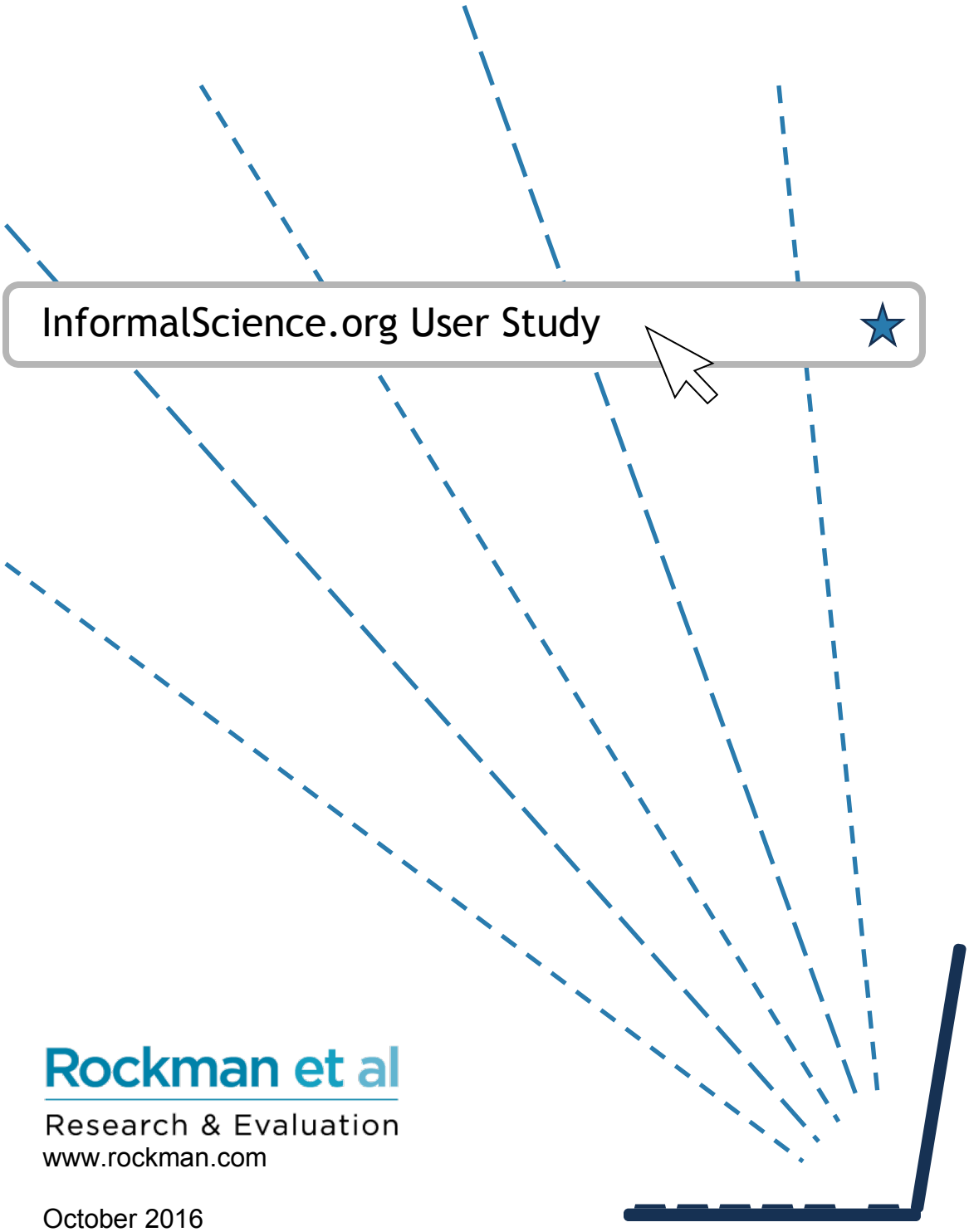
InformalScience.org User Study



Rockman et al
Research & Evaluation
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We are grateful to the team at CAISE for their clarity, guidance, and detailed knowledge of the site and its users. The evaluation team would also like to thank the wide audience of InformalScience.org for patiently complying with survey and interview requests and providing their valuable and detailed feedback.

About Rockman et al:
Rockman Et Al is an innovative research, evaluation, and consulting company that specializes in examining critical issues in formal and informal education. The Rockman team includes evaluators with diverse backgrounds and skill sets who help clients answer critical questions in clear, direct, and honest ways. Rockman Et Al has served as the lead evaluation firm for numerous projects funded by the National Science Foundation as well as several other public and private funding agencies.

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INTRODUCTION

The InformalScience.org 2016 User Study

InformalScience.org is an online collection of resources designed to serve a broad community of professionals whose work relates to informal education[1] in science, technology, engineering, and math (STEM). Funded by the National Science Foundation and managed by the Center for Advancement of Informal Science Education (CAISE), InformalScience hosts a variety of user-contributed resources, including a wiki of evidence-based information on the impacts of informal STEM and a database of over 7,000 reports, articles, project descriptions, and other items uploaded by CAISE and website members. The site also features reference materials generated by CAISE on how informal STEM projects are developed, researched, and evaluated. Additionally, CAISE maintains a calendar, forum, blog, and member directory on the site and distributes additional content via its social media platforms. Together, these resources are designed to serve and maintain a community of informal STEM professionals. In particular, the site strives to serve individuals who are applying for NSF Advancing Informal STEM Learning awards (AISL) or who are involved in projects that have received AISL funding.

The 2016 user study was undertaken as part of an ongoing effort to better serve the website's visitors. Following a redesign of the site in January of 2016, the CAISE team wanted to ensure that the site was user-friendly and contained content of value to its users. Rockman et al was hired to conduct the study, focusing on the following questions:

- What types of users frequent the website? What are their goals, motivations, and needs?
- Is the purpose of the website clear to users?
- Is the website organized in a way that is intuitive to visitors? Can users easily navigate to the material that interests them?
- Do website users find the content on InformalScience useful and relevant to their work?
- What changes in site organization or content would improve the utility of the site for users?

Sub-points for each of the bullets above included questions about the site's homepage, headers, menus, and search functions, as well as questions that target AISL PIs as a specific audience of the site. The user study kicked off in June of 2016. Data collection took place from June through August.

[1] "Informal science education (ISE) is lifelong learning in science, technology, engineering, and math (STEM) that takes place across a multitude of designed settings and experiences outside of the formal classroom." (www.informalscience.org/what-informal-science)

Methods

Rockman et al worked with CAISE to establish a list of guiding questions for the study and then devised three methods to collect the data necessary for answering these questions: web analytics, surveys, and interviews (see Table 1).

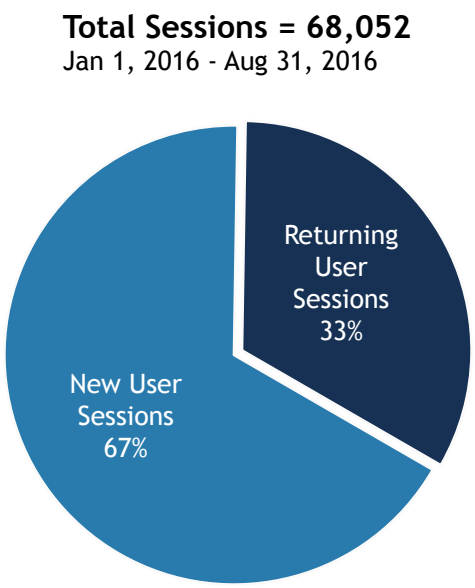
Table 1. Guiding Questions and Associated Methods

	GUIDING QUESTIONS	*METHODS*		
		Web Analytics	**Surveys**	**Interviews**
Clarity	Does homepage make website purpose clear? Is it clear where users should navigate next?	X	X	X
	Are words and phrases on homepage tabs intuitive? Is it clear from headings what content they will find?		X	X
	Is the metadata intuitive, clear, and easily understood?			X
Content	What types of resources do users search for?	X		
	Is content interesting and relevant?	X	X	X
	What would be useful/relevant content for users now and in the future?	X	X	X
	Do AISL PIs use resources on InformalScience.org to better their proposals and projects?		X	X
Navigation and Search	Are landing pages useful entry points? Do they align with users' goals?	X		X
	Are users able to find what they need?	X	X	X
	How can we help users find resources that will help them?		X	X
	What search functions work well and how can others be improved?			X

Website Analytics

Web analytics data were collected via Google Analytics, which was set up on the site in 2008. For the purpose of this study, analytics data covers the time period from January 1, 2016 through August 31, 2016 unless otherwise noted. This period begins roughly with the launch of the new site design, and covers a long enough span of time to identify important trends in site activity.

Figure 1. Web Analytics – Summary Data



Average Session Duration:	3 min 8 sec
Pageviews/ Session:	2.88
Unique Pageviews/ Session:	2.19
Bounce Rate:	59.41%

session
a "visit" to the website, beginning when the user first opens a page on the site and ending when they either exit the site or time out due to inactivity

pageviews
the total number of pages viewed, including repeat views of a single page

unique pageviews
the total number of pages viewed at least once, excluding repeat views of a single page

bounce rate
the percentage of visitors who enter the website and then navigate away after viewing only one page

Particular analytics of interest included bounce rates for the homepage and landing pages, pages that receive the highest hits, userflow through the site, and use of the site's multiple search features. Analytics data was also used to investigate and verify trends from the interview and survey data.

Rockman staff established filters starting June 1 that separate internal web traffic data (from CAISE and Rockman computers) from external data; however, this filter cannot be applied retroactively to data collected previously. Some of the data reported here therefore includes data generated by internal traffic on the site. Analytics data reported here also includes data generated

by survey and interview participants who used the site. Based on response rates, traffic from study participants accounts for less than 1.5% of website sessions during this time period, and therefore is not likely to have skewed the data in any meaningful way. Similarly, internal traffic should only represent a neglible portion of total site traffic.

Surveys

Rockman et al designed a brief, online survey distributed to both current website users and potential users through multiple avenues. Current site users were recruited via CAISE's lists of newsletter subscribers and registered site members. AISL PIs were recruited via public records of past grantees available through the NSF website. Additional participants were recruited through the professional networks of a variety of organizations and institutions associated with education, museums, learning sciences, and evaluation. Where the total population size of a particular audience group was known (website members, CAISE newsletter subscribers, and AISL PIs), Rockman set a target sample size based on a 95% confidence interval and 5% margin of error (Table 2). The total population size of other audience groups – namely potential site users in relevant professions – was unknown. CAISE and Rockman therefore settled on a target of 50 survey participants from each of several audience groups such as museum educators, professional evaluators, and learning researchers (Table 3).

Table 2. Survey Response Rates – Audience Groups with Known Population Sizes

AUDIENCE GROUP	Total Population	Target Sample	Survey Participants
AISL PIs (past and current)	185	126	96
registered site members (not including AISL PIs)	3695 (3586)	349 (348)	467 (396)
CAISE newsletter subscribers (not including AISL PIs or site members)	6687 (4056)	364 (352)	574 (171)

The survey reached its goals for website members and newsletter subscribers, but only received 96 of the 126 desired AISL participants, representing 52% of the AISL PI population.

Whether or not targets were met for other potential audience groups depended on whether or not these groups were held exclusive from the primary audience categories (website members, newsletter subscribers, and AISL PIs). In the end, securing participation from individuals outside of these primary audience groups proved difficult. The survey did receive feedback, however, from individuals with a wide range of experience using the site, including many users who said they had only "scratched the surface." (See Figure 6, p. 14)

Table 3. Survey Response Rates – Audience Groups with Unknown Population Sizes

non-mutually exclusive categories

AUDIENCE GROUP	Target sample	Survey participants exclusive of primary audiences (Table 2)	Survey participants total
AISL applicants	50	6	68
informal STEM educators	50	57	343
museum professionals	50	49	283
evaluation professionals	50	23	185
learning researchers	50	27	180
STEM researchers	50	25	175
graduate students	50	27	86
undergraduate students	50	2	7
other*		31	168

*Participants listed a variety of professions under "other," with university faculty, teachers, Broader Impacts professionals, and grant writers being some of the most prevalent.

Interviews

Finally, to gather more detailed feedback from users on their experience with the site, Rockman staff conducted semi-structured interviews with users while they browsed the website and performed a series of directed tasks. The interviews were conducted online via Google Hangouts with screen sharing enabled so that the interviewer could observe participants' actions as they navigated the site. Interview activities included questions about website clarity and content, open time to explore features of interest and offer feedback, search exercises to locate some of the website's key resources, and a "Share Your Work" exercise during which users tested the site's form for uploading resources using their own work as an example. Interviews took slightly over one hour, and participants were compensated for their time.

Interview recruitment was tied into survey recruitment, and 25 individuals were chosen by semi-random selection. Individuals were asked to rank their previous experience with the site on a scale of 1 to 5 (1= no experience, 5 = extensive experience). Fifteen inexperienced users (ranked 1-2) and ten experienced users (ranked 4-5) were selected. Rockman also ensured the selection process delivered users from a variety of professions without being weighted too heavily in any one direction. Professions and AISL status of interview participants is listed below. The list adds to more than 25 (the total number of participants), since several interviewees fell into more than one of these categories:

- 8 AISL PIs and 5 AISL applicants
- 6 evaluation professionals

- 6 museum professionals
- 10 education researchers
- 5 STEM researchers
- 16 informal STEM educators

Each interview was video recorded using screen capture technology, which allowed for replay and coding during the analysis phase. Throughout the interviews, Rockman paid attention to common issues with navigation, what features users found intuitive or not, the different ways users responded to the site based on personal preferences and needs, and the content which users found helpful or lacking.

About this Report

This report summarizes findings according to the major themes present in the guiding questions and the data collected:

- User Characteristics
- Homepage Impressions
- Navigation
- Submitting Resources
- Search Tools
- Content

Key findings and recommendations are summarized at the beginning of each section, and overall findings and recommendations are summarized at the end of the report.

Blue boxes enclose important findings.

Orange boxes enclose important recommendations.

USER PROFILES AND CHARACTERIZING SITE USE

Key Findings

The site attracts educators, researchers, evaluators, and many people who fall into more than one of these categories. Patterns in website use are similar across professions.

AISL PIs and applicants make up about one fifth of users but are the most likely individuals to contribute their work to the database, along with professional evaluators.

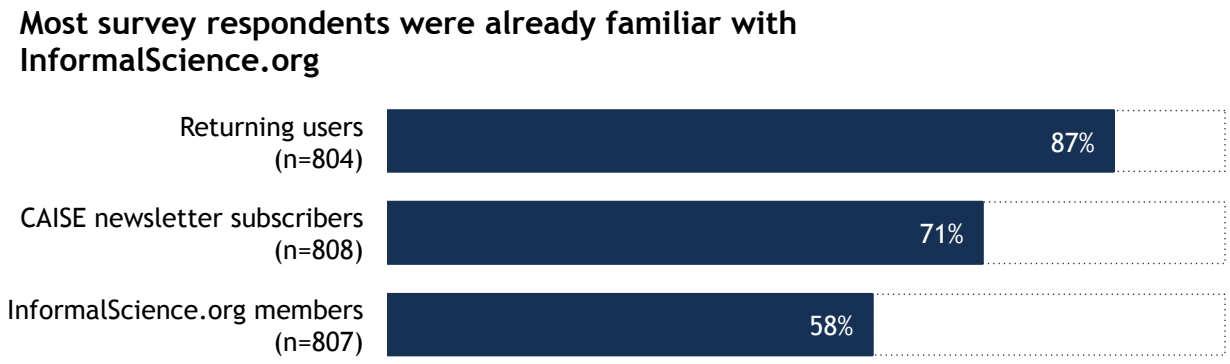
About 55% of AISL PIs and applicants said they used the site to prepare their AISL proposals. Fifty-nine percent have used it while their AISL project is underway, but their use of the site dies down once the project has completed.

Most users are infrequent visitors to the site and have not explored its full range of features and information. Very few individuals qualify as "power users" and even experienced users may not be aware of all features on the site.

Above all, visitors use InformalScience.org to find reports and research on ISE. News and updates from the field are also important to users, and over a third of users come to the site looking for evaluation resources.

During the two months the survey was active, over 800 total responses were collected. Since the majority of survey participants were already familiar with InformalScience.org (Figure 2), their responses paint a robust picture of the website's current user base. Most site members are newsletter subscribers, but a very large number of newsletter subscribers have not registered as site members, suggesting a funnel of engagement where signing up for the newsletter is the first step and signing up as a site member indicates deeper engagement. Encouraging or reminding newsletter readers to create a site profile may prove fruitful for increasing website usage and increasing the number of registered members.

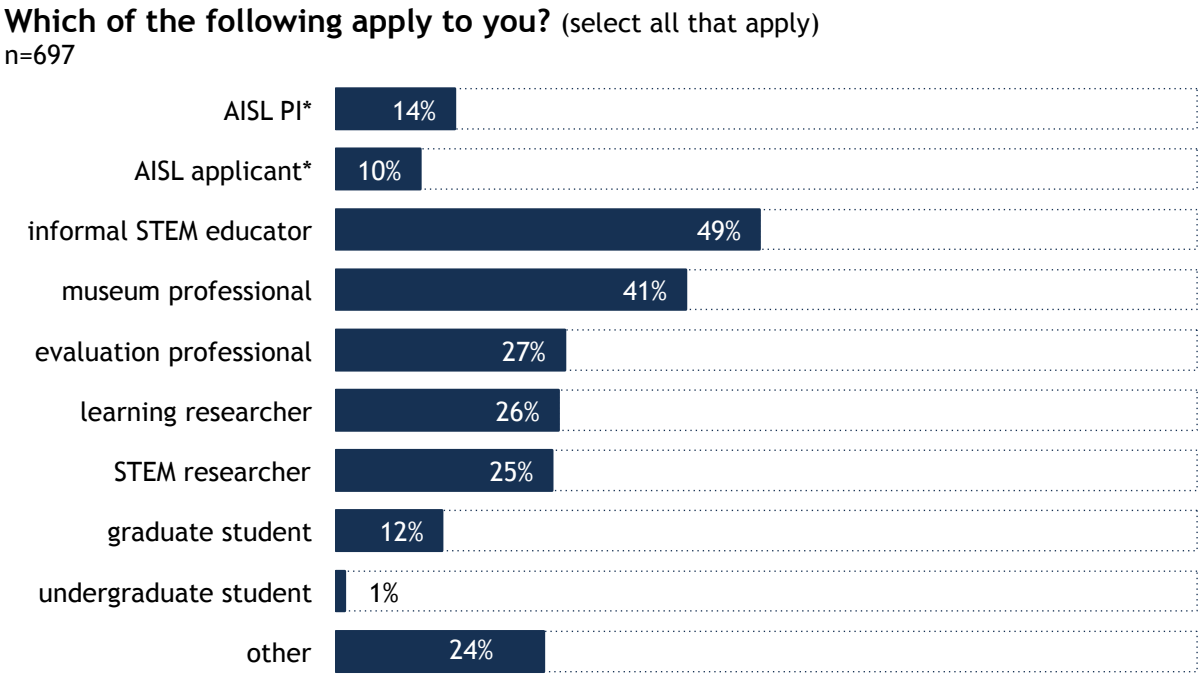
Figure 2. Survey - Respondents' Familiarity with Website



User Professions

Most survey respondents fell into more than one professional category, selecting two or more options from the list shown in Figure 3. Their responses coupled with interview feedback shows that the website's users occupy a complex Venn diagram of professions and professional responsibilities – for example, museum educators who sometimes do evaluation, researchers who occasionally work in museums, graduate students who are part time educators, and so on.

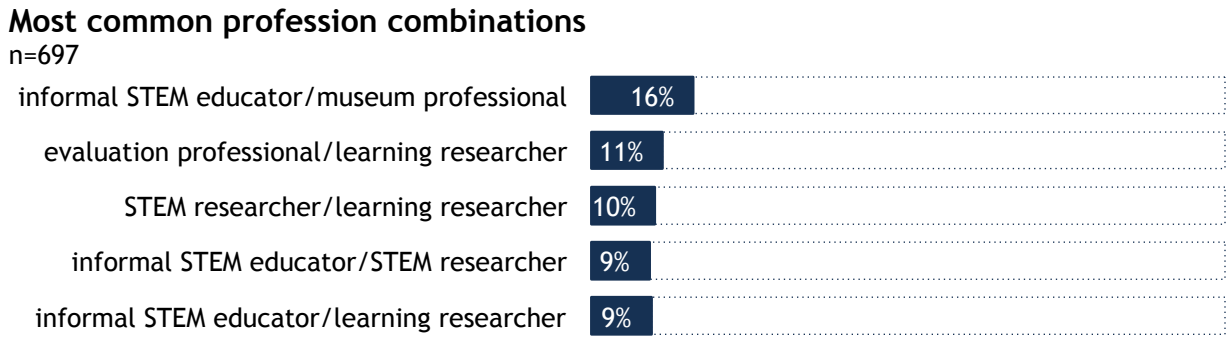
Figure 3. Survey – Professions of Returning Users



(*Survey data was cleaned to categorize individuals as either AISL PIs or AISL applicants, but not both. Those who selected both options were categorized as AISL PIs.)

Half of the survey respondents chose two or more options from the list of professions shown in Figure 3Figure 3, (not including selections of "AISL PI" or "AISL applicant" since these are not necessarily professions on their own). The most common overlaps in profession are shown in Figure 4. People who characterized themselves as informal STEM educators were most likely to select multiple professional titles, including museum professional, learning researcher, and STEM researcher. A large number of survey respondents also characterized themselves as "other." These individuals listed a variety of professions, with university faculty, teachers, Broader Impacts professionals, and grant writers being some of the most prevalent.

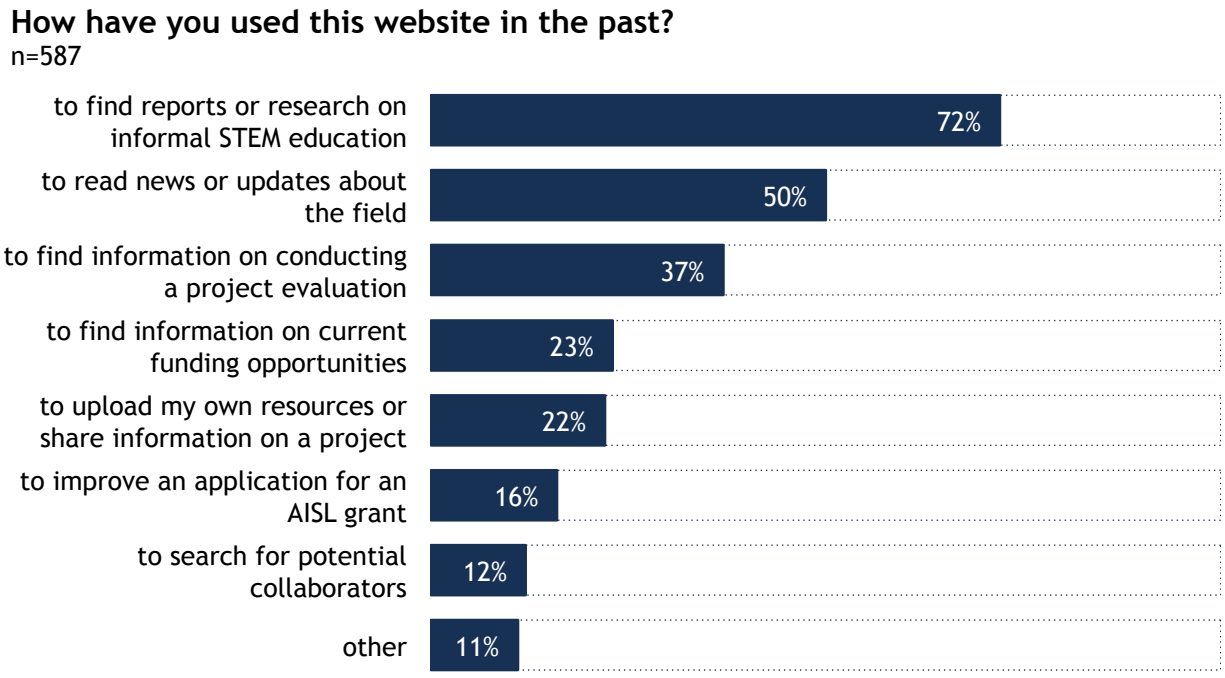
Figure 4. Survey - Overlaps in Professions Among Returning Users



Site Activities

The majority of survey respondents said they come to InformalScience.org to look for research or resources about informal STEM education (Figure 5). Half of respondents said they use the site to follow current news from the field of ISE, and about a third reported using the site for its resources on project evaluation. Although 72% of participants said they conduct research on the site, only 22% said they have contributed their own resources to the database. A few interviewees sheepishly admitted that although they wish the site's resource database was larger, they hadn't yet contributed their own work. Finding ways to boost the number of contributors would enhance the site for many users. Some minor suggestions that might encourage more users to share their work follow, in "Submitting Resources to the Database" (p. 36), but the larger task of building a dedicated base of contributors is beyond the scope of this study.

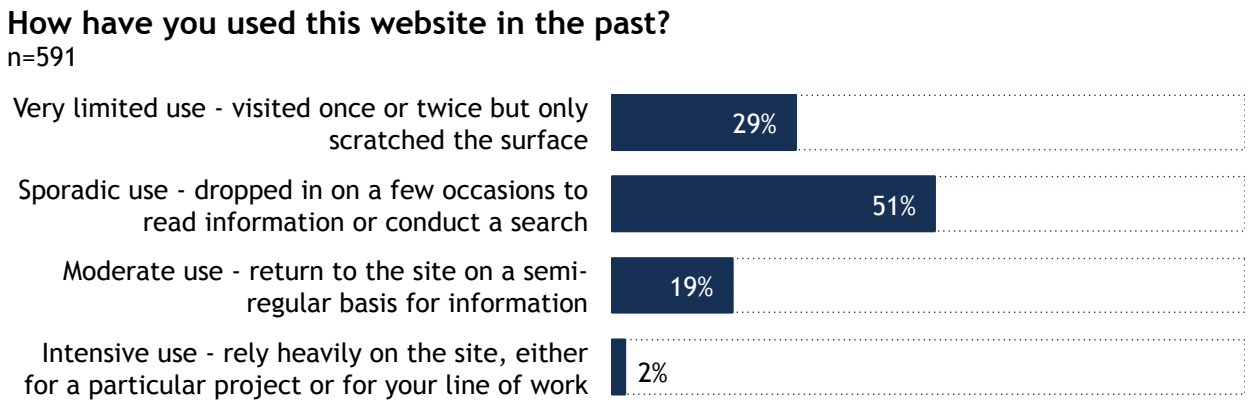
Figure 5. Survey - Activities Performed on Site



Frequency of Use

Characterizing frequency of site use is tricky, since for many users it can vary depending on the projects that currently engage them (Figure 6). Responses from both the survey and interviews suggest many users will drop into the site to conduct research or look up information when they have the need for a particular project, but then they might not return until the next time a need arises – sometimes weeks or months later. A smaller base of users (21% of survey respondents) said they use the site more frequently in their work, returning on a regular basis or using the site quite heavily. These may be individuals who have the need to conduct research on a regular basis or who check in to view changing site content that keeps them up-to-date, such as posts to News & Views or the calendar.

Figure 6. Survey - Frequency of Site Use



Patterns in Usage

To further understand usage patterns, respondents' answers on *how* they use the site were compared to their answers of *how often* they use the site (Figure 7). Intensive users tend to use the site for a wider variety of activities than other users. Only eleven individuals fall in this category, and it may be that these users have learned to maximize the site through repeated use. People who characterized their use as intensive, moderate, or sporadic all show a similar pattern in the types of things they use the site for. Finding reports and research, keeping up with news in the field, and finding information on conducting project evaluations are the top three uses for all three categories of users. Those who described their use of the site as "very limited" show a different pattern. Naturally, they've had less time to explore the site and therefore don't perform as wide a range of activities on the site. Finding reports or research on the site ranks high for these users, but more than a third also have used the site to search for potential collaborators.

Types of website activities were also compared to users' professions to see if particular types of users were more likely to use the website for some purposes than others. Interestingly, users' answers did not show a great deal of variation based on their profession. AISL PIs and applicants naturally were more likely to report using the website for improving AISL grant applications, but the percentage of users who reported using the website for most others activities was fairly similar across all professions. The one exception was in uploading resources and sharing project

information on the site (Figure 8). People who identify as AISL PIs and evaluation professions lead the pack for sharing resources through the website. Informal STEM educators were the least likely to say they engaged in this activity.

Figure 7. Survey - Patterns in Frequency and Type of Use

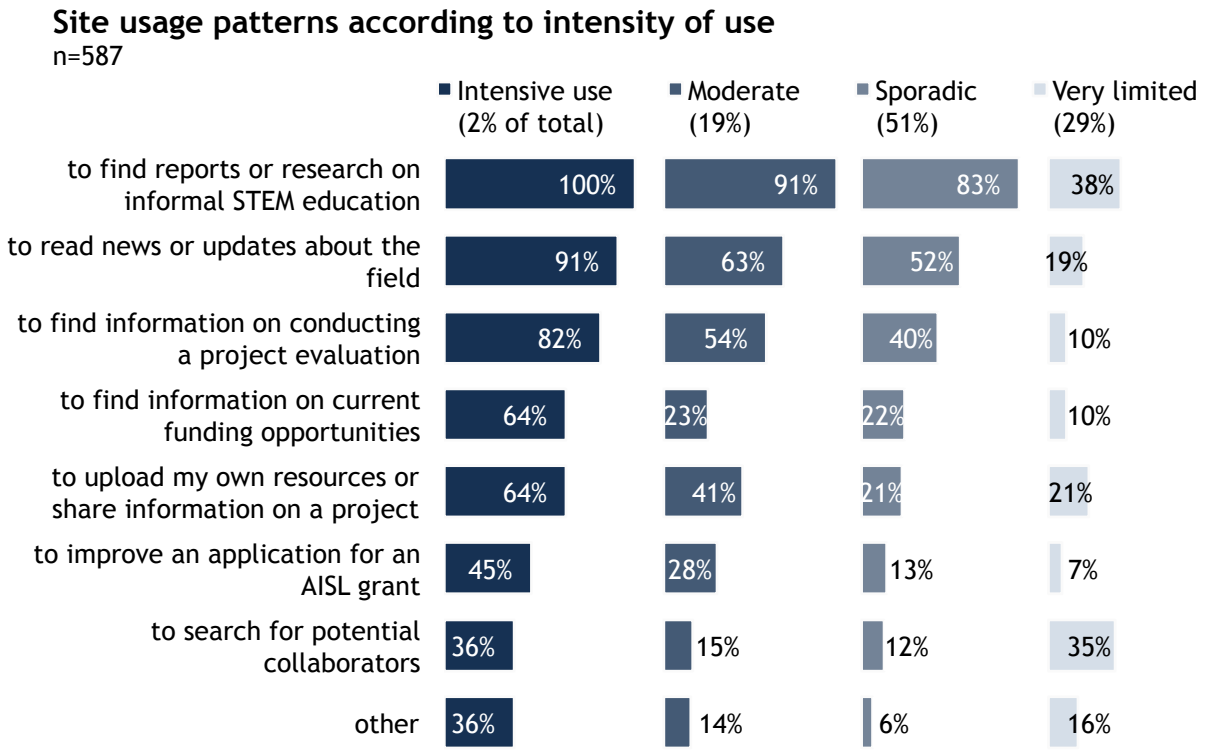
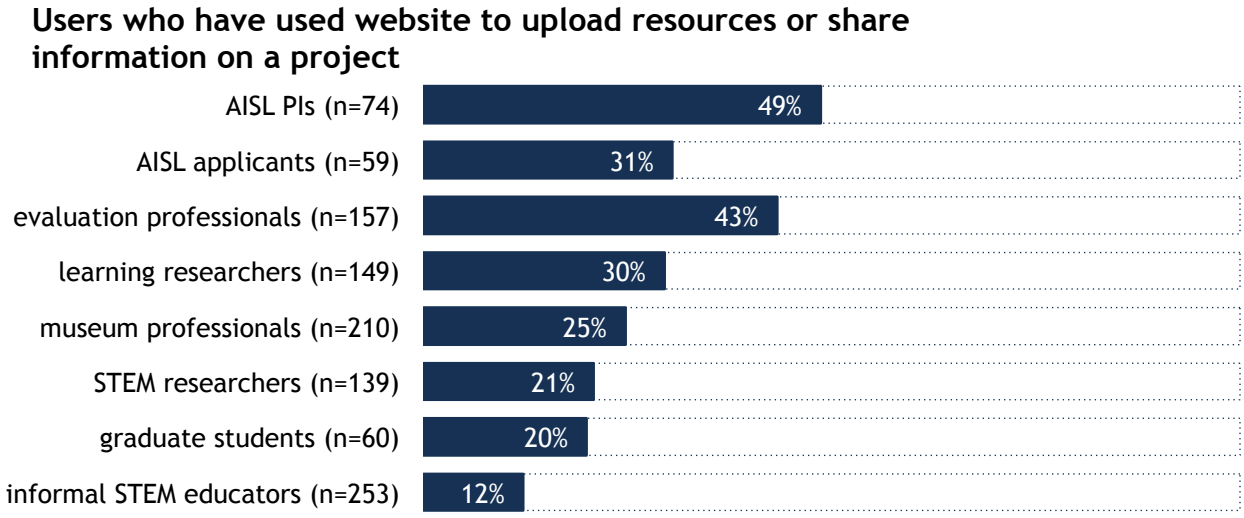


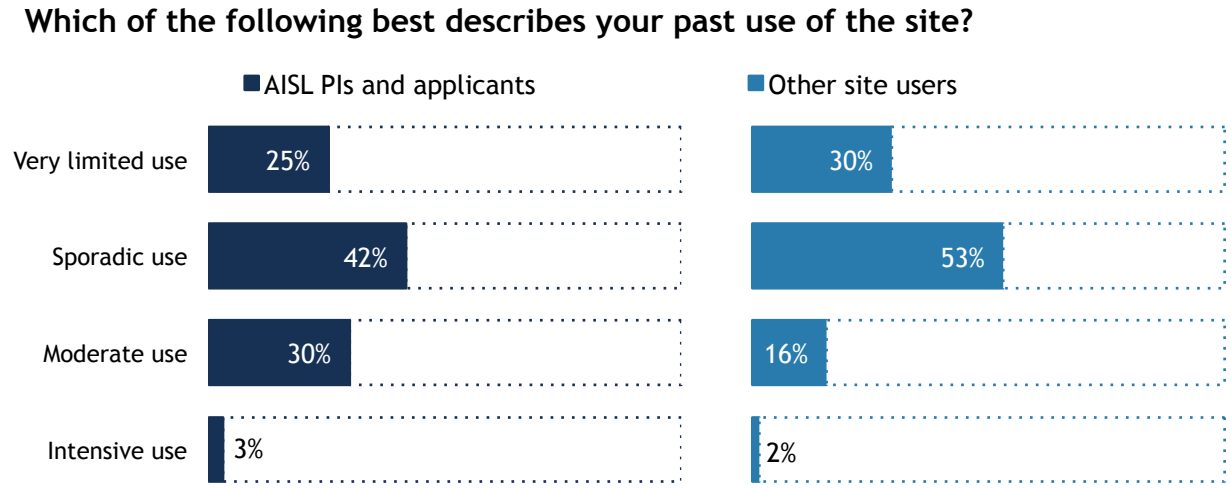
Figure 8. Survey - Resource Sharing by Profession



AISL PIs and Applicants

AISL PIs and applicants together make up about one quarter of returning users, suggesting that the website serves a very large population beyond its direct target audience (Figure 3). On the other hand, AISL PIs and applicants said they utilize the site slightly more often than other survey respondents (Figure 9). This raises an interesting question that was also pointed out by an interview respondent – Should CAISE focus its efforts on serving the larger fraction of website users who only visit occasionally or on serving the smaller fraction of website users who use the site more heavily and who also contribute most of its content? Ideally, findings from this user study will help CAISE to achieve both.

Figure 9. Survey - Frequency of Site Use - AISL Respondents

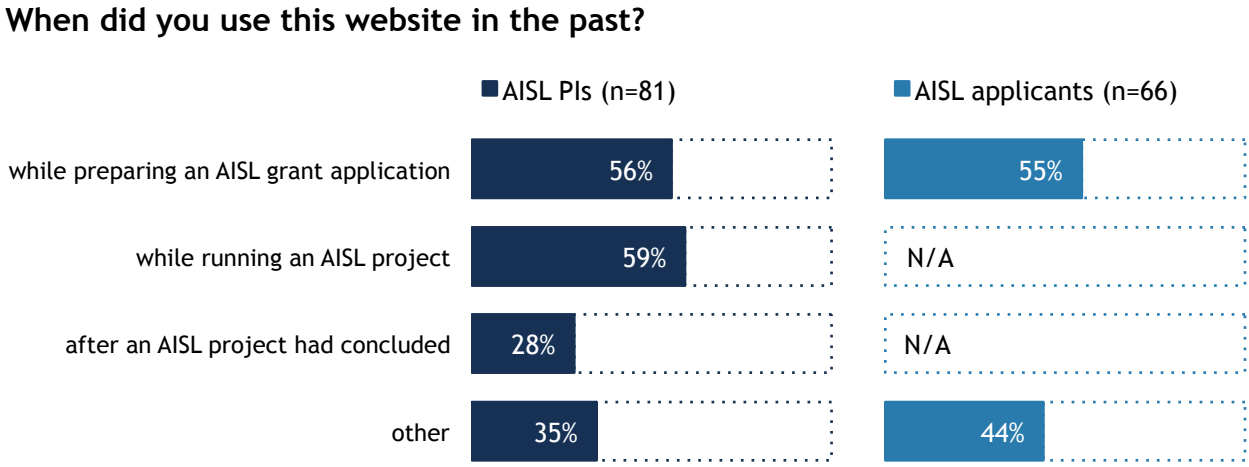


Survey data shows that the bulk of site use relating to AISL projects happens during the grant application process or while the project is underway (Figure 10). Use of the website once the project has concluded is lower. About half of the interviewees who had applied for an AISL in the past said they had used the site during the application process, which aligns with the survey data. These individuals described using the site to develop their proposals. In particular, they used the site to find other projects similar to their own and to ensure that they were building on previous work in their field and not duplicating another project's efforts. Some who said they hadn't used the site for their AISL proposals said they weren't sure if the site had been available years ago when they were going through the application process.

Fewer interview participants talked about using the website while their AISL project was underway. Those who did use it during this time talked about using the member directory to look up individuals, searching for resources on evaluation, or using it to disseminate their work.

Quite a few AISL PIs and applicants reported on the survey that they used the site on other occasions beyond their AISL projects (Figure 10). Examples include searching for evaluation resources, finding members of the informal science community, or conducting research for other projects.

Figure 10. Survey – Site Use Related to AISL Projects



Other Websites that Support Users' Work

Interviewees were asked about other websites similar to this one that support their work, and most started by saying there aren't any other sites like this:

> *"InformalScience.org is pretty unique as a knowledge base and a repository for relevant papers for informal science education."*

When pressed, however, they listed a variety of sites where they turn for different types of information, including:

- Google Scholar (5 mentions) and Google (2)
- Academic search engines: Academia.com, EBSCO, ERIC (2), Psych Info (2), PubMed, Research Gate, and Web of Science
- Professional organization websites: AAAS – Trellis (2), ACM, ASTC (2), AZA, NABI, National Afterschool Association, National Association for the Education of Young Children, National Network for Ocean and Climate Change Interpretation, National Science Teachers Association (2)
- Government agency websites (5) – NASA, NEH, NIH, NOAA, NSF
- Afterschool Association Network and the Afterschool Alliance (3)
- Websites of specific informal education institions: Exploratorium, Denver Zoo, Cleveland Metropark Zoo
- Science Buddies, Children and Nature Network, CS10K

Providing links to these related sites of interest could help visitors locate resources that are outside of CAISE's purview – for example, sites that provide informal STEM curriculum materials. This is an option CAISE is currently considering.

HOMEPAGE IMPRESSIONS

Key Findings and Recommendations

Most sessions on the website (77.5%) don't include stops on the homepage – users are navigating directly to other content.

Most users find the homepage at least fairly clear in communicating the site's purpose, but the wording in the blue search box seems vague to many users. It is also overlooked by many users due to the small font size.

The streamlined look of the homepage places the most emphasis on the database search tool and the Projects, Research, and Evaluation Pages. Other site features that receive less emphasis are less apparent to users – such as funding opportunities or the calendar.

The word "Projects" can have many interpretations and leads some users to believe there are curriculum resources and informal STEM activities to be found on the site.

To clarify the site's purpose and intended audience, CAISE could consider a variety of options:
- Adding a tagline to the page header
- Increasing the size or prominence of the link to the "What is Informal Science?" page
- incorporating photos that represent a variety of informal science learning environments

Rewording the explanatory text in the database search box to describe specific resource types and increasing the size of this text may alleviate some user confusion.

Increasing the size of the News & Views and Community headers will help emphasize these features on an equal footing to Projects, Research, and Evaluation.

Limiting the use of acronyms – especially on the homepage - will make the site more friendly to a broader audience. Since ISE is a common acronym throughout the site, it may be helpful to provide a translation of this somewhere on the homepage.

Homepage Analytics

The homepage has critical importance for websites because it is often viewed as the point of entry and the place from which users either make a navigation choice or decide to leave the site altogether. Like the cover of a book, a homepage needs to convey the site's purpose and value and entice the user to read further. Basic analytics data from InformalScience.org demonstrates, however, that the homepage may not have this opportunity with most site visitors. Only 22.5% of site visitors between January and August of 2016 viewed the homepage at some point during their visit to the website (Table 4). Furthermore, new users viewed the homepage much less often than returning users. Traffic to InformalScience.org may be following a trend seen on other

sites experiencing "death of the homepage," where referral links (from social media, the CAISE newsletter, or other sources) lead users to specific content, bypassing the homepage altogether.[2]

sessions with pageview	*entrances*	percent exit
percent of sessions during which the page was viewed at least once	percent of visitors that began on the page	# of exits / # of pageviews (how often users exit from this page after viewing it)

Table 4. Homepage Analytics Data

PAGE	Sessions with Pageview	Entrances	Percent Exit
Homepage - all users	**22.51%**	**19.77%**	**32.73%**
Homepage - new users	17.57%	15.99%	41.67%
Homepage - returning users	32.52%	27.51%	24.63%

The low percentage of homepage views does not necessarily change the role of the homepage – those who view the homepage are still looking for the same cues to understand what content the site holds and where they should click next. The low number of views does suggest, however, that CAISE may want to pay close attention to navigation originating from other points of entry. For example, the explanatory text that accompanies the database search tool on the homepage is not found on other pages of the site. Including the text on all pages might help visitors who enter the site from different points. Alternatively, a small link to a page about the database could fulfill a similar purpose.

Analytics data for the site's homepage shows an average bounce rate of 36.18% for June through August of 2016, meaning slightly more than a third of visitors leave the site after viewing only the homepage. Bounce rate can be difficult to interpret without additional context, but one would hope that a homepage with a clear purpose and navigation options would have a lower bounce rate than one with a less certain purpose. The homepage's bounce rate during the same time period in 2015 was slightly higher – 39.57%. This may indicate that design changes that took place in January are encouraging more visitors to stay and browse the site's offerings.

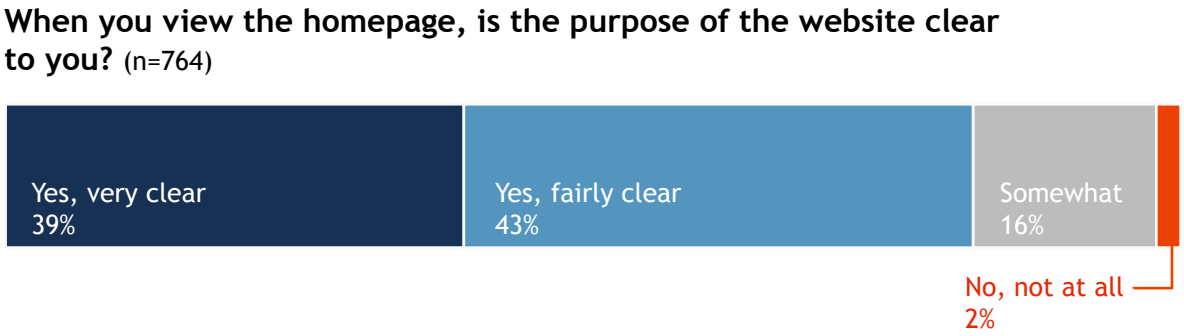
Clarity of Homepage Message

A central concern for CAISE is ensuring that the homepage clearly communicates the purpose of the site and that users can easily determine from header and menu options where they should click next to find the information they are seeking. Survey respondents were asked about the

[2] Thompson, D. (2015). What the Death of Homepages Means for the Future of News. *The Atlantic.* Retrived from http://www.theatlantic.com/business/archive/2014/05/what-the-death-the-homepage-means-for-news/370997/

clarity of the homepage, and most responded that it was “fairly clear” or “very clear” in communicating the purpose of the site (Figure 11).

Figure 11. Survey - Clarity of Homepage and Website Purpose

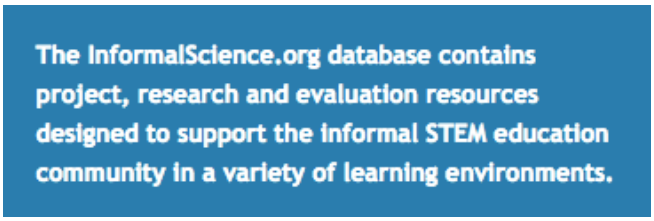


Interviewees were also asked to give feedback on the sentence that appears at the top of the blue search box for the resource database (Figure 12). Opinions were split, with half finding the wording to be fairly clear and half finding it to be somewhat vague or unhelpful. Experienced and inexperienced users fell in both camps. Several individuals also noted that they were likely to skim over this information without reading it, since the eye is drawn to the large text and icons below. One experienced user noted,

> *"It's funny I never noticed that - it feels very limiting to me. It's a much more active place than a database. To me it's more of a community hub (maybe not everyone sees it that way), although obviously it's an amazing database."*

A few other experienced users made similar comments, discussed under “Hierarchy of Content” (p. 22).

Figure 12. Website - Resource Database Description on Homepage



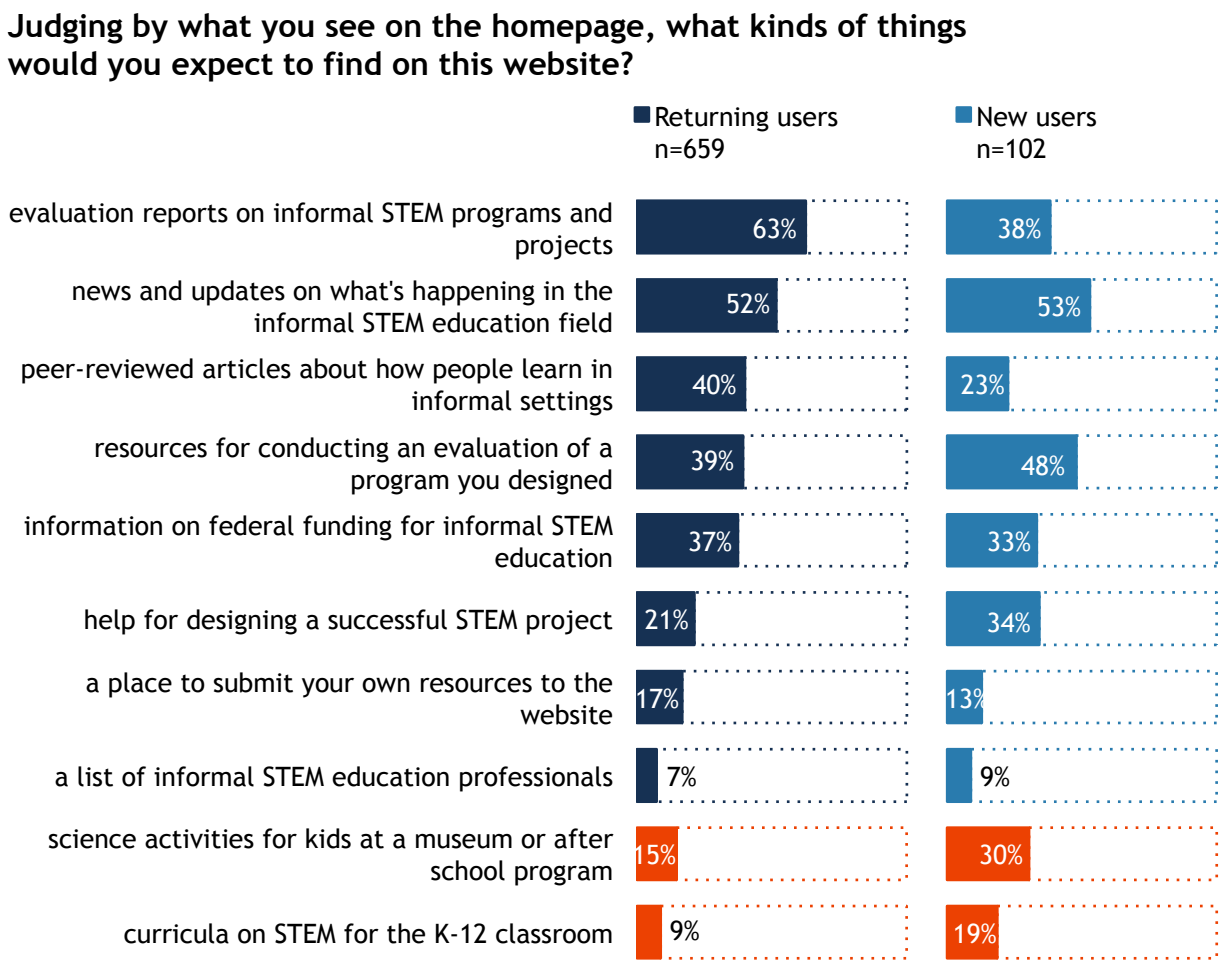
Resources to be Found

To follow up on whether individuals’ perceptions of the website’s purpose were accurate, the survey gave respondents a list of resources and asked them which three they thought were most likely to be found on the site (Figure 13). Eight of the ten options are items that can be found on InformalScience.org. Two options – shown at the bottom of the figure in orange – are not found on the site. CAISE has found these to be resources that individuals expect to find based on their

past conversations with site users. The survey included these items in order to see if users continue to have the misconception that curricula and activities are among the site's offerings.

Responses to this question show that evaluation reports are the number one thing that comes to mind for repeat visitors to the site, followed by news and updates from the field. New visitors also selected news and updates as one of the most likely options, followed by resources for conducting program evaluations. Despite the bright orange "Share Your Work" button, both groups selected this option less often, and the list of ISE profesionals was selected least often of any of the correct choices.

Figure 13. Survey - Content Expected from Website



A moderate number of repeat visitors and a fairly high number of new visitors selected at least one of the two incorrect choices, demonstrating that either previous ideas about the website or messaging on the homepage continues to cause misconceptions. Among interviewees, five inexperienced users and one experienced users also believed that activity resources or curriculum materials existed on the site. Resources they expected to find included experiment ideas, teaching modules, and activity guides. When asked what led them to this conclusion, interviewees frequently cited the word "projects" as suggesting these types of materials. One

educator was disappointed to find the site didn't provide these kinds of resources, but the other interviewees did not seem to mind. Other websites, they pointed out, provide those kinds of materials, and this site fills a different niche. Providing links to these other sites (as discussed above) is one way CAISE can be accomodating to these visitors without taking on entirely new content areas.

Interviewees had longer to review the homepage than survey respondents, and they provided a number of insights on the message communicated by the text and imagery. The words "projects," "research," and "evaluation" stand out to viewers the most, especially since they are found in both the header menu and the blue database search box. Most users said the site was a place you could go to find resources on these three topics, and one commented that the blue box conveyed that the site is essentially a large search engine. Six users also referred to the site as a place where you would go to connect with other professionals in the field of ISE. One individual wondered if the site provided information on funding opportunities, but noted there was nothing on the homepage to directly suggest this. There is, in fact, a link to funding opportunities from the homepage, but it is located below the fold.

Hierarchy of Content

A few of the more experienced users of the site commented that the homepage layout gives precedence to the database and projects, research, and evaluation content at the expense of other site features. News & Views and Community, for example, appear in smaller text and separate from the Projects, Research, and Evaluation headers. After staring at the page for a while, one user remarked that it didn't quite convey the richness of the website:

> *"I don't know if it really jumps out at me as a compelling place to look for stuff. I already know what's in there, but I'm wondering if I didn't, would I be really grabbed by this website? It actually seems a little underwhelming."*

The stylistic distinctions on the homepage help indicate different types of content and also give a clean look to the page, however one interviewee pointed out that it makes News & Views and Community appear somewhat lower in the hierarchy. Whether or not other users have a similar reaction isn't certain, but it's worth considering how much weight is given to different features on the homepage. An interviewee pointed out that even though these features (community resources and conversations) might only be important to a minority of users who are highly active on the site – say 10% of overall users – it might be wise to make these features more accessible, since highly active users are those who make the effort to contribute content. It's a philosophical question, he noted, about who CAISE should try to serve with the site.

Intended Audience

When asked who they thought the website's intended audience might be, most individuals said it could be almost anyone involved in informal STEM, including researchers, evaluators, and educators. One new visitor commented,

> *"When I first came here I must admit I was not sure. I have clicked around a little bit. I created a profile. And at first I was like, 'Is this a place I should be creating a profile? I don't even know,' but ultimately decided, 'yes.' I was thinking that it might be a mix of educators, program evaluators, and maybe scientists who do research on STEM education."*

A few individuals felt the homepage seemed oriented more toward academics due to the vocabulary used and the subdued aesthetic. Interviewees and survey respondents also occasionally commented on the use of acronyms and language that felt exclusionary to people who are new to the field or who come to it from another background. One survey respondent stated,

> *"Frankly, the terminology is pretty insider and semi-jargon-ish--I usually have to dig around to find what I want because I am not trained as an educator."*

Another individual who works in afterschool programs noted that the vocabulary is not familiar in the world of afterschool programming. "Informal science" or "informal education" are not terms they tend to use. "Expanded learning" or "out of school time" are more common. Although it may be cumbersome at times, spelling out acronyms the first time they appear on a page will help many users from feeling confused or excluded. Another individual recommended providing a list of common acronyms or jargon in the field. Increasing the text size of the link to "What is Informal Science?" might also help, since this page can orient visitors who are less familiar with the field.

NAVIGATION

Key Findings and Recommendations

Most users think it is fairly easy to navigate the website. The structure is intuitive enough that users can find their way around with minimal frustration.

Distinguishing between the resource database and other resources and site content causes some difficulty in navigation – partially due to the overlapping use of the words "projects," "research," and "evaluation" to describe site resources.

Currently, the homepage does not communicate that the resource database is largely compiled of documents submitted by users. As a result, both new and returning users are sometimes confused about the scope and nature of the database.

Finding peer-reviewed literature is of primary importance to many users. Users aren't always sure where to start their search or aren't aware of the site's multiple options.

Free EBSCO access is an attractive feature available to website members, but the EBSCO page needs clarification for those who are unfamiliar with the database.

The Knowledge Base is somewhat difficult for users to locate, partially because the name causes confusion and partially because it is not currently featured in a dropdown menu beneath any of the homepage headers.

Adding action verbs or additional descriptors to the main headers (Projects, Research, and Evaluation) may help describe the content found there and distinguish in from the resource database.

Emphasizing the collaborative nature of the database may help users understand its scope and overall purpose. CAISE might consider:
- moving the "Share Your Work" button to within the blue search box.
- changing the explanatory text in the blue search box to describe the database as a "repository" or a "user-contributed" collection.

An explanation on the EBSCO page that describes 1) what EBSCO is, and 2) the benefit of site membership, may encourage more users to register as site members and to use this resource.

The EBSCO page could also be improved by providing direct access to the EBSCO search function and ensuring that EBSCO opens in a new tab to prevent exits from InformalScience.org. (CAISE incorporated this feature shortly after data collection concluded.)

Since users frequently scan headers and dropdown menus when searching for content, adding dropdown menus to the News & Views and Community headers will help guide users to additional pages such as the Calendar and the Knowledge Base. (CAISE is currently working to implement this solution.)

"Once I understood the conventions (which I know a whole lot better now than when we started [this interview]) it's pretty obvious to me how to use it and how to find things on it. There's some nuances I've had to learn - if I wanted to add projects for instance or wanted to see other things - but from a novice user of the site, I feel comfortable with it." – interview participant

Participants in both the survey and interviews were generally positive about their experience navigating InformalScience, even if they sometimes had difficulty finding their way around. Most search exercises on the survey and during the interviews were successful with only a small amount of effort. Users also seem to understand that there is a necessary learning curve when using a new website, and they were not usually frustrated if their clicking occasionally led them astray or if they had to try different tactics to find the information they needed. In some cases, however, even experienced site users had navigation problems or misconceptions about how the site is organized, suggesting that even with practice users may have difficulty. Making certain elements of site structure more transparent may help even experienced users to utilize the website better.

General Feedback

Survey participants were asked to perform a 1-2 minute search on the site for information or resources relevant to their interests and report back on the difficulty of the task. Seventy-three percent of respondents said the search was either "somewhat" or "extremely" easy (Figure 14).

Figure 14. Survey – Difficulty Conducting Search

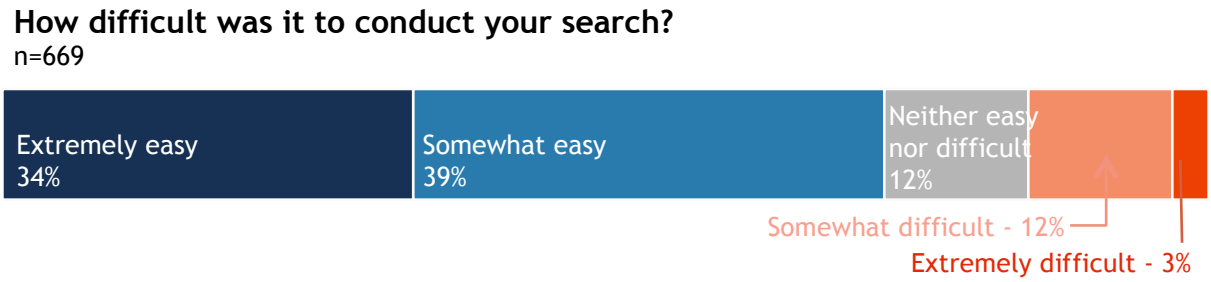
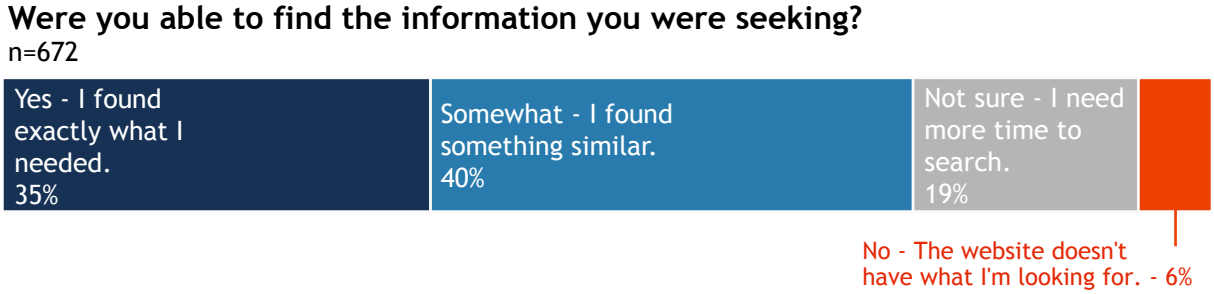


Figure 15. Survey – Search Success



Seventy-five percent of survey respondents said they either found what they were looking for or something similar (Figure 15). The remaining quarter either said they needed additional time to search or said the website didn't have the item they were looking for.

Survey data doesn't show any distinguishable links between the types of resources users searched for during this exercise and the difficulty they had in finding these resources. Participants who said they had a difficult time conducting their search were looking for a wide range of items, almost all of which should be accessible through the site.

Other survey and interview questions, however, provide helpful clues to where users are encountering navigation issues. One survey question showed users an image of the homepage and asked where they might click to find various resources. Heat map images were produced based on the number of clicks received in different areas of the homepage (example Figure 16). The resulting images showed that users had almost no issues finding the best place to locate most of the resources. Heat maps for the top five items in Table 5 showed almost all clicks occurred in the correct location or locations if there were multiple options. (For a complete set of heatmap images, see Appendix C.)

Figure 16. Survey - *Where would you click to find help for designing a successful STEM project?*

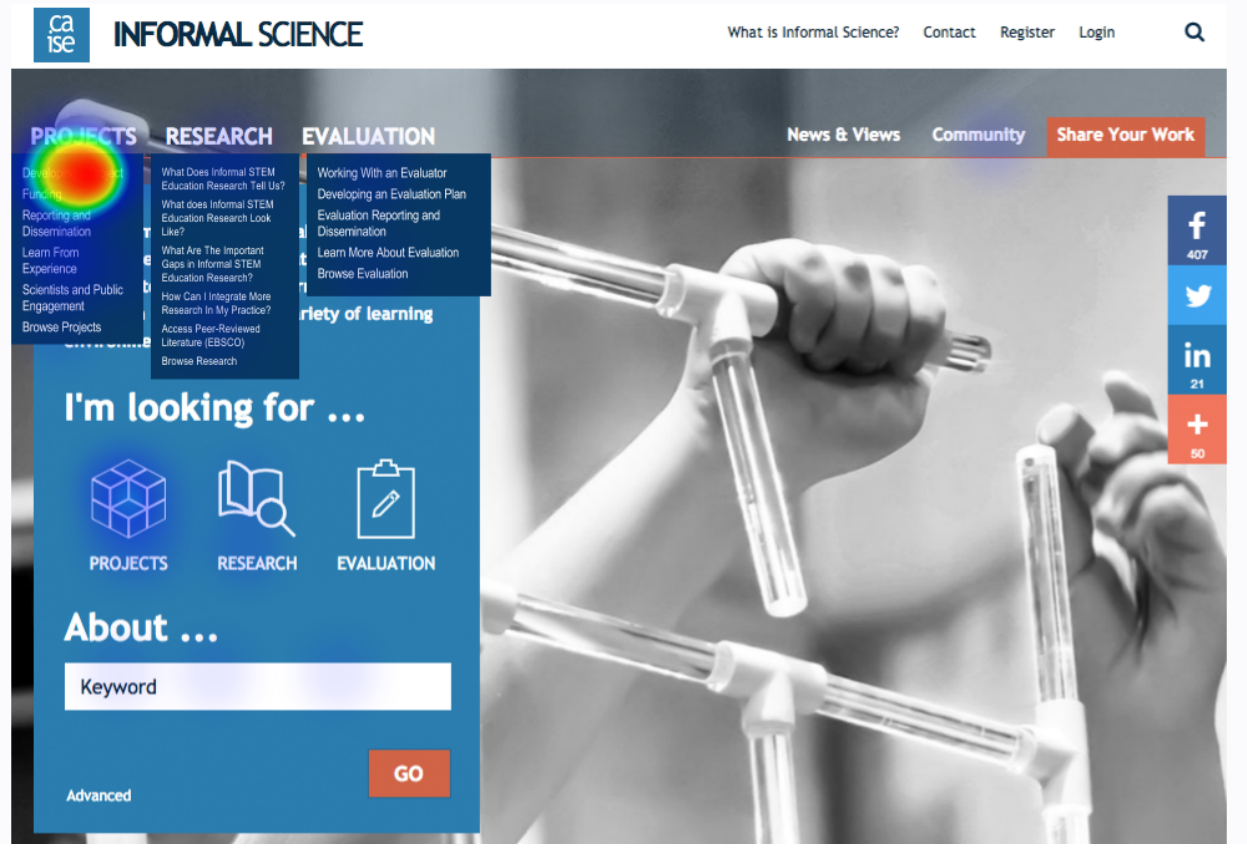


Table 5. Survey - Directed Search Task Results

WHERE WOULD YOU CLICK TO FIND…	**Task Difficulty**
help for designing a successful STEM project	easy
news and updates on what's happening in the informal STEM education field	easy
information on federal funding for informal STEM education	easy
a list of informal STEM education professionals	easy
a place to submit your own resources to the website	easy
peer-reviewed articles about how people learn in informal settings	moderate
resources for conducting an evaluation of a program you designed	moderate
evaluation reports on informal STEM programs and projects	moderate

Responses for the last three items in Table 5 show more variation on the heat maps, hinting at some of the navigation troubles users also experienced during their interviews. The patterns in navigation issues that emerged from these different datasets are discussed further below.

Accessing Research and Peer-Reviewed Literature

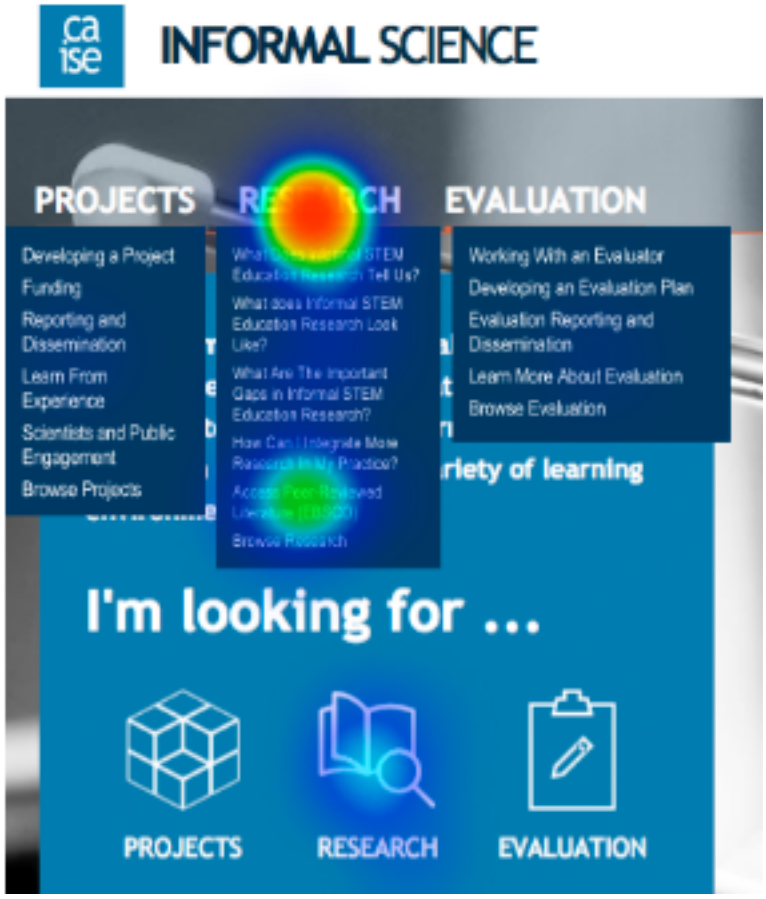
Survey participants who were asked to find peer-reviewed articles gave responses which were primarily on the right track, if not always a direct hit (Figure 17). Most survey respondents selected the Research header, which aligns with findings from the interviews. Many interviewees stated that when they hear "peer-reviewed" they think "research," and typically the Research header was the first thing to catch their eye. Interviewees also frequently overlooked the database search box and instead went to the Research page or dropdown menu. Similarly, the heatmap for this survey question shows fewer people clicking on the Research filter in the database search box.

Half of the interview participants (5/10) who were asked to find peer-reviewed material did so either by selecting "Browse Research" or by going to the Research landing page and using the database search box to perform a search. Three of these eventually discovered they could limit their searches by resource type to only display peer-reviewed articles, but two did not discover that option. Given more time, these users may have discovered how to filter their search down to peer-reviewed literature, especially since "Resource Type" is the top filter option on the page. It's worth noting, however, that for some users the words "research" and "peer-reviewed" are almost synonymous, and the "Browse Research" option may therefore return results that aren't always considered helpful, given the variety of materials which aren't peer-reviewed that fall under this category (e.g. blog posts, presentation slides, and conference proceedings).

Despite the prominence of the database search box with Research filter button, few survey participants or interviewees chose this option. It may be that users scan the page from the top down and choose the first likely link to catch their eye, in which case the header menus would capture their attention. It's also possible that the survey and interviews questions caused

participants to lean more toward finding the correct link to click and less toward performing a search. Throughout the interviews, users searching for material would almost always perform an initial scan of the website's main headers and use the site's search functions as a secondary option, suggesting that clear content headers and dropdown menus are essential for site navigation.

Figure 17. Survey - *Where would you click to find peer-reviewed articles?*



Accessing EBSCO

When asked to find peer-reviewed material, many survey and interview respondents selected "Access Peer-Reviewed Literature (EBSCO)" from the dropdown menu under Research, which could also be considered a successful hit. Five out of the ten interview participants who were asked to find peer-reviewed research located the link to EBSCO in the course of their search.

Registered members of InformalScience.org are granted free access to EBSCO – a feature that many interview participants were excited to find, since EBSCO resources are usually behind a paywall. Free access to journal articles is an attractive feature to site users, which has a few implications for the site. Users who know of this free perk might be more motivated to become registered members of the site – two interviewees affirmed this to be true. One interviewee pointed out, however, that the site may need to provide more information to encourage this step.

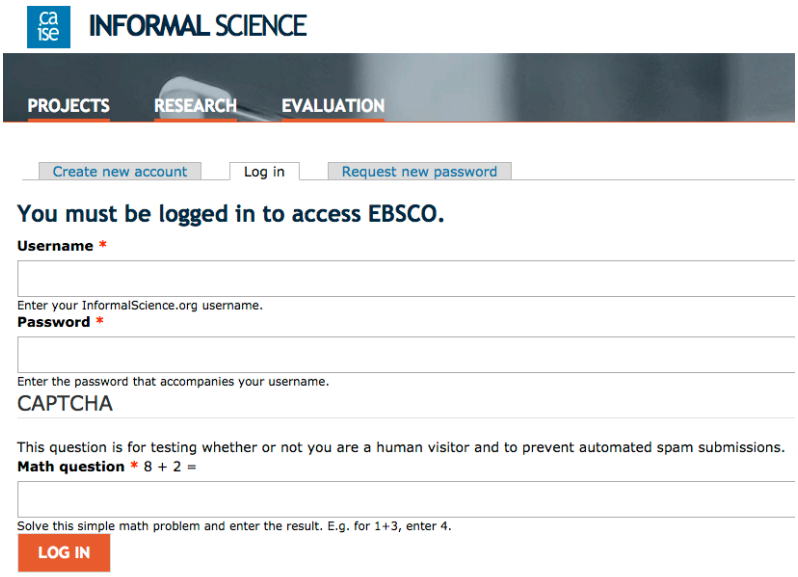
The page where users currently arrive after clicking on “Access Peer-Reviewed Literature (EBSCO)” is somewhat of a black box (Figure 18).

> *"I think just being more clear when you get here that this is free with your account... and here's what you're going to find there. All of a sudden - I'm on your site, and it's asking me to log in to another site. How do they link together? Why are you sending me somewhere else? That's a question I would have."*

Providing an explanation of what EBSCO offers and the related benefit of being a registered site member might therefore be beneficial both to CAISE and to site users.

Once a user is logged in, they see a different page that leads to EBSCO resources (Figure 19). This page guides the user to select one of numerous topic links, which leads them to an EBSCO search result page filtered by that topic. Another interviewee suggested adding an option for accessing EBSCO directly so that you can perform your own search, rather than having to first go through the topics listed. CAISE has been aware of this issue and implemented a solution not long after the interviews concluded – a button that takes users to an empty search form on the EBSCO website.

Figure 18. Website – EBSCO Page Before Login

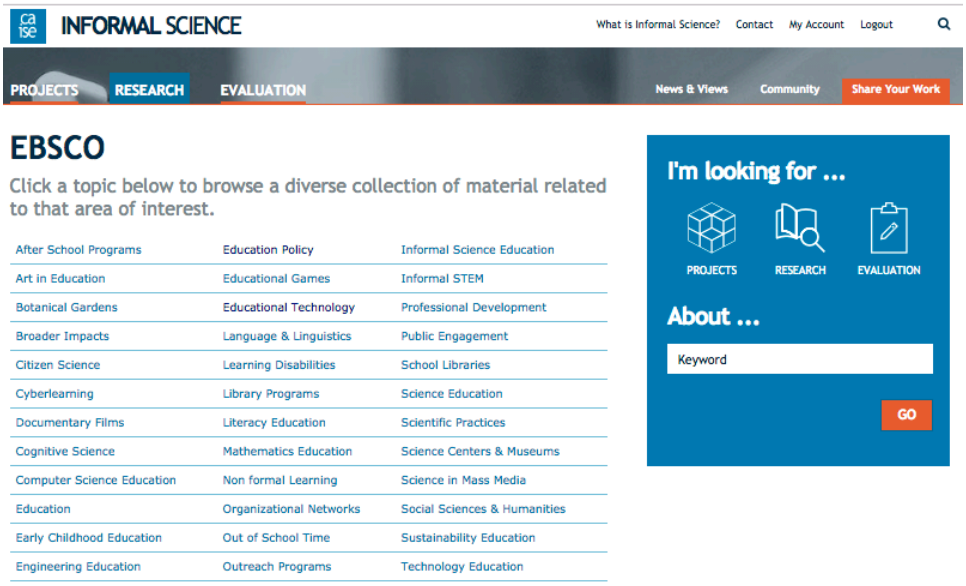


EBSCO access might also have negative repercussions for the site from an analytics standpoint, since clicking on any of the topic links currently results in the user exiting in the site, since the links do not open in a new tab. The page currently has an exit rate of 31.59%. An easy remedy could drop this rate however, if users could browse EBSCO while also keeping InformalScience open in its own tab.

Some users regard peer-reviewed literature as more desirable than other resource types (see more under “Content - Peer-Reviewed Articles”). By clarifying what options are available through the site and how to access each, CAISE can help users find what they need and also highlight

options they might not currently be aware of. One option for achieving this might be to provide a filter for peer-reviewed research on the homepage or in the large blue box that searches the database. Another option might be to add a note to the EBSCO page that describes the site's other options for finding peer-reviewed resources using its internal search engines.

Figure 19. Website – EBSCO Page After Login



Projects, Research, and Evaluation Headers

Interviewees had little difficulty when asked to find resources located under either the Research or Evaluation headers, but they often found the Projects header less intuitive. Users might find the resource or page they were looking for, but several interviewees commented that the Projects header seemed to function like a catch-all for resources that couldn't find a home elsewhere. A few users also commented that funding is sufficiently important to be its own header.

When asked if the site's organization according to these three main areas – projects, research, and evaluation made sense – most interviewees gave a hesitant yes. Several noted that it might not be perfect, but that they couldn't think of a better structure themselves. The difficulty for many was the overlap that they felt happened between the three categories:

> *"I guess I'm kind of wondering about the relationship between Projects and the other two. Some of them are research projects with an evaluation component in them."*
>
> *"I'm not sure it's always intuitive what's under Projects versus Research… I feel like there's a lot of crossover here and evaluation crosses over everything."*
>
> *"I'm not sure how projects and research and how projects and evaluation are fundamentally different."*

Others, however, saw a logic to the organization once they browsed the dropdown menus. One user commented that the Research resources are what you might want while you're developing the idea for a project, the Project resources are useful while the project is underway, and the Evaluation resources are things that come in handy when a project is wrapping up. In line with this thinking, the CAISE team is currently considering adding action verbs to the headers to help clarify their purpose, described in the paragraph below. This solution may be exactly what the homepage needs to iron out its navigation issues.

User-Generated Database Versus CAISE Content

Another common theme from the interviews (and hinted at by the survey data) was the difficulty users sometimes had in distinguishing between the reference-type materials provided by CAISE (primarily accessible through the header menus) and the resource database. The Projects, Research, and Evaluation landing pages each contain substantial amounts of information generated by CAISE, as well as links to subpages that provide addition content, resources, and external links. These pages offer reference materials, how-to guidance, and general information on the field of informal STEM education. In contrast, the resource database (accessed through the blue search box featured throughout the website) is a library of documents that have been submitted largely by website members and cataloged by CAISE according to a metadata tagging system (see Appendix B). Some of the documents in the database were compiled by the CAISE team from a variety of content sources, such as open access journals. Users are not always clear on the distinction between the two and where different types of resources are likely to be found – especially since both the homepage headers and the database search icons refer to the same trio of Projects, Research, and Evaluation. The CAISE team is currently working to find phrasing for the homepage headers that will help clarify their content. "Projects," for example, may be replaced with "Developing Projects" to indicate the types of support found under this header.

Figure 20. Survey - *Where would you click to find resources for conducting an evaluation*?

Two of the survey heatmapping questions highlight this issue. One question asked participants where they would click to find resources for conducting an evaluation (Figure 20) while the other asked them where they would find evaluation reports (Figure 21). Resources for conducting an evaluation might be found through the database, but the reference materials under the Evaluation header are the most relevant to this topic. The heatmap shows users clicking in both places. Evaluation reports, on the other hand, are most easily accessed through the database. The heatmap shows most users got this right, but a large portion also clicked on the Evaluation header or dropdown menu (and not on "Browse Evaluation" in the dropdown, which would also have been a correct choice).

Figure 21. Survey - *Where would you click to find evaluation reports*?

Interview findings help to pinpoint this issue, as many interviewees navigated the site or made comments that displayed the same confusion. For example, when asked to locate "a page that provides info on the most recent call for NSF AISL grant applications," four out of thirteen interviewees performed a search using the blue database search box. Two of these individuals were more experienced users of the site. For some users, this problem may simply indicate confusion about how the blue search box functions. They believe it can be used for searching general website content, when in fact it is more limited (see "Limitations of Database Search," p.

52 for further discussion). Other users, however, seem confused about the different types of content available through the website and the nature of the database. After an hour of browsing the website during their interviews, at least four participants (inexperienced users) were not aware that the database consists largely of content contributed by site members. At least one experienced user was also unaware. Some thought all site content was compiled and uploaded by CAISE, while others pictured the site as an academic search engine similar to JSTOR. Consequentially, these users were disappointed to discover much less peer-reviewed content on InformalScience.org than they would find on JSTOR or another academic search engine. Clarifying the website's purpose can help prevent these disappointments and help users take advantage of the site's strengths. Unfortunately, this issue was not anticipated, so the interview protocol did not directly address it. It's unknown just how many interviewees and site users have similar misunderstandings.

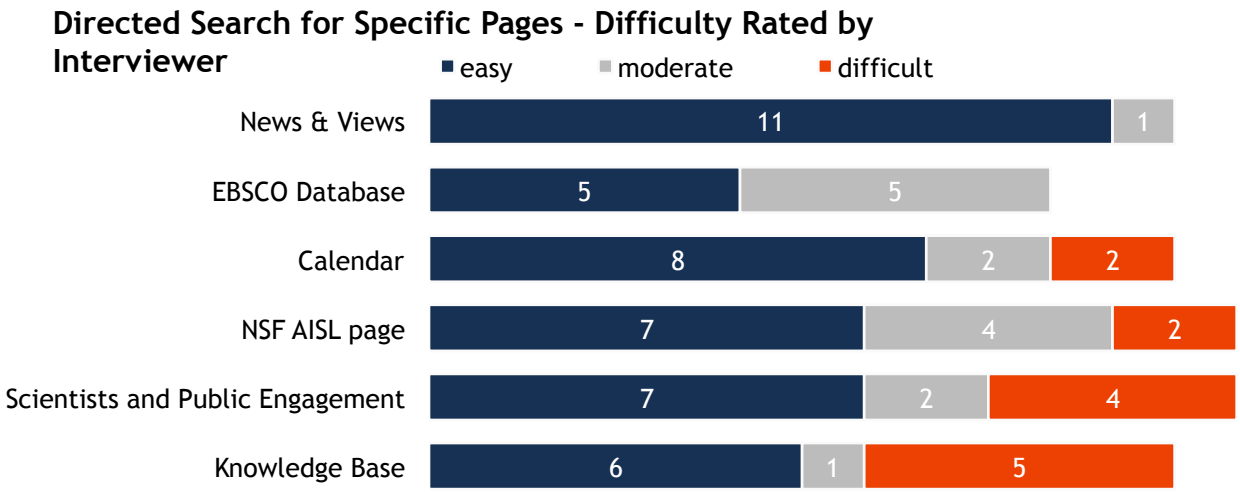
Adjusting the wording in the blue search box may help to remedy the situation. One experienced user suggested calling the database a "repository" or using similar wording to indicate that the database is created by the informal science community and that users can publish their work here. The word repository was also echoed by two other interview participants describing the database. Another change that might help underscore the collaborative nature of the database would be to move the "Share Your Work" button within the blue box. Further discussion of how these misconceptions could be addressed is found in "Homepage Impressions" (p. 18).

News & Views and Community Pages

Feedback from both the surveys and interviews shows that users have a good idea of what they will find on the News & Views and Community pages, even if they have never been to the website before. When asked to describe the type of content they would expect to find on each of these pages, interviewees listed a variety of items, most of which directly aligned with actual content. Similarly, the heatmap questions from the survey show users correctly selected these buttons when asked where to find news and updates from the field of informal STEM education (News & Views) and a list of informal STEM education professionals (Community) (see heatmaps in Appendix C).

Interview search exercises also showed that users had no trouble locating the website's blog within News & Views (Figure 22). Some expressed slight confusion over whether or not News & Views was actually a blog, since the format doesn't visually resemble some blogs they are familiar with (there are less pictures, for example). They were also uncertain as to how "News" different from "Views," since posts are categorized as one or the other. One individual found after poking around that it's possible to leave comments on Views but not News, and they were curious why this is the case. Finally, one user commented that they prefer the title "News & Views" over the word "blog" because it sounds more professional and trustworthy. Whatever their reaction to the page, people seem to have no difficulty in finding it, and the material there is generally what they expect to find.

Figure 22. Interviews - Directed Searches for Specific Pages



Finding the calendar took slightly more effort for interviewees. Most interviewees found access to the calendar through the Community page and thought this was fairly intuitive. A third of the respondents instead found the calendar link below the fold on the homepage. Two interviewees commented that the homepage links are not particularly eye catching and at first glance look like links to rotating blog content (Figure 23).

Figure 23. Website - Flexboxes on Homepage

Finally, the Knowledge Base was one of the more difficult pages to locate, in part because it was difficult to describe the Knowledge Base to users so they would know what to search for. Some users said the word "wiki" led them to believe the Community page was a logical place to look, since a wiki is a collaborative creation. These users were able to find the Knowledge Base easily. Other users were confused about how the Knowledge Base was different from the database or other information on the site, leading back to the dilemma of distinguishing between types of resources that InformalScience provides. A simple solution might be to add the Knowledge Base to a dropdown menu under Community, as these menus are typically one of the first places users scan for content. CAISE is also considering changing the name of the Knowledge Base, either returning to its previous title – the ISE Evidence Wiki – or choosing another title that does a better job of conveying its content.

Interviewees were asked to reflect on site navigation at the close of their interviews, by which time they had the chance to try a variety of search tasks and often had encountered sites features and issues they weren't previously aware of. About half of the interviewees either thought navigation was easy or that it would be easy with a little practice and exploration:

> *"I found it pretty user-friendly so far as where the information is."*

> *"Once you get the hang of it it's easy, so now I would know where to look."*

One user commented that they like the new site layout and appreciated how easy it is to access the resource database. Overall, navigation on the site works for most users but could still be improved with some small adjustments.

SUBMITTING RESOURCES TO THE DATABASE

Key Findings and Recommendations

The orange "Share Your Work" button does a good job of catching most users' attention. Users who are logged in and looking at the options for navigating their accounts had more difficulty noticing this button.

The resource submission form is straight-forward and easy to use. A few fields in the form could be clarified, but overall interview participants found it to be simple and user-friendly.

The form has minor layout issues for some users who found it to be visually long (although not long in terms of effort required). Some also had difficulty distinguishing where one section stopped and another began.

The resource type menu caused the most confusion for users – in part because the scrollable menu is difficult to navigate and in part because the hierarchy of resource types is not immediately apparent or intuitive.

Devise a process for tracking submissions that occur via email as well as through the website, in order to monitor the health and growth of the database.

Adding a "Share Your Work" button to the navigation tabs for the user account page may seem redundant, but this option would help those users who overlook the button at the upper right of their screen.

Providing additional guidance on each section of the form could help users make decisions on how to fill in the required information – for example, explaining how postal codes are used or what constitutes a good abstract. As an alternative, CAISE could provide links to examples from the database as guidance to users.

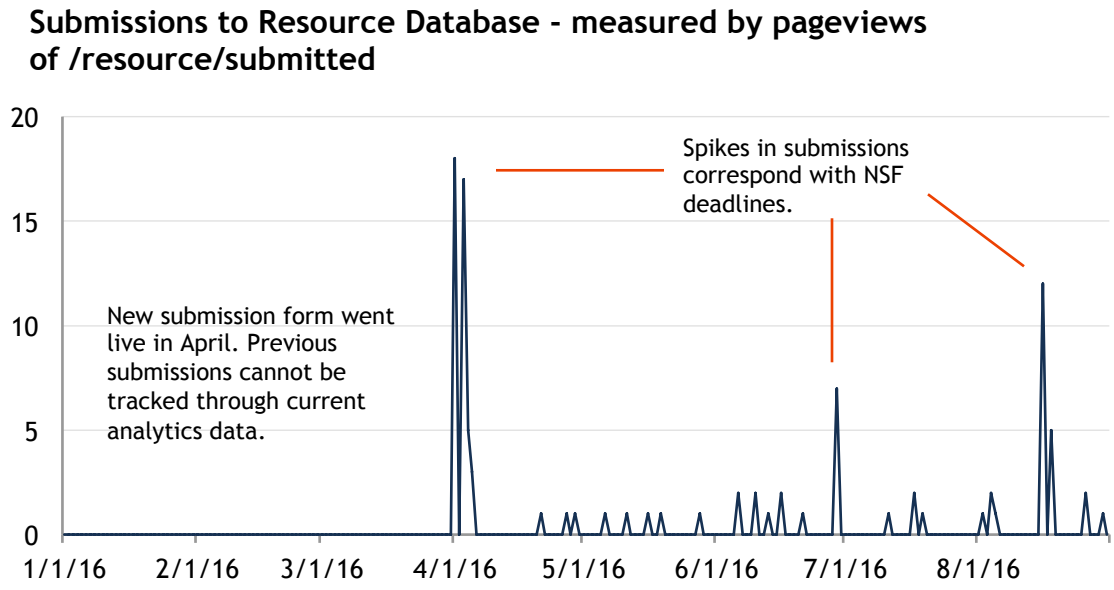
Finding another way to display the resource type list would help users navigate their options and make selections. Possibilities include:
- Increase the size of the menu so that a larger portion of the list is visible at one time.
- Change the dashes that denote the lists' hierarchy to bullets or more recognizable symbols.
- Trade the dropdown menu for an expanded list with checkboxes, so that users can see all their options at once.

The strength of the InformalScience.org resource database depends on the contributions of users who take the time to submit their work and the efforts by CAISE to review submissions and ensure they are properly tagged. Following the site redesign in January, a simplified version of the submission form was launched in April. Figure 24Figure 24 shows analytics data on the use of this form, which was completed 94 times between April and August. Spikes in submissions align with NSF deadlines, which often spur AISL PIs to disemminate their work on the site. Not all submissions to the database are made through the website's form, however. According to CAISE's Digital Librarian, about half of the content contributed to the database is submitted via email. CAISE hopes that the simplified form will encourage more users to use the online

submission form. In the future, the team plans to track email submissions and compare this data with website submissions, as well as how overall submissions change in response to the team's efforts.

Encouraging more users to submit work to the database is an ongoing effort for CAISE, and recommendations for building a community of dedicated contributors is beyond the scope of this user study. This study did investigate, however, how CAISE can make the submission process as painless as possible for users who want to contribute their work. During their interviews, participants walked through the process of submitting a resource using an actual item from their own work as an example. In this way, participants were able to put the form through a practical test and see which fields made sense, what options might be missing, and where confusion might occur.

Figure 24. Web Analytics - Resource Submissions



Starting the Process

Interviewees were asked to first navigate to where they thought they could initiate the process of submitting a resource. The orange "Share Your Work" button was obvious to 21 out of the 25 participants, similar to findings from the heatmap survey question (see Figure 51, Appendix C). Four individuals had difficulty finding where to start the process. Two of these searched for an option under the Projects header. The other two logged into their website account and then had difficulty proceeding to the next step. Once logged in, users see a series of tabs that allows them to access various settings and features of their account (see Figure 25). The two participants who began here browsed through these tabs looking for an option to upload a resource but did not find one. (The orange "Upload" button under the "Edit" tab misled them for a moment, before they realized this was a button for uploading a profile image. See Figure 26.)

Adding a link or tab in logged-in window might help some users navigate to the resource submission form more easily. It also might highlight that sharing work through the website is an option – since some interview discussions showed that not all site members are aware of this possibility.

Figure 25. Website - Logged In Screen

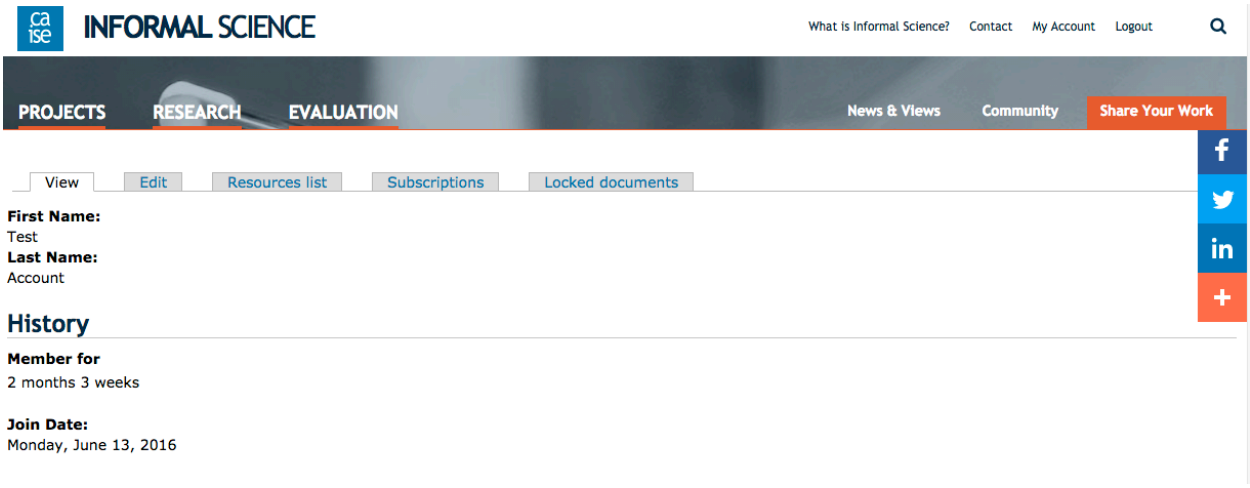
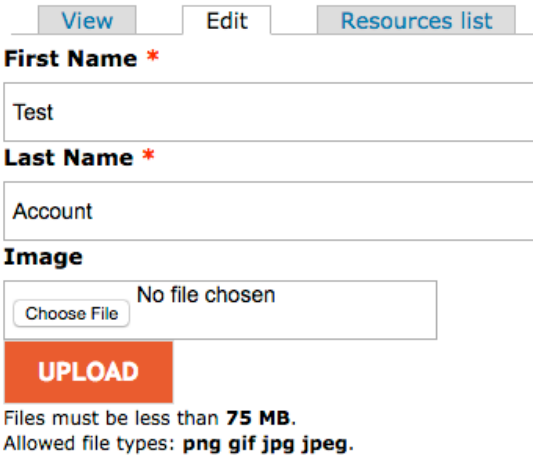


Figure 26. Website - Logged In "Edit" Tab

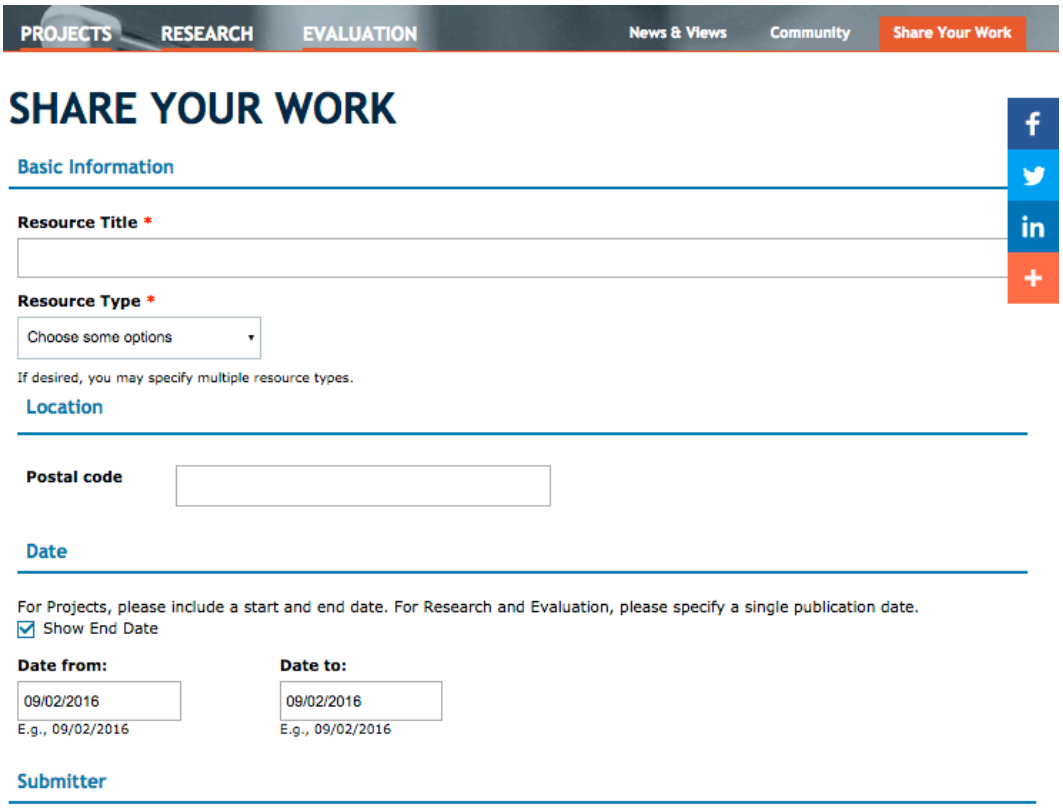


General Form Feedback

Previously users would fill out a separate form depending on whether their resource fell under the category of "Projects," "Research," or "Evaluation." The new page for submitting resources combines the necessary fields for each of these into a single form (Figure 27). As a result, not all fields apply to all resources that a user might like to submit. This was not generally a problem for interviewees, who understood fairly quickly that not all fields were required. Fields that are mandatory are highlighted with an orange asterisk, and this was intuitive to most participants.

Adding an explanation at the top of the form that states "* = required field" would emphasize this point, but most users will probably understand this without it being stated explicitly.

Figure 27. Website - Share Your Work Submission Form



Interviewees generally agreed that the form was straightforward and easy to use, although a few said it was somewhat long. A few commented that the form was much more straightforward than one that the National Science Foundation provides for a similar purpose.

> *"I think it's easy to use… not cluttered. Very clear, concise."*

> *"It's fine. You have to do a lot of scrolling down, but that's okay… It's not difficult. It's what one would expect."*

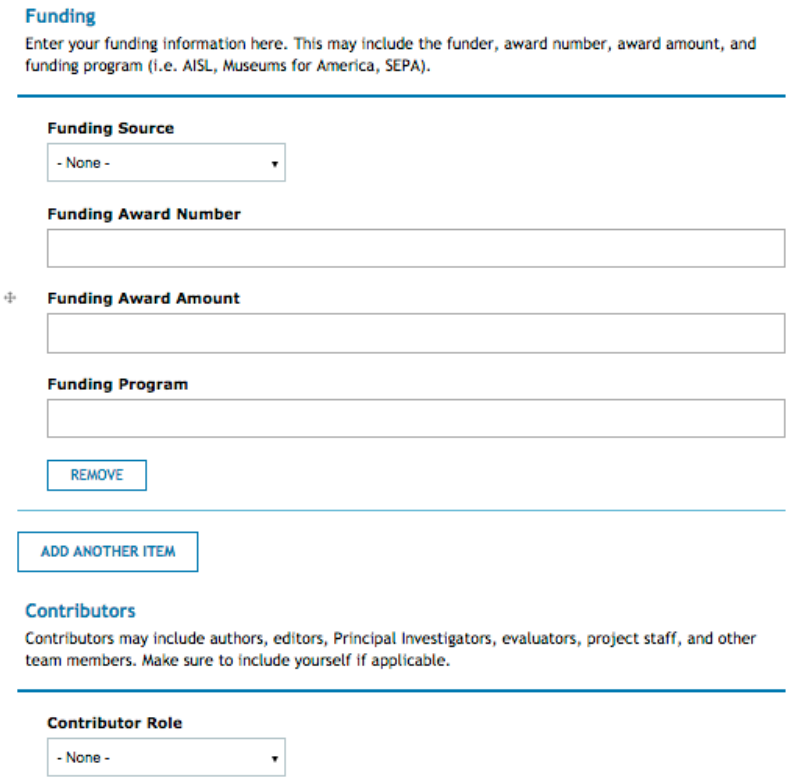
Critiques about the length of the form seemed to be less about the amount of information users have to fill out (since many fields are not required) and more about the amount of scrolling required to view the entire form. Despite the length, one interview participant said they appreciated the fact that the entire form was visible on a single page, so that they could easily see what information they would need to complete the process:

> *"One thing I really like about it is that it's all on one page. I feel like there's no surprises. If I go there I know everything I'm gonna need available to do it…"*

Another user suggested moving some of the fields up by displaying them side-by-side in the white space that appears on wider screens. This may or may not be a feasible option since narrower screens will not have as much real estate, but collapsible fields could achieve a similar goal.

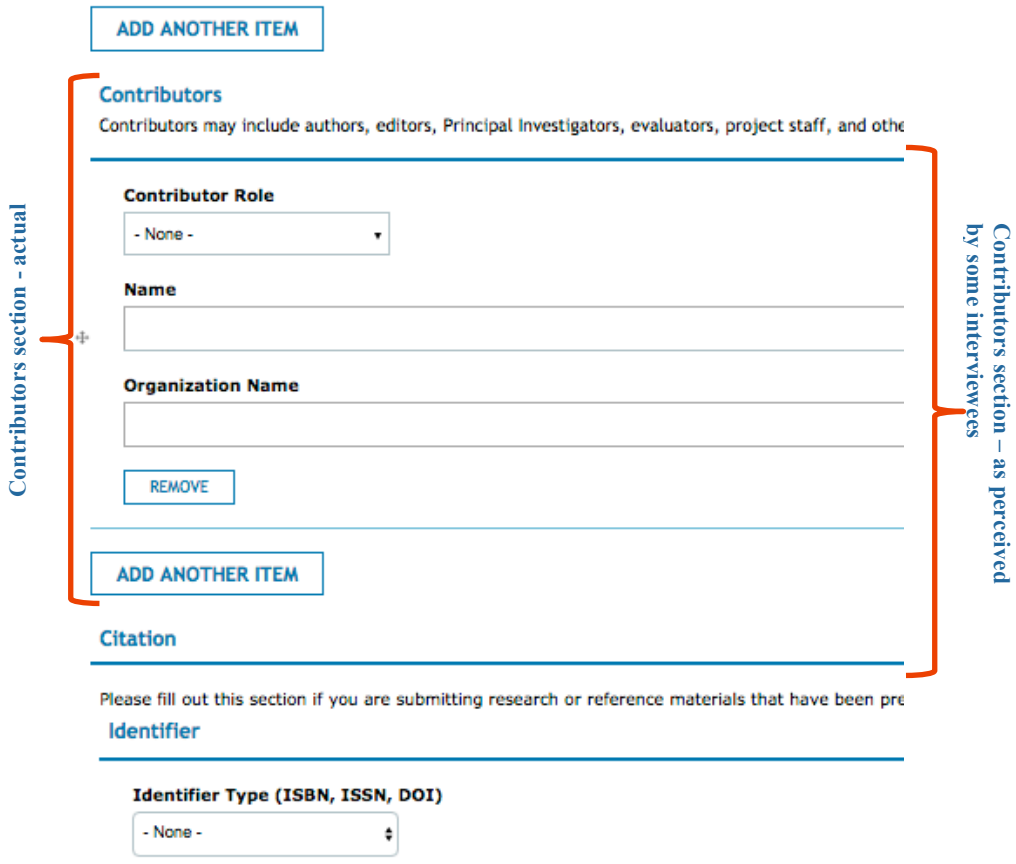
One issue that many users experienced with the form was confusion about the buttons that read "Add Another Item." Many users' first assumption was that these buttons would allow them to submit a second resource. This misconception is quickly corrected when they click the button or notice that it appears multiple times on the form. The button actually allows them to add additional funding sources, additional contributors, and so forth (see Figure 28). Changing these buttons to read "add another funding source" or "add another contributor" would clear up the confusion. It may also help to indent the button so that it is in line with the fields above it and decrease the text size to signal its place in the form's hierachy.

Figure 28. Website - Share Your Work Submission Form Detail



This issue, though minor, is tied in to a problem several users had with the visual organization of the form. At least five interview participants felt the size of text, use of bold or thin lines, and/or use of indentation were misleading. To these individuals, it was not clear where each section of the form starts and stops. These users expected the bold blue lines to separate different sections of the form, when in fact they appear beneath the heading for each section (see Figure 29). Although this confusion may slow users down for a few moments, it's unlikely to impede their overall use of the form.

Figure 29. Website - Share Your Work Submission Form - Confusion



A few interviewees commented that they would probably look at examples from the database first for guidance on how to fill out the form. Another participant said it would be helpful if the website provided an example so that they could see how the fields they were filling out would appear in the finished resource detail page. Providing links to one or more examples that CAISE finds exemplary could help users fill out their forms accurately and with the right amount of detail.

Field Feedback

Interviewees also provided feedback on each field within the form to identify potential stumbling blocks. Participants found most of the fields to be self-explanatory or understandable after viewing some of the drop down menus and reflecting for a moment. Thoughts on specific fields are listed below. Fields that are not mentioned here did not have any issues identified by interviewees.

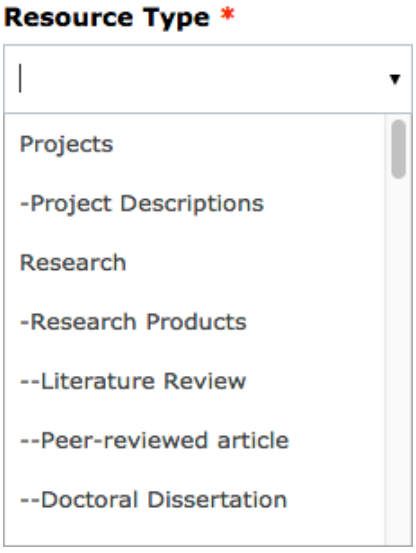
Resource Type

The resource type menu (Figure 30) presented a few challenges for interviewees. They found the list fairly comprehensive but occasionally had trouble finding an exact home for the documents they wanted to submit (including white papers, handouts, and infographics). They usually concluded that one of the broader categories, such as "research products," would work for these items. The organization of the list was also puzzling to some interviewees. Some did not understand that the categories were hierarchical – the dashes used to signify different levels didn't register for them. Bold headings for upper levels of the hierarchy might help.

Others were confused why certain levels of the hierarchy had only one category or resource type in the level beneath it – for example, "Projects" has only "Project Descriptions" and "Evaluation" has only "Evaluation Reports." Once users discovered that they could select multiple resource types, some were confused as to why a hierarchy was necessary. They liked that they were able to select multiple types, however.

The list is also difficult to navigate because the small dropdown menu window only allows users to view a small portion of the list at a time. One user was not aware that the menu was scrollable, because their browser only showed the scroll bar if they hovered their mouse in the correct spot. If possible, showing a longer window for the menu would help users view it at a glance and understand their various options. Removing the dropdown menu and listing the resource types directly on the page with check boxes would also achieve this aim, although it would introduce some visual clutter.

Figure 30. Website - Share Your Work Submission Form - Resoure Type Menu



Postal Code

Most interviewees had no issue with this field. Those who had questions were generally those whose projects spanned multiple postal codes. One user wondered if they should put their office

postal code or the postal code of the project site. Another wondered why this information was necessary if the database doesn't have an option for searching by location.

Dates

This field was usually straightforward if users took the time to read the explanation at the top. Stating that ongoing projects don't need to specify an end date would help some users.

Funding

Several users commented that they would like to be able to specify the funding source of projects that fall beneath the "Other" category on the list of available options. A few commented that state funding should be an option on the list, and another participant noted that the list is skewed toward federal grant-funded projects rather than private donations and support:

> *"It's always good to promote your donors... especially for foundations. This is huge actually. When I'm visiting someone's website, I want to know who's funding them because then I want to apply for that funding. We all know about federal funding, but I'd like to know about smaller ones."*

Two other users said it would be helpful to spell out the acronyms of funding agencies. As one individual noted, "DOE" could stand for Department of Energy *or* Department of Education.

Contributors

This field did not give users any issues, but one participant was curious how they could ensure their entries would be linked to site members' profiles. They were concerned that misspellings or name variations would result in individuals not receiving credit. Currently, the CAISE Digital Librarian does the work of ensuring that member profiles are properly linked to resources. Another participant said it would be nice if there was an option to submit photos for those individuals who are not registered as site members.

Documents and Links

Several interviewees commented that they would like to be able to submit photos or videos related to their projects. The website doesn't currently support these file types, but participant feedback suggests that users browsing the resource database would also like to see more visual content. If image and video hosting is not an option, CAISE might consider putting a message in this section, explaining that users can upload their content on other sites free of charge (such as YouTube) and post a link here.

SEARCH TOOLS

Key Findings and Recommendations

The prominence of the blue search box guides many users to utilize the resource database – sometimes even for searches that should be performed using the sitewide search option.

Very few users notice the option to perform an advanced search from the homepage.

Most users are not immediately aware that the icons within the blue search box are filters that can be applied to a search. Their first impression is that the icons are clickable links to pages within the website.

The database search and filters are fairly intuitive to users, although some exploration is required to familiarize users with search operators and filter categories, such as "Learning Environment" or "Audience."

The database search causes issues for users when it applies hidden logic in ways that are not necessarily intuitive – for example, hiding filter categories with hit results of zero and applying the "Projects," "Research," or "Evaluation" filters to display a subset of resource types.

The sitewide search is overlooked by most users, and users are also not certain of how this search function differs from the database search tool. Those who do use the sitewide search find that the search results are difficult to navigate.

The site currently lacks an easy option for searching the Knowledge Base and News & Views. Although the sitewide search can be used for this purpose, users are not aware of this fact, and the tool itself is not particularly user-friendly.

Adding text to clarify what resources are accessible via the database search versus the sitewide search will help users choose the correct tool for their needs.

The option for an advanced search can be made more obvious to users by increasing the size of the font on the link reading "Advanced," moving this link closer to the keyword search box, or changing the link to read "Advanced Search."

Adding radio buttons beneath the Projects, Research, and Evaluation icons may help users understand that these are filters rather than links to subpages.

Wherever possible, making hidden logic in the search tools visible will increase usability:
- Show filter categories even when current search results for a category are equal to zero. These options can be shown as greyed-out or with "(0)" following them to indicate there are no matches, rather than hiding them from view.
- Indicate that the main Projects, Research, and Evaluation filters are tied to a specific set of resource types, and add an option to easily clear this filter so users can widen their search.

Increasing the size of the sitewide search tool and labeling it as a sitewide search may encourage use of this feature.

Adding search tools for the Knowledge Base and News & Views would help some users find the content they are looking for. If this is not possible, directing them to the sitewide search tool might help.

Adding filter options to the sitewide search would make the search results more user-friendly. Users might appreciate the ability to narrow their search to pages within the Knowledge Base, pages within News & Views, Calendar entries, and CAISE's reference materials.

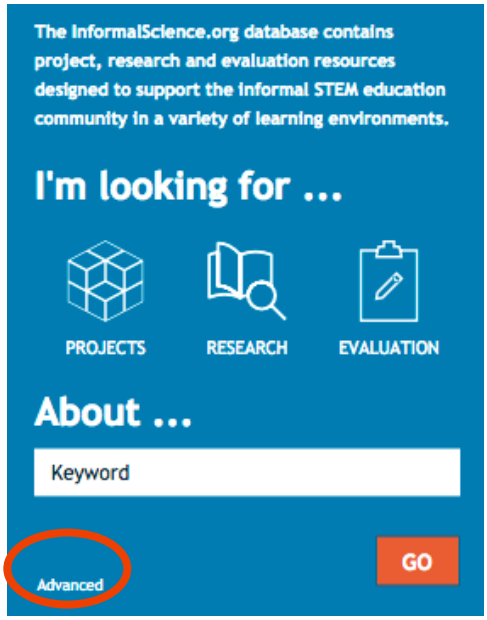
Since many users come to InformalScience.org to conduct searches for resources, the site's search tools play a leading role in how they navigate the site. InformalScience contains multiple search tools – a small sitewide search box in the upper right corner of all pages, the large blue database search box which figures prominently on almost all pages, and a community directory search. Users' ability to use these tools as intended has large repercussions on how they perceive what resources are available and whether or not the site is useful to them.

Observations during the interviews, comments from survey participants, and – to a lesser extent – analytics data showed interesting trends in how visitors use and perceive the website's search tools. Although basic settings in Google Analytics can be used to monitor simple site searches, tracking the use of multiple search tools and the use of advanced search features and filters requires cumbersome work-arounds or the assistance of Google Tag Manager, which is not currently enabled on the site. Due to this limitation, the analytics data provided here cover only overall use of the database search and sitewide search tools. In the future, setting up Google Tag Manager to track use of specific filters and search functions could provide more nuanced data on site searches.

Database Search

Analytics data shows that 18.48% of sessions included pageviews within the resource database. Although many interviewees (mostly inexperienced users) elected to begin their searches from the "Browse Projects," "Browse Research," or "Browse Evaluation" pages, eventually they would end up using the database search tool and filters to narrow in on their objective. Interview observations and discussions indicate that most users can successfully use the database search with a little trial and error. With a few exceptions, the database search tool works similarly to other search engines that users may have encountered before, which speeds the learning process. Problems occur, however, when the database logic is hidden from view and when individuals use it to search for content that is not located within the resource database.

Figure 31. Website - Advanced Search



Advanced Search

An oft-overlooked feature of the database search tool is the ability to conduct an advanced search from the homepage (circled for emphasis in Figure 31). Users were asked about this feature toward the end of their interviews, and only five out of the 25 interviewees said they had noticed it during their use of the website. One of these individuals commented that although she had noticed the text, she wasn't sure what it was there for. Another individual said the size and positioning of the link look more like a coding mistake that an intentional choice. Interviewees gave multiple options for fixing this problem, including increasing the text size of the word "Advanced," writing "Advanced Search," and moving the text closer to the search box above. Any of these ideas are easy solutions for making the advanced search more apparent to users.

Once aware of the advanced search option, most users said they were glad to have this option to direct their search. Some said they were more likely to conduct a broad search first and use filters later to drill down to the content they were seeking, but providing the advanced search option upfront is helpful to some. One user did note that not all filter categories are available through the advanced search. Resource Type is missing and might be worth adding, since this is a filter that comes in handy for many users. The CAISE team is already working on this addition to the search feature.

Icon Filters

The large icon filters that appear within the blue search box presented another of the most prevalent search challenges for interviewees, since most assumed that these buttons operate as links to content pages rather than search filters. This issue occurred for 18 out of 25 interviewees and was also mentioned frequently in survey feedback on site navigation. As one interviewee commented about the filter design, "It's slick, but almost *too* slick." Interview respondents who used the buttons correctly often mentioned that they had problems with the icons previously, but

had learned to use them through trial and error or by seeing that the icons are highlighted in grey on the "Browse Projects," "Browse Research," and "Browse Evaluation" pages. A few users who did not understand the filters said they might assume the buttons were broken links, which might even prompt them to leave the site. Although the filter problem is prevalent, it also possesses an easy fix - replacing the button design with check boxes or a toggle button - which users may find more familiar.

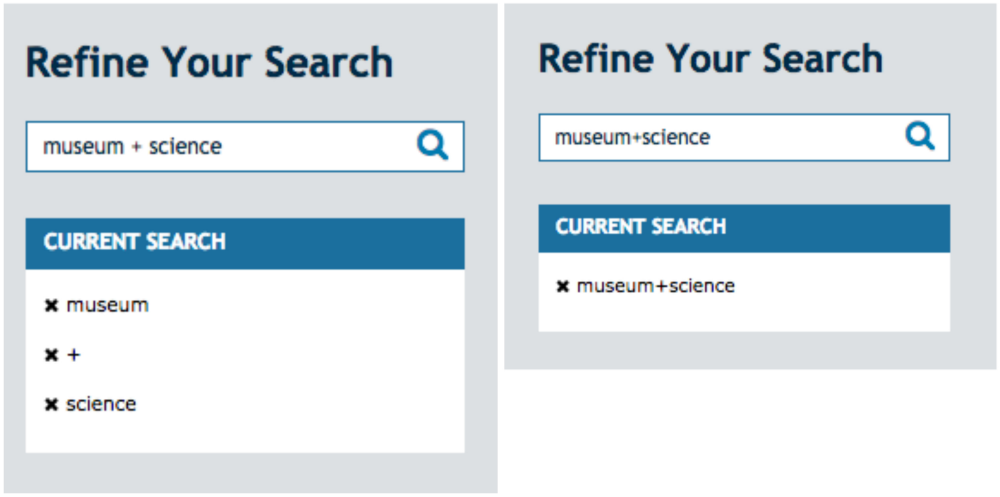
A few users also commented that they would like to be able to unselect the filter icons after clicking on them, which is not currently possible. CAISE is aware of this issue and is working with their web designer to find a solution.

Keyword Conventions and Search Operators

Another minor issue for the database search tool is the way it handles phrases and search operators. Users who search for a phrase quickly discover that the search engine treats each word as a separate search term, rather than searching for the entire phrase. If users enclose their phrase in quotes, the problem is resolved.

The search tool is also thrown off by key terms connected by plus signs when spaces are used. Omitting the spaces solves the problem (see Figure 32). Other punctuation that search engines typically ignore (such as commas) can cause issues as well with this search tool. Most users are able to adjust their search tactics, however, after observing how the tool responds.

Figure 32. Database Search Operators

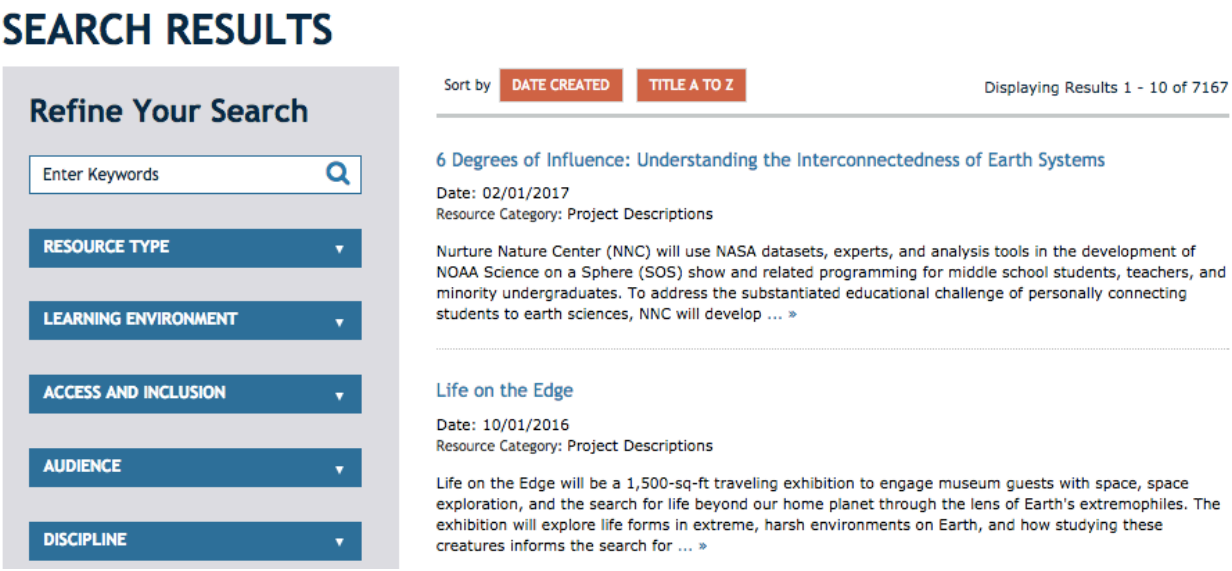


Search Results

Users gave positive feedback on the way search results were displayed. Most felt that the short entries given for each resource in the search results view (example, Figure 33) were sufficient for deciding whether or not different resources were worth investigating. These entries give the resource title, a date (presumably the date it was added to the database), the resource type, and the first 3-4 lines of the resource description or abstract. Two individuals noted that it would also be nice to see the author or host institution listed, and another said they might like to see a list of

relevant keywords or topics for each resource. This same interviewee said it would be nice to have the learning environment listed, but they also noted that including all this extra information could quickly lead to distracting clutter on the page. As one individual noted, searching the database usually turns up a modest number of results, and it's not too cumbersome to click through to a resource's detail page if you want more information.

Figure 33. Website - Search Results Page



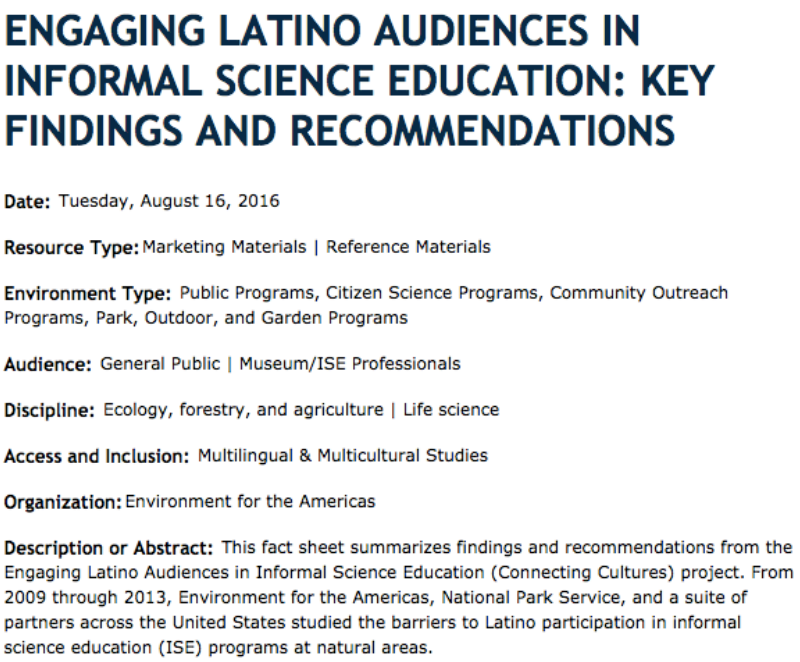
One user suggested a feature which might enhance the usability of the search without adding too much clutter: an icon for resources in the search results that have a downloadable document hosted on the site. Too often on other search engines, he noted, you will click on a title only to realize that the actual document is hosted on another site and behind a paywall. Although this might not be the case for many resources on InformalScience, contributors sometimes link to their documents rather than uploading them directly to the site, and links occassionally go dead. Icons in the search results could allow users to quickly see what documents are immediately accessible through the site and which are hosted elsewhere.

Another reader also suggested adding the capability to bookmark resources to your profile when you are logged in to the site. Being able to quickly access articles and reports of interest from your profile would be an attractive feature.

Users also had generally favorable reactions to the detail pages that accompany each resource (example Figure 34). They said the organization was clear and provided the information they would hope to see. A few users wished the project description pages included photos to add interest. Project descriptions are different from other resource types in the database, in that they serve as a type of "homepage" that provides links to other resources but don't have an attached resource of their own. Some users expected these pages to contain richer content, perhaps similar to a blog post. In fact, previous interations of the website allowed members to submit images

along with their resources, but users did not use this feature. Additional commentary on project descriptions is provided below under "Content - Landing Pages" (p. 59).

Figure 34. Website - Resource Detail Page



ENGAGING LATINO AUDIENCES IN INFORMAL SCIENCE EDUCATION: KEY FINDINGS AND RECOMMENDATIONS

Date: Tuesday, August 16, 2016

Resource Type: Marketing Materials | Reference Materials

Environment Type: Public Programs, Citizen Science Programs, Community Outreach Programs, Park, Outdoor, and Garden Programs

Audience: General Public | Museum/ISE Professionals

Discipline: Ecology, forestry, and agriculture | Life science

Access and Inclusion: Multilingual & Multicultural Studies

Organization: Environment for the Americas

Description or Abstract: This fact sheet summarizes findings and recommendations from the Engaging Latino Audiences in Informal Science Education (Connecting Cultures) project. From 2009 through 2013, Environment for the Americas, National Park Service, and a suite of partners across the United States studied the barriers to Latino participation in informal science education (ISE) programs at natural areas.

Filters

Interview participants liked the search filters provided in the database and found most of the options both helpful and sufficient for their needs:

> *"I really like this. You don't have to slog through so much. You can really pinpoint [what you're looking for]."*
>
> *"I think they're pretty clear and really allow you to narrow things in."*

During the interviews, users experimented with adding and removing terms to adjust their search and seemed to find the system fairly intuitive. A few were momentarily confused that clicking the "x" next to a term removes it from your active filters, but they figured it out quickly enough. Four interviewees commented that it would be nice to have a single button that allowed all the filters to be cleared at once.

The filter headers that appear in each blue box were not straightforward to all users at first, but after expanding each menu and viewing its options the meaning became clear. Several individuals had initial misconceptions about the term "Audience," which they took to mean the intended audience of the resource document – for example, an article written for educators or a blog post aimed at children). Their confusion was usually cleared up, however, when they viewed the list of options and realized their assumption wasn't logical (e.g. there wouldn't be a

peer-reviewed article aimed at pre-K children). Additional feedback from interview data is found in Table 6.

Table 6. Interviews - Search Filter Feedback

FILTER HEADER	**Interviewee Comments**
Resource Type	Interviewees liked this filter and primarily used it to narrow their search to peer-reviewed articles or occasionally to projects.
Learning Environment	This filter was also a very helpful option to users.
Access and Inclusion	Several interviewees commented that they liked seeing this option available, although not many participants used it in their search. One user expressed confusion about the "Multilingual & Multicultural Studies" filter and wondered if this were the best option for finding studies regarding minorities.
Audience	Although initially confusing to some (see paragraph above), this was regarded as a very helpful filter to most users.
Discipline	A few interviewees sometimes had difficulty thinking of where their own work would fit within the options available, but most said this filter category and its options were straightforward. Interviewees did not use it to filter their own searches, however.
Content Source	This filter category was confusing to users. Searches will often show CAISE as the only option on this menu, which makes users wonder why it is provided. (CAISE is currently working to remove this filter from the front-end view.)
Funding Source	A few users said this was a useful option, and one individual noted they were curious about what the NEH is funding related to informal STEM. Providing more specific options according to funding program might be useful in some cases – for example, allowing users to filter options to just show NSF AISL projects.
Year	One interviewee noted that the years are not shown in chronological order under this menu, which is counterintuitive.

Ordering the filters headers according to those which are likely to receive the most use might streamline users' searches, for example: Resource Type, Learning Environment, Audience, Discipline, Access and Inclusion, Funding Source, Year, and Content Source. One user commented that they might be too lazy to scroll down and see all the filter options, so fitting them above the fold on the page might also increase the likelihood that site visitors use them in their searches. Displaying the options under each filter header alphabetically may also be more user-friendly. Since items are ordered according to number of hits, their place in the list jumps up and down depending on the search. Depending on the number of items under any given filter header, a user's eyes have to search for a while to find the the option they are looking for.

Hidden Logic

Like any search engine, the InformalScience.org database search applies a series of rules when sifting materials and displaying results. Some of these rules may be intuitive to users or become obvious after a few searches. Others, however, confused interview participants and might hamper users' ability to use the database effectively.

One example of hidden logic is the way filter options are displayed after a search has been performed. The options that appear beneath each filter header only include categories that apply to the search that has been performed. If users are not aware of this fact, they might think there are fewer filter options than actually exist. For example, without any searches or keywords entered, there are twenty possible options under "Learning Environment." If you perform a search for "endangered species," the list shrinks to 17 options. If you perform a search for a more specific term - for example "panda" - only four possible learning environments are shown. Interviewees were occasionally tripped up by this hidden logic, not realizing that by clearing out search terms these options would be expanded.

A similar issue arises when users perform a search from the "Browse Projects/Research/ Evaluation" pages. Searches from these pages are automatically filtered to show only a subset of resource types, but there is no indication on the search results page to show how the filter is acting on the results. This is less of a problem for browsing research or evaluation, which each encompass a fairly large number of resource types as well as items that are cross-listed between the two over-arching categories. When browsing projects, however, the search results are limited almost exclusively to project descriptions. One interviewee who accessed the resource database this way was led to believe that the database only included one peer-reviewed article.

Whenever possible, making database logic visible to users will help them understand how to improve their searches and access the resources they need. This might mean adding language to the "Browse Projects/Research/Evaluation" search results to make it more apparent that results will be limited – for example, a header that reads, "You are browsing projects. Click here to browse full database." Another option might be to show the full list of filter options at all times and find a visual way to indicate which ones don't apply to the current search. This might be something as simple as having the complete list with the a zero for the hit number after some options, or it could also be accomplished by showing non-applicable items in grey, italicized text.

One user also wondered if the option to browse research and evaluation separately is even necessary:

> *"In my mind the lines between research and evaluation - for what I'm imagining someone is coming to this site for - are a little more blurred, so I don't know if it's necessary to separate the two… I would want everything to come up in one search, rather than having to do several searches."*

She added that she would rather be pleasantly surprised when a search turned up too many results and then have to narrow the search down than find that the filters she was using to start were too restrictive.

Interviewees did like that they could filter their search by resource type, however, so if the option to browse by "Projects," "Research," or "Evaluation" is removed, it may help to make the resource filter more prominent.

Limitations of Database Search

A final usability issue with the database search is the content that it can and cannot access. As discussed above, interview participants frequently used the blue search box when seeking information that is not found with the resource database. For example, participants used the database search in attempts to find information located within the blog, the Knowledge Base, the community directory, and the Projects, Research, and Evaluation landing pages. There are several explanations for their confusion. First, a few interviewees pointed out there is no text that specifically states the blue search box is used to access a library of community-generated content. Second, the size of the search box, the wording within it, and the fact that it is featured on almost every page of the site suggests that it is a central avenue for accessing site content. During a discussion about this search tool, one interviewee commented,

> *"Our conversation is making it clear to me that there's a sort of fundamental confusion about how limited the blue box is, because it seems like that's the go-to place, and it's only searching the database."*

This misunderstanding frustrated one interviewee, who had searched extensively for a specific blog post using the database search tool and was unable to find it. Although the blue search box appears on the News & Views page, News & Views content is not accessible through the database search. The same is true of the Knowledge Base. There is not currently a mechanism for directly searching either the blog or the Knowledge Base (although sitewide search will turn up results from both – see below under "Sitewide Search"). Both resources can be browsed by categories and filters, but there is no keyword search readily available. Finally, one interviewee commented that they had also been misled into thinking that the blue search box could be used to search EBSCO, since the box appears on the InformalScience page that grants access to EBSCO (see Figure 19). The EBSCO database cannot be searched through any mechanism on the InformalScience website, although some users have cross-referenced EBSCO material in the InformalScience resource database. Full EBSCO searches, however, have to be conducted through the EBSCO site itself.

In many ways, the problem of the database search tool represents the persistent struggle between clean design and clear design. The blue search box is visually simple and provides quick access to a large portion of the site's resources. If users are unaware of the limitations of the search, however, they are likely to be frustrated.

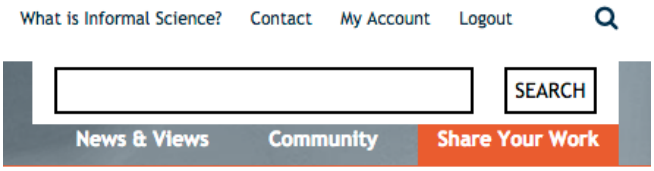
One possible solution is to provide search tools on both the News & Views page and the Knowledge Base page that allow users to search that specific content. Another possibility is to adjust the wording of the smaller text at the top of the blue search box, adding language that clarifies this tool's purpose and limitations.

Sitewide Search

What can't be found via the database search *can* be found via the sitewide search option offered at the upper right of each webpage within the site (Figure 35). Analytics data shows, however, that only 2.83% of sessions included pageviews generated by search results from this feature. With time users might discover this search option, but approximately half of the interviewees

said they hadn't noticed it until it was pointed out to them toward the end of the exercise. Only two individuals used this search function without being prompted.

Figure 35. Website - Sitewide Search



One interviewee noted that the search field and magnifying glass of the sitewide search tool disappear once you scroll down on any page, making it even less likely that visitors will notice them. One visitor was happy to have it pointed out and said he was likely to use that feature in the future. "I think it's a mistake these days to hide a global search," he noted.

When interviewees were asked how they perceived the functions of the two search tools (database and sitewide), about half were able to articulate something that was on the right track. Nine individuals, however, did not understand the difference until it was explained to them. Several thought the two search boxes would operate in more or less the same way, and some were just unclear on why you might want to use one search box versus the other. One individual pointed out that both searches use the same magnifying glass icon, which suggests they work in the same way. Anyone who tries the sitewide search, however, quickly learns from the search results page that this tool operates differently from the database search tool.

Aside from often being overlooked, the sitewide search presents one other problem for usability: the search results are difficult to navigate (Figure 36). Currently, search results give the page title for each item and an excerpt of the text where the search term appears. One user suggested using this convention for database search results, to highlight where keywords appear in the resource descriptions. There is no information to indicate whether pages listed are part of the resource database, the blog, the Knowledge Base, or anywhere else on the site. If possible, providing this information would greatly enhance this search tool. Even providing the URL of each page would give users a clue as to the type of page referenced by each entry.

Figure 36. Website - Sitewide Search Results

CONTENT

Key Findings and Recommendations

Users are happy with the content provided by InformalScience.org because no other website compiles ISE resources in one place. Most of the recommendations that users made for website content are things that CAISE already provides.

Site traffic on InformalScience.org is not strongly concentrated in any one area, indicating that users come to the site for a wide variety of content. News & Views and the resource database received some of the highest visitation rates, with roughly 18% and 16% of sessions resulting in views on these pages.

Users who are searching specifically for peer-reviewed articles are sometimes disappointed at the prevalence of non-peer-reviewed material on the site. Their disappointment stems largely from a misunderstanding of the database and the website's purpose.

Current content on the Projects, Research, and Evaluation landing pages is seen as more helpful to beginners than those experienced in the field of ISE. Most users navigate past the main landing pages to more detailed content in the subpages beneath these headers.

Users found the Projects, Research, and Evaluation pages to be very text heavy.

Some users were disappointed that the Projects section did not contain richer material with examples and pictures from successful ISE projects.

Users are especially interested in content related to funding opportunities, and occasionally the funding page fell short for users.

For additional, rotating content users prefer CAISE's newsletter and the website's blog over social media such as Facebook, Twitter, or LinkedIn. The types of content they prefer are in line with what CAISE currently provides, including Project Spotlights, funding announcements and deadlines, and upcoming opportunities in the field of ISE.

Emphasizing the unique nature of the InformalScience resource database will help the site communicate its value to visitors and head-off confusion or disappointment from those who expect the site to function like a large academic search engine. Possibilities for achieving this include:

- Adjusting the wording in the blue search box to describe the nature of the database.
- Adding a page that describes how the database is compiled and organized. Make the link to this page clearly accessible from the homepage.

Providing a filter for peer-reviewed literature within the database search box on the homepage will help users navigate directly to that content, if that is their preference.

Rearranging menus on the Projects, Research, and Evaluation pages will help more experienced users navigate to the content they find most helpful and skip over introductory material they don't need.

Adding a header on the Projects, Research, and Evaluation pages that describes the introductory material as such will highlight this information is designed for beginners to the field of ISE.

Additional headers and bullets on the Projects, Research, and Evaluation pages would help to break up text into manageable parts that users can skim for relevant material.

Linking to Project Spotlights or exemplary projects from the homepage (under the Projects dropdown menu or elsewhere) may satisfy users who are looking for illustrated examples of ISE projects and a better idea of the audience InformalScience.org is serving.

AISL PIs and applicants would appreciate content that addresses specific requirements of the AISL application – for example, the sections on broader impacts and advancing the practice.

CAISE should focus on blog and newsletter content over social media content, or else use cross-posting to reduce the time and effort required to produce Facebook posts, tweets, and other social media material that is reaching a limited user base.

Valuable, Focused Resources in One Place

Interviewees and survey participants both agree that InformalScience.org is invaluable because of its unique content.

> *"There is nothing out there like this website. Great resource. I have shared with many others." – survey respondent*

> *"I don't think there's another comprehensive site like this, so you guys are bookmarked and saved…I use this as my main platform and spring off from there." - interviewee*

Users especially like that the site focuses just on informal education, since most other databases lump formal and informal learning together, leaving it to the user to filter out material that is not relevant to their interests. They also appreciate that the site features evaluation reports and other grey literature that aren't found through other databases. The resources provided here show users what other professionals in their field are up to, what funding they've received, and what other opportunities are available.

When interviewees were asked about what is likely to bring them back to the site, most users cited the database, but they also listed other features that cover the breadth of InformalScience's content, including the list of funding opportunities, EBSCO access, the Knowledge Base, the community directory, the ability to submit resources, and more.

Some users described the website as a one-stop-shop for their field of work – a place you can find funding opportunities, conduct research to support the grant writing process, and later publish your work:

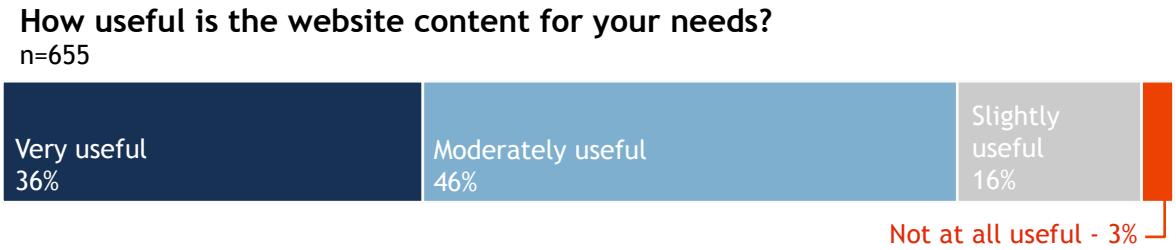
"The information I am looking for - evaluation, research, and projects related to zoos, aquariums, and museums is in one place - on one website. I don't have to go to 10 different websites to find the information. The sources are reputable and reliable. I know I can trust the information and use it in good conscience…" – survey respondent

Several interviewees also commented that they trust the site to provide good information. Some individuals trust the site because they are familiar with its contributors and with CAISE through their previous work. Two interview participants who were not familiar with CAISE, however, took time to investigate the site's credentials by reviewing the NSF funding notice at the bottom of the homepage and clicking on the "What is Informal Science?" link at the top of the homepage. One of these individuals commented that more information on the individuals who comprise CAISE would help solidify the site's reputation for new users.

Survey respondents' feedback on site content was more conservative in its praise, which might be expected for several reasons. Interview recruitment may have attracted individuals who already had positive associations with the site. Interviewees also had the chance to explore the site and discover new features throughout the course of the interview. Misconceptions and points of confusion were often cleared up through the interview process, and many individuals said they had a better understanding and appreciation of the site thanks to their participation. Finally, the interview process sometimes generates more positive feedback simply because individuals speak face to face.

Still, over 80% of survey respondents said the site's content was at least moderately useful for their needs (Figure 37).

Figure 37. Survey - Usefulness of Site Content



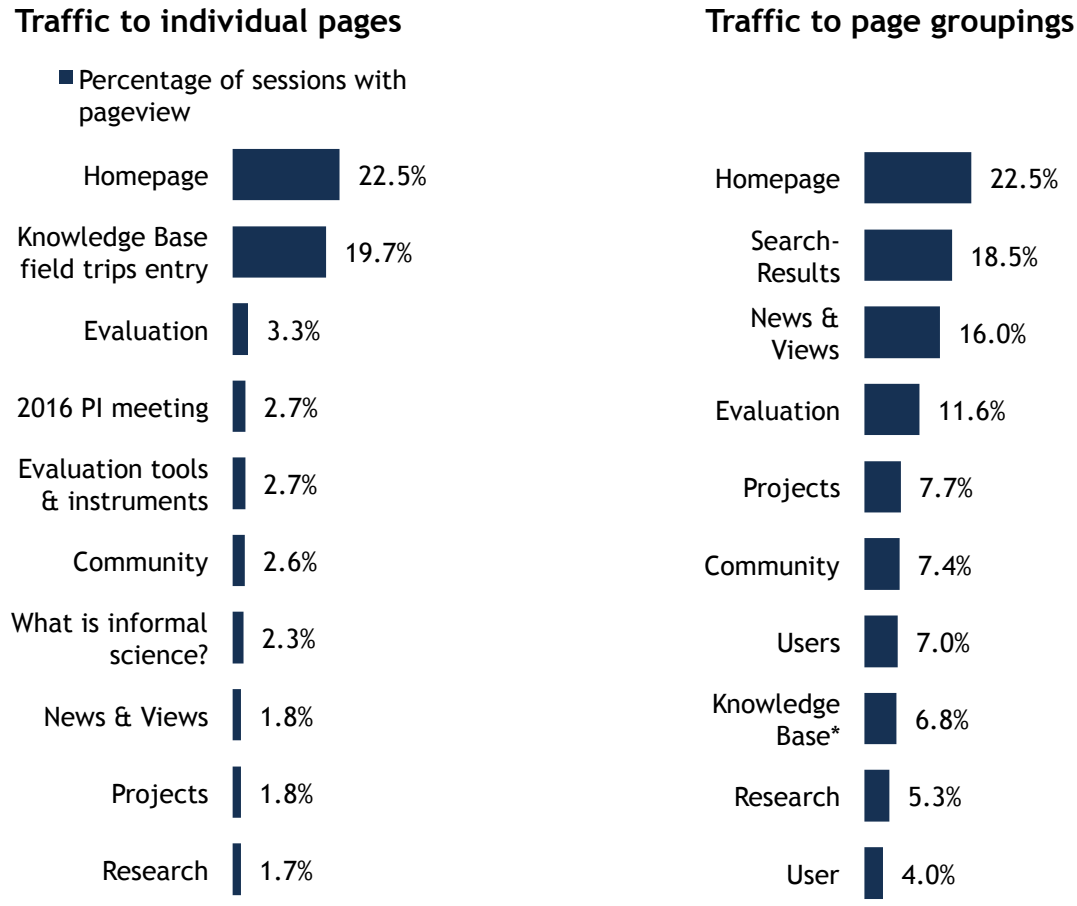
Survey participants also referred to a wide variety of the site's content as being useful for their needs. Their answers about content did not cluster in any particular area, with the exception of evaluation resources which accounted for ten percent of the responses.

Survey respondents were also asked to explain their rating of the site's content in an open-ended response. Critiques given by those individuals who described content as only slightly useful or not useful at all actually highlighted navigation problems more often than issues with site content. Those who did refer to the site content in many cases were simply reporting that the material was not relevant to them at this time. Specific critiques on the quality or breadth of content were fewer in number and did not display any specific patterns.

Content Analytics

To understand trends in content use on InformalScience.org, Rockman researchers reviewed the analytics data to determine where most visitors spend time on the site. Researchers paid attention to the traffic to individual pages as well as to page groups – for example, all pages within the Knowledge Base, all pages within News & Views, and so on. Analytics trends show that aside from the homepage and one particular entry in the Knowledge Base, page traffic on the site is very dispersed with no single page receiving more than 4% of visitors and most page groupings receiving less than 10% (Figure 38).

Figure 38. Web Analytics - Areas of Greatest Traffic



The particular page within the Knowledge Base attracting nearly 20% of site visitors is an entry titled, "Field Trips Are Valuable Learning Experiences" (Figure 39). The high visitation rate to this page is perplexing, since its content is very specific and the page is buried at a lower level of the site's organizational hierarchy. User flow data from Google Analytics shows that the majority of visitors to this page (69%) are arriving via an organic search using Google or another search engine. The site's analytics account cannot currently track the exact search terms which

are bringing visitors to this page. Tracking search queries for a site through Google Analytics requires use of Search Console – a separate Google service that can be integrated with Analytics accounts. Even if this capability was enabled, results for the field trip page may not be particularly useful. Most individuals (82%) exit the site after viewing this page, suggesting it is a not a useful entry point for the site.

organic search traffic
visitors who arrive at your site through a search engine result, as opposed to links from paid advertisements or other referring links

Aside from the anomaly of the field trips page, traffic to other page groupings shows some interesting trends in site use (Figure 38). News & Views ranks high – 16% of visitors arrive here at some point during their session. Pages starting with the url "www.informalscience.org/search-results" are accessed by more than 18% of users. This url accompanies searches using the resource database.

Figure 39. Website - Field Trips Knowledge Base Entry

http://www.informalscience.org/knowledge-base/field-trips-are-valuable-learning-experiences

Peer-Reviewed Articles

Although many users appreciate the kinds of resources found in the InformalScience database, some users are disappointed at the scope of the database and the percentage of peer-reviewed articles. Interviews with users showed this disappointment is often due to misunderstandings about the nature of the database and the expectation that the site should function like a much

larger academic search engine (discussed in "Navigation - Accessing Research and Peer-Reviewed Literature" (p. 27). One survey respondent remarked,

> *"I really want to see a curated list of quality research. Right now, the stuff posted on the site is stuff that users add. That limits its usefulness. I would prefer it functioned as a bit of quality literature review of actual research. A qualified staff would be constantly reviewing the literature and posting new articles. Now when I search the "research" page it is cluttered with blog posts, etc. Not useful. May as well just use google to find what I need."*

One interviewee pointed out that there are both good and bad sides to the fact that the resource database is peer-contributed. If CAISE can find a way to clearly communicate the nature of the database and its intended purpose, it may be able to head-off complaints like the one above and manage users' expectations. There is also an opportunity to highlight what makes this particular database special, which so many interviewees and survey respondents pointed out in their comments. One interviewee pointed out that there is sometimes a distinct advantage to consulting sources that are *not* peer-reviewed:

> *"In this case I think there's something uniquely valuable about sort of non-peer reviewed information, and that is if people are willing to share projects that are unsuccessful - for example, if you had an NSF project that didn't end up working it would be really helpful to know that so I didn't have to make that same mistake. This is a big problem with peer-reviewed literature. There's such a strong positive result bias."*

Landing Pages

The Projects, Research, and Evaluation pages (Figures 40-42) contain important reference information that in many ways anchors the rest of the website, therefore they received special focus during the interviews. Interviewees were asked to view each of the pages and give feedback on the content. Users' initial reaction to each of these pages was often to comment that there was too much text. Twelve out of the 25 participants made comments to this effect – particularly when viewing the Projects and Evaluation pages. Visitors preferred the layout of the Research page, where bullets are used to break up the text and make it more manageable. Using headings and bullets on the other two pages may improve users' reactions.

Several interviewees were somewhat sheepish in critiquing the amount of text, noting that as academics and/or professionals they ought to be willing to do a little reading. The problem might not be the quantity of text, so much as the fact that it's difficult for users to navigate to the content they find relevant for their work. As one interviewee aptly put it:

> *"Even though we're science professionals and we're used to doing a lot of reading, if we're on the web that's not necessarily what we want to do during the navigation process. It's what we want to do once we navigate to exactly what we want to read about. I'm willing to read a 40 page article, but I don't want to read 20 pages to get there."*

Figure 40. Website - Projects Page

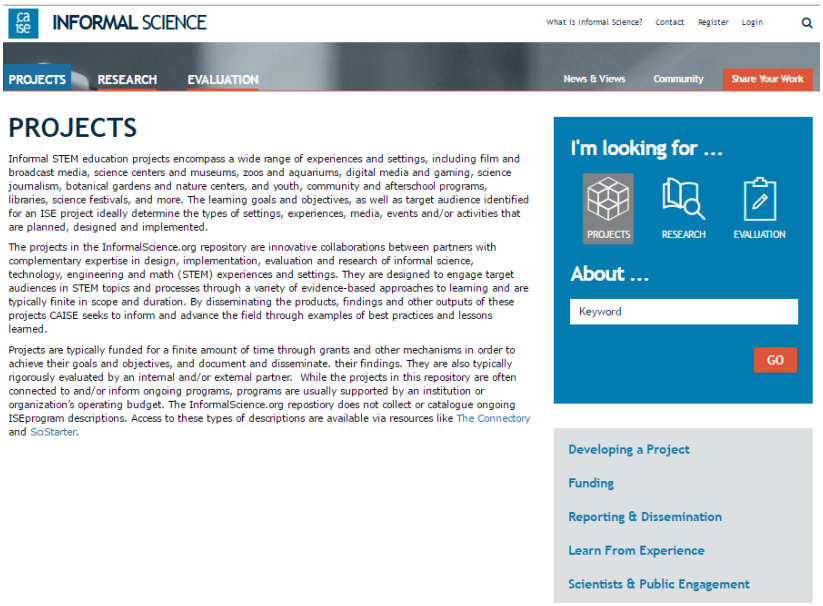
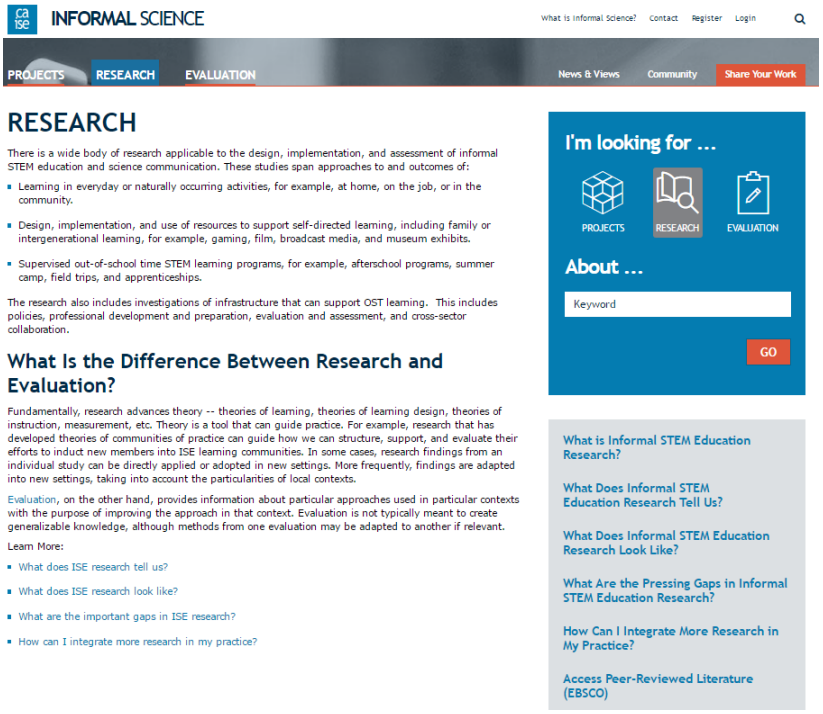


Figure 41. Website - Research Page



Getting participants to stay on the main pages long enough to skim content and provide feedback was often a challenge, as many tended to move beyond the landing pages quickly by selecting the links offered either in the body of the pages or to the lower right in the grey box. Once they slowed down to skim the content, their most common assessment of the material is that it seemed oriented at a beginner audience:

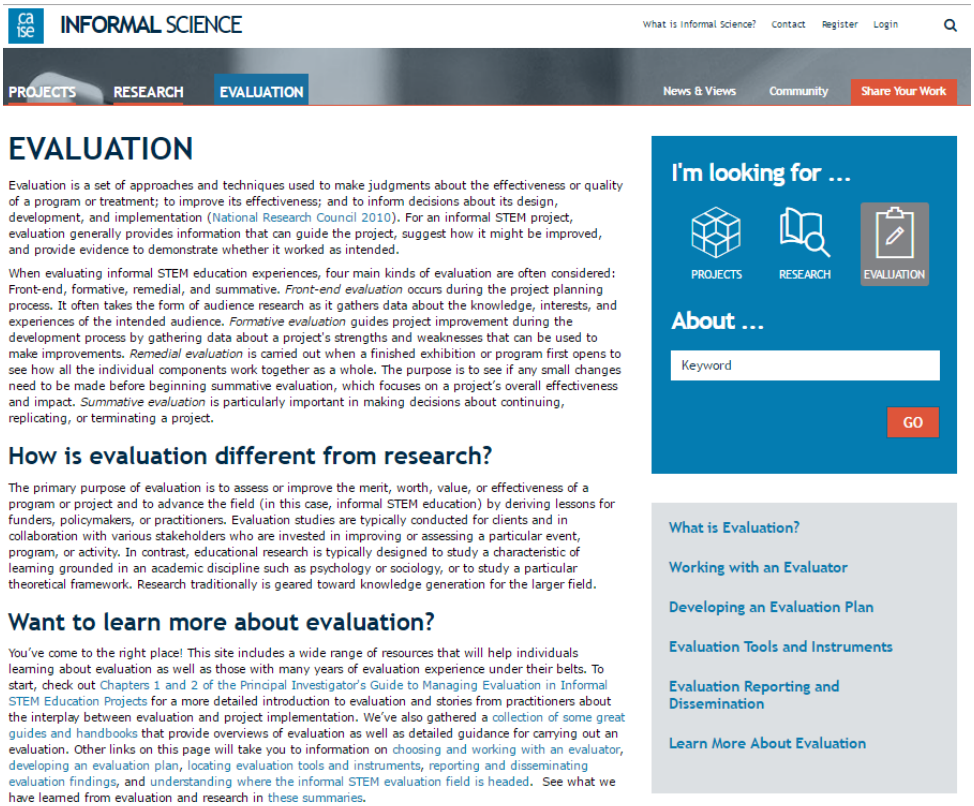
"It strikes me as introductory, which is good for some people. I don't think I've really looked through it before."

"Perhaps someone coming to site for the very first time might need this information, but I can't imagine anybody else would."

Ten out of the 25 participants made remarks of this nature. Several commented that the information was good to have and was likely to be useful to some visitors, just not to them in particular. A few also said these pages could be useful to them because they have colleagues or students who they could refer here. In that sense, the pages might serve as a handy guide for experienced users to explain their work to others. The discussion about research versus evaluation also drew positive comments from several users who said they often had struggled with this question themselves or that it was a prevalent debate in the field of ISE:

"I love this question, because a lot of people really don't understand that."

Figure 42. Website - Evaluation Page



Content on the subpages was generally of greater interest to the interviewees, since none of them identified themselves as beginners in the field of ISE. Several recommended bringing the links to these subpages higher on the page, especially since the "wall of text" to the left might prevent them from ever noticing the links:

"It looks like you've gotten to the place and you're done. But I know from experience there's more content here."

This is especially true of the Projects page, where the length of the paragraph text is shorter. Users who don't continue scrolling down might miss the subpage links entirely. Bringing these links to the top of the page would solve this problem.

Highlighting Projects

The Projects page has a particularly large burden to carry for the site, because the title can be interpreted quite broadly and therefore attracts a lot of users. Inexperienced users who are looking for examples of ISE projects are likely to click here first. Although the "Browse Projects" page might be a good place to start for these users, the project descriptions are not particularly eye catching and might disappoint visitors who are looking for content more similar to a blog post. This was the reaction of one interviewee, who said the Projects page was the biggest letdown of the site. The Project Spotlights from News & Views are a much friendlier introduction to the site content than diving directly into the database or sifting through the text-heavy pages under the Projects header. If CAISE can find a way to bring the Project Spotlights to the forefront of the site, new users might be more likely to stick around and see what else the site has to offer.

Funding Opportunities

The final trend in interviewees' reactions to the landing pages and subpages is that the Funding page is not as thorough as it could be. Adding links to the various funding agencies would be helpful. One user also requested brief descriptions of the different funding programs and agencies that are mentioned. If this were provided, users would not have to click on each one to discover whether or not that opportunity is applicable to their work. The website also has additional funding resources located elsewhere that could be linked from this page. One example are News & Views posts related to funding. Another possibility would be to provide information here on how the database can be used to filter results by funding sources – an option many interviewees hadn't thought of but were eager to try once it had been pointed out. The CAISE team is also currently considering how to highlight funding information on the site and may be adding "Funding Deadlines" as a dropdown menu option under a "Calendar" header on the homepage.

Surprisingly, two interview participants were particularly interested in international opportunities and wished that this section was more developed. The community directory shows that InformalScience does have an international audience, with members from countries around the world. Providing resources for these international professionals is likely a lower priority for CAISE, however, given that the site is largely focused on AISL funding and AISL projects.

Landing Page Analytics Data

Table 7 shows a comparison of pageviews, time on page, and exit rates for the site's three landing pages as well as metrics for each page grouping. (For explanations of these metrics, see Figure 1, p. 7 and Table 4, p. 19). The analytics data shows that visitors tend to spend slightly

more time on the subpages of each group than on the main landing pages. The percentage exit metric also shows users on the subpages leave the site less often than users on the landing pages.

Table 7. Landing Page Analytics

PAGE	Sessions with Pageview	Time on Page (m:s)	% Exit
Projects	1.77%	0:55	23.52%
Projects page group	7.69%	1:12*	21.90%*
Research	1.74%	1:01	18.84%
Research page group	5.31%	1:16*	18.03%*
Evaluation	3.27%	1:17	37.21%
Evaluation page group	11.65%	1:27*	26.23%*

*These values have been averaged for all pages within the page grouping.

As with all analytics data, these numbers are most useful when given context from other sources. For example, although the sessions with pageview percentages might seem quite low, the website's traffic as a whole is highly varied, with no single page receiving more than 23% of session traffic. These metrics also support findings from the interviews, which suggests that the subpage content is more useful to most visitors than the introductory information on the landing pages. The analytics also support survey findings that evaluation content is useful to a high percentage of visitors. The percent exit metric can be difficult to interpret, however, since users might exit a page out of frustration if they don't find what they are looking for, but they also might exit if they *did* find what they are looking for and consider their goal in using the webpage achieved. Another way analytics data can be contextualized is through A/B testing. Tracking these metrics over the next several months may provide helpful feedback of before/after results for any changes CAISE decides to implement.

AISL Recommendations

Interviewees and survey respondents who were AISL applicants or PIs were also asked for specific feedback on how the site can serve these types of users better.

Assisting the Application Process

AISL respondents said keeping funding information accessible and up-to-date is one way the website can assist in the application process. One interviewee recommended that a specific search filter for AISL projects be added, since the database currently allows you to filter searches by NSF projets but not by specific NSF programs. A few interviewees said it would also be helpful to have blog posts or pages that provide guidance on specific parts of the grant application, such as the broader impacts statement, the data management plan, and the section on advancing the practice. Examples of successful applications would be especially useful.

One AISL respondent suggested blog posts or webpages that highlight how the website can be used to address different parts of the application process. Improving the site's options for

searching the member database would also help AISL PIs find partners and evaluators. Highlighting the member directory is also important, since not all users are aware it exists.

Two interviewees pointed out that the NSF website already provides a great deal of information, and there's no need to replicate all of it. One thing InformalScience could do, however, is provide information on how to utilize the NSF site. For example, savvy applicants already know how to find lists of past awardees on the NSF site, but a blog post on InformalScience could help individuals who are new to the process learn to use the site to their advantage.

Supporting Dissemination

Another interviewee stated that, "There's more and more of a demand on AISL projects for us to disseminate more quickly and in more varied and informal ways." CAISE might be able to assist in this by making it easier for users to contribute blog posts or perhaps allowing users to post updates (including photos) to their project description pages. Some AISL PIs work on projects that dedicated websites or blogs, but those that don't might appreciate if the detail pages on InformalScience.org had enhanced functionality. Unfortunately, providing this feature does not guarantee that users will take advantage of it, and CAISE's past experience shows that it is difficult to encourage users to submit basic information, much less updates and richer content.

Perennial reminders to AISL PIs and others to submit their work would be helpful. Several interviewees felt guilty admitting that they had not contributed various resources to the database yet. One AISL respondent said it might help to receive a reminder that the database only grows through the submissions of its users.

Newsletter, Blog, and Social Media Content

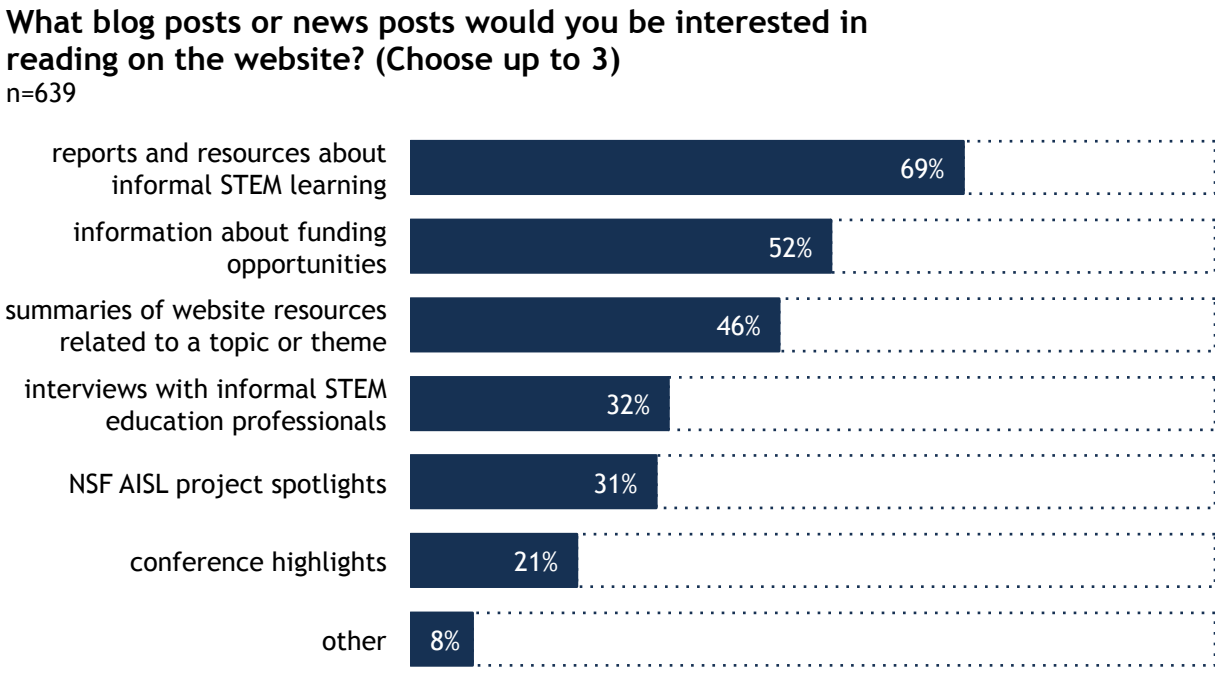
Interviewees and survey respondents were also asked about the content they would like to see provided via the website's blog, the CAISE newsletter, or through InformalScience's social media outlets. Interview feedback suggests that reaching users through social media may be difficult. Only two individuals said they currently follow InformalScience on Facebook, and three follow InformalScience on Twitter. Five out of the twenty-five respondents said they might be likely to follow InformalScience on Facebook in the future, seven might use LinkedIn, and three might use Twitter. Overall, interviewees said they found the blog and newsletter to be more helpful, although some admitted that they don't get around to reading the newsletter as often as they should.

During interviews, suggested content for InformalScience's social media was fairly uniform across different platforms. Funding opportunities, save-the-dates, and other time-sensitive information was a top request. One individual mentioned that they liked the way the American Alliance of Museums uses LinkedIn to promote professional opportunities. Users also said they like seeing interesting projects and research highlighted, as through the Project Spotlights on the blog. Other suggestions for the blog and newsletter include pieces that highlight features on the website (such as the Knowledge Base), synthesis pieces around a theme ("Check out these five or ten resources on this topic - that's really nice, even better than a specific project highlight."), or pieces that highlight important articles that have been published recently, even if those articles are not available through InformalScience. Many of these suggestions are in line with the topics

CAISE currently covers through its blog and newsletters. The team is hesitant to highlight content offsite, however, if it is behind a paywall. More likely, the team will continue to focus on content that is available to everyone. Several interviewees also requested that the website include an archive of past newsletters, but after previous internal discussions CAISE has decided not to include this feature.

Survey respondents gave similar answers when asked about the blog and news posts that interested them most (Figure 43). Resources on ISE, funding opportunities, and summaries of website resources were most popular with respondents.

Figure 43. Survey - Blog and News Post Content Requested



Comparing content suggestions to users' professions and their past experience with the site yielded more similarities than differences, but a few predicatable patterns emerged. AISL PIs and applicants were more interested than others in seeing NSF AISL Project Spotlights on the blog and in the newsletter. Intensive users of the site were particularly interested in funding opportunities and conference highlights. Aside from these minor differences, most users on the site follow the general patterns of interest shown in Figure 43.

Specific Topics for the Database Resources

The field of ISE covers a wide range of subject matter, as evident by the twenty options under the "Discipline" filter heading in the database. Hot topics and terminology are also constantly evolving, which presents a challenge for keeping the database current and tagging resources in a way that is helpful and consistent. Interviewees and survey respondents often commented that resources were slim for their particular area of interest, which may be inevitable when interests

are very specific. The following are examples of ISE topics or resources that individuals hoped to find:

- "nature play" – particularly relevant to zoos and aquariums
- indigenous science and evaluation
- top articles from journals that often contain content related to ISE (*Visitor Studies*, *Curator*, *Journal of Learning Sciences*, and *Life Science Education*, for example)
- family learning at science festivals
- longitudinal studies
- teaching parents to teach children
- learning in planetariums, museums, immersive theaters, spaces with audio visual technology

CONCLUSIONS AND RECOMMENDATIONS

Summary of Findings

Participants in the 2016 User Study expressed overall positive feedback on InformalScience.org, both in terms of the content it provides and the ease with which users can navigate that content. Although users identified some areas for improvement, the site's solid design and reputable information does a good job of meeting users' needs – particularly those who are familiar with the field of ISE.

The study confirmed some of CAISE's suspicions about weaker areas of the site and uncovered a few flaws that were previously unknown. Findings also pointed to some of the website's strengths and areas that CAISE can emphasize to help users maximize the site's potential.

InformalScience.org attracts users from a variety of professions, but most are looking for similar information – reports and research on ISE and updates from the field of ISE (particularly funding opportunities).

Experienced users and AISL PIs only comprise a small percentage of visitors but are more likely to contribute material to the site. They are therefore especially important to the site's health and its utility for all visitors.

The simplistic design of the homepage works for experienced users but sends a vague message to new users. The database search tool dominates the page, but may distract users from the other offerings on the site.

Users frequently rely on the site's dropdown menus to navigate. Site features that are not found here are much harder to access.

Distinguishing between the site's different forms of content (the resource database, reference pages, and Knowledge Base for example) is difficult for users. Many are not aware of the full range of site content and where to find different categories of information.

Peer-reviewed material is especially important to many users, but they are not always aware of the site's multiple options for accessing this content.

The "Share Your Work" form is straight-forward, but some users would appreciate additional guidance and examples to make the submission process even easier. Small tweaks to the form's layout and options are also requested.

The database search works well for users except when database logic is operating behind the scenes in ways that are not intuitive – for example, applying filters without explanation or hiding filter categories when hit results are zero.

The advanced search and sitewide search are underutilized, primarily because they are overlooked.

Users like the content CAISE provides via its newsletter and blog. They are more likely to refer to this content than social media posts.

Key Recommendations

Emphasize the value of InformalScience.org stemming from its specific focus on informal education and its collaborative resources that can't be found through other search engines.

Continue to provide content aimed at both new and experienced professionals in the field of ISE. Make beginning users feel welcome by limiting jargon and providing explanatory pages and information. Help experienced users navigate past beginning content by using clear headers, bullets, and strategically placed links.

Devise content aimed at AISL PIs that both helps them with their projects and encourages them to support the site. Use blog posts to address specific sections of the AISL application, and send reminders about submitting work through the site and how easy the process is.

Add explanatory text on the homepage to help clarify the site's purpose or increase the prominence of the "What is Informal Science?" page.

Adjust the wording in the database search box to reflect the collaborative nature of this resource. Provide explanatory text or a separate page to distinguish this database from other resources on the site.

Provide blog posts or explanatory pages/text that help users distinguish between different types of content offered. Add cross-references between similar content (for example, between the EBSCO database page and peer-reviewed content in the resource database).

Use dropdown menus to make key site features such as the Calendar, Knowledge Base, and Funding deadlines more accessible.

Provide examples of completed forms or detail pages from the resource database to guide individuals filling out the "Share Your Work" form.

Wherever possible, make the logic behind search tools visible to users. Indicate which results are being excluded from searches and how users can broaded their search. Show available filter categories even when hit results are zero.

Increase the prominence of the advanced search and sitewide search. Provide an explanation for how sitewide search varies from the database search.

When developing new content, focus on the newsletter and blog. Use cross-posting to reduce effort in generating social media content.

Use short video tutorials or blog posts to introduce visitors to different content on the site and explain how to use search tools and the submission form. Compile these how-tos in one place so visitors can reference them at any time.

User Personas

Findings from the user study were used to craft four hypothetical user profiles designed to help CAISE make future decisions about site structure and content. Called "personas," these profiles represent trends in user characteristics, needs, and activities on the site as determined by the user study. Using personas to guide the design process is a popular practice in web design because they can make a site's user-base seem more concrete and relateable, allowing decision-makers to test their ideas against "real" members of their audience and design with different types of users in mind. Personas can be harmful, however, when they simplify userbases into stereotypes that prevent designers from having to think about the complexity and variation in their actual audience. These pitfalls can be avoided by grounding personas in real data that has been triangulated, by avoiding superficial details that don't directly relate a user's associated needs to their activities on the site, and by using personas as a tool supported by other contextual information as provided in this report.

New Novice

This user may have visited the site once or twice before, but if they did they don't remember much about the experience. They probably don't know about CAISE, and their main interest in visiting the site is to obtain information – they probably aren't aware that they can submit their own work to the site, and they probably don't have the intention of becoming an active member of the site. They may be familiar with the term of informal education – at the very least they are familiar with the concept – but they aren't necessarily familiar with all of the buzzwords and acronyms that often go along with the field. They may never have heard of the AISL program. They might know some names in the community directory, but they probably don't realize that individuals they know are registered members on the site or that the directory exists.

This user probably doesn't have to conduct research very often in their line of work. They may have designed or administered a survey before, but if they do this type of evaluation work it's more likely for the purpose of gathering quick feedback and less likely to go in a formal report. Their work revolves more around offering educational services than reflecting and writing about those services. They may be an informal STEM educator looking for inspiration for projects, funding opportunities, and resources that will help them apply for these opportunities. They might also be an undergraduate or graduate student who is new the field of ISE. These individuals are more likely than other users to be interested in reading interviews with ISE professionals, and they might also be interested in seeing summaries of website resources around particular topics and themes.

New Expert

The New Expert is new to the site but not new to conducting ISE research. Similar to the New Novice, they probably don't know about CAISE, and they are more interested in obtaining information from the site than becoming an active contributor. Although they are new to InformalScience.org, they are familiar with developments in the field of ISE. Jargon and acronyms are less of a problem for the New Expert. They also know their way around a search engine. Although they aren't familiar with InformalScience's search tools, they're comfortable using trial and error. They might not have patience for InformalScience.org, however, if a more

familiar site seems to work better. They value evidence-based practice and peer-reviewed articles, but they may be less familiar with citing evaluation reports and other grey literature in their work.

This user may be an informal education researcher, a STEM researcher, an evaluation professional, or a graduate student. They are looking for quick access to research materials that support their work, funding opportunities (particularly new ones they haven't encountered before), and ways to stay current with developments in the field of ISE. They have more experience applying for funding opportunities than the New Novice. They also might be interested in finding collaborators and individuals with similar research interests. If they were aware that the site can be used to build their profile within the ISE community, they might be interested in this feature too.

Experienced User

This user has visited InformalScience.org before on several occasions and knows some of the types of resources that can be found there. They are familiar with the field of ISE and probably have heard of CAISE. They know more than a few of the names in the site's community directory. Their use of the site is probably focused primarily in one area, such as the resource database or the evaluation resources. They subscribe to the newsletter (but may not read it very often) or they've created a profile, or possibly even both. Their profile is probably not well-developed, however, and they probably haven't submitted their first resource yet. They might not have even considered that option.

The Experienced User knows that InformalScience.org offers a particular type of content and values it for that reason. They have read or prepared evaluation reports in the past, and they've encountered the debate over evaluation versus research. They value peer-reviewed articles too, but they are not focused on this content to the exclusion of other sources. They are on the lookout for funding opportunities and information, and may have been part of an AISL application or project in the past. Experienced Users may include professional evaluators, museum professionals who have designed ISE projects, or researchers with an interest in ISE. They are looking for information to make their grant applications more competitive. They are also interested in information on what has already been tried in ISE, what works, and what doesn't. Professional development opportunities are also of interest, as are opportunities to network with other individuals who have similar interests or expertise from which they can learn.

Dedicated User

This user is in the minority among the site's visitors, but they frequent the site more often than most. They know about CAISE and have probably met or corresponded with members of the CAISE team before. They value the site and know there isn't another like it that focuses on content related to ISE. They likely feel a sense of obligation when it comes to submitting their work and building the database. They've probably submitted at least one or two resources to the site, but there's a lot more material that they could add as well. They know their way around the site, or at least they think they do, but there are areas of the site that they've never fully explored. They are newsletter subscribers as well as site members, although they don't necessarily maximize the benefits of either. They know and have worked with many others who are also members of the site.

These users are often AISL PIs and applicants or professional evaluators who have partnered on AISL projects. Like all users, they are interested in reports and resources on informal STEM learning, but they are also especially interested in funding opportunities. They are more likely than other users to be interested in conference summaries and AISL Project Spotlights. Summaries of website resources around particular topics or themes are also of interest to this group.

INFORMALSCIENCE.org USER STUDY ACTION PLAN

Between May 2016 and September 2016, Rockman et al (REA) will conduct a user study of InformalScience.org on behalf of the Center for the Advancement of Informal Science Education (CAISE). Researchers will collect user feedback via **web analytics**, **online surveys**, and **task-based interviews.** The study purpose is to improve functionality of the website, to build toward the longer term goal of building a community among AISL PIs and others involved in informal STEM education. REA will seek to understand users' intentions and information-seeking needs and how the website serves these, in order to establish concrete metrics for measurement and website goals. The study will focus on questions of website clarity, utility of content, and ease of navigation and search functions:

		METHODS		
	GUIDING QUESTIONS	**Web Analytics**	**Surveys**	**Interviews**
Clarity	Does homepage make website purpose clear? Is it clear where users should navigate next?	X	X	X
	Are words and phrases on homepage tabs intuitive? Is it clear from headings what content they will find?		X	X
	Is the metadata intuitive, clear, and easily understood?			X
Content	What types of resources do users search for?	X		
	Is content interesting and relevant?	X	X	X
	What would be useful/relevant content for users now and in the future?	X	X	X
	Do AISL PIs use resources on InformalScience.org to better their proposals and projects?		X	X
Navigation and Search	Are landing pages useful entry points? Do they align with user's goals?	X		X
	Are users able to find what they need?	X	X	X
	How can we help users find resources that will help them?		X	X
	What search functions work well and how can others be improved?			X

WEB ANALYTICS	Participants
Metrics such as time on site, time on page, number of pages visited, and bounce rates will give a broad picture of how the website is performing and meeting users needs. Heat mapping, user flows, and response to calls to action will give additional information on how users on navigating the site and making use of its resources. In particular, REA researchers will track user pathways and page hits related to access of the knowledge base, calendar, and blog post pages. REA researchers will also use Google Analytics "goals" to track conversions in response to the following calls to action: • Uploading/downloading resources • Registering as a site member • Updating user profile	all current website users

SURVEYS	Participants	Total Population	Target Sample
An online survey with branching options tailored to different participant groups will collect more detailed information to help explain trends seen in web analytics and give qualitative answers to the user study questions defined above. Survey questions will be primarily close-ended (multiple choice and fill-in-the-blank) to reduce survey fatigue and encourage higher participation rates.	website members	3586	348*
	current and past AISL PIs	185	126*
	newsletter subscribers	4056	352*
	additional audience groups	∞/unknown	50/group

*These sample sizes will allow for a 95% confidence interval and 5% margin of error

Recruitment and Sampling Strategy

Current website members and current/past AISL PIs will be recruited via email lists using a random sampling strategy. If the target sample is not reached after several rounds of reminders, recruitment will be opened up to the total population of both groups, replacing random sampling with convenience sampling to maximize feedback.

Additional audience groups - including museum professionals, evaluators, and graduate students in relevant programs of study - will be recruited via message boards and list servs. If allowed by the website host (Drupal), recruitment will also be performed via a pop-up survey on InformalScience.org. REA researchers will use a convenience sample for this group as well as "snowball"/chain-referral sampling. Researchers will also attempt to reach unsuccessful AISL applicants by asking website members and other survey respondents to provide referrals.

TASK-BASED INTERVIEWS	Participants	Target Sample
A smaller sample of AISL PIs and other website users will be recruited to participate in task-based interviews. These participants will think aloud as they complete website tasks while interviewers observe and ask questions to identify any issues with navigation, content, or website clarity. These interviews will provide richer detail on website use and problems users may encounter, helping to flesh out the data obtained from both web analytics and surveys. They will also provide the opportunity to solicit feedback from participants on ways to improve and expand the website's offerings and organizational structure.	power users (website members and AISL PIs)	10
	infrequent or non-users (AISL PIs and other ISE professionals)	15

Recruitment

Power users will be identified by CAISE team based on their knowledge of the membership and members' past website activity. Remaining participants will be recruited via email lists, message boards, and list servs alongside recruitment for the online survey.

DELIVERABLES

Persona and user profiles - Findings will be used to craft a persona and user profiles that serve as a guide for future website development.
Infographic - A brief, visual summary will present key findings in an easy-to-read format for the purpose of sharing with CAISE stakeholders.
Final report - A written report will present detailed findings from web analytics, surveys, and interviews.
Pop-up survey - REA researchers will create a brief user survey through a free survey-host (e.g. Google Forms or Survey Monkey) that can be used to collect additional information from website users after this user study has concluded.
Analytics dashboard - REA researchers will set up an analytics dashboard that summarizes the indicators found by this study to be most pertinent for measuring website performance.
Monitoring and evaluation plan - This document will serve as an extension of the final report, with recommendations that will help CAISE continue to gather user feedback and improve the website as needs and audiences change. It will include a list of objectives for the website and key performance indicators.

TIMELINE

	Activity	Approximate Completion Date
June	Action Plan	June 3
	IRB application	June 6
	Draft of online survey	June 10
	Establish analytics goals and begin tracking	June 15
	Launch survey	June 15
	Draft interview protocol	June 27
July	Recruit for interviews	July 1-8
	Monitor surveys and send reminder emails	July 1-30
	Conduct interviews	July 11-29
August	Close surveys	August 5
	Compile and analyze data	August 1-19
	First draft of report	August 31
	Develop pop-up survey and analytics dashboard	August 15-31
September	Discuss persona and user profile development with CAISE	September 1-8
	Report revisions	September 15
	Submit final report and visual summary	September 30

Survey

Which of the following apply to you?
- ❑ AISL PI (past or current)
- ❑ AISL applicant (past or current)
- ❑ STEM researcher
- ❑ learning researcher
- ❑ informal STEM educator (for example, in an after-school program, a club, a library, or other non-school setting)
- ❑ evaluation professional
- ❑ graduate student
- ❑ undergraduate student
- ❑ museum professional
- ❑ other _____

Have you ever visited the website InformalScience.org before?
- ❑ yes
- ❑ no

Are you a member of InformalScience.org?
- ❑ yes
- ❑ no

Do you subscribe to the newsletter from the Center for Advancement of Informal Science Education (CAISE)?
- ❑ yes
- ❑ no

When you view the homepage (pictured below), is the purpose of the website clear to you?
- ❑ Yes, very clear
- ❑ Yes, fairly clear
- ❑ Somewhat
- ❑ No, not at all

Judging by what you see on the homepage, what kinds of things would you expect to find on this website? Pick the three you think are most likely:
- ❑ help for designing a successful STEM project
- ❑ peer-reviewed articles about how people learn in informal settings
- ❑ curricula on STEM for the K-12 classroom
- ❑ information on federal funding for informal STEM education
- ❑ science activities for kids at a museum or after school program
- ❑ a list of informal STEM education professionals
- ❑ resources for conducting an evaluation of a program you designed
- ❑ evaluation reports on informal STEM programs and projects
- ❑ news and updates on what's happening in the informal STEM education field
- ❑ a place to submit your own resources to the website

Heat map questions – Each participant was randomly assigned one from the following list:

Where would you click first if you were looking for help designing a successful STEM project? Click on the image below.

Where would you click first if you were looking for peer-reviewed articles about how people learn in informal settings? Click on the image below.

Where would you click first if you were looking for information on federal funding for informal STEM education? Click on the image below.

Where would you click first if you were looking for a list of informal STEM education professionals? Click on the image below.

Where would you click first if you were looking for resources for conducting an evaluation of a program you designed? Click on the image below.

Where would you click first if you were looking for evaluation reports on informal STEM programs and projects? Click on the image below.

Where would you click first if you were looking for news and updates on what's happening in the informal STEM education field? Click on the image below.

Where would you click first if you were looking for a place to submit your own resources to the website? Click on the image below.

What type of information or resources might this website have that would be useful to you? Please provide an example.

Please take 1-2 minutes to search the website for the information/resource that you described. Then answer the following questions.

How difficult was it to conduct your search?
- ❑ Extremely easy
- ❑ Somewhat easy
- ❑ Neither easy nor difficult
- ❑ Somewhat difficult
- ❑ Extremely difficult

Were you able to find the information or resource you were looking for?
- ❑ Yes - I found exactly what I needed.
- ❑ Somewhat - I found something similar to what I needed.
- ❑ Not sure - I would need more time to search.
- ❑ No - The website doesn't have what I'm looking for.

AISL PIs and applicants who have used website before:

When did you use this website in the past? (check all that apply)

- ❑ while preparing an AISL grant application
- ❑ while running an AISL project
- ❑ after an AISL project had concluded
- ❑ other _____

Participants who have used the website before:

Which of the following best describes your past use of the site?
- ❑ Very limited use - have visited once or twice but only scratched the surface
- ❑ Sporadic use - have dropped in on a few occasions to read information or conduct a search
- ❑ Moderate use - return to the site on a semi-regular basis for information
- ❑ Intensive use - rely heavily on the site, either for a particular project or for your line of work

Participants who have used the website before:

How have you used this website in the past? (check all that apply)
- ❑ to find reports or research on informal STEM education
- ❑ to find information on conducting a project evaluation
- ❑ to search for potential collaborators
- ❑ to improve an application for an AISL grant
- ❑ to find information on current funding opportunities
- ❑ to upload my own resources or share information on a project
- ❑ to read news or updates about the field
- ❑ other _____

Participants who have used the website before:

How useful is the website content for your needs?
- ❑ Very useful
- ❑ Moderately useful
- ❑ Slightly useful
- ❑ Not at all useful

Why do you say that?

AISL PIs and applicants:

How can we make the website more useful for AISL applicants?

AISL PIs:

How can we make the website more useful for AISL awardees?

What blog posts or news posts would you be interested in reading on the website? Choose up to 3.
- ❑ NSF AISL project spotlights
- ❑ interviews with informal STEM education professionals
- ❑ information about funding opportunities

- ❑ reports and resources about informal STEM learning
- ❑ conference highlights
- ❑ summaries of website resources related to a topic or theme
- ❑ other _____

Please provide any suggestions you have for improving the website's navigation or content:

Interview Protocol

Introduction/Consent (~10 min)

Thank you for participating in this interview. I'll ask you some basic questions about your background and professional interests. Then, I'll ask you to explore the website and try some different tasks. I ask that you think aloud as you make choices about where to click and what to do, so I can get a sense for what works well about the site, what doesn't, and why. I'll have some questions for you about things like website clarity, navigation, and how useful the content is. Overall, it should take us about one hour to complete the interview and tasks. I'm going to use screen capture software to record a video of your screen during the interview, so that if I need to I can play it back to see how you navigated the site; however, all your information from this interview will be kept confidential. Although results from this study may be published, no names or identifying information will be used in any reporting efforts. This study is voluntary, so you can choose to stop your participation at any time. Do you have any questions for me before we begin?

Can you tell me a little about the work you do that's related to informal science/STEM?

New Users

Based on what you know about InformalScience.org (by the recruitment email and/or survey), what kinds of things might you hope to get out of using a website like this?

What web resources would you find useful for conducting your work that may be included on a website like this one?

Experienced Users
About how often do you use the website? (Have you used it since it was relaunched with a new design in January of 2016?)

What do you use it for?

Do you find it to be a helpful resource for your needs? What's helpful or useful about it?

Was there anything that you thought you might use the website for, but couldn't?

AISL PIs
Did you use this website while preparing your AISL proposal?
- How did you use it?
- Was it helpful?

Did you use it while carrying out your AISL project?
- How did you use it? *(implement, evaluate, or disseminate projects?)*
- Was it helpful?

All Users
What other websites or resources do you use to inform/support your work?

Homepage First Impressions (~5 min)

Give participant about 20 seconds to view homepage. Note if they scroll to the bottom or not, where they hover the mouse, what text they read, etc.

Based on your first impressions, what is the purpose of this website?
What makes you say this? (Is there certain text that led you to this conclusion?)

Who would you say this website is designed to serve?

Is the text in the blue box, which begins "The InformalScience.org database...", clear to you? Based on what this says, what do you expect to find on the site?

What type of resources or information would you expect to find on this site?

What would you expect to find if you clicked on "News & Views"?
On "Community"?
Can you see yourself using a member directory like the one this site provides?

Site Exploration (~10 min)

New users
Now I want to give you time to explore the site a little more in depth. So if you've seen something of interest you can investigate that, or if there's a resource you want to search for you can look for it. And as you explore, just tell me how you're deciding where to click and what your thoughts are on what you find, so I can get a sense for how the site is working for you.

Experienced users
What's a typical action you perform on this site, or something that you have used it for in the past? Can you show me where you navigate to do this?

Can you think of a resource this site might have that you haven't used in the past (or that you haven't used since the redesign)? If not, think of this as an opportunity to explore what else the site has to offer.

Take a few minutes to explore, and as you do talk to me about what draws your attention, how you're choosing where to click, and what you think about what you find.

All participants – prompting questions
Did you find what you expected when you followed that link? (If not, what were you hoping to see?)

Is the site easy or difficult to navigate? Is the site structure apparent to you?

Do the search functions work the way you expect them to?

Are the headers and menu items helpful?

Search Exercises (~10 min)

Next I'm going to list a few different pages and resources hosted on the site, and I'd like you to try to locate these on your own so that I can see what's intuitive about the site and what's not. *(Participants will be read the page description but not the page title.)*

Pages CAISE wants visitors to find: (ask participant to locate 3 from list - give limit of 2 minutes to find each resource)

Knowledge Base - a "wiki" or digital encyclopedia related to informal STEM learning and its impacts
EBSCO Database - a page where you can access a searchable database of peer-reviewed articles related to education
Scientists and Public Engagement - a page that provides info and resources on how informal STEM can help scientists engage with the public and communicate the broader impacts of their work
NSF-AISL - a page that provides info on the most recent call for NSF AISL grant applications (AISL = Advancing Informal STEM Learning)
Blog Post - the website's blog with information on recent news in the field of informal STEM and highlights of informal STEM projects
Calendar - a calendar of upcoming events, opportunities, and deadlines relating to informal STEM

Pages visitors are likely to be searching for: (ask participant to locate 2 from list)

1. Information on funding available for informal STEM projects
2. Examples of successful projects that have received funding
3. Information on the value of informal STEM education
4. Support for preparing evaluation reports
5. Deadlines for funding opportunities
6. Evaluation reports from [program of interest to participant]
7. Support for creating an evaluation tool or strategy

Track which specific search tools participants use to search - various search boxes, filters, etc.

Uploading Resources/Metadata (~7 min)

Next I'd like you to try submitting your own resource to the InformalScience database. Is there a project or document related to your work that would be at home in the database here?

If yes, ask to describe briefly. - Great. So now I'll ask you to go through the motions as though you're going to upload that document/submit that project.

If no - That's okay. We can use the sample on your interview guide. If you look at the section "Uploading Resources" you'll see a description of a resource that I'll have you submit.

Sample resources for exercise:

1. Project Report: Bridging the Gap
2. Peer-Reviewed Article: Parental Support and HS Student Motivation
3. Evaluation Report: NASA Astronomy Days
4. Evaluation Report with Instruments: Wild Reef Sharks at Shedd
5. Project: Ecohumanities for Cities in Crisis

First, can you navigate to the place where you would begin the process? *(Note any issues in finding "Share Your Work")*

Next, you can login using my test account. (test account login and password provided)

Now, can you talk me through your thought process as you fill out this form? Try to fill out the fields accurately or tell me how you would fill them out if this hypothetical resource was something you were actually uploading.

Why did you choose the title you selected? *(Are there naming conventions that make sense to users?)*
How did you decide which resource type to select?
- Does this menu make sense to you?
- Are the categories intuitive?
- Did you find a good match for your resource? Why or why not?
- Does this menu cover all the potential resources you might like to contribute? (Can you think of a hypothetical document you might like to upload in the future? Is there a resource type for this document on the list?)

Are any of these sections unclear or confusing?
- Funding
- Contributors
- Citation/Identifier
- Documents and Links

Landing Pages (~7 min)

These questions can be asked as participants encounter the landing pages in the course of the exercise, or can be asked as a separate block if participants do not encounter them organically.

Next I'd like you to take a few minutes to view the site's three main landing pages. You don't have to read all of the content, but spend long enough to get a sense of what each page is about. Then I'll ask you some questions.

Are the pages helpful to you? Why/why not?

Do they help you understand ways you might use the website or where you might want to navigate next?

Much of the site is organized using these three categories - Projects, Research, and Evaluation. Does this structure make sense to you? Why or why not?

Search Tools (~3 min)

(As you may have discovered) this site has a few search tools. How might you use each of these?

Whole site search (magnifying glass)
Resource database (blue search box)

Do you see them as having the same function? (Would you expect to be able to use them interchangeably?)

If they haven't used the toggle search buttons: Were you aware you can use these buttons to filter your search results?

Are these useful filters for the searches you would want to perform?

If they used "Advanced" search options or filters to refine a search: When you did a search for [item sought during interview] I saw you used the filters to refine your search. Were these useful? Why or why not?

If they didn't use metadata filters: Can you take a moment to repeat your search for [item sought during interview] using the blue search box?

Did you notice the option to use an advanced search?

Did you notice these search filters at the left when you did this search?

Are these filters helpful for refining your search? Why or why not?

Wrap Up (~5 min)

What aspects of the site work well for you?

What aspects of the site work less well?

Did you have any issues with navigating the site? Do you have any suggestions for making navigation easier?

Do you see this site as a useful resource for your future work? Why or why not?

What other websites or resources do you use to support your work? How?

What suggestions do you have for improving the site's usability? (Particularly for AISL projects)

Is there any content that you would like to see? (Particularly for AISL projects)

> What blog or newsletter topics would be most useful to you?
>
> What kind of resources would you like to find in the database?

Have you used any of InformalScience's social media outlets to keep up with what's going on for the website and the field of informal STEM?

> *If yes* - Which social media do you use to follow InformalScience? How does following InformalScience help you?
>
> *If no* - Going forward, are you likely to use social media to keep up with news related to the website and informal STEM? (If not, why?) Which forms of social media are you most likely to frequent for this purpose?
>
> What type of Twitter or Facebook tweets/posts would be helpful to you?

Is there anything else you would like to say as feedback on the site?

APPENDIX B. INFORMALSCIENCE.ORG RESOURCE METADATA

Basic Information

Title [free text]

Primary Resource Type [dropdown, appears as the resource type in the search results view. Should be the most specific.]

- Project Descriptions
- Research Products
  - Peer-reviewed article
  - Doctoral Dissertation
  - Thesis
  - Research Case Study
  - Research Brief
  - Literature Review (coming soon)
- Reference Materials
  - Blog Post
  - Book
  - Edited Chapter
  - Mass Media Article
  - Educational Standard
  - Glossary/Index
  - Marketing Materials
  - Policy/Memoranda
  - Conference Proceedings
  - Report
  - Presentation Slides
  - Funding Solicitation
  - Webinar
- Evaluation Reports
  - Audience Study
  - Front-End
  - Formative
  - Summative
  - Remedial
- Research and Evaluation Instruments
  - Rubric
  - Survey
  - Test
  - Self-Assessment
  - Question/Answer Key
  - Interview Protocol
  - IRB/Consent Form
  - Observation Protocol
  - Performance Measure
  - Scale
  - Coding Schema

Secondary Resource Type [dropdown, includes all other resource types that are applicable]

- Project Descriptions
- Research Products
  - Peer-reviewed article

    - Doctoral Dissertation
    - Thesis
    - Research Case Study
    - Research Brief
    - Literature Review (coming soon)
- Reference Materials
    - Blog Post
    - Book
    - Edited Chapter
    - Mass Media Article
    - Educational Standard
    - Glossary/Index
    - Marketing Materials
    - Policy/Memoranda
    - Conference Proceedings
    - Report
    - Presentation Slides
    - Funding Solicitation
    - Webinar
- Evaluation Reports
    - Audience Study
    - Front-End
    - Formative
    - Summative
    - Remedial
- Research and Evaluation Instruments
    - Rubric
    - Survey
    - Test
    - Self-Assessment
    - Question/Answer Key
    - Interview Protocol
    - IRB/Consent Form
    - Observation Protocol
    - Performance Measure
    - Scale
    - Coding Schema

Location [postal code, does not display on front end]
Date [for projects, date range]
Submitter [username & e-mail, auto-generated]
Content Source [dropdown]

- ASTC
- ATIS
- CAISE
- CitizenScience.org
- EBSCO
- NAME
- NIOST
- NISE
- Open Exhibits
- RR2P

- VSA

Funding

Funding Source [dropdown]
- NSF
- IMLS
- NASA
- NOAA
- NIH
- NEH
- DOD
- DOE
- DOI
- Private Foundation
- Donor
- International Public
- Wellcome Trust
- Other

Funding Award Number [free text]
Funding Award Amount [free text]
Funding Program [free text]

Contributors

Contributor Role [dropdown]
- Author
- Co-Principal Investigator
- Contact
- Contributor
- Editor
- Evaluator
- Former Co-PI
- Former Principal Investigator
- Principal Investigator
- Project Manager
- Project Staff
- Publisher

Name [free text]
Organization Name [free text]

Description

Description or Abstract [free text]
Audience [checkboxes]
- Elementary School Children (6-10)
- Middle School Children (11-13)
- Pre-K Children (0-5)
- Youth/Teen (up to 17)
- Undergraduate/Graduate Students
- Adults
- Families
- Parents/Caregivers
- Seniors

- Administration/Leadership/Policymakers
- General Public
- Educators/Teachers
- Museum/ISE Professionals
- Scientists
- Evaluators
- Learning Researchers

Full Text [checkbox, doesn't display on front end]

Discipline [checkbox]

- Art, music, and theater
- Chemistry
- Climate
- Computing and information science
- Ecology, forestry, and agriculture
- Education and learning science
- Engineering
- General STEM
- Geoscience and geography
- Health and medicine
- History/policy/law
- Life science
- Literacy
- Materials science
- Mathematics
- Nature of science
- Physics
- Social science and psychology
- Space science
- Technology

Learning Environment [checkbox]

- Media and Technology
    - Broadcast Media
    - Websites, Mobile Apps, and Online Media
    - Games, Simulations, and Interactives
    - Films and IMAX
    - Planetarium and Science on a Sphere
    - Comics, Books, and Newspapers
- Public Programs
    - Afterschool Programs
    - Summer and Extended Camps
    - Citizen Science Programs
    - Community Outreach Programs
    - Making and Tinkering Programs
    - Museum and Science Center Programs
    - Public Events and Festivals
    - Theater Programs
    - Library Programs
    - Park, Outdoor, and Garden Programs
    - Laboratory Programs

    - Aquarium and Zoo Programs
- Professional Development, Conferences, and Networks
    - Professional Development and Workshops
    - Conferences
    - Resource Centers and Networks
- Exhibitions
    - Museum and Science Center Exhibits
    - Aquarium and Zoo Exhibits
    - Parks, Outdoor, and Garden Exhibits
    - Library Exhibits
- Informal/Formal Connections
    - K-12 Programs
    - Pre-K/Early Childhood Programs
    - Higher Education Programs

Access and Inclusion (checkboxes)

- Indigenous and Tribal Communities
- Low Socioeconomic Status
- Multilingual & Multicultural Studies
- People with Disabilities
- Rural
- Women and Girls

Citation

Identifier Type [dropdown]

- ISBN
- ISSN
- DOI

Identifier [free text]
Publication Name [free text]
Volume [free text]
Number [free text]
Page Number [free text]

Documents and Links

Upload Document
Related URL [Title, URL, URL Kind (has part, is part of), URL Type] *note: this is used to add project websites, as well as to create the linkages between projects and their products*

APPENDIX C. HEAT MAP IMAGES

Figure 44. Survey - *Where would you click to find help designing a successful STEM project*?

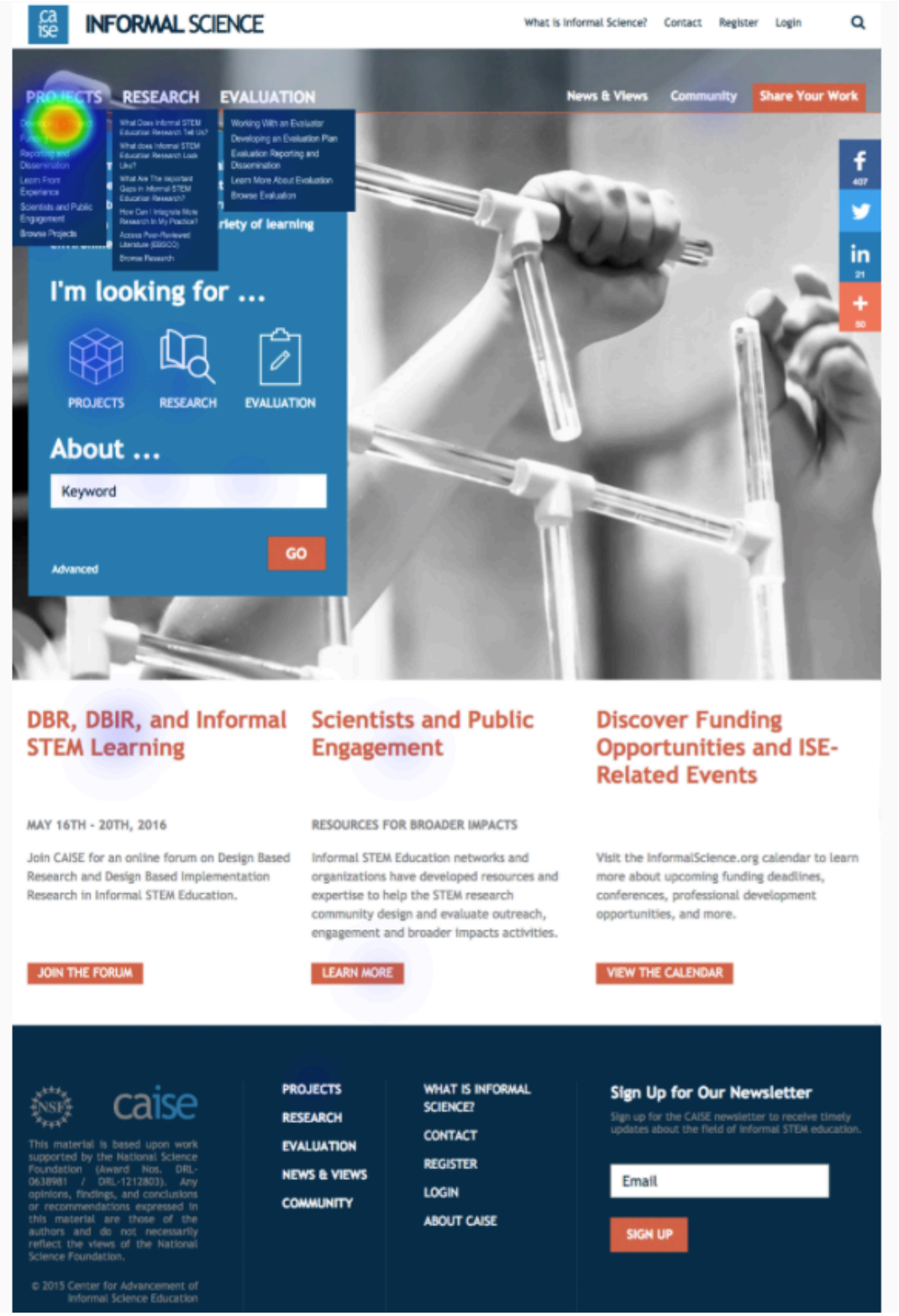


Figure 45. Survey - ***Where would you click to find peer-reviewed articles on how people learn in informal settings?***

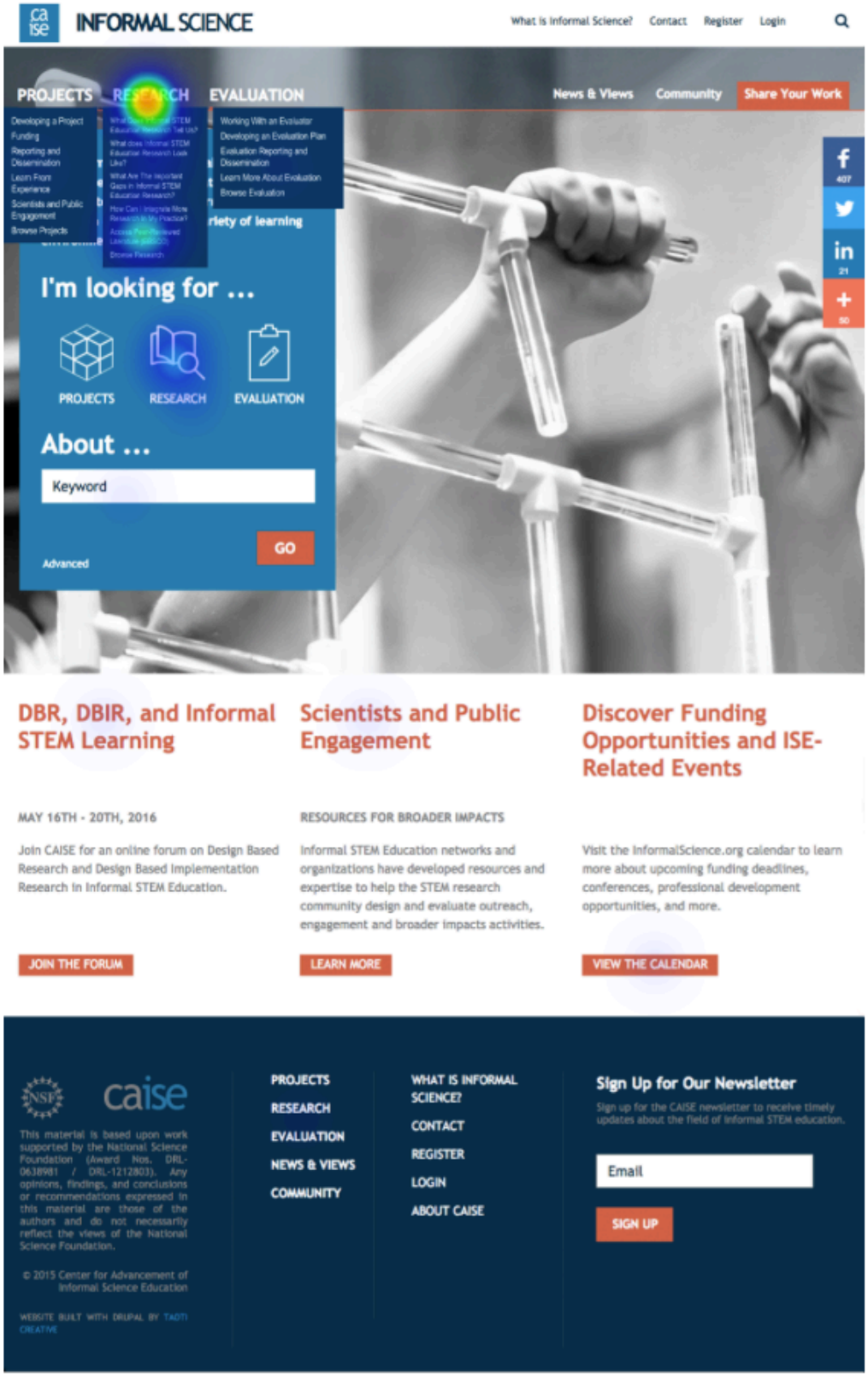


Figure 46. Survey - *Where would you click to find federal funding for informal STEM education*?

Figure 47. Survey - ***Where would you click to find a list of informal STEM education professionals?***

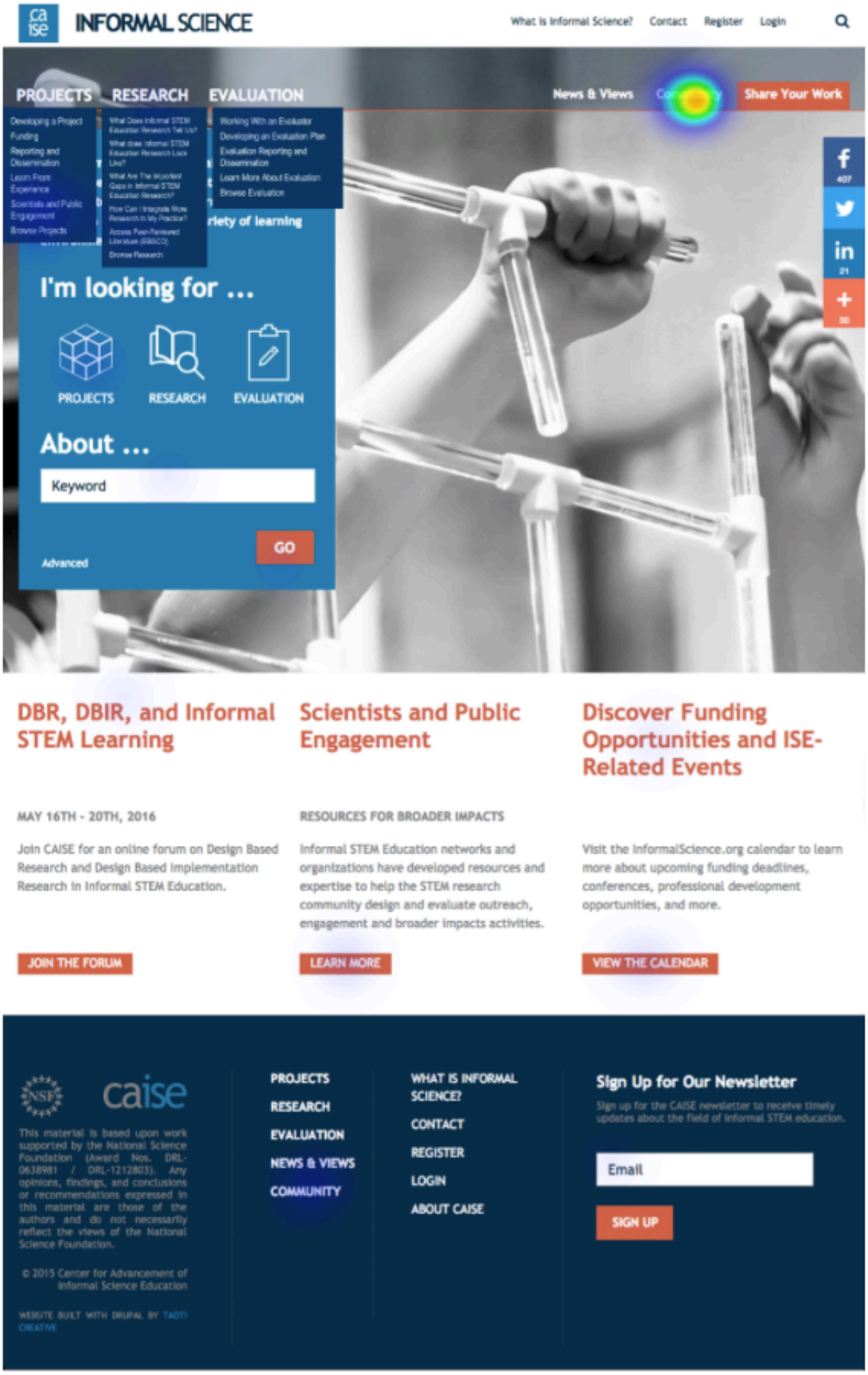


Figure 48. Survey - *Where would you click to find resources for conducting an evaluation*?

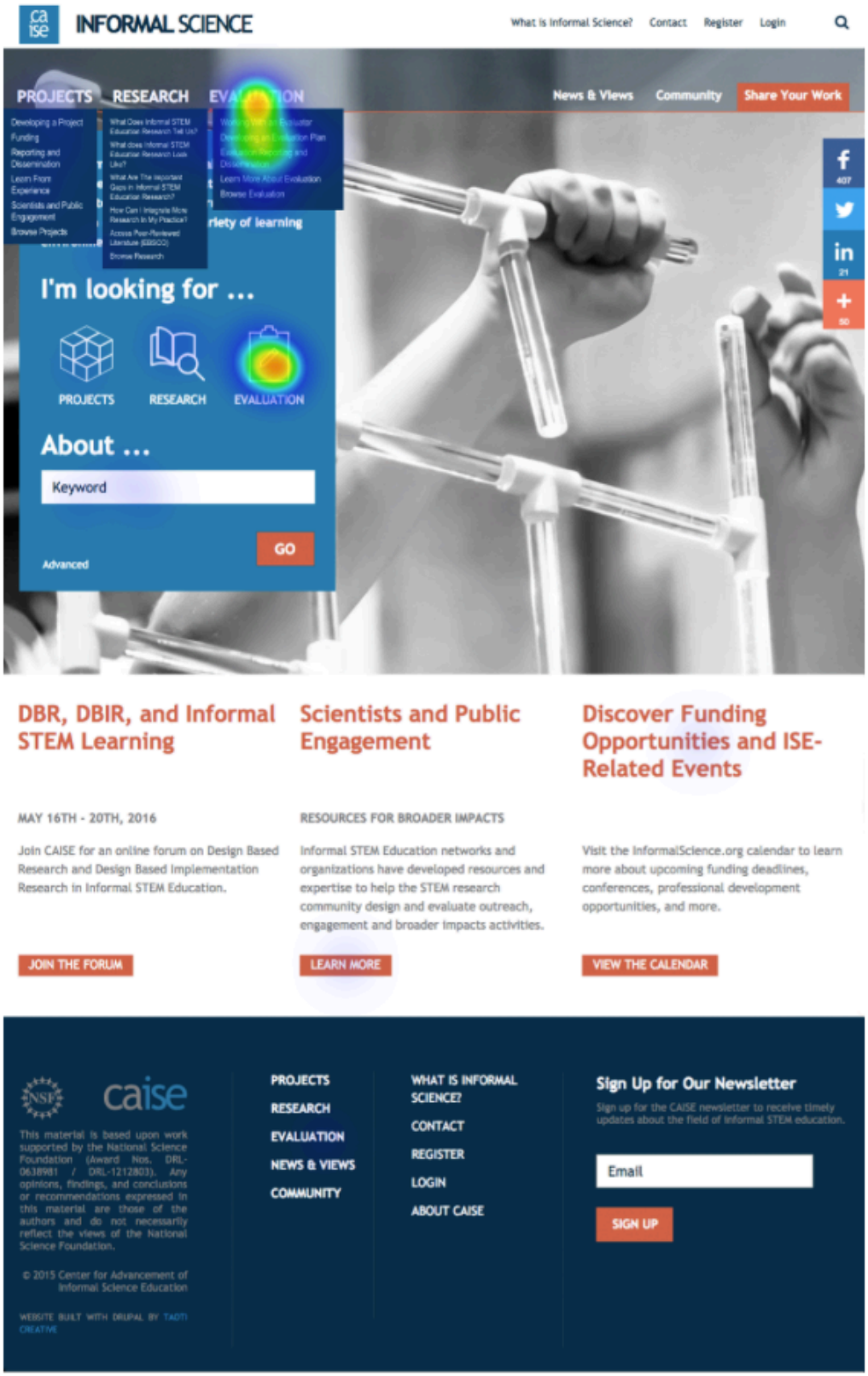


Figure 49. Survey - ***Where would you click to find evaluation reports on informal STEM programs and projects?***

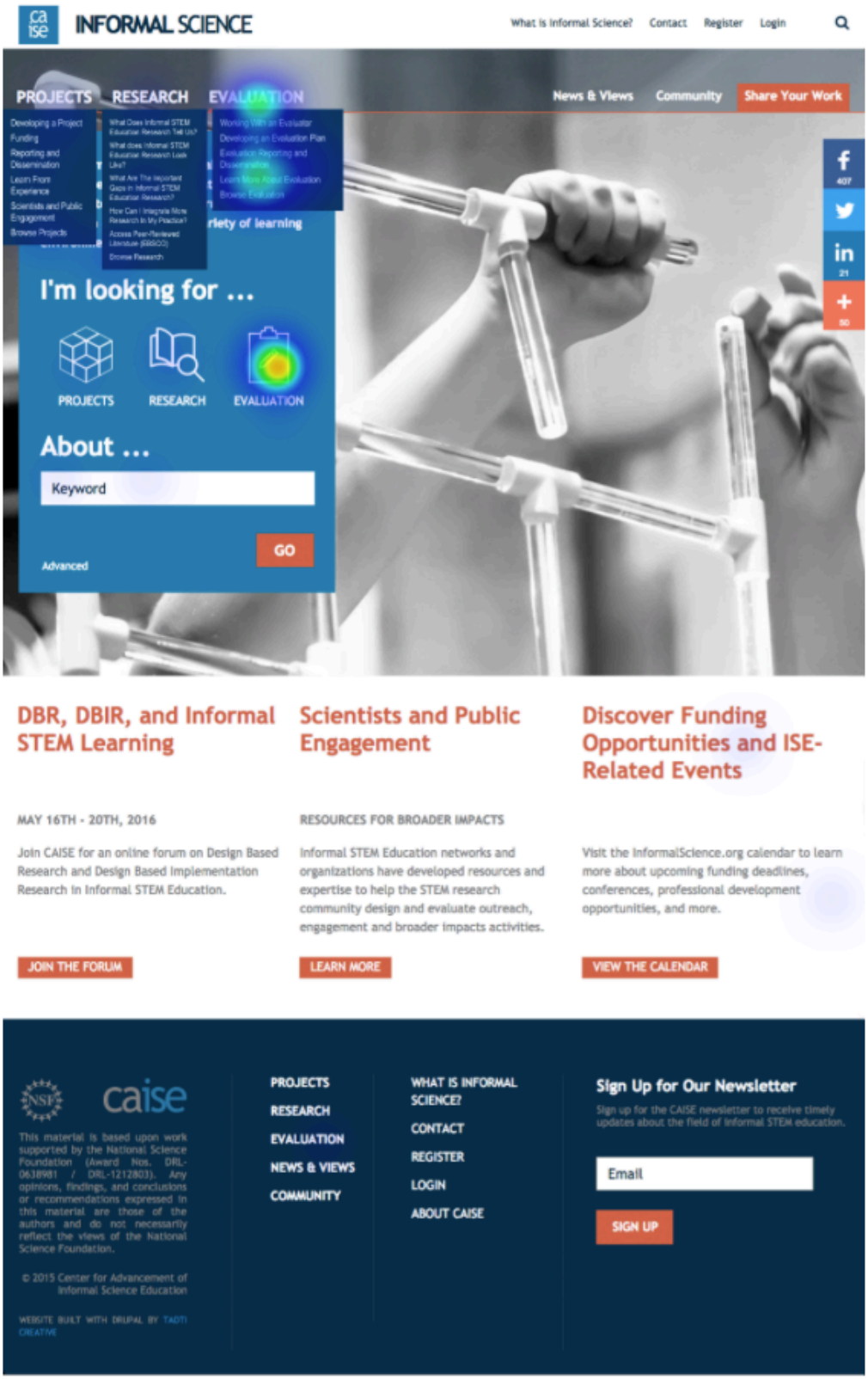


Figure 50. Survey - ***Where would you click to find news and updates on what's happening in the field of informal STEM education?***

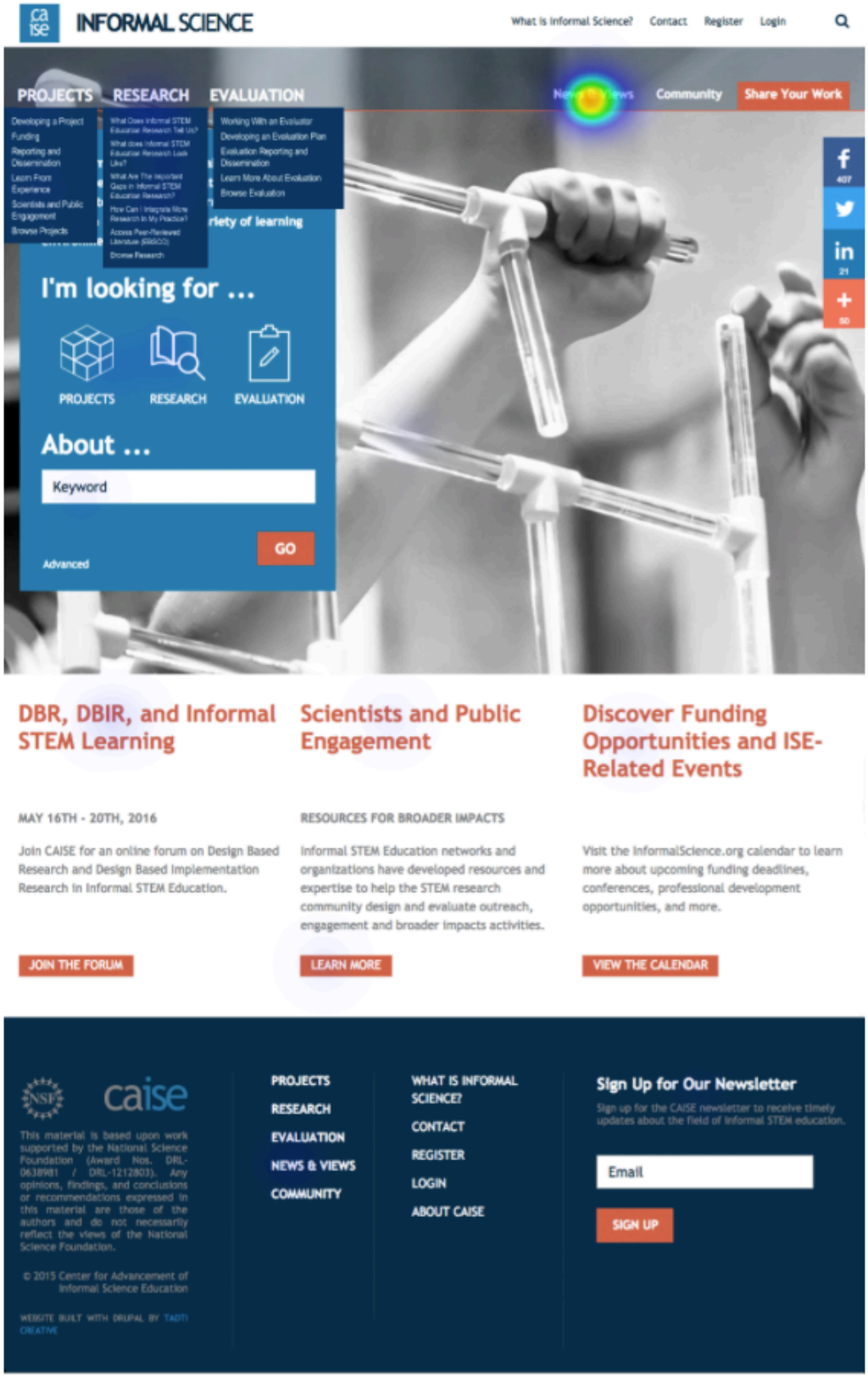


Figure 51. Survey - *Where would you click to find a place to submit your own resources to the website*?