

So.cl: An Interest Network for Informal Learning

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Abstract

Web search engines emerged prior to the dominance of social media. What if we imagined search as integrating with social media from the ground up? So.cl is a web application that combines web browsing, search, and social networking for the purposes of sharing and learning around topics of interest. In this paper, we present the results of a deployment study examining existing learning practices around search and social networking for students, and how these practices shifted when participants adopted So.cl. We found prior to using So.cl that students already heavily employed search tools and social media for learning. With the use of So.cl, we found that users engaged in lightweight, fun social sharing and learning for informal, personal topics, but not for more heavyweight collaboration around school or work. The public nature of So.cl encouraged users to post search results as much for self expression as for searching, enabling serendipitous discovery around interests.

Introduction

A phenomenal amount of information is readily accessible on the Internet through search tools. With billions of searches *every day* in Google (Worldmeters, 2011), we are truly in the information age, where an entire world of knowledge is at our fingertips.

As information has gone online, we have observed a transformation in how we conceptualize learning (Atkins et al., 2010) with the *democratization of knowledge*. That is, rather than learning from experts in ivory towers, such as professors in universities, people are learning from their peers in online communities. This democratization of knowledge has striking implications for us as a culture. As people from different disciplines and perspectives directly share and build on each other's work, innovation is exponentially accelerated in directions we could not have predicted (Cross, 2006).

Most of this movement toward online learning has been occurring within highly motivated, tech-savvy communities with fairly sophisticated knowledge sharing tools. This raises the question, how do we foster peer-based, informal learning for a more every day audience?

When considering informal learning, the issue of motivation becomes extremely important – what will inspire people to go online to learn new topics on their own time? The answer, we believe, is in the context of social media.

Learning theories have long posited that a need for social connection is an essential factor in motivating people to learn (Ryan and Deci, 2000; Vygotsky, 1986; Wenger, 1998). This leads to our primary argument – that we may leverage social media as a context for inspiring new interests and motivate learning.

To that end, we created an online *interest network*, called **So.cl**. Given that learning is going online, we felt it was critical to redesign tools from the ground up to combine browsing the web, sharing links, connecting with people through what they share, and learning and ultimately gaining expertise. In this paper, we present an overview of So.cl, and lessons learned from a deployment study to a group of college students.

Related Work

It has long been acknowledged that learning is no longer confined to those years we spend in the school or in classrooms. It is a lifelong activity, and through the use of the Internet may occur on demand. More than 80% of our waking hours consists of informal learning, that is, learning outside the classroom and structured environments (Bransford, 2006). Online technologies help learners gain access to global knowledge and social resources not available face-to-face. That said, there tends to be a disconnect between the tech savviness of students, how they use technology in their learning, and how technologies are used in more formal educational environments (Barron, 2006; Levin and Arafeh, 2002). Consequently nationwide initiatives are seeking to incorporate technology into learning programs (see Atkins et al., 2010), and there is an awakening awareness of the important role social media may play (Ito, 2010).

Learning is Social

How we might foster motivation for learning online is an important consideration for activities outside the class-

room. A sense of relatedness with others may be highly motivating force (Ryan and Deci, 2000), and the desire to connect with mentors is an important part of the learning process (Vygotsky, 1986). Similarly, learning communities and communities of practice (Wegner, 1998) meaningfully provide incentives and support toward learning, as members develop a sense of belonging to a group that drives their desire to work with others towards common goals around shared interests. In an examination of the volunteer sector, for example, Bellarby and Orange (2006) found learning communities to be an important resource for inspiring the motivation to learn and share with others, with members developing self-confidence and self-awareness as a group as they did so.

Social Search and Social Tagging

Well-used search engines such as Google or Bing are designed for solitary searching, even though collaborative web search behaviors are commonplace. People often search shoulder-to-shoulder or share search results through computer-mediated communication tools (Morris, 2008). Evans and Chi (2008), in a study of online search behaviors, found that social interactions are an important aspect of multiple stages of information search -- in foraging for information, engaging in the sensemaking process, and sharing information.

Search systems have been developed with the goal of aiding individuals manage information overload by prioritizing search results using social metadata (Carmel et al., 2009; McDonnell and Shiri, 2011). Social tagging systems take a similar approach (Marlow et al., 2006; Millen et al. 2007), where users annotate search results with tags to help organize their searches, and web site topics and popularity may be inferred from the frequency of tags across users. Kammerer et al. (2009) and Freyne et al. (2009) found such social annotations are highly valued in prioritizing search results. These *social search* systems -- where the collective intelligence of a network or community can be used to improve the quality of the search process -- tend to be focused primarily on improving search and discovery around topics, rather than focused on personal interactions around common interests or inspiring learning.

Morris and Horvitz (2008) developed a system, S^3 , that allowed users to aggregate and organize their search investigations, which could then be shared and edited by others. This was a more heavy-weight tool for online research, without tools for interest-based sharing or discovery.

Learning Communities

There are any number of learning communities online that foster the creation and sharing of user generated content, enabling community innovation (Cross, 2007). For example, Scratch (Monroy-Hernandez, 2007) and Kodu (Mac-

Laurin, 2009) allow members to create and share programmatic games that others may then experience, copy and extend. Open-sourced developer communities such as Sourceforge (See Sourceforge.net) allow people to share code and rapidly iterate new projects by building on each other's common components. In recent years there has been a growing movement for do-it-yourself or maker web sites such as Instructables (see Instructables.com) and Make Magazine (see Makezine.com). These communities are so prevalent, some have characterized this as a remix or participatory media culture (Jenkins et al., 2005). Such sites tend to be walled communities with high barriers for sharing, with members who are already motivated to learn around a specific topic. This inhibits serendipitous discovery of people and interests across community boundaries.

Interest Networks

Interest-based networks with peer-based sharing are an important vehicle for informal learning (Ito, 2010). These public, asymmetrical networks allow people to broadcast posts comprised of text, photos, links, and so forth that others may choose to follow or not. Blogs and microblogging systems such as Twitter (see Twitter.com), Pinterest (see Pinterest.com), and Tumblr (see Tumblr.com) provide effective tools for a more lightweight sharing and serendipitous discovery. Even relationship-based online social networks may be an important social learning resource (Greenhow and Robelia, 2009), because they provide a place for validation and appreciation, emotional support, and task support around learning activities. Tumblr and Pinterest, much like social tagging systems, allow people to orient their content around topics. However, none of these interest networks integrate the act of search itself.

So.cl

So.cl was designed as a collaborative search engine with three key goals in mind: to help people a) find each other around common interests, b) be inspired to find new interests, and c) learn from each other through these interests. So.cl combines the process of searching for interesting content online with the ability to share findings with a lightweight sharing tool. It is a public system, providing access to people and topics users may have never met.

So.cl blends a Twitter-style public feed and follower model with the traditional search engine results page and the ability to curate search results. See Figure 1. The central feature of So.cl is the ability to construct a collection of search results (called a "post") around a particular interest (See Figure 2). The collection, having been posted to the public feed, is visible to the community where people with similar interests may choose to begin collaborating around that post.

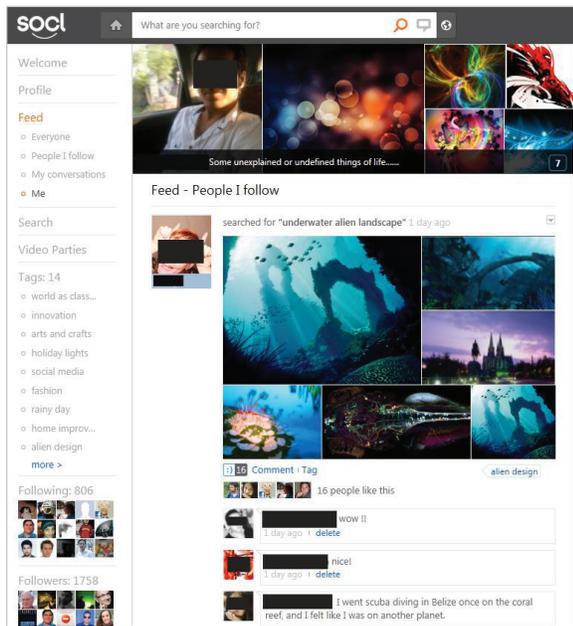


Figure 1: *So.cl combines a Twitter style follow model with a search engine and lightweight sharing. Users first search, and then select items from the results to share in a post to the feed.*

Every new post on So.cl begins with a series of searches. Once users have constructed a post, they have the option of adding context to the post in the form of a message. For example, a user may have searched for “learning theories” and then constructed a post with informative links and pictures. However, the community may not necessarily understand the context in which the user created this post. As such, the context message might say “Interested in good papers on Activity Theory in particular”. This would give the community sufficient context to engage accordingly. Once posted to the public feed, the collaboration begins around the post through the commenting system and as users respond to each other’s posts with their own.

So.cl facilitates discovery of people with similar interests by blending search results from the Internet (using the Bing API) with search over similar posts within So.cl. For example, a user may search for “Asia’s largest dam”, and may discover information from Bing as well as from related searches within the community. The user, having discovered people performing related searches, may choose to follow them and start engaging in conversation. Other features, such as tagging and video parties, were also designed to facilitate the discovery of new interests and people.

Method

To evaluate So.cl we selected college students as our target demographic, to learn from their searching and collabora-

tive learning behavior. The goal of the study was to evaluate if So.cl would enable students to a) find each other around common interests, b) be inspired to find new interests, and c) learn from each other through these interests.

Procedures

To develop a rich picture of how participants used So.cl over the course of a month we triangulated on our research questions with a mixed-method approach, combining more qualitative focus groups and in-depth interviews, with weekly questionnaires and site instrumentation.

Focus groups

We introduced 33 students into a private, pre-release version of So.cl through seven focus group sessions (about 5 people per session). In these sessions, participants completed an online questionnaire to assess demographic information, use of Internet and social media, social networking sites, search engines, and use of resources both of-line and online for learning new topics. In an open discussion, we asked students to provide examples of learning pathways they recently took to learning in one of three categories: hobby/activity, news/event, or school/work. We then introduced and demonstrated So.cl, allowing time for individual exploration and questions. Students were then asked to provide feedback such as likes and dislikes, perceived problems and suggested improvements in the form of an open discussion. Finally, we discussed their responsibilities for the month long study which included using the site as their primary search engine for at least 16 hours per week.

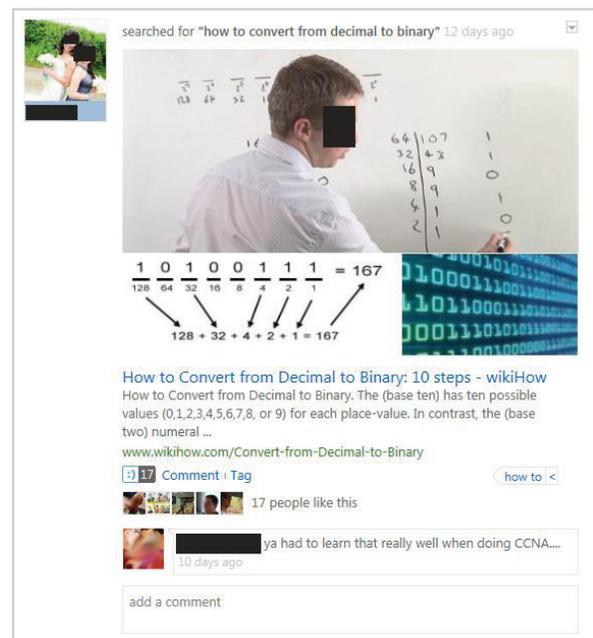


Figure 2: *In So.cl, users may create posts using a combination images and links they find through search.*

Questionnaires

We tracked the student's usage over four weeks by sending out weekly questionnaires, and then through a follow-up questionnaire after ten weeks. The goal of these questionnaires was to better understand our target users and the socio-techno ecosystem into which we were introducing So.cl. The questionnaires prompted participants for details surrounding their use of So.cl through both closed-ended multiple choice or Likert scales, and open-ended questions. We collected information related to So.cl usage time and engagement, discovery of information, discovery of people with common interests, privacy concerns, collaboration experience, likes and dislikes.

In-depth Interviews

We conducted a one hour, semi-structured, in-depth interview with each student after two to three weeks of usage. We asked about their experience using So.cl, and how their experience of searching had changed. Questions were geared to allow participants to describe the situations where they met people with similar interests in So.cl and to elaborate on what those interactions were like. We also asked them to discuss if they found new topics of interest or if they learned anything new from their interactions on the site. These interviews allowed us to develop a much deeper understanding of our users and their experiences with So.cl than could be elicited through questionnaires.

Participants

33 (61% male, 39% female) students from the University of Washington participated in the study in exchange for a software gratuity at the time of the focus groups, and a small stipend for ongoing use of So.cl and feedback over the weeks of the study. 1 participant dropped out after the initial focus group, leaving 32. They were on average 21 years of age, with 3% freshmen, 12% sophomores, 27% juniors, 46% seniors, 3% graduate students, and 9% recent graduates. Their ethnic backgrounds reflected that of the school, with 20% Caucasian, 61% Asian, 12% mixed, and 3% African-American participants. Many students were at least partially employed, with 3% having a full-time job, 58% a part-time job, 3% self-employed, and 36% not employed. Their areas of study were quite diverse, ranging from international studies to business.

Results

Socio-techno Ecosystem

We asked a series of questions to develop a better understanding of the existing socio-techno ecosystem into which we were introducing So.cl. The students were very tech-savvy, reporting that they spend 7.8 hours a day on the Internet, 4.6 for social activities, and 3.2 to access infor-

mation. These students accessed the Internet through their computers 68% of the time, and through their phones 27% of the time.

When asked which communication tools were most important for communicating and sharing with others, social networking sites dominated -- with 32 out of 33 reporting Facebook as their primary social network -- followed by email accounts and instant messaging. See Figure 3. When we asked in particular where they would share professional or personal content they had found online, it was clear that professional sharing with coworkers or their professors occurred almost entirely in email accounts ($M = 6.8$, where 1 = not at all and 7 = extremely so), whereas personal sharing occurred across these mediums, particularly online social networks ($M = 6.3$), text messaging ($M = 5.4$), email ($M = 5.2$), and instant messaging ($M = 5.0$).

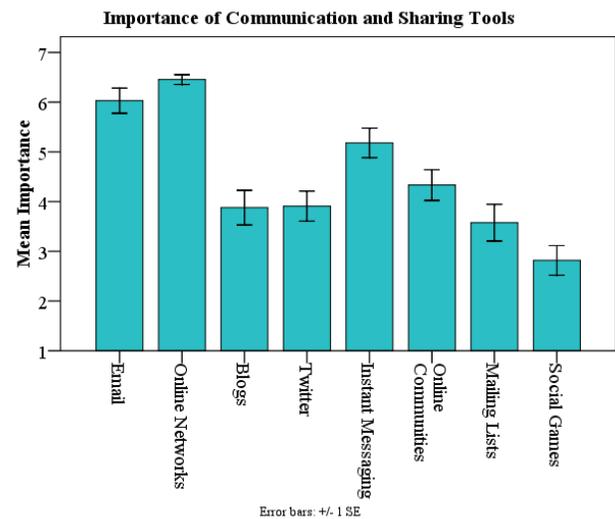


Figure 3: Online social networks were the most important communication tool, followed by email and instant messaging (where 1 = not at all, and 7 = extremely so).

In our in-depth interviews we probed for more information about the high number of hours people were reporting spending online, particularly in Facebook. What became quickly apparent was that no matter where they were and what they were doing, students were *always on* either through their computers or on their phones. 30 out of 32 students also reported using Facebook groups as a way to coordinate social interactions or exchange information, with the deliberate exclusion of more formal relationships (namely supervisors, professors, family members). Of those using Facebook groups, 63.6% used them for topic-based interest groups or clubs (e.g., a gaming group, a Seattle flash mob, and a Tagalog club), while 50% used them for school project groups (e.g., Religion 101, math, or informatics). Other lesser mentioned uses were 23% for friends, 13% for work, 3% for family.

Existing Practices for Social Learning

In our preliminary questionnaire we asked students if they needed to learn a new topic, to what extent they used various resources. We found that informational web sites on the Internet have already achieved dominance as sources of information (See Figure 4). However social relationships – both offline and online – were also very important resources for learning.

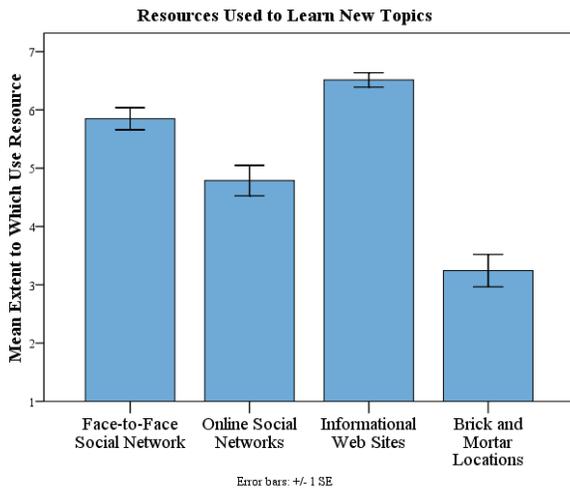


Figure 4: The Internet was a primary resource for learning new topics, followed by face to face contacts and online social networks (where 1 = not at all, and 7 = extremely so).

When asked which tools they use for *communicating and collaborating* with their fellow students for school, again social networks and text messaging were most dominant, followed by email. See Figure 5.

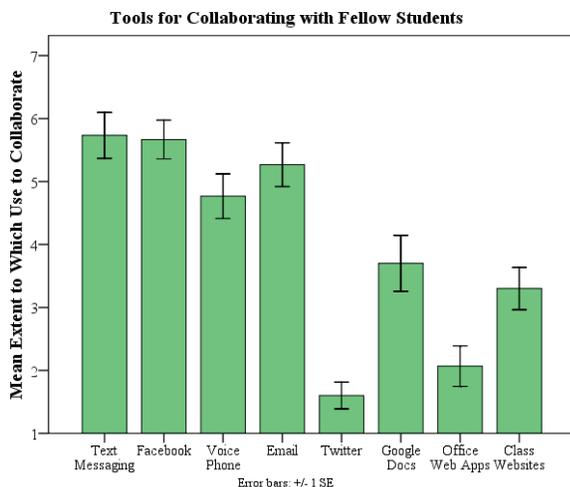


Figure 5: Facebook, text messaging, and email accounts were all used to collaborate with fellow students for school (where 1 = not at all, and 7 = extremely so).

To further explore what resources participants utilize when learning and the role offline and online social connections play, during the initial focus groups we asked students to describe their pathways to learning something new in the last two weeks. We found that 69% of the learning pathways described involved a social interaction of some form or another.

We then looked at what direction the learning went along a continuum of personal interaction, where pure content (books, TV) is on one end of the spectrum and personal, one-on-one interaction (email, face-to-face) is at the other end. 43% of these social learning pathways started with a personal interaction and ended in more pure content.

I learned about Steve Job's death from a friend on twitter and then checked Bloomberg for potential impact.

These social learning pathways were usually first inspired by a person introducing an interest, and moved towards pure content with online foraging and sensemaking around the topic (Evans and Chi, 2008).

26% of the social learning pathways started with content and ended in more personal interactions.

I use Tumblr to keep track of news related blogs. On blogs I saw an Occupy Wallstreet posts. Saw one about Rome. Then I was talking to a girlfriend who is in Rome. Told her that I saw photo of car fire on tumblr. She said 'I saw a car on fire last night, we got trapped in doors because of protest.'

These interactions typically started with content foraging and then go to more personal interactions to inspire discussion, get feedback, or seek advice.

In 30% of the social learning pathways, students described weaving in and out of personal and impersonal content.

I emailed professor, then was stuck don't know what to do. He said: 'here are some philosophy journals on line' gave me links to 30 philosophy sites, topics that they were writing on, catholic ones, some terms I didn't understand so I go to wiki, and keep email page open.. facebook is also open at all times. Discovered topic trinity, then emailed him, asked if that was alright, then friend gave me more resources: 'check out these books that I found one line', she gave me some more links on his website, there were links to other journals, he emailed me 2 more links, gave guidelines through his website.

In sum, we found learning is indeed already very social, with personal connections both inspiring new interests and helping participants make sense of information they find.

Overall So.cI Usage

We examined So.cI usage based on data from our 32 participants, including 3256 search queries, 1563 of which were shared as posts. The data were collected during the four week period from October 17, 2011 to November 17,

2011. In that time, our participants on average created 49 posts, 49 comments, and 53 likes. It should be noted that at this time So.cl had about 250 other pre-release test users participating in the community, and each post was receiving an average of 1.5 comments and 1.4 likes.

In our follow-up questionnaire after 10 weeks of use, our participants reported enjoying their experiences with So.cl ($M = 5.3$, where 1 = not at all and 7 = extremely so), finding it was not difficult to use ($M = 2.7$), that it was fairly useful ($M = 4.9$) and that they would continue using it after the study was over ($M = 5.0$). When asked what they most liked in an open-ended question, 56% described the interest-focused socializing.

I liked that it allowed me to look through other peoples' feed, posts, and interests. I liked that I was able to socialize with other people with common interests.

I like the community aspect. The whole site is kind of a room of people having different conversations, and you can choose which one you want to join. It's also interesting to see what people are searching for around the world.

When asked what they disliked or how they would improve So.cl, responses were very diverse, such as wanting it to be faster, less buggy, open to all their friends, with better tools for chatting, and on their mobile phones.

To get a better perspective on the type of content our participants were sharing, we categorized their posts into three types: personal interests, school or work, or news or media. We then further analyzed the comments for instances of explicit collaboration -- where participants were working jointly on a search problem, with at least one other user contributing to the discussion by either sharing a link or giving a suggestion.

The results showed that sharing on the site was highly personal. 75% of searches shared were personal and consisted of informal, lightweight sharing. 20% were school or work related and 5% were news or media related. Looking at collaboration in the comments, we found 6% of personal posts became collaborative, while 4% of school, and 2% of the news related posts became collaborative. The remaining comments and conversations tended to be more lightweight interactions, where users greet each other, indicate they like the post, or shared the interest expressed.

Initially our project goals assumed that since we recruited students, we would be seeing searches that were geared towards knowledge-based content with the goal of learning. However, we immediately noticed a trend start to emerge -- students were engaged in searching with the goal of *sharing*. Searching started becoming not only a place for informational searching, but also a place to post interests, what users are about and what they find amusing -- *via* intentional searches. In other words, search for learning became re-purposed as search for self-expression.

Achieving our Stated Goals

We asked participant to rate the extent to which So.cl accomplished their search and social networking goals in our final questionnaire, and found that their ratings of So.cl fell in between our preliminary measures of their primary search engine (primarily Google) and social network (primarily Facebook). See Table 1.

Goal Achieved	Search Engine	Social Network	So.cl
Learn some new information?	6.5	5.8	5.6 ^s
Connect with someone new?	2.1	5.7	5.5 ^s
Form stronger connections with friends or contacts?	2.4	5.5	3.9 ^{s,n}
Discover something new about a friend or a contact?	2.3	5.9	4.9 ^{s,n}
Discover new people with common interests?	2.6	5.2	5.6 ^s
Find an expert on a topic you wanted to learn about?	5.6	3.8	3.8 ^s
Cooperate with others to search for information?	4.2	4.5	3.8
Find information to share with friends or contacts?	5.6	5.7	5.1

Table 1: In ratings of goals achieved So.cl fell in between search (Google) and social networks (Facebook), where 1 = not at all, and 7 = extremely so. Superscripts 's' and 'n' indicate So.cl ratings are significantly different from the user's primary search engine or social network, at $p < .05$ using pairwise *t* tests, two tailed.

Serendipitous discovery of people

One of our primary research questions was whether students were able to find others with common interests through So.cl. Their ratings indicated that using So.cl did bring serendipitous discovery of new people with common interests ($M = 5.6$, see Table 1), more so than their primary search engine or social network.

I found a ton of people with similar interests.. every day. Yogurtland, coffee, fantasy football

Examples of common interests included food recipes, music, sports, video games, celebrity gossip, and fashion talk - - again illustrating that these were largely fun, lightweight interests that provided avenues for connection with other users.

Someone else really liked a musical artist that I did as well that I hadn't heard of in a while. The artist came out with a new album and I discovered that on So.cl.

I searched Quantum Harmonic oscillators and some one commented and seemed really interested in the topic.

Serendipitous discovery of information

Using So.cl went beyond just that of a directed search tool, but also brought about serendipitous discovery of new information ($M = 5.6$, see Table 1).

There was more diversity in my searching.

I think what really helped me is seeing other people's search results.. like oh you're interested in skydiving, then we can get into a little conversation about it.

An interesting phenomenon that started to occur was that as a topic was presented, a theme would get perpetuated, and the community would start “riffing” or elaborating on each other’s posts. For example, prior to Halloween, several posts seeded So.cl with costume ideas, pumpkin recipes, pumpkin carving, and so forth.

Last week, the common interest I shared w/ quite a few people was halloween costumes. Like me, many people searched images of past halloween costumes and posted them to socl and we would laugh about them or talk about what we were going to be for Halloween

Stronger connections to friends and contacts

Although the participants were able to comment and ‘like’ each other’s searches publicly, it became quickly apparent that they could not take the process to the next level of interaction. 31 out of 32 participants mentioned that they strongly desired a way to communicate with each other directly and privately.

I had no way to connect with them besides commenting, trying to go deeper with them is basically impossible.

This was a real frustration for the students that illustrated the important role that one-on-one communication has in collaboration. Students were thirsty to take their content-based connections to a deeper level of personal interaction.

So.cl and Learning Pathways

In the in-depth interviews we probed again about learning pathways after two to three weeks of use. This time, we asked students to provide examples in one of three categories (hobby/interests, school/work, and news/media). We found that 50% of the learning pathways involved a social interaction, and of those 59% were for a hobby, 53% for school, and 37% for news. We found that 45% of these social learning pathways wove in and out of social media as a part of the sensemaking process.

The scandal at pen state heard it on TV espn. It started to escalate, so I wanted to get more info. The head coach got fired . Go to Facebook and post ‘why are you firing the coach?’ had 21 comments after that. I go to a link to court transcript, then I started to read got sick reading it, but able to find info. Went and did a google search of topic pen state , clicked various links. Videos of interviews espn.com.

In 18% of these pathways, learning started with a personal interaction and ended with content. This was typically because the idea was inspired by a personal interaction and then further investigated by searching for pure content.

My friend told me in person about stabbing in home town. I wonder if this is a big issues I searched for it wasn't in the search, but in the news tab. Clicked on different links to see if they were the same.

When learning started with impersonal content and moved to more personal interactions (48% of the time), it was typically because people would get exposed to information and then seek more personal feedback or advice. For example, here a student finds home improvement inspiration.

Find home and garden channel [TV], do it yourself to decorate.. Sister is buying a house. I discovered different ways to make the house open, different types of color that pops the room, mainly pictures. She lives with me, so I showed her the photos.

We were particularly interested how these pathways were impacted by So.cl. We found that So.cl did in fact get integrated in 26% of the pathways mentioned. Of these, about half (53.5%) integrated So.cl into a social learning pathway, while for the other half (46.4%) So.cl was used purely for searching content. In the following example, a student was introduced to a news event through So.cl.

Didn't know much about occupy wall street. I learned everything on socl search . People posted articles, pictures and videos, went on youtube. Learned through that.

32% of the time, the pathways that integrated So.cl wove in and out of personal and impersonal media. This weaving in and out of different information sources was an important part of the foraging and sensemaking process.

This week I'm planning a trip to Vancouver. Saw flier on tumbler, hearing about it on twitter that there is a concert for a Youtube artist. Use So.cl to look up hotels. Gave me links to cheap hotels, hotwire, hotel, how far it was, how much gas. Talked to friends. texted two of them, called up one other person, ar ranging, posted on Facebook all on group. Facebook Group called ‘room 407’, always hanging out in that room but on line. Talked about prices.

Conclusions and Discussion

So.cl is a web application that combines web browsing, search, and social networking for the purposes of sharing and learning around topics of interest. Given the increasingly online nature of learning, we felt it was critical to design tools that reimagined search as social from the ground up. We found in a pre-release deployment study that students are already heavily employing a combination of search and social media tools for learning, and that the use of So.cl enabled lightweight, fun social sharing and learning for informal, personal topics. So.cl became actively used in our participants’ learning pathways – through both informational content and personal connections -- as they engaged in the foraging and sensemaking process.

The public nature of So.cl encouraged users to post search results as much for self-expression as for searching, enabling serendipitous discovery around interests. While So.cl's public nature encouraged the use of search for self-expression, it inhibited more heavy-weight collaboration around learning topics as participants avoided sensitive, socially stigmatizing, or boring topics. Participants commonly requested more tools for private interactions, highlighting the design tension in social media for enabling serendipitous discovery through broadcast sharing, and more meaningful, controlled collaboration through private messaging and collaboration tools.

Our study was designed to optimize for rich feedback from our target population as we seeded the community before release. We used a mixed method approach to develop a thorough picture of existing practices around social learning and the impact of So.cl. However, we recognize the limitations of the trade-offs we made in our study design, including the small sample size and lack of experimental control.

Nonetheless, our findings present a compelling case for recognizing the deeply social nature of learning and the importance of social media for inspiring learning around new topics through social connections. We found the easy, lightweight integration of sharing around search in So.cl effectively fostered serendipitous, informal learning online. In the future, we expect to further examine how to enable informal learning and collaboration around web content online – including richer tools for personal interaction in an always on, mobile community of users.

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