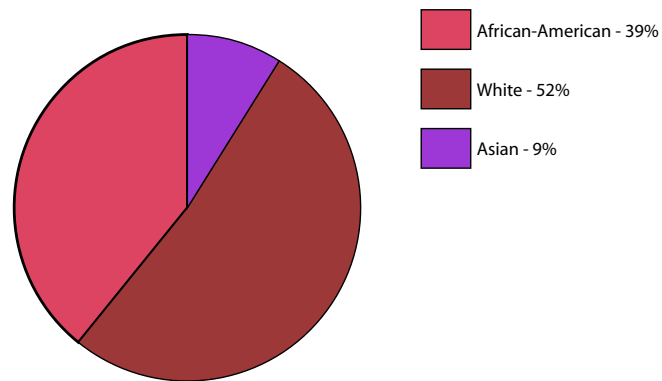
Figure 9. Online Frequency (n=43)

Less than once a week - 7%

1- 2 days a week - 19%

3- 5 days a week - 23%

About once a day - 16%

Several times a day - 21%

Every few weeks - 14%

Figure 10. Online Location (n=43)

School - 7%

Home - 89%

Don't know - 2%

Public Library - 2%
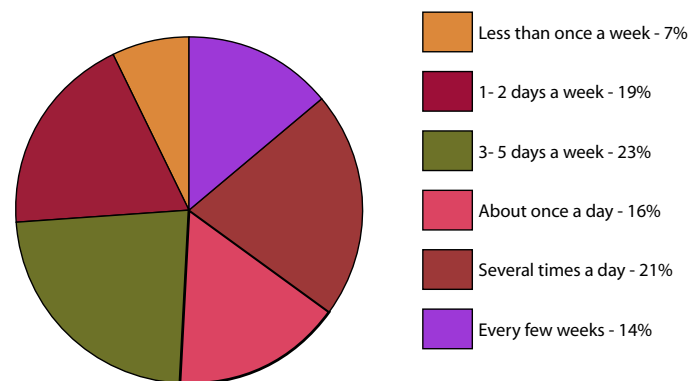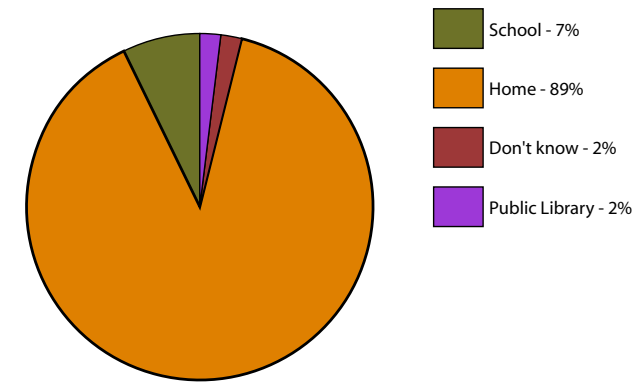
Eye-Tracking Analysis

The following images (Figures11-24) demonstrate the powerful qualitative analysis made possible with eye-tracking technology. These "hot-spot" images are a static representation of the fixation points of all of the students combined into one view. The "hotter" the area, indicated by more red color, the longer that area was looked at. Figures 12-24 present "hot spots" by grade (i.e., elementary, middle, and high school) levels and for different search topics.

Previous eye-tracking studies (http://www.enquiro.com/eye-tracking-pr.asp) on search sites have shown a "golden triangle" where people tend to look. This is not a firm, exact, triangular boundary, but rather a trend that is observable over many subjects looking at the same page. In Figure 11 the golden triangle is marked in blue. In general, the golden triangle hypothesis is upheld in the observations of students using SchoolRooms.

Another tendency shown in eye-tracking is that subjects tend <u>not</u> to scroll down in a web page. This means that information "below the fold" is typically not seen. Figure 14 is a particularly clear example of this tendency. This tendency was noted very frequently. Younger children were especially unlikely to scroll down.

A detailed analysis of the thirty-eight eye tracking sessions will require additional time and effort. However. this detailed analysis should result in a clearer picture of how SchoolRooms is used and how children search for electronic information.

Figure 11. SchoolRooms Homepage

STUDY: schoolrooms.   STIMULUS: schoolrooms.   FRAME: http://test.schoolrooms.net:8088/rooms/.
NUMBER OF RECORDINGS: 45.   HOTSPOT TYPE: Fixation Count.   MAX: 3 Fixations.
TIME SEGMENT: Exclude data from the first 0 ms and the last 0 ms. First visit only.
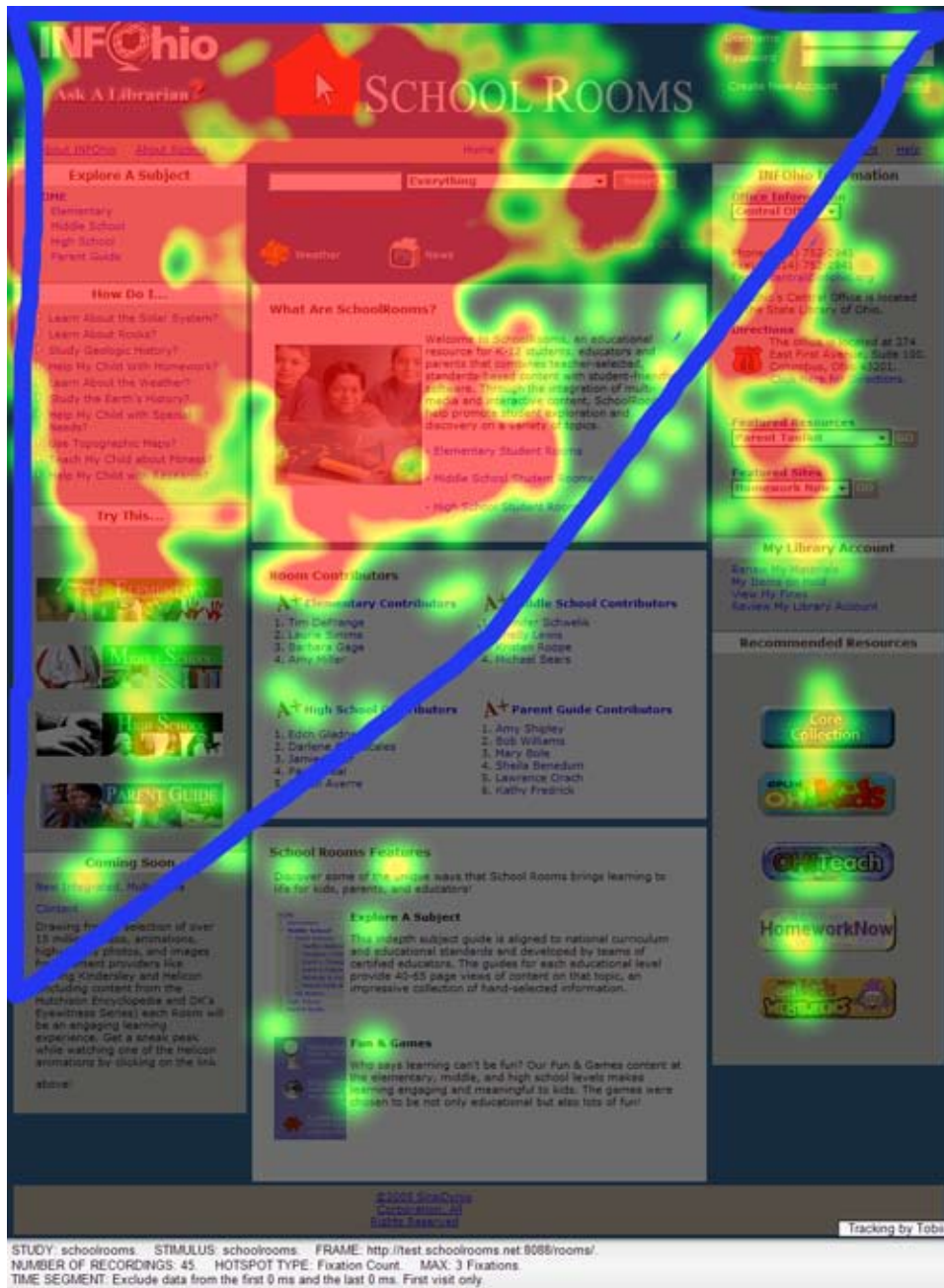
Figure 12. SchoolRooms Elementary Level Homepage

STUDY: schoolrooms.   STIMULUS: schoolrooms.   FRAME: http://test.schoolrooms.net:8088/rooms/portal/page/Elementary
NUMBER OF RECORDINGS: 45.   HOTSPOT TYPE: Fixation Count.   MAX: 3 Fixations.
TIME SEGMENT: Include data from 0 ms to 200345 ms.
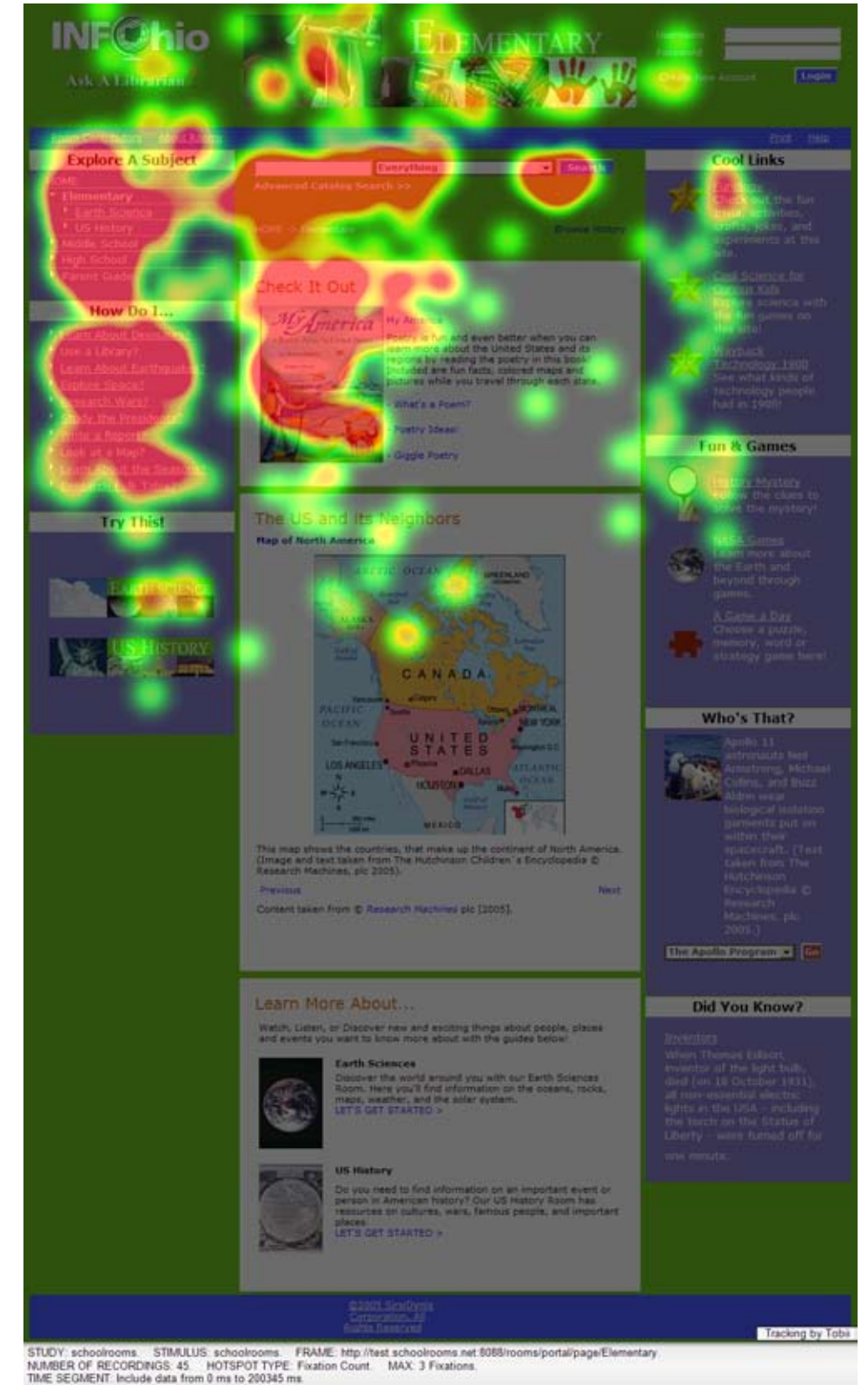
Figure 13. SchoolRooms Elementary — Science Homepage
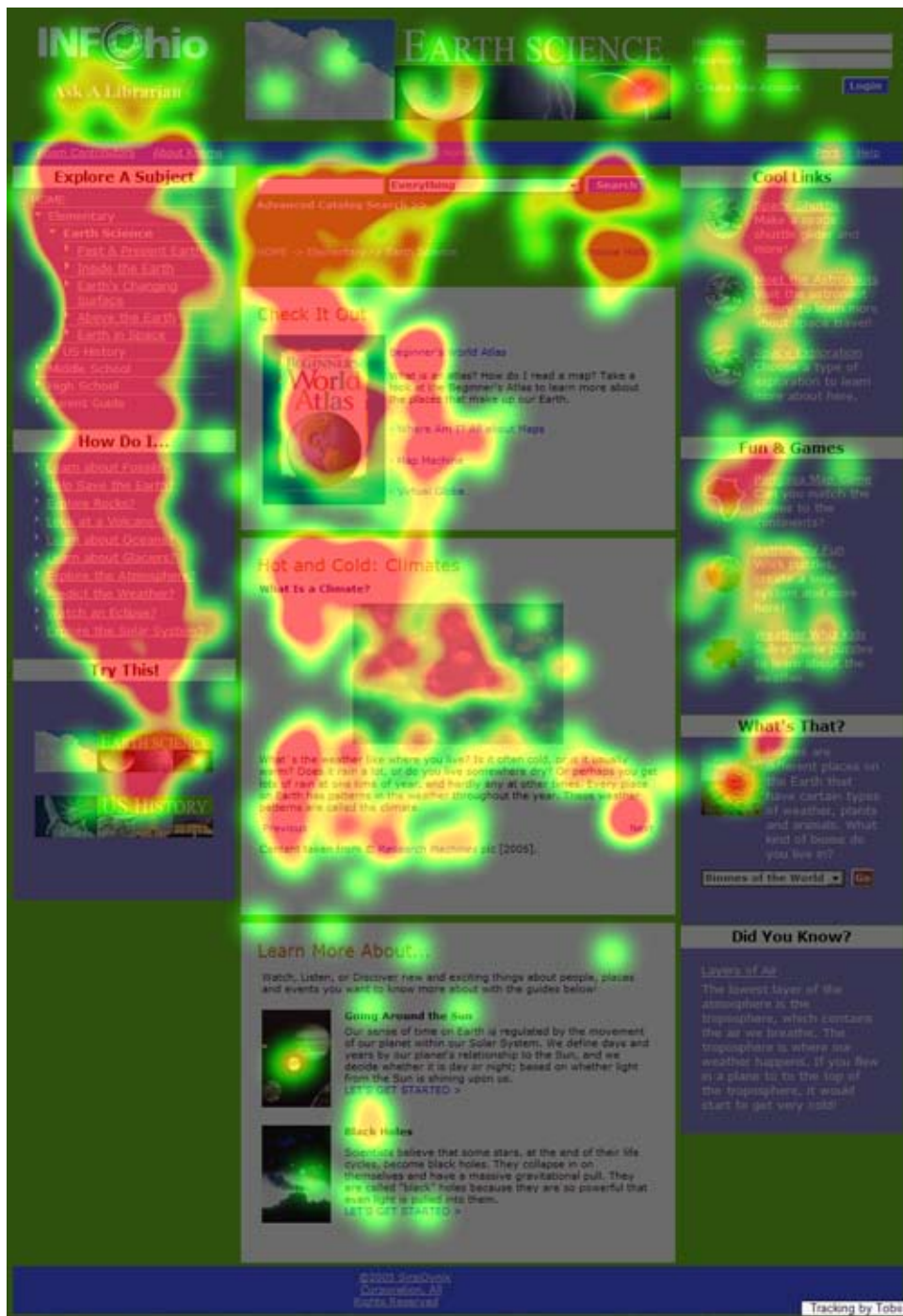
Figure 14. SchoolRooms Elementary — History — Famous People

Figure 15. SchoolRooms Middle School Level Homepage
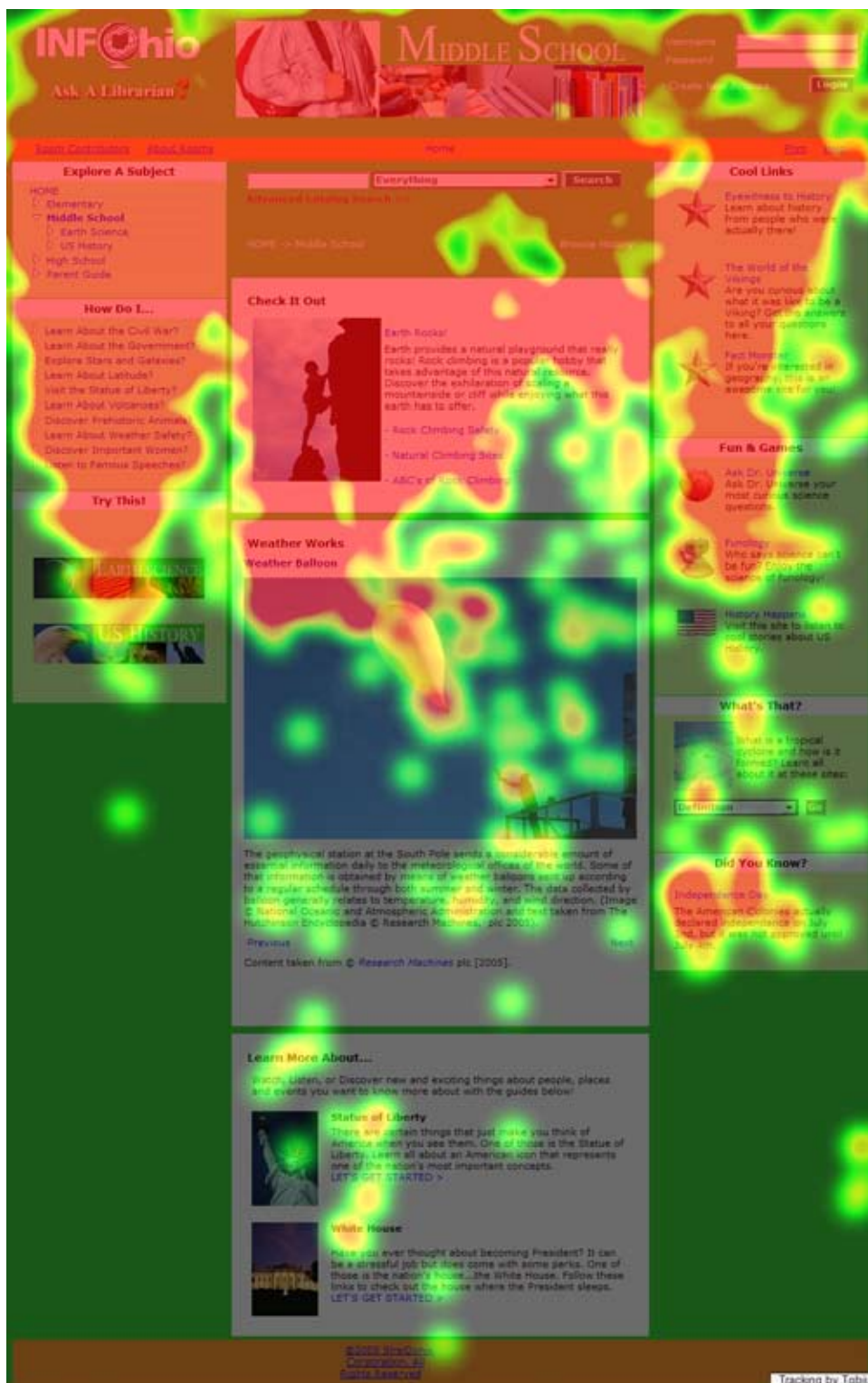
STUDY: schoolrooms.   STIMULUS: schoolrooms.   FRAME: http://test.schoolrooms.net:8088/rooms/portal/page/Middle_School.
NUMBER OF RECORDINGS: 45.   HOTSPOT TYPE: Fixation Count.   MAX: 3 Fixations.
TIME SEGMENT: Include data from 0 ms to 428625 ms.

Figure 16. SchoolRooms Middle School — Science Homepage

STUDY: schoolrooms.   STIMULUS: schoolrooms.   FRAME: http://test.schoolrooms.net:8088/rooms/portal/page/Middle_School_Earth_Science.
NUMBER OF RECORDINGS: 45.   HOTSPOT TYPE: Fixation Count.   MAX: 3 Fixations.
TIME SEGMENT: Include data from 0 ms to 57546 ms.

Figure 17. SchoolRooms Middle School — Science — Solar System

Figure 18. SchoolRooms Middle School — History Homepage

Figure 19. SchoolRooms Middle School — History — Wars and Conflicts

Figure 20. SchoolRooms Middle School — History — Wars and Conflicts — Civil War

Figure 21. SchoolRooms Middle School — History — Wars and Conflicts — World War I

Figure 22. SchoolRooms High School Level Homepage

STUDY: schoolrooms.   STIMULUS: schoolrooms.   FRAME: http://test.schoolrooms.net:8088/rooms/portal/page/High_School.
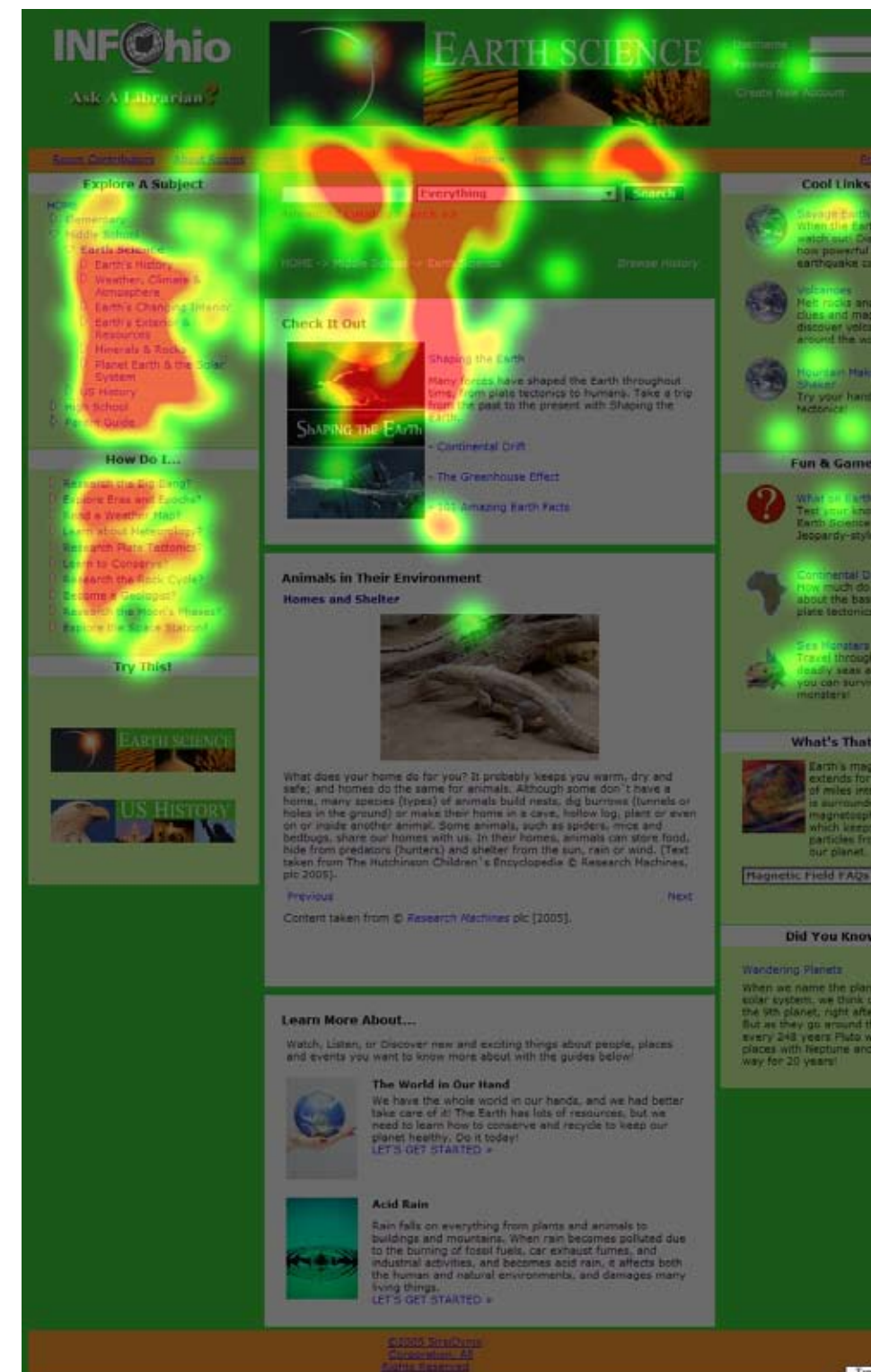NUMBER OF RECORDINGS: 45.   HOTSPOT TYPE: Fixation Count.   MAX: 3 Fixations.
TIME SEGMENT: Include data from 0 ms to 356556 ms.

Figure 23. SchoolRooms High School — Science

STUDY: schoolrooms. STIMULUS: schoolrooms. FRAME: http://test.schoolrooms.net:8088/rooms/portal/page/Earth_Science.
NUMBER OF RECORDINGS: 45. HOTSPOT TYPE: Fixation Count. MAX: 3 Fixations.
TIME SEGMENT: Include data from 0 ms to 8159 ms.
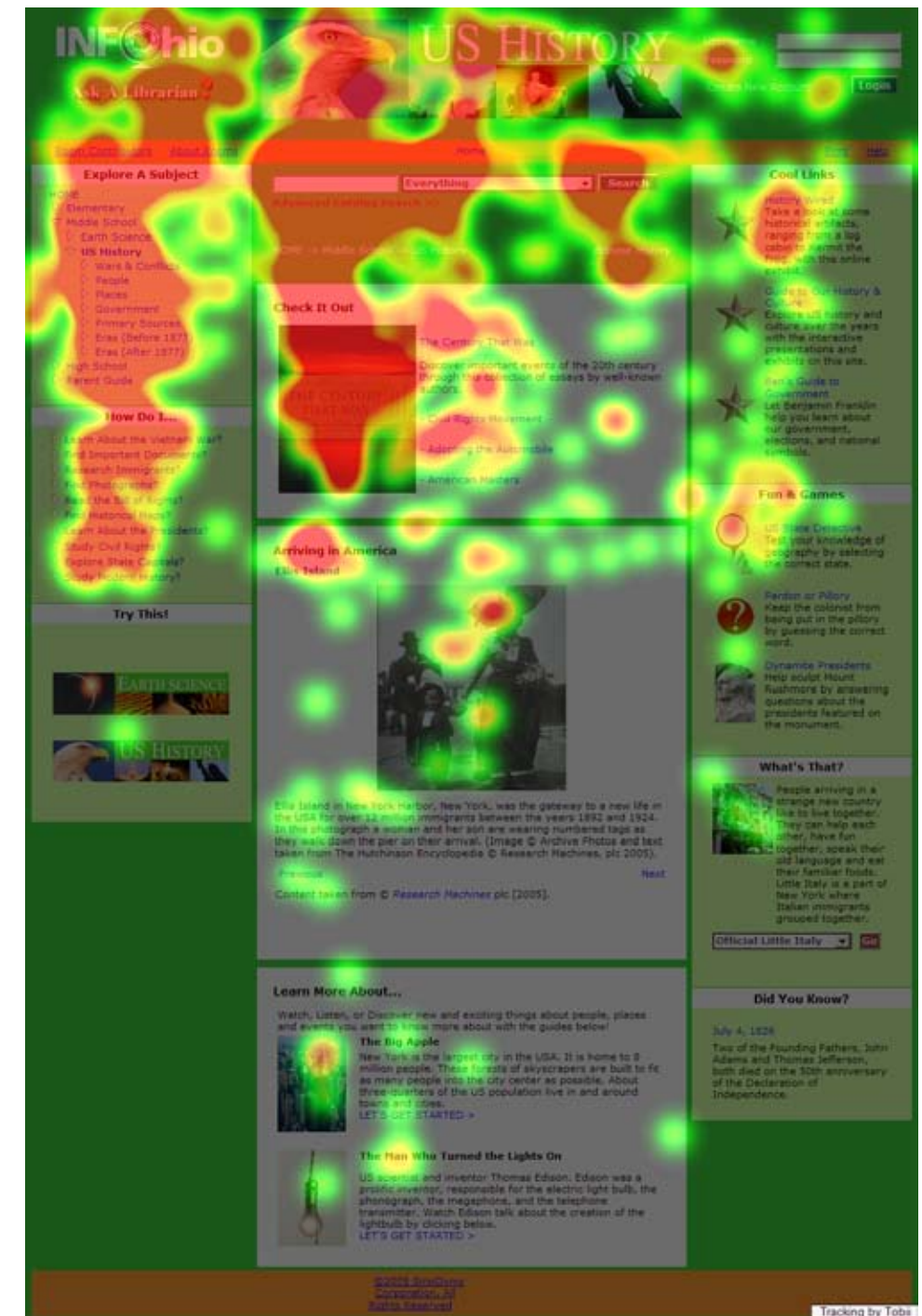
Figure 24. SchoolRooms High School — History

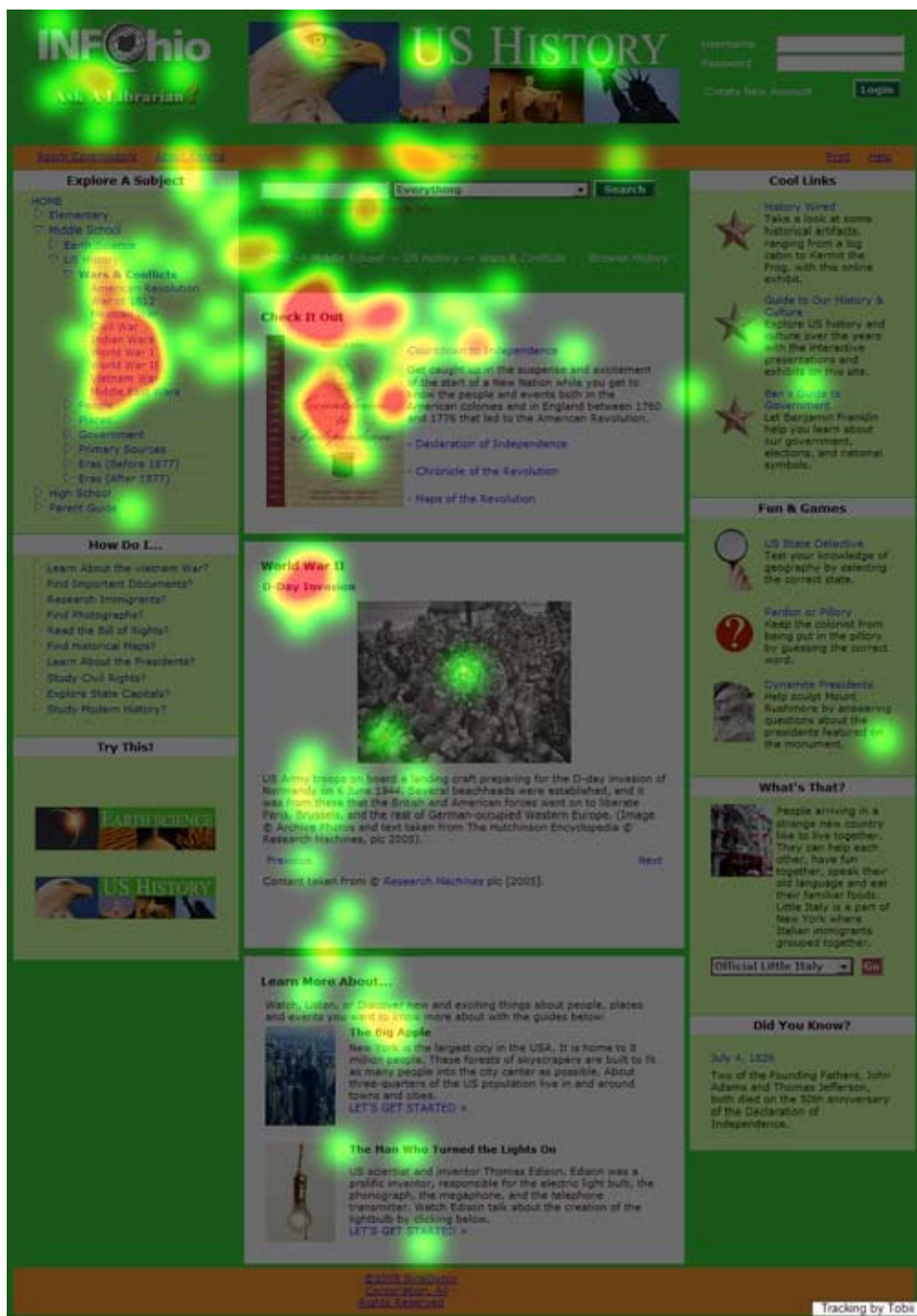STUDY: schoolrooms. STIMULUS: schoolrooms. FRAME: http://test.schoolrooms.net:8088/rooms/portal/page/US_History.
NUMBER OF RECORDINGS: 45. HOTSPOT TYPE: Fixation Count. MAX: 3 Fixations.
TIME SEGMENT: Include data from 0 ms to 91835 ms.

RESULTS FROM PILOT STUDENTS

Subjects, Procedures, and Scope

Results presented in this section are from the observations of the 87 students who were part of the SchoolRooms pilot classrooms. The search tasks were developed by the teachers who participated in the pilot testing of SchoolRooms. Because the search tasks varied from class to class, this section only summarizes results of data analysis of the post-search questions that were common for all participating classrooms.

The subjects were those students whose parents had returned the consent form to allow their child to participate in the study. Also, the oral assent was obtained from the participating students before each search session. Each pilot class was given a brief introduction of School-Rooms by its classroom teacher or the School Library Media Specialist at each school. Then individual students were pulled out to conduct their search assignment using the laptops or the computer with eye-tracking equipment provided by the research team.

Demographic and General Questions

For the pilot sample, 56% of the students were 8th graders, 26% were 10th graders, and a minimal 20% represented grades 4, 5, 9, and 11 students. With a breakdown by school level, 56% of the participants were middle school students, 34% were high school students, and 10% were elementary school students. In order to provide sensible data, when reporting responses of post-search questions, responses by school level are provided in addition to an overall summary.

In terms of age of the pilot participants in the study, the sample largely represents students between the ages of 13 and 15, a group covering 83% of participants. The sample also represents largely White Non-Hispanic (66%) and Black Non-Hispanic (24%) with the remaining 10% for Hispanic (1%), Asian/Pacific Islander (5%), American Indian/Native American (1%), and Middle Eastern/European (3%).

Most pilot participants go online pretty often, with 69% doing so at least on a daily basis, 90% at least 3-5 days a week, and 94% at least on a weekly basis. When asked where they go online most often, 86% of students indicated that they do so mostly from home, 12% from school, and 2% from someplace else other than home, school, or a public library.

The specific distributions of student responses to demographic and general questions are summarized in pie charts below (Figures 25-29).

Figure 25. Grade Distribution (n=85)

- Grade 11 - 1%
- Grade 10 - 26%
- Grade 9 - 7%
- Grade 8 - 56%
- Grade 5 - 6%
- Grade 4 - 4%
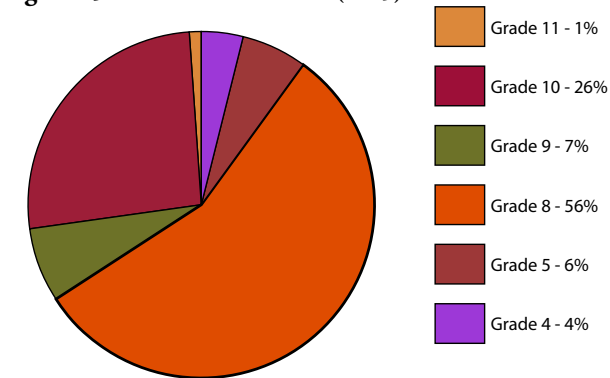
Figure 26. Age Distribution (n=84)

- Age 18 - 1%
- Age 16 - 6%
- Age 15 - 24%
- Age 14 - 30%
- Age 13 - 29%
- Age 11 - 1%
- Age 10 - 5%
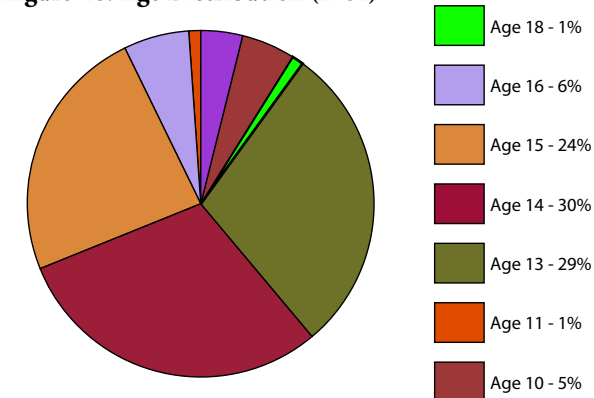
Figure 27. Racial Distribution (n=80)

- Middle Eastern/European - 3%
- White Non-Hispanic - 66%
- American Indian/Native American - 1%
- Asian/Pacific Islander - 5%
- Black Non-Hispanic - 24%
- Hispanic - 1%
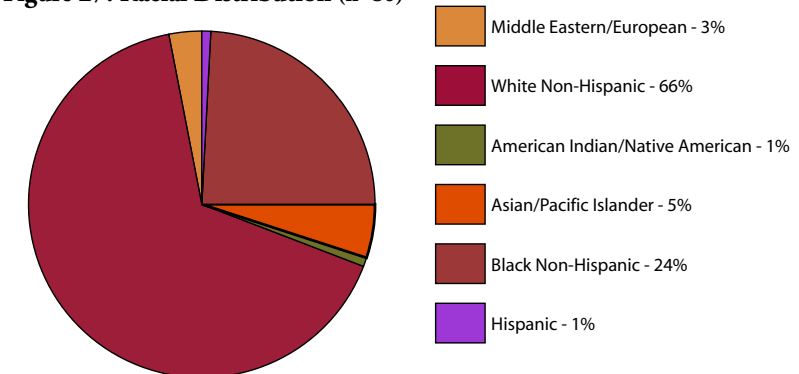
Figure 28. Online Frequency Distribution (n=85)

- 3- 5 days a week - 21%
- Less than once a week - 5%
- 1- 2 days a week - 4%
- Every few weeks - 1%
- About once a day - 42%
- Several times a day - 27%
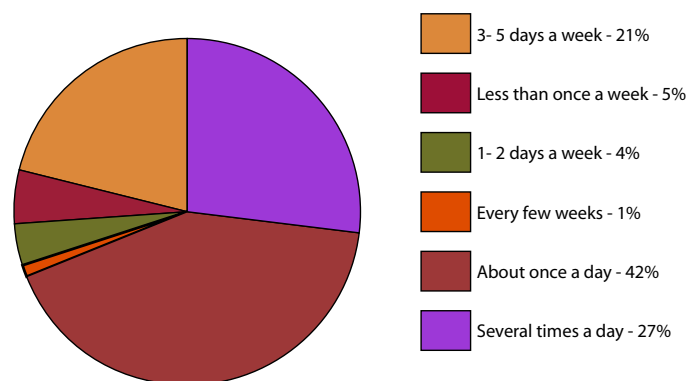
Figure 29. Online Frequency Distribution (n=86)

- Home - 86%
- Someplace else - 2%
- School - 12%
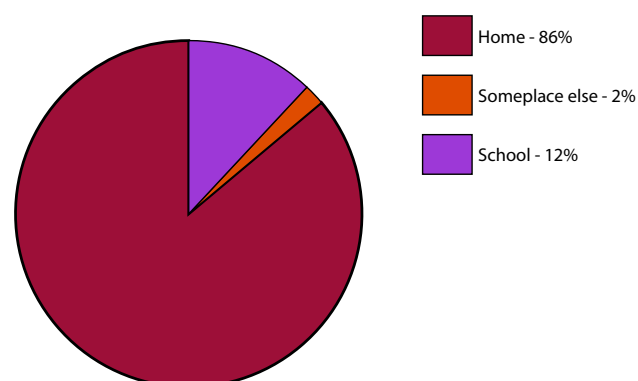
Responses to the Post-Search Questions

Question 1:
In evaluating their experience about finding information using SchoolRooms for their search assignment, 41% of the students felt it was "easy," only 7% felt it was "hard," while 52% felt it somewhere "in-between." It seemed middle school students had an easier time using the site compared to high school and elementary school students – 44% of them felt it was easy compared to 36% for high school students and 37% for elementary school students.

Question 2:
Overall, when trying to find the information using SchoolRooms, about half (51%) of the students pretty much knew what they were doing, 13% of the students felt confused, and about one-third (36%) felt mixed. It is interesting to note that among the three grade levels, the middle school students had the highest percentage of those who felt mixed about the site and the lowest percentage of students who felt confused or pretty much knew what they were doing.

Question 3:
Compared with what they expected, about half of the students (49%) considered their search task to be "fast" overall, 24% of them considered it "slow," and 27% of them considered it "in-between." Among those surveyed, elementary students had the most positive response, with three-quarters of them considering their search to be "fast," one quarter "in-between," and no students considering the task to be "slow" at all. On the other hand, middle school students tended to consider their task "slow" compared to students in other school levels.

Question 4:
When rating the text displayed on screen at SchoolRooms, an overwhelming majority of the students (92% overall) rated that it was easy to read, with only a very few high school students considering it to be hard to read the text on screen.

Question 5:
The "Explore a Subject" feature was well received overall: 81% of the students considered it easy to use, only 7% considered it hard to use, while the remaining 12% considered it in-between. This feature tended to be received more positively in general among high school students although a few of them considered it hard to use.

Question 6:
Only the high school and middle school students rated the search box feature. It is interesting to note that this feature was much better received by middle school students. For one, 70% of middle school students considered this feature "easy," while only less than half (47%) thought the same among high school students. Furthermore, while 11% of middle school considered this feature "hard," near a third (32%) of high school students thought the same. It would be worthwhile to look into why high school students tended to consider the feature hard to use.

Question 7:
In terms of the look of SchoolRooms, overall, nearly two-thirds (66%) of the students considered the site to look "really good" and no students considered the site to look "really bad." In particular, it seems elementary school students liked the site most among all the students.

Question 8:
In response to the effect of the pictures and graphics in SchoolRooms, while overall 55% of the pilot students didn't think the pictures and graphics had any effect at all on their search, 37% of the students did think they were helpful. Not surprisingly, the pictures and graphics were best received among elementary school students – 63% of them indicated that the pictures and graphics helped them find the things they needed.

Question 9:
In rating the response speed when they clicked on items in SchoolRooms, students considered the next page to load at a reasonable speed in general, with an overall 54% of the students rating it "fast," 12% of the students rating it "slow," and one-third rating it "in-between." However, there were some observable differences in rating among the students in different school levels. While over 60% of high school and elementary school students rated it "fast" to load the next page in SchoolRooms, only less than half of the middle school students rated the same. This pattern is consistent to that of the student responses to question 3 and the perception of the overall pace of their search task.

Question 10:
While most students had a neutral perception about whether SchoolRooms is a fun or boring site, more students perceived it as a fun site than those perceiving it boring (28% vs. 15% overall). In particular, an overwhelming majority (88%) of elementary school students perceived the site "fun," while only 28% and 19% considered the site "fun" for high school and middle school students, respectively. Apparently, the site was more appealing to the elementary school students.

Question 11:
In terms of productiveness using the site, overall, 58% of the students felt they got a lot done, 12% felt the opposite, and the remaining 30% felt "in-between." Among the participants, elementary school students felt the most productive using the site, followed by the high school students. Only about half (51%) of the middle school students felt productive using the site.

Question 12:
When comparing SchoolRooms with other search sites such as Google, Yahhooligans!, and MSN, more students were in favor of SchoolRooms, with a percentage of 43% for overall, 48% for high school students, 34% for middle school students, and 75% for elementary school students. In comparison, only 26% of students overall, 21% of high school students, 32% of middle school students, and 13% of elementary school students were in favor of other search sites. While it is a clear win for SchoolRooms over other search sites among high school and elementary school students, it is essentially a tie among middle school students.

Question 13:
Overall, a majority of the students (90%) indicated that they would like to use SchoolRooms again for another school assignment, which is consistent across all three grade levels.

The details of student responses to post-search questions are summarized in the table below.

Table 21. Post-search questions for pilot students.

Question 1. Finding this information was:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Easy	34	41%	10	36%	21	44%	3	37%
Hard	6	7%	2	7%	3	6%	1	13%
In-between	44	52%	16	57%	24	50%	4	50%
Total	84	100%	28	100%	48	100%	8	100%

Question 2. Trying to find the information just now, I felt:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Confused	11	13%	5	17%	5	10%	1	13%
Pretty much knew what I was doing	43	51%	16	55%	22	46%	5	62%
In-between	31	36%	8	28%	21	44%	2	25%
Total	85	100%	29	100%	48	100%	8	100%

Question 3. Compared with what you expected, this task was:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Slow	20	24%	5	17%	15	31%	0	0%
Fast	42	49%	16	55%	20	42%	6	75%
In-between	23	27%	8	28%	13	27%	2	25%
Total	85	100%	29	100%	48	100%	8	100%

Question 4. The text on the screen was:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Easy to read	78	92%	26	90%	44	92%	8	100%
Hard to read	3	3%	3	10%	0	0%	0	0%
In-between	4	5%	0	0%	4	8%	0	0%
Total	85	100%	29	100%	48	100%	8	100%

Question 5. Using "Explore a Subject" was:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Easy	59	81%	25	86%	29	78%	5	71%
Hard	5	7%	3	10%	2	6%	0	0%
In-between	9	12%	1	4%	6	16%	2	29%
Total	73	100%	29	100%	37	100%	7	100%

Question 6. Using the search box was:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Easy	35	62%	9	47%	26	70%	0	0%
Hard	10	18%	6	32%	4	11%	0	0%
In-between	11	20%	4	21%	7	19%	0	0%
Total	56	100%	19	100%	37	100%	0	100%

Question 7. The way SchoolRooms looks is:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Really good	56	66%	20	69%	29	60%	7	88%
Really bad	0	0%	0	0%	0	0%	0	0%
In-between	29	34%	9	31%	19	40%	1	12%
Total	85	100%	29	100%	48	100%	8	100%

Question 8. The pictures and graphics in SchoolRooms:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Helped me find the things I needed	31	37%	13	45%	13	27%	5	63%
Didn't help me find the things I needed	7	8%	3	10%	4	8%	0	0%
Didn't have any effect at all	47	55%	13	45%	31	65%	3	37%
Total	85	100%	29	100%	48	100%	8	100%

Question 9. When I clicked on things in SchoolRooms, the next page loaded:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Fast	46	54%	18	62%	23	48%	5	63%
Slow	10	12%	2	7%	7	15%	1	12%
In-between	29	34%	9	31%	18	37%	2	25%
Total	85	100%	29	100%	48	100%	8	100%

Question 10. Using SchoolRooms was:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Fun	24	28%	8	28%	9	19%	7	88%
Boring	13	15%	3	10%	9	19%	1	12%
In-between	48	57%	18	62%	30	62%	0	0%
Total	85	100%	29	100%	48	100%	8	100%

Question 11. When I used SchoolRooms, I felt like:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
I got a lot done	49	58%	19	66%	24	51%	6	75%
I didn't get much done	10	12%	1	3%	9	19%	0	0%
In-between	25	30%	9	31%	14	30%	2	25%
Total	84	100%	29	100%	47	100%	8	100%

Question 12. If I compare SchoolRooms to other search sites (Google, Yahooligans!, MSN, etc.), I am:

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Like School-Rooms better	36	43%	14	48%	16	34%	6	75%
Like the others better	22	26%	6	21%	15	32%	1	13%
In-between	26	31%	9	31%	16	34%	1	12%
Total	84	100%	29	100%	47	100%	8	100%

Question 13. Would you like to use the SchoolRooms website again for another school assignment?

	Overall		High School		Middle School		Elementary School	
	Count	%	Count	%	Count	%	Count	%
Yes	74	90%	26	90%	41	90%	7	88%
No	8	10%	3	10%	4	9%	1	12%
Total	82	100%	29	100%	45	100%	8	100%

Students' Comments

Besides the above close-ended multiple choice questions, students were asked a series of open-ended questions as part of the post-search questions. The questions and summary of student comments for pilot students are below. The full list of comments can be found in Appendix C.

Question 14. Did you learn anything new about your topic by using SchoolRooms? If "yes," what?

There were 81 responses to the question, with an overall positive reaction. Regarding what they learned about their assignment topic using SchoolRooms, most students were able to pinpoint the exact topics they learned. Among the responses,
- 39 (48%) answered directly and positively that they learned something new about their search topic;
- 24 (29.5%) suggested that they learned something new and most were able to mention the specific subjects they learned;
- 15 (18.5%) indicated directly that they did not learn anything new, although some did evaluate positively about the sources they found at the site; and
- 3 (4%) could not decide whether they learned anything new or did not have time to look through the site.

Question 15. What did you like best about SchoolRooms? Why?

There were 81 responses to the question. Among the things students mentioned they liked best about SchoolRooms, many credit the look and design of the site:
- Colors, style, arrangement (10)
- Graphics (5)
- Variety of options (3)
- Drop downs (3)
- Links (6)
- Categories (2)
- Weather prediction

Some students appreciated the contents and functionality of the site:
- Variety of sources (4)
- Databases
- Search system (5)
- Information & text (4)

Among the reasons why they liked SchoolRooms, students offered some interesting perspectives:
- Accommodating multiple learning styles
- Allowing exploration (6)

Some students were able to compare the content collection and functionality of School-Rooms with other search engines such as Google:
- SchoolRooms contains more accurate/filtered information (8)
- Offering specific/narrowing information (7)
- More compact
- Easy to use/navigate (21)
- Fast (6)
- Amount of (relevant) information
- Fun

Question 16. What did you like least about SchoolRooms? Why?

There were 77 responses to the question. What students liked least about SchoolRooms reflects their experience with the site for the specific search task, and some reactions were conflicting. For example,
- Too many links to follow (4)
- Too many hits
- Too few choices/hits (5)
- Poor links (4)

Some of the comments relate to the site's overall design and functionality:
- Drop downs (4)
- "Explore a subject" (3)
- Side menu
- Search box
- Poor content/vocabulary (3)
- Poor graphics/detail (4)
- Colors, style, arrangement (6)

Among the specific reasons why they did not like certain aspects of the site, some comments reflect the students' specific search experience for their assignment:
- Didn't find information (4)
- Links didn't work (2)
- Too limiting (2)
- Too specific (3)
- Too general (3)
- Poor information/hits (2)

But some comments reflect student perception and overall experience of the site:
- Slow/Errors loading (12)
- Confusing and overwhelming (6)
- Difficult to use/navigate (6)
- Distracting/Wastes time (2)
- Missing Google bar

OBSERVATIONS AND RECOMMENDATIONS

General Observations

These observations are based on impressions of the researchers over the course of the entire study. Not all of them are verifiable with the available data.

There should be a closer design connection between "Explore a Subject" and the search re-sults interface. Many of the subjects were under the impression that "Explore a Subject" and Search were contextually connected. That is, they felt that if they navigated down through a couple of levels in "Explore a Subject," and then felt that the "scent" had been lost, they could use the search box. In addition, it was apparent that they thought the search function would search only in the "room" they were in at the time. For example, if a subject used "Explore a Subject" – US History – Wars and Conflicts, and then didn't know where to go from there, they would click in the search box hoping it would search on the terms entered in "Wars and Conflicts" only. This was not the case, and they were further thrown off the scent of the problem solving activity.

We also observed that younger students tended not to use the drop down menu associated with the search box. This drop down menu would have helped them refine their searches. It is recommended that SchoolRooms keep these options visible for the student. Children are not sophisticated navigators. The tendency observed in this study was to simply take what-ever was available. When confronted with a long list of search results, the students would work their way through the first box that showed results, particularly if it was "above the fold," or visible without scrolling down. Elementary students found SchoolRooms somewhat challenging, but they evaluated all of the features very positively and found it be very attrac-tive and useful.

A further observation, as mentioned above, was that children tended to struggle with naviga-tion, especially complex navigation such as a hierarchy. Although the "Explore a Subject" browsing produced successful results, the question remains whether they will struggle with the navigation if they can get "good enough" results from a search—especially if the results are above the fold. In short, if information is hidden, it is less likely to be noticed and used by students. Drop down menus hide information; the "Explore a Subject" hierarchy hides information. Students have to work hard to get it. That is not a bad thing in and of itself, but future studies based on this data should focus on the ability and willingness of children to navigate in a hierarchy and dig more deeply for information not readily visible.

Another general observation is labeling—several of the high school students seemed to understand the term "databases" meant "the stuff I get through INFOhio." In an article/web site, "Library Terms that People Understand" John Kupersmith (at http://www.jkup.net/terms-studies.html) summarizes several studies on labeling of library resources. In gen-eral, jargon is a problem for patrons of all ages, and especially children. It is recommended that future versions of SchoolRooms take this into account. On the positive side of labeling, students readily recognized the "Fun & Games" label in the right hand column and wanted to use it. This was observed all the way through the high school level.

Explore a Subject

- Older students were able to grasp the concept of a hierarchy and navigate ef-fectively and efficiently. The younger students tended to have more difficulty un-derstanding the relationships between concepts and therefore had more difficulty efficiently navigating the interface.

- After clicking on a link in the "Explore a Subject" hierarchy, there was a general tendency for students to look to the middle section expecting a change there instead of staying in the hierarchy to continue navigation.
- The issue of scalability to 70 Rooms total with at least 20 rooms per grade level needs to be considered. The pilot version of SchoolRooms only had 2 Rooms for each grade level. Adding more complexity to the hierarchy may have a significantly deleterious effect on navigation.
- "How do I…" and "Try this…" elements compete visually with "Explore a Sub-ject". All three are above the fold. Furthermore, "How do I…" leads the student to specific, easy-to-access answers, whereas "Explore a Subject" requires the more cognitively taxing hierarchy navigation thus making it an attractive distraction.
- The researchers observed many students accidentally backtracking into pages they had already seen and disregarded as irrelevant. This is mainly attributable to the drop down menus used for the websites at the destination pages. First, many students either did not recognize or did not utilize the drop-down function at all. They simply click on the "Go" button, bypassing the other web resources hidden under the menu. Second, the drop down menus do not give the same brows-ing navigation clues as regular hyperlinks. That is to say, a regular hyperlink can indicate which links have already been clicked by changing color which can help to orient the student and increase browsing efficiency.

Search Box

- Several students wanted to "contextualize" their search by navigating to a level in Explore a Subject, then going over to the search box to run a query. This seemed to be a natural behavior and was not prompted by the researcher, teacher or school media specialist.
- Search drop down menu. Generally, students wanted to use the drop-down box to narrow or refine their searches. Not all students understood that it was possible to pull down a menu to refine the search. In other words, they were not aware of the visual convention of the drop-down menu. In general, students with more computer and web experience recognized that a drop down menu contains more information than is immediately visible.
- When running a search, the contextual color scheme to indicate educational level (e.g., black for the high school level) is lost. All searches regardless of level, go to a blue background.

Search Results

- To get complete results from all sources (library catalog, Best of Web, Web, Data-bases, etc) takes a really long time to load…routinely more than 20 seconds. The students displayed impatience at having to wait, usually demonstrated by clicking the "back" button on the browser. It is crucial that the slow system response time be addressed.
- Search results display at different times from different sources. The library catalog results generally came back first and database results generally came back last. A common problem encountered was that a student would enter a query in the search box that would be too narrow to return library materials. The results page would return "No Results" for the library catalog (the first thing to load) and the student would not wait for the rest to load, assuming justifiably there were no results at all for their query.
- Visually, the search results page was not consistent. Each results box from the dif-ferent sources was a different size with a different number of hits. Most students

did not follow the "See X More" in each box to see more from that source, instead relying only on the preliminary results returned. For the younger students especially, the distinction between different sources was lost. The results boxes were not a strong enough visual clue to distinguish library catalog results from Best of the Web results.
- Too many of the results load "below the fold," meaning the student has to scroll to get even the preliminary results. The eye-tracking analysis demonstrates that important information needs to be above the fold
  - Smaller header graphics, less header information
  - Perhaps some type of meta-search results first, even briefer than what is provided now.
- The term "databases" does not indicate "magazine articles" for most students. Some of the high school students were able to recognize this connection due to previous exposure to INFOhio resources. The younger students did not make this connection.
- The term "Best of the Web" is not well described or well understood by students.

Technical Issues
- At 800x600 screen resolution, much of the right hand column is lost forcing the user to manipulate the horizontal scroll. In our study, the computer monitors were set to 1024x768. However, at each of the schools in Shaker Heights, the monitors were set to 800x600. The eye-tracking hot-spot images show that students will look at the far right hand column if it's visible.
- Randomly, SchoolRooms would auto-refresh to the main SchoolRooms home page. Needless to say, this can be very disconcerting if a student is in the middle of a search session, forcing them to navigate back to where they just were.
- Searches don't cache. Students expressed frustration at having to wait to re-search (already noted as a time-consuming process in itself) the same topic every time they wanted to go back to the search results.
- It is not possible to find any of the images or graphics in SchoolRooms using either "Explore a Subject" or the search box. For examples, a student may remember seeing an image, but now needs it and can't locate it.
- The persistent "previous query" function is beneficial in some cases (e.g. within a SchoolRoom), but should be cleared if the student navigates to another room or goes to the home level or room level link.

FUTURE DIRECTIONS

In the future, we anticipate more studies coming out of the data collected as part of the SchoolRooms Pilot Project looking at the specific aspects of the information seeking process of K-12 students as they interact with information sources on the Web. We will continue to analyze the eye tracking data for various patterns of behavior in SchoolRooms. For example, it would be interesting to see if boys and girls track in any significantly different ways.

In addition, we will investigate the relationship of cognitive load to performance, success rates, time on task, and errors. Cognitive load can easily be ascertained by changes in pupil size measured by the eye tracker. Increases in pupil size have been correlated with harder mental labor during tasks.

We wish to explore the differences among grade levels with regard to changes in information seeking processes, behavior and cognition. This can be measured by more closely comparing recorded performance on tasks and classroom assignments.

Noting some of the difficulties children demonstrated navigating hierarchies, we will carefully comb the data for patterns in this regard. Again, there are many factors (cognitive, emotional, developmental, motivational, etc.) related to hierarchical navigation, and other behaviors.

USABILITY ENGINEERING LIFECYCLE

Deborah Mayhew has developed a model of such a practice (1999) (see Figure 25). The model is called the Usability Engineering Lifecycle and it is composed of three major phases of development (software, web sites or any other design in which user interaction will be the ultimate measure of success).

The first phase is the *requirements analysis*. It is composed of completing profiles of the audiences the system will serve, task analyses, listing of constraints such as platform, collecting general design principles in existence for comparable systems, and culminating with a set of usability and system goals. From these goals it is possible to develop a style guide for the product that sets the parameters around all system development.

The second phase of the model is a staged development of the system called *design/testing/development*. It begins with a conceptual design. The conceptual design is tested on users in the form of low fidelity paper prototypes or simple drawings in the same way movies are conceived through storyboards. This is done prior to any coding. Only after the conceptual design are electronic mock-ups done in order to test on users. Repeated tests and redesigns are done in this phase. Finally after usability goals are met, a detailed interface for the system is developed, tested and refined after each phase of testing.

Finally, the system rolled out in the *installation* phase. Even at this final stage, user feedback is sought through testing or informal comments. The advantages of using this model are many but the primary one is that usability is built in from the beginning and there are no surprises in the implementation that require major changes to the interface or back-end system.

The usability study conducted as part of this project did not begin until the *installation* phase. Consequently, problems and issues are now harder to address without a more complicated and time-consuming re-design. Early involvement of usability testing in future web development projects would help get a better product to market in a shorter period of time.

Figure 25. Mayhew's Usability Engineering Lifecycle (direct copy from Mayhew, D. J. (1999). *The usability engineering lifecycle.* **New York: Morgan Kaufmann).**
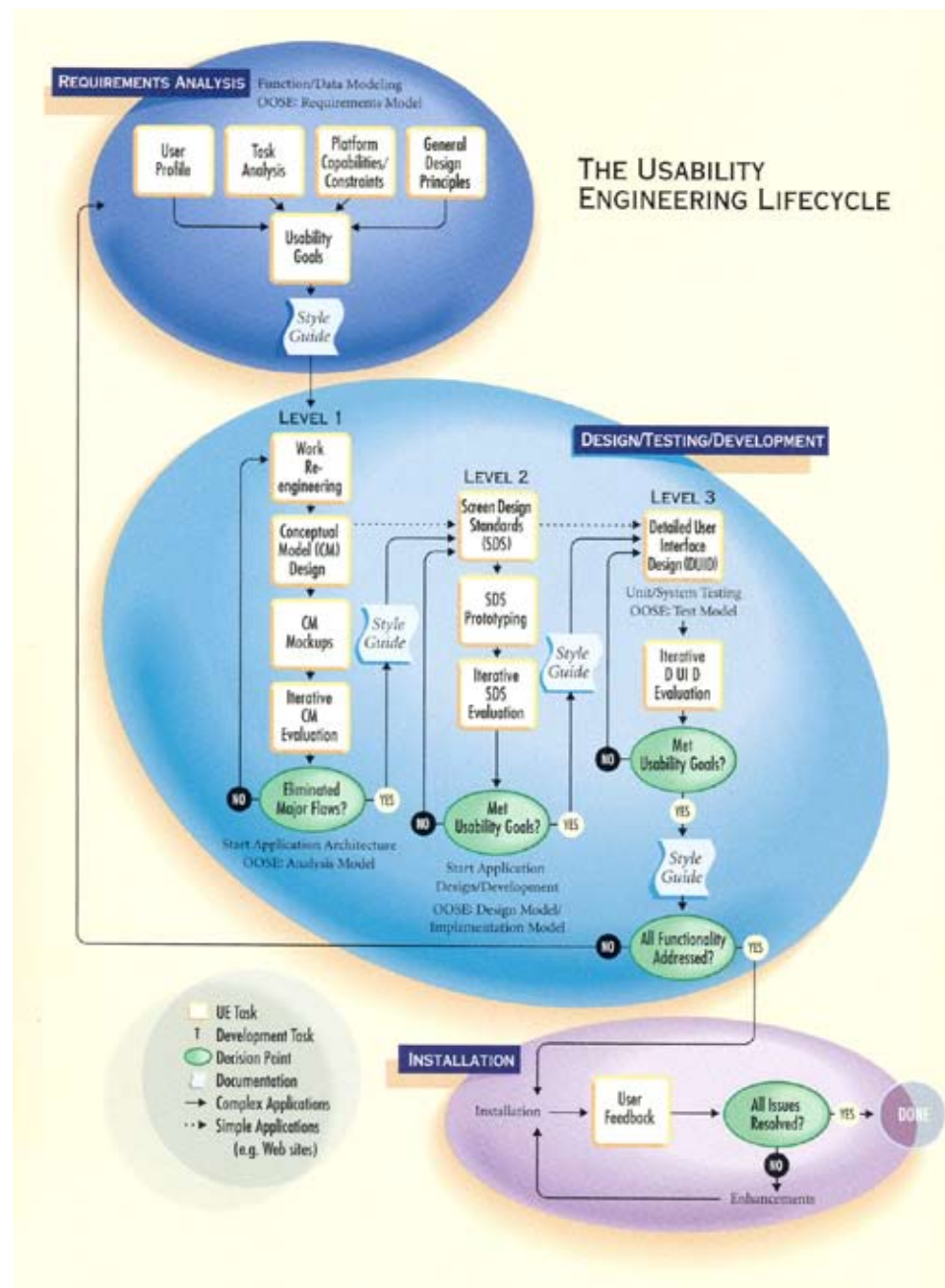
CONCLUSION

Designing web interfaces for children is very difficult. There are a wide range of cognitive factors to take into account. We know that in realistic situations, 2nd graders and 12th graders have very different information tasks to accomplish within the system, very different knowledge bases, and different levels of searching skills that SchoolRooms is trying to address with essentially the same interface for them both. Additionally, information design heuristics that work with adults may not work with kids. Clearly, more research studies need to be conducted in this area, both for SirsiDynix and for anyone interested in children's information seeking behavior.

It would be beneficial to re-test any new design changes that are implemented based on this report, particularly addressing the issue of the scalability of the "Explore a Subject" hierarchy, the search results page, and overall design. Hopefully, a second round of testing on a re-design will produce a demonstrably better interface for the intended audience. As the development of this and future versions of SchoolRooms and other SirsiDynix products, it might be useful to include usability testing from the outset of the project. Even before any coding has taken place, usability can be incorporated into design. In fact, design and usability are inseparable.

APPENDICIES

APPENDIX A
Non-Pilot Research Protocol and Observation Sheet

SirsiDynix/Shaker Non-PILOT

Score Sheet

Put Label Here:

Date   _____
Time   _____
Teacher   _____
Grade   _____
School   _____

Script for OUT OF PILOT Tests

NOTE TO RESEARCHER: Start Morae Recorder

Hello, My name is [researcher's name]

I am trying to learn more about how students use the SchoolRooms system to find information. It is a web site you can use to search for library books, articles, web sites, and other information.

I am going to ask you to find information on several topics and then answer several questions about it. Also, I will record this conversation for research purposes.

While you are looking for the information, I would like for you to talk about what you are doing and thinking while you are doing it. Tell me what you like and dislike about it, or anything else that comes to mind. For example, you might tell me why you are clicking on one link instead of another.

There are no right or wrong answers. We are not testing YOU, we are testing this system to see how easy it is to use.

Do you want to do this? [If the child does not indicate affirmative agreement, you cannot continue with this child.]

[If the answer is "No," then let the student go.]

[If the answer is "Yes," STUDENT MUST ACTUALLY *SAY* "YES," AND NOT JUST NOD!]

Do you have any questions before we start? [Clarify if necessary.] Great. If you want to stop at any time just tell me.

NOTE TO RESEARCHER: If students are silent for more than one minute, please prompt them in some way to think aloud. You might say something like, "What are you thinking right now?" or "What are you doing right now?" (in a kind way)

Task 1. Find information that tells you how to identify different types of clouds (cirrus, cumulus, stratus, etc.). Tell me when you are done.

Post task questions:

1. Finding this information was:
☐ Easy
☐ Hard
☐ Mixed

2. Trying to find the information just now, I felt:
☐ Confused
☐ Pretty much knew what I was doing
☐ Mixed

3. Compared with what you expected, this task was:
☐ Slow
☐ Fast
☐ Medium

Researcher Notes:

	Subject was:	
Search was:	**aware**	**unaware**
successful		
unsuccessful		

Task 2. Using the search box, find a book on the Civil War. Tell me when you are done.

Post task questions:

4. Finding this information was:
☐ Easy
☐ Hard
☐ Mixed

5. Trying to find the information just now, I felt:
- ☐ Confused
- ☐ Pretty much knew what I was doing
- ☐ Mixed

6. Compared with what you expected, this task was:
- ☐ Slow
- ☐ Fast
- ☐ Medium

Researcher Notes:

Search was:	aware	Subject was: unaware
successful		
unsuccessful		

Task 3. Using "Explore a Subject," where might you locate information about the causes of World War I? Tell me when you are done.

Post task questions:

7. Finding this information was:
- ☐ Easy
- ☐ Hard
- ☐ Mixed

8. Trying to find the information just now, I felt:
- ☐ Confused
- ☐ Pretty much knew what I was doing
- ☐ Mixed

9. Compared with what you expected, this task was:
- ☐ Slow
- ☐ Fast
- ☐ Medium

Researcher Notes:

Search was:	aware	Subject was: unaware
successful		
unsuccessful		

Task 4. Where could you find battlefield maps of the Civil War? Tell me when you are done.

Post task questions:

10. Finding this information was:
- ☐ Easy
- ☐ Hard
- ☐ Mixed

11. Trying to find the information just now, I felt:
- ☐ Confused
- ☐ Pretty much knew what I was doing
- ☐ Mixed

12. Compared with what you expected, this task was:
- ☐ Slow
- ☐ Fast
- ☐ Medium

13. Circle all books with your mouse (DON'T click!!!!!) Is that all?

14. Circle all websites with your mouse (DON'T click!!!!!) Is that all?

15. Circle all magazine articles with your mouse (DON'T click!!!!!) Is that all?

Researcher Notes:

Books

Search was:	aware	Subject was: unaware
successful		
unsuccessful		

Websites

Search was:	aware	Subject was: unaware
successful		
unsuccessful		

Magazine articles

Search was:	aware	Subject was: unaware
successful		
unsuccessful		

Task 5. Use the search box to find information about the solar system.

Post-search session questions:

SchoolRooms evaluation questions

26. The text on the screen was
    - ☐ Easy to read
    - ☐ Hard to read

27. Using "Explore a Subject" was
    - ☐ Easy
    - ☐ Hard
    - ☐ Not too easy and not too hard

28. Using the search box was
    - ☐ Easy
    - ☐ Hard
    - ☐ Not too easy and not too hard

29. The way Schoolrooms looks is
    - ☐ Really good
    - ☐ Really bad
    - ☐ Not too good and not too bad

30. The pictures and graphics in Schoolrooms
    - ☐ Helped me find the things I needed
    - ☐ Didn't help me find the things I needed
    - ☐ Didn't have any effect at all

31. When I clicked on things in Schoolrooms, the next page loaded
    - ☐ Fast
    - ☐ Slow
    - ☐ Not too fast and not too slow

32. Using Schoolrooms was
    - ☐ Fun
    - ☐ Boring
    - ☐ Not too fun and not too boring

33. When I used Schoolrooms, I feel like
    - ☐ I got a lot done
    - ☐ I didn't get much done
    - ☐ I got about a normal amount done

34. If I compare Schoolrooms to other search sites (Google, Yahooligans!, MSN, etc.), I am
    - ☐ Satisfied
    - ☐ Not satisfied
    - ☐ Not really satisfied or dissatisfied

35. Would you like to use the SchoolRooms website again for another school assignment?
    - ☐ Yes
    - ☐ No

36. What did you like best about SchoolRooms? Why?

37. What did you like least about SchoolRooms? Why?

Demographic and general questions

38. School Grade: ___

39. Age: _____

40. Gender: ___

41. Race/Ethnicity: _____

42. Overall, how often do you go online:
    - ☐ Several times a day
    - ☐ About once a day
    - ☐ 3-5 days a week
    - ☐ 1-2 days a week
    - ☐ Less than once a week
    - ☐ Every few weeks
    - ☐ Never
    - ☐ Don't know

43. Where do you go online MOST often?
    - ☐ Home
    - ☐ School
    - ☐ Public Library
    - ☐ Someplace else
    - ☐ Don't know

Thanks, That was great! Good job!

APPENDIX B
Pilot Research Protocol and Observation Sheet

SirsiDynix/Shaker IN-PILOT

Score Sheet

Put Label Here:

Date   _____

Time   _____

Computer #   _____

Teacher   _____

Grade   _____

School   _____

Script for IN-PILOT Tests

NOTE TO RESEARCHER: Start Morae Recorder

Hello, My name is [researcher's name.]

I am trying to learn more about how students use the SchoolRooms system to find information. It is a web site you can use to search for library books, articles, web sites, and other information.

I am going to observe you while you work on the assignment given to you by your teacher. Also, I will record your searches and comments for research purposes.

While you are looking for the information, I would like for you to talk about what you are doing and thinking while you are doing it. Tell me what you like and dislike about School-Rooms, or anything else that comes to mind. For example, you might tell me why you are clicking on one link instead of another.

There are no right or wrong answers or ways to find the information. We are not testing YOU, we are testing this system to see how easy it is to use.

Do you want to do this? [If the child does not indicate affirmative agreement, you cannot continue with this child.]

[If the answer is "No," then let the student go.]

[If the answer is "Yes," STUDENT MUST ACTUALLY *SAY* "YES," AND NOT JUST NOD!]

Do you have any questions before we start? [Clarify if necessary.] Great. If you want to stop us from observing you at any time just tell me.

NOTE TO RESEARCHER: If students are silent for more than one minute, please prompt them in some way to think aloud. You might say something like, "What are you thinking right now?" or "What are you doing right now?" (in a kind way)

Researcher Observations (try to note how the searcher goes about the search—for example, you might note their overall tendencies to search or browse. You might note problems they have with the interface or with their search techniques). Other types of things to ask during the search process to encourage thinking aloud:

- Why did they choose Explore a Subject vs. use the search box?
- How did they come up with this search term _____ for the task? What were you looking for?
- Why did you decide to select a site?
- Did you think the information on this site was useful? Why?
- What kind of information was useful to the assignment (which search task)?

Post-search session questions:

1. Finding this information was:
   - ☐ Easy
   - ☐ Hard
   - ☐ Mixed

2. Trying to find the information just now, I felt:
   - ☐ Confused
   - ☐ Pretty much knew what I was doing
   - ☐ Mixed

3. Compared with what you expected, this task was:
   - ☐ Slow
   - ☐ Fast
   - ☐ Medium

4. The text on the screen was
   - ☐ Easy to read
   - ☐ Hard to read
   - ☐ Sometimes easy and sometimes hard

5. Using "Explore a Subject" was
   - ☐ Easy
   - ☐ Hard
   - ☐ Not too easy and not too hard

6. Using the search box was
- ☐ Easy
- ☐ Hard
- ☐ Not too easy and not too hard

7. The way Schoolrooms looks is
- ☐ Really good
- ☐ Really bad
- ☐ Not too good and not too bad

8. The pictures and graphics in Schoolrooms
- ☐ Helped me find the things I needed
- ☐ Didn't help me find the things I needed
- ☐ Didn't have any effect at all

9. When I clicked on things in Schoolrooms, the next page loaded
- ☐ Fast
- ☐ Slow
- ☐ Not too fast and not too slow

10. Using Schoolrooms was
- ☐ Fun
- ☐ Boring
- ☐ Not too fun and not too boring

11. When I used Schoolrooms, I feel like
- ☐ I got a lot done
- ☐ I didn't get much done
- ☐ I got about a normal amount done

12. If I compare Schoolrooms to other search sites (Google, Yahooligans!, MSN, etc.),
- ☐ I like SchoolRooms better
- ☐ I like the others better
- ☐ In-between

13. Would you like to use the SchoolRooms website again for another school assignment?
- ☐ Yes
- ☐ No

14. Did you learn anything new about your topic by using SchoolRooms? If "yes," What?

15. What did you like best about SchoolRooms? Why?

16. What did you like least about SchoolRooms? Why?

Demographic and general questions

17. School Grade: ___

18. Age: ____

19. Gender: ___

20. Race/Ethnicity: _____
- ☐ White Non-Hispanic
- ☐ Black Non-Hispanic
- ☐ Asian/Pacific Islander
- ☐ American Indian/Native American
- ☐ Hispanic

21. Overall, how often do you go online:
- ☐ Several times a day
- ☐ About once a day
- ☐ 3-5 days a week
- ☐ 1-2 days a week
- ☐ Less than once a week
- ☐ Every few weeks
- ☐ Never
- ☐ Don't know

22. Where do you go online MOST often?
- ☐ Home
- ☐ School
- ☐ Public Library
- ☐ Someplace else
- ☐ Don't know

Thanks, that was great! Good job!

APPENDIX C
Complete Compilation of Student Comments

The following are the complete compilation of the comments made by students to two questions:

• What did you like most about using SchoolRooms?
• What did you like least about using SchoolRooms?

The comments are arranged in tabular form in which the rows are the comments of a subject and the two columns are the two questions above. There is no editing other than the attempt to make the most faithful transcription of the comments from the recordings. We left them all in so that the readers may see the total breadth of the subjects' responses. Some comments are not about SchoolRooms, per se, but about the resources and websites found by using SchoolRooms. The first section of the table is "Non-Pilot" comments, followed by the comments of the subjects in the "Pilot" group.

Non-Pilot Comments

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
liked explore - easy to find info.	OK
somewhat easy to search, gives you books, magazines, websites. Google you get too many.	explore a subject had to click on 3 or 4 links
It shows you a lot of good stuff I could think of more; showed you a lot of information	I liked all of it
Student liked learning about new topics - he thought this would prepare him for the older grade(8th + 9th grade)	It was frustrating to find certain things - especially finding a civil war map.
when you typed it in it only gave what you were looking for and not anything else. It was very organized.	Only two categories in eight columns (explore a subject); possibly add president on up-to-date stuff.
made find things easier; pictures + graphics pretty easy to read overall.	add first sentence of book to record

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
doesn't just stay on the topic, gives you pictures if you want pictures; has a lot of options you can go for; has thing most websites don't have the books, such as CDs, parent help…	Nothing really, it's pretty cool
Information pops Not going through a lot to find	waiting for loading; websites didn't go through
Did not get to the last questions, but inferring from responses throughout tasks, student seemed to like the experience and knew that she was getting trustworthy information.	She said some of the explore a subject subtopics could be labeled in more intuitive ways.
Like history. Like how it's organized. Explore a subject.	Confusing sometimes.
The simple search box just like the other websites gives you different types of info websites, databases.	Have to be very specific with subject search. Don't get broad results.
Organization, can find broader topics. Colorful, can tell an adult designed it, looks professional & college level.	Hard to find specific info. Technical. Search box didn't help much. Information on same subject should be together. Could be brighter, more colorful and kid friendly, looks technical.
Dif. Media/stuff	explore ??
Explore a subject.	
search categories	
explore a subject	sometimes hard to find. Slow to load. Gives you wrong stuff.
good search engine. Less broad-related to what you're looking for.	slowness
Different schools of search engines.	how different categories came up on one pg.
Graphics- showed pictures - helped her	nothing.

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
got to use computer.	Couldn't find the info the way she normally would, had to type stuff in.
lots of information.	lot a words. Too much to look at.
learning about things.	Didn't like some of the pics. Didn't go with what they really were.
Liked the different categories shows number of results.	No page numbers. Click back takes you back to main page.
likes search box.	Web should download faster.
easy to find things.	no
That it has subjects listed under Elementary, Science, etc.	I didn't know what a search box is.
good: games for things; set up so easy to find; link that if has pictures not boring as all writing	C with Google; This = 7 more on school subject; lots of info.
Look up a lot of stuff; good to specific things? If you needed to lots of options to search.	
It is inviting -- good categories	made more precise
pictures show good interpretations of what its saying.	looks slow, want to get answers quickly.
like list of same results.	search drop down confusing

Pilot Comments

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
like the overview on this webpage; like arrangement, if things are the same kind they are in the same area.	the font -- very small, needs to be a little bit bigger
they're mostly quiet.	It was slow to load.
easy + fast to use	1 page was slow loading

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
not confusing also the website easy to use	Explore a subject hard time navigating orienting in hierarchy
Different way of learning. Would Schoolrooms allows accommodate different learning styles?	the optic on the main pages were too general; he would like to see a topic of the month or current topic of interest that changes often.
Has different information and resources and allows you to search using questions.	You have to keep looking, slow wants a search box.
New window, organization	not sure
don't know	no negative
easy user interface	load times for database were slow.
Student liked that schoolrooms filtered out all of the 'bad' information that popular search engines usually provide.	RESEARCHER COMMENT: Student did not like the search box; she felt that it should have provided better results. Student would have liked if you could use the search box to search schoolrooms instead of having to navigate through the explore a subject sidebar.
pull downs find different sites, variety.	needs more content.
Liked black colors, cool links.	Guess & check, where to look: organized, but still had to look.
Likes that you can search a variety of ways.	Explore a subject, just gives you info you don't want to read.
Had a lot of info. More specific than Google, better sites.	Can't think of anything.
easy to use.	Search, not what looking for, too broad. Comp skills -some from school, some from family, parents.
Sidebar explore helps you think about your subject & narrow it down.	Going to web site that sold things.
Once figured it out, easy to figure out what you want. Mix between pictures & text.	# of links it took to get places. Lack of links on home page.
You don't have to know what you're looking for.	Small print -can't read it.
Easy to find info. Helpful.	
Explore a subject.	Slow load on search. It took a while.

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
Everything is going to be truthful, unlike Google.	glitches, not loading pages and pictures.
Pictures that I found.	Confusing, not enough to choose from. Just discovered search.
Like explore a subject, really easy to find things this way.	RESEARCHER COMMENT: Doesn't like the drops on the explore a subject page because it limits what you can search for. Would like search bars instead.
search	dead links at loc
different options.	
The first search is usually right and it's fairly quick.	Sometimes links were cylindrical and took you right back to previous page.
explore a subject	search box. Confusing.
Organized -easy.	Drop down boxes. Each section should be separate.
Links - more of them, made searching easier and faster.	Wasn't a lot of detail about the photographs, hoping to find more info.
I have no idea.	Nothing I guess.
pictures	harder to find info the more specific.
Straight to information.	Too long for search.
Gives you different options, get results fast.	Looks almost too grown-up, could be more from brighter colors/ graphics.
The pictures. They explained -could tell what text was trying to explain without having to read it.	Ran out of time for this question
Menus-hierarchy. Easy to find/follow information.	Took too long to find info, since this was the first time using the schoolrooms.
easy to look for. category.	didn't find things.
easy to find things, likes big fonts & colors & bold, easy to use	Drop down for search menu, confusing. "How do I…" would be distraction, enable procrastination, would go see Statue of Library link instead of school work.
The information was all relatively relevant, I felt like I didn't have to worry about whether or not the information was accurate.	It didn't have the exact information I was looking for, but I think it would have been better for a different assignment.

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
Specific oriented to assignments, find what you need fast.	Hard to find broader info.
drop downs, easy to read	
loads fast	not many pictures
nothing	Difficult to find what I was trying to get, after a while got used it.
easy to get to stuff with direction like how do I, but use it for this assignment.	Box didn't pop up right away. Links didn't work.
each page had links to a site that I could use	The links on the each rock page were slightly different, so each page navigated differently.
Databases	N.
I liked the different mediums of data it gives me. I can get web sites, books and other things for my reports easier now.	I did not like the limited material that I got and didn't like how it loaded slowly.
No junk here.	Need more graphics and page numbers in the library catalog's first page.
Easy to get to different web sites explore a subject.	Top header graphics. A lot of web site in search results.
explore subject. Info on how to do things. ??	Didn't provide where he may get info middle school.
Lets you try different searches- not just one basic one.	Vocabulary unclear.
Organized & Structured. Made it easier.	Best of Web should be above web.
it different links to things.	setup, don't like the overwhelming setup, too much.
Get info from all sources. -2:47-	It was good info- didn't dislike anything.
Displayed different searches on one page- didn't have to click around.	Very slow.
Very easy & clear. Find what looking for.	Topic very recent, so wasn't recent for book but good for web.

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
Not as much to sort through to find good info.	Links could be better. Add Google link bar.
Type of materials is categorized. Easy to recognize.	Teacher's resources are available but may not be accessible to students.
Narrowed down search Easier to find what needed.	Could have been more hits - Description of case
I liked the searching system.	I liked that it searched multiple resources.
It is narrowed down so you are not looking at useless sites.	The loading time because it was kind of slow.
Found good info, thought it was the same as Google.	
Organization.	Color was dark - not happy. Liked the green on Middle School pg. Not dark blue.
find?	slow?
filtered out unhelpful stuff.	search box results.
Liked how explore a subject helped you get to your topic.	Thought it was a normal web site.
links you to other sites out	can't think of something, I don't like, no
Information had a flow, know what you were doing.	Repeats of content, had some different information helpful, reread, rethink, not helpful, wastes time.
accurate, not false information like Google might give.	I think it is good, but if you wanted something broader more general they could have cut some of the stuff,
Easy to find where you were going, better than Google, just plain information	loading slowly
court diagram, actual text.	menu on side is confusing
The good choices of websites and its easy to find info.	I don't know, nothing really.
Easy to find info, pick out what you want.	Links clicks on had lots of unnecessary detail.

What did you like most about using SchoolRooms?	What did you like least about using SchoolRooms?
get a lot of choices.	didn't find much to help
Page or landmark supreme court cases, lots of info on her one case.	There wasn't anything. Took to a lot of websites that were selling books, wasn't expecting.
Colors, eye catching, information	drop down menu not very clear, not easy to decide what to pick.
drop down boxes	search box, not a lot of results.
relatively easy to use, categories, sub-	links sometimes confusing, may not apply
searched, got information at sites only	nothing too bad, navigation too, compared to Google, 1 box
Ed heads, liked weather prediction	No
don't know.	No
It's fun.	Temp?? Control too fickle

APPENDIX D
Task and Survey Questions By Grade Level

Question 1

Finding this information was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy	4	67%	8	33%	3	50%	5	71%	20	47%
Hard	0	0%	4	17%	0	0%	1	14%	5	12%
In-between	2	33%	12	50%	3	50%	1	14%	18	42%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 2

Trying to find the information just now, I felt

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Confused	0	0%	3	13%	2	33%	1	14%	6	14%
Pretty much knew what I was doing	2	33%	10	43%	2	33%	3	43%	17	40%
In-between	4	67%	10	43%	2	33%	3	43%	19	45%
Total	6	100%	23	100%	6	100%	7	100%	42	100%

Question 3

Compared with what you expected, this task was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Slow	1	17%	6	25%	2	33%	1	14%	10	23%
Fast	4	67%	9	38%	3	50%	4	57%	20	47%
In-between	1	17%	9	38%	1	17%	2	29%	13	30%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 4

Finding this information was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy	1	17%	14	61%	2	33%	3	43%	20	48%
Hard	3	50%	6	26%	1	17%	0	0%	10	24%
In-between	2	33%	3	13%	3	50%	4	57%	12	29%
Total	6	100%	23	100%	6	100%	7	100%	42	100%

Question 5

Trying to find the information just now, I felt

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Confused	2	33%	5	22%	0	0%	1	14%	8	19%
Pretty much knew what I was doing	1	17%	12	52%	4	67%	5	71%	22	52%
In-between	3	50%	6	26%	2	33%	1	14%	12	29%
Total	6	100%	23	100%	6	100%	7	100%	42	100%

Question 6

Compared with what you expected, this task was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Slow	5	83%	5	23%	1	17%	1	14%	12	29%
Fast	1	17%	10	45%	3	50%	4	57%	18	44%
In-between	0	0%	7	32%	2	33%	2	29%	11	27%
Total	6	100%	22	100%	6	100%	7	100%	41	100%

Question 7

Finding this information was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy	0	0%	9	38%	4	80%	2	29%	15	36%
Hard	5	83%	8	33%	0	0%	5	71%	18	43%
In-between	1	17%	7	29%	1	20%	0	0%	9	21%
Total	6	100%	24	100%	5	100%	7	100%	42	100%

Question 8

Trying to find the information just now, I felt

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Confused	1	17%	9	38%	0	0%	4	57%	14	33%
Pretty much knew what I was doing	0	0%	8	33%	4	80%	2	29%	14	33%
In-between	5	83%	7	29%	1	20%	1	14%	14	33%
Total	6	100%	24	100%	5	100%	7	100%	42	100%

Question 9

Compared with what you expected, this task was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Slow	3	50%	7	29%	0	0%	3	43%	13	31%
Fast	0	0%	9	38%	4	80%	2	29%	15	36%
In-between	3	50%	8	33%	1	20%	2	29%	14	33%
Total	6	100%	24	100%	5	100%	7	100%	42	100%

Question 10

Finding this information was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy	3	50%	6	26%	2	40%	2	29%	13	32%
Hard	2	33%	10	43%	1	20%	3	43%	16	39%
In-between	1	17%	7	30%	2	40%	2	29%	12	29%
Total	6	100%	23	100%	5	100%	7	100%	41	100%

Question 11

Trying to find the information just now, I felt

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Confused	0	0%	7	30%	0	0%	1	14%	8	20%
Pretty much knew what I was doing	4	67%	11	48%	2	40%	2	29%	19	46%
In-between	2	33%	5	22%	3	60%	4	57%	14	34%
Total	6	100%	23	100%	5	100%	7	100%	41	100%

Question 12

Compared with what you expected, this task was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Slow	2	33%	6	26%	0	0%	3	50%	11	28%
Fast	4	67%	7	30%	3	60%	1	17%	15	38%
In-between	0	0%	10	43%	2	40%	2	33%	14	35%
Total	6	100%	23	100%	5	100%	6	100%	40	100%

Question 26

The text on the screen was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy to read	3	50%	17	71%	6	100%	6	86%	32	74%
Hard to read	0	0%	0	0%	0	0%	0	0%	0	0%
In-between	3	50%	7	29%	0	0%	1	14%	11	26%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 27

Using "Explore a Subject" was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy	3	50%	13	54%	4	67%	5	71%	25	58%
Hard	1	17%	2	8%	0	0%	0	0%	3	7%
In-between	2	33%	9	38%	2	33%	2	29%	15	35%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 28

Using the search box was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Easy	5	83%	15	63%	6	100%	4	57%	30	70%
Hard	0	0%	4	17%	0	0%	1	14%	5	12%
In-between	1	17%	5	21%	0	0%	2	29%	8	19%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 29

The way Schoolrooms looks is

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Really good	4	67%	18	75%	3	50%	5	71%	30	70%
Really bad	0	0%	0	0%	0	0%	1	14%	1	2%
In-between	2	33%	6	25%	3	50%	1	14%	12	28%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 30

The pictures and graphics in SchoolRooms

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Helped me find the things I needed	3	20%	13	57%	2	67%	5	43%	23	53%
Didn't help me find the things I needed	1	20%	1	17%	0	17%	1	57%	3	7%
Didn't have any effect at all	2	60%	10	26%	4	17%	1	0%	17	40%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 31

When I clicked on things in SchoolRooms, the next page loaded

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Fast	2	33%	9	38%	0	0%	7	100%	18	42%
Slow	0	0%	6	25%	2	33%	0	0%	8	19%
In-between	4	67%	9	38%	4	67%	0	0%	17	40%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 32

Using SchoolRooms was

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Fun	5	83%	15	63%	1	17%	4	57%	25	58%
Boring	0	0%	0	0%	0	0%	0	0%	0	0%
In-between	1	17%	9	38%	5	83%	3	43%	18	42%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 33

When I used SchoolRooms, I felt like

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
I got a lot done	1	20%	12	57%	4	67%	4	43%	21	49%
I didn't get much done	1	20%	4	17%	1	17%	1	57%	7	16%
I got about a normal amount done	4	60%	8	26%	1	17%	2	0%	15	35%
Total	6	100%	24	100%	6	100%	7	100%	43	100%

Question 34

If I compare SchoolRooms to other search sites (Google, Yahooligans!, MSN, etc.), I think

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
I like SchoolRooms better	1	20%	13	57%	4	67%	3	43%	21	51%
I like the others better	1	20%	4	17%	1	17%	4	57%	10	24%
In-between	3	60%	6	26%	1	17%	0	0%	10	24%
Total	5	100%	23	100%	6	100%	7	100%	41	100%

Question 35

Would you like to use that SchoolRooms website for another school assignment?

	Grade 2		Grades 4-6		Grade 8		Grades 10&12		Overall	
	Count	%	Count	%	Count	%	Count	%	Count	%
Yes	6	100%	19	83%	6	100%	5	83%	36	88%
No	0	0%	3	13%	0	0%	1	17%	4	10%
In-between	0	0%	1	4%	0	0%	0	0%	1	2%
Total	6	100%	23	100%	6	100%	6	100%	41	100%

Notes