Designing an Online Professional Development Network for Project GUTS

New Mexico EPSCoR Innovation Working Group Report

Valles Caldera Education Center
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Background

Project GUTS: Growing Up Thinking Scientifically is an afterschool science, technology, engineering and math (STEM) program for middle school students based in Santa Fe, New Mexico. Project GUTS serves middle school students across New Mexico and partners closely with the Supercomputing Challenge to offer teacher professional development in computational science. Project GUTS is hosted by the Santa Fe Institute and has been funded by New Mexico's Experimental Program to Stimulate Competitive Research (NM-EPSCoR), the National Science Foundation, the Bengier Foundation, the Los Alamos National Bank, Lockheed-Martin Foundation, the New Mexico Public Education Department Math and Science Bureau, Los Alamos National Laboratory Foundation, and by private donors.

The New Mexico EPSCoR Innovative Working Group (IWG) on the topic of designing an online professional development network for teachers implementing computational science curricula took place on February 9th through 12th at the Valles Caldera Science Education Center in Jemez Springs, NM. The participants in the IWG included experts in teacher professional development, computational science, and online tools for community building, and educators who represent our target audience of middle school teachers implementing the Project GUTS afterschool clubs. (see Appendix A: IWG participant list)

Key efforts (with guiding questions)

The goal of the IWG was to design the online professional development network that was capable of supporting and nurturing teachers to become computationally enabled STEM teachers confident and practiced in implementing computational science curricula and developing the expertise of our community such that members of the community can help each other. The design of the online professional development network (OPDN) took into account current best practices in teacher professional development, new technologies for online community development, and the needs and use scenarios of teachers. The design also took into account the human infrastructure of community; the willingness of our community members to share their knowledge and resources with other teachers in order to develop the community.

Guiding questions:

The IWG was focused on answering a set of four guiding questions:

1) What are the specific needs of teachers who act as club leaders that are not met through teacher professional development workshops?
2) How might these needs be met with an online network and Web 2.0 tools?
3) Which existing tools / platforms fit the needs, capabilities, and technology access of teachers?
4) Which user interface design elements or metaphors will provide teachers with quick access and ease of use of materials and functions on the network?

Preparation for the IWG.

Prior to the IWG, information was gathered from our community. At the Winter Project GUTS professional development workshops in Santa Fe (1/7/12) and Las Cruces (1/14/12) we surveyed our club leaders. (See Appendix B: Pre-survey of GUTS club leaders.) We also gathered statistics on our existing GUTS webpages to determine use of different components of our website. (See

Appendix C: GUTS website statistics.) The PI, Lee, attended the National Science Foundation's Computing Education in the 21st Century (CE21) community meeting in Washington, DC the week prior to the IWG. She attended two sessions, best practices in teacher professional development in CS and developing online communities of practice, that provided additional background information that was incorporated into the IWG. (See Appendix D: Best Practices in Teacher Professional Development in Computer Science and Appendix E: Notes from session on Developing Online Communities of Practice)

Descriptions of the sessions (See Appendix F: Agenda and schedule)
Over the four-day workshop we followed a set of nine steps, one per session, that enabled us as a group to answer the guiding questions. The first four sessions laid the foundation for our design work: we assessed the current status of our existing resources, workshops, and tools; we learned about the theory behind Communities of Practice and heard considerations and best practices for cultivating communities of practice; we characterized our practitioners, the primary audience of online professional development network; and we learned about existing tools and technologies that support online communities of practice. This foundational work ensured that the design team built upon a common understanding.

Within the subsequent three sessions we used a design charrette process in which our end users' needs, abilities, constraints, and desires guided the design of the online professional development network. A "design charrette" is a method of organizing thoughts from experts and the users into a structured medium that is unrestricted and conducive to the creativity and the development of myriad scenarios. During the charrette participants were tasked with uncovering key problems with which community members were faced then collaboratively drafting a solutions to the problem in break out groups. The charrette took place over multiple sessions in which the group divided into sub-groups. Each sub-group then presented its work to the full group as material for discussion and refinement. The iterative charrette processes was conducive to quickly generating design solutions while integrating the aptitudes and interests of our diverse group of participants.

One of our goals was to avoid the "design it and they will come" mentality that has led to many failed experiments using new technology [Barab]. Our process was also vastly different from "design by committee"; instead, it is design process informed by active participants who determined what they need, will share and will use. During the iterative design process, we saw designs merge and best features of each come together synergistically. Participants took responsibility for different tasks within the subgroups: we had commentators, designers, dreamers and reporters. The final stage of the design charrette was a technical review of the design we had created. This stage was not fully completed – we found that some additional research into existing tools (specifically ELGG and Drupal) will be needed prior to fully specifying the technical design.

The final two sessions of the working group served to review our progress and assess our conceptual design for the online professional development network using a set of questions shared by Joni Falk, author of the authoritative text "Creating and Sustaining Online Professional Learning Communities". (See appendices H through L for summaries of each session.)

Deliverables:
The deliverables of the IWG included a white paper, documentation of the conceptual, technical, and user interface design, and an implementation plan for the network. The working group outcomes also contributed to the development of an NSF-Computing Education in the 21st Century (CE-21) proposal entitled "New Mexico Computer Science for All" submitted on April 27, 2012.

White Paper: An Online Professional Development Network for the Project GUTS community.

Project GUTS: Growing Up Thinking Scientifically is an afterschool science, technology, engineering and math (STEM) program for middle school students based in Santa Fe, New Mexico. Project GUTS serves middle school students across New Mexico and partners closely with the Supercomputing Challenge to offer teacher professional development in computational science. Project GUTS is hosted by the Santa Fe Institute and has been funded by New Mexico's Experimental Program to Stimulate Competitive Research (NM-EPSCoR), the National Science Foundation, the Bengier Foundation, the Los Alamos National Bank, Lockheed-Martin Foundation, the New Mexico Public Education Department Math and Science Bureau, Los Alamos National Laboratory Foundation, and by private donors.

The Project GUTS community consists of the teacher club leaders, facilitators, and coordinators/ managers of the Project GUTS program. The community consists of people new to the use of any technology in education to those who are expert in modeling and simulation as well as use of various technologies in the classroom. The current practitioners span various dimensions that pertain to their implementation of Project GUTS clubs including: STEM content knowledge, teaching experience, programming experience, math skills, access to technology, comfort with technology, physical location, grades taught, subjects taught, position at school, pedagogy accustomed to, time constraints, and passion for the topics (computational modeling, inquiry science, computer programming, and complex systems.) Our community includes novice, familiar, and expert Project GUTS practitioners. Project GUTS was initially designed with a professional development model in which novice club leaders progressed to be facilitators (able to lead a Project GUTS club without external facilitation) over a three-year period. For the first 4 years (2007-2011) this trajectory seemed to accurately model the development of club leaders into facilitators. In the 2011-2012 year we saw a large turnover of club leaders (especially in Santa Fe) that was detrimental to the development of future facilitators.

Our goal in creating an online professional development network (OPDN) was to offer better support to our community members while leveraging the knowledge base of our community. Our hypothesis is that community members can and will support other members' learning through regular interaction online within an environment specifically designed for this purpose. If successful, such an environment will allow Project GUTS to meet the needs of distal club leaders and may reduce facilitation costs if club leaders are able to get questions answered and develop skills faster through an online network.

In a front-end survey of our community, 75% of respondents (n=32) felt they would use an online professional development network for Project GUTS. This is not surprising due to the technologically focused nature of the Project GUTS program and the teachers it attracts. 95% of respondents who were interested in using an online professional development network (n=23) stated that they would like to use the network to "learn to program". The top three features of an online network that respondents expressed interest in were: a) learn to program videos and webinars (52%), curriculum discussion (38%) and general GUTS questions and answers (28%). The majority of respondents reported being online at least part of the day: 39% reported being online 1-2 hours per day; 16% reported being online 3-4 hours per day; 16% reported being online 5-6 hours per day; and 13% reported being online 7-8 hours per day. Respondents seemed to be split into two categories; either they used social networks daily or not at all. Most respondents said that they already use the internet or web resources for personal learning or professional development.

The current Project GUTS website (projectguts.org) is used primarily as a resource archive site. The home page has received over 300,000 hits over the past 4.5 years. Of the pages open to the general public, the areas receiving the most "hits" are: Join Project GUTS (15222 hits); About Us (11475 hits), Video tutorials (10645 hits), Science pages (10536 hits), Publications (9773 hits), Announcements (9577 hits), and Cookbook pages (8213 hits). Of the pages accessible only to club leaders and facilitators, the most viewed pages were within the Teacher / Club leader resources section, primarily the "Curriculum and tools" page (5262 hits). The current projectguts.org website can be characterized as a broadcast site with little two-way communication. Program coordinators and curriculum developers post new materials (one-way) and club leaders submit logs and comment on implementation (one-way) there is not the straightforward mechanism for two-way communications on the site. Emails are commonly used for this type of communication but are not captured in a way that could be shared with the larger community. Students using the site have limited access to curriculum. Though students are able to post their models, comment on posted modelsm, and blog, these features are underutilized. Currently, teacher club leaders have not used the blog and upload features of the site.

There are important lessons to be learned from others who have implemented and studied teacher professional development. The best practices include taking into account how people learn, how people develop expertise, and how communities of practice form and support participation. Specifically, from the work of Branford ["How People Learn"], we know the importance of detecting and addressing misconceptions using formative assessment. From the knowledge base on developing expertise and the progression from beginner to expert, we know one needs facts, concepts, retrieval and application or transfer of knowledge. Building conceptual understanding is necessary but not sufficient in the development of expertise. To build meta-cognitive skills it is important to include acquisition, reflection, integration and participatory practice. Experts recognize patterns, the organization of content knowledge, and how knowledge that is conditioned. Adaptive expertise is the goal, not static knowledge. Communities of practice can be used to develop adaptive expertise and a venue for participatory practice. Becoming a member of CoP- often begins with peripheral participation.

In professional development focused on computer science teachers, three key elements have been CS concepts, teaching and learning through inquiry, and developing equitable classrooms that take into account the classroom culture. Pedagogy and content are offered in a 1-to-1 ratio. Communities of Practice (CoP) have been used to foster reflection and growth. Teachers have used CoPs to plan lessons, discuss strategies, and review what works, for whom, and in what context. Developing reflective practices and pedagogy is what helped teachers own the material and become leaders of community. Leaders were able to modify and share curriculum and serve as district champions for integrating CS education into the regular school day. Pairing novice CS teachers with more experienced teachers aids in providing coaching and instruction. Working with several teachers from the same school also aids in sustainability of the programs within schools. Providing teachers with prepared materials such as slides, worksheets, projects, grading rubrics, videos, posters, books and online resources eased the planning and implementation demands for new teachers. Incentives such as stipends, professional development credits, endorsements and certificates, were used to successfully motivate teachers. Hands-on activities also were seen to increase teacher motivation.

Different audiences have different needs, different amounts of interactivity, different anticipated products. As more and more people have become savvy with technology, their needs in terms of interface design change and their views on community membership, and level of commitment to participating online change. Many may want to tune you out because of information overload. People may want to limit the influx of data so providers must have really good reasons to ask others to join an online community. Information should be made available in digest form. There needs to

be a critical mass of contributors for communities to thrive – typically 80-90% are lurkers and only 10-20% post. (This may be a high estimate, some put the percentage of lurkers at community sites at 98%.) While most people will browse, community designers must take into consideration which community members will post. Some online communities have assigned correspondents, moderators, and reporters. It is important to find the constituents who want to collaborate, communicate, and share resources, and support them.

There are four different types of online communities of practice: Type 1: Broadcast sites with no communication; Type 2: User groups. End users with posts; Type 3: Collaborative resource centers where users primarily share resources; and Type 4: Collegial social networks. As previously mentioned the current projectguts.org site is Type 1. In order for our community to grow from a type 1 to one including features of a type 2, 3 or 4 more is needed than just the infrastructure to support this use - professional development on how to use the tools and model their use during professional development workshops. Typically the measures of success for online communities are the number of hits, pages, and community members. These measures may no longer be adequate as information from sites get broadcast to other sites and not easily counted. More pertinent measures may be increased access to shared resources that the community deems important, and increased discourse within networks. This can take the form of discourse during webinars, think out louds, collaboration on shared projects, and members' sharing of findings.

The Project GUTS community has several aspects of a community of practice already. Community members have formed collegial bonds and relationships with one another, they meet face-to-face several times a year and share information, they develop solutions and modifications to the materials we provide, and they request information from others they feel are more advanced or more proficient. Thus far, these aspects are largely carried out at face-to-face workshops or via private communications (email). The development and utilization of an online professional development network could further enhance the Project GUTS community's interactions and growth by:

1. Enabling online sharing of materials (community contributions),
2. Providing a way for teachers to learn programming, share information more regularly,
3. Recognizing and sharing expertise of all members of community,
4. Allowing for virtual visits between clubs and club leaders, and
5. Making documentation a shared responsibility.

IWG participants provided many ideas for tools, mechanisms, and steps to take that would augment and enhance the existing Project GUTS face-to-face professional development offered at workshops. Each is summarized below.

Recommended functions and features of the Project GUTS OPDN:

Proficiency development: (building ladders to progress from novice->familiar->experienced)
For novices we need to provide social and resource networks, pair programming experiences and mentoring as in a big brother/ big sister program. A more experienced club leader will be paired with the novice. We should schedule the novices' clubs to run one week later than the others so novices can utilize the reflection forum, mentoring, shared programs and ancillary materials developed by more experienced club leaders. For familiar and experienced club leaders we have them lead PD sessions, reflection forums, web meetings and other GUTSEd functions. All club leaders participate in "help" forums where club leaders are expected to post questions so they can be answered by the community. Answers are placed in the FAQ or left on the forum so they can be found by search. We should offer periodic (monthly) web meetings with club leaders and facilitators. Note: At professional development sessions we should teach how to use the new online network including how to sign up and participate in web-based meetings, how to pair program and how to use the reflection forum. (this changes the nature of our PDs)

Levels & Tools to monitor progress of individuals and of the community as a whole:
Offer a self-assessment (survey or tools?) We need to define in broad strokes what differentiates a novice from a familiar from an experienced club leader (e.g. Novices can run SLTNG programs, do simple debugging). Also we could take video interviews of novice, familiar, experienced and ask club leaders to decide "Whom am I most similar to?" During web meetings and conference calls a facilitator can listen in and identify progress or those needing special attention. These levels and skills are associated with badges and sliders on a panel showing individual progress. Since we will have self-assessments, profiles with sliders, Surveymonkey survey results and site statistics, we can graph and analyze the cumulative growth of the community.

Online sharing of information:
Forums can be helpful to club leaders at all levels. Novices can post questions and familiar and experienced club leaders can participate in extended discussions. After a new question is posted, it is visible on a "recent forum activity" side bar, responses posted to the question can include links to blogs and FAQs. Chat or Skype can be used to give assistance in real time. A "who's online" panel should be available upon login. Blogs can be used for detailed discussions. Blogs can be tagged by subject, for whom this information may be pertinent (new, familiar, experienced), and by topic. Blogs or Forums can also be used for "what's going on in your club?"

Curriculum mentoring:
For novices we need to provide appropriate level of assistance: in-person facilitation at clubs, and online welcome pop-up. Novices need to be able to download curriculum and models easily. They need a FAQ section for trouble-shooting, video tutorials, cookbook pages, online chat functionality and forums. We could give novices guidelines such as 15 minutes of required activity online to build on the expectation of pre-planning for the club meetings, and prepare for the next week.

Assistance for all – also Familiarity and building community (helping people help themselves)
We need user profiles that are searchable so someone can find someone else with more experience. We need an active "chat right now" button that alerts a member when another is online. We need to find a way to get club leaders help – perhaps through a welcome screen. We need categorization of problems and issues, and plenty of how-tos.

Curriculum tailoring and sharing:
For those with familiarity with our curriculum we'd like a way for them to easily share their customizations and adaptations our content/lessons. They should be able to upload and share content, see comments and critiques of curriculum pieces and resources, contribute to the model discussion forums, create and post videos to assist others in expanding models. We need better model documentation such as the NetLogo model description template (What is it? How does it work? Things you can do with it? Etc.).

Pair programming:
In pair programming a novice would be paired with an familiar or experienced club leader, and a familiar/ intermediate would be paired with an experienced club leader. They would build models or solve short challenge problems using the driver/navigator paradigm while online. The tools needed to accomplish this are screen sharing, application sharing and thinking out loud, and conveying tacit information. This pair programming could be offered as part of a summer intensive, and for-credit) [find tools] [find research citations on pair-programming]

Webinars:
During webinars we would demonstrate a programming concept. A presenter and a moderator

would facilitate each session. The moderator would watch the chat window and interrupt the presenter if questions come up in the chat window. The community could suggest and vote on the content of the upcoming webinars to make sure the content is relevant to club leaders. The webinars could take a "watch then do" format where the presenter offers up a challenge then waits for the participants to think about the solution (or discuss a solution or work on the solution) prior to showing a solution. Webinars would be offered monthly. We would need online conferencing (Visimeet, gotomeeting, or other), screen sharing. Novices would view the webinar, familiars would view and perhaps moderate the webinar, and experienced would serve as presenters of the webinar. [could we incorporate features of peer-instruction?]

Group mentoring / Online Roundtables:
All PD participants (and club leaders who were unable to attend the PD) start with a base model for a unit. They are given an assignment/challenge to modify the model in some way. They come to the roundtable online one week after a professional development workshop to show their progress, get help from one another and share their solutions. Familiar would learn through practice as a participant, the experienced would facilitate as necessary. [this is something we have successfully done in face-to-face PD workshops in breakout sessions] Roundtables are a known metaphor where Project GUTS participants share their work, often "in progress".

Online "office hours":
Office hours would be offered Monday – Friday for 1 hour each day at the same time when clubs meet. These hours can be used to fulfill the "help me now" function or for planning/reviewing the club meeting/activities for the following week. We could have an open Visimeet session or Google+ Hangout open and announce the URL on the GUTSed homepage and through emails and text messages. Club leaders could bring in a problem – anyone can show up. We may need a waiting list if there are several people waiting. Experienced club leaders could host office hours.

Conceptual design of the Project GUTS online professional development network
The conceptual design is a high level description and organization of the functionality of the site and its intended use. One key decision was to keep the Project GUTS site separate from the online professional development network. The network is specifically designed to be used by teachers who serve as club leaders and facilitators who offer professional development and support to the club leaders. The conceptual design of the Project GUTS OPDN incorporates three main functions: Share, Interact and Practice.

The "Share" feature incorporated typical aspects of a content management systems for organizing and downloading resources with the added features of commenting on and rating individual resources (videos, lesson plans, and activities) and sharing modifications to existing resources.

SHARE: View current curriculum and upload modifications to Curriculum
SHARE: View and upload models, Model documentation page and template.
SHARE: View and upload video tutorials
SHARE: View and upload Cookbook pages / How tos
SHARE: View categorizations/matrices of resources, Q&As, problems and issues.

The "Interact" feature integrated social networking tools for communication (updates, blogging, chat) and for accessing member information. Participants in the IWG suggested the use of badges to show expertise in different content and/or pedagogy areas, experiences, as a means towards asking for help from appropriate persons.

INTERACT: Communicate via Forums, Blogs, and Chat

INTERACT: Post code snippets as images.
INTERACT: Tag content and materials
INTERACT: Rate content and materials / Stars (how useful was this resource?)
INTERACT: Post status updates and activity feeds (SNS)

The "Practice" feature supported scheduling of three types of practice sessions: pair-programming, group project work, and office hours. While the practice sessions themselves would take place using free conferencing and document sharing tools, IWG participants needed a way to schedule partners and work times.

PRACTICE: Participate in video conferencing enabled with document & application sharing.
PRACTICE: Participate in live Webinars or view recorded webinars
PRACTICE: Participate in Pair programming challenges
PRACTICE: Participate in Roundtables with challenges
PRACTICE: Participate in Office hours with announcements on the homepage

Additionally, some key functions were designated as "always available". These features and functions did not fit into the any of the above categories and would most likely be accessed through a side bar. These include: a FAQ, a search box, a "who's online now" pop-up menu, a calendar for event scheduling and a rolling ticker tape of recent posts.

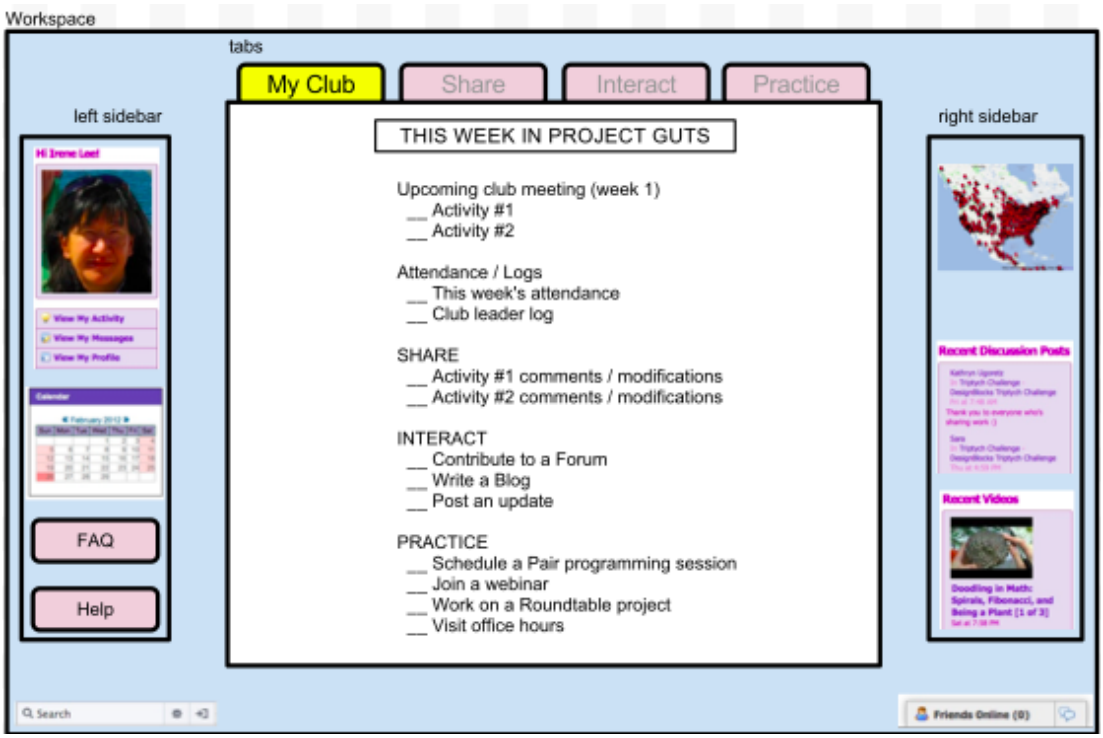
A Member's page is always available. It would be accessed through a button or map of member locations. Some of the functions available on the members page are listed below.

MEMBER: Find members by level of expertise, name, or location.
MEMBER: View member statistics such as number of contributions, participation, etc.
MEMBER: View self-assessments of confidence levels, survey responses, etc.

One's own member data could be viewed on the member's info page.

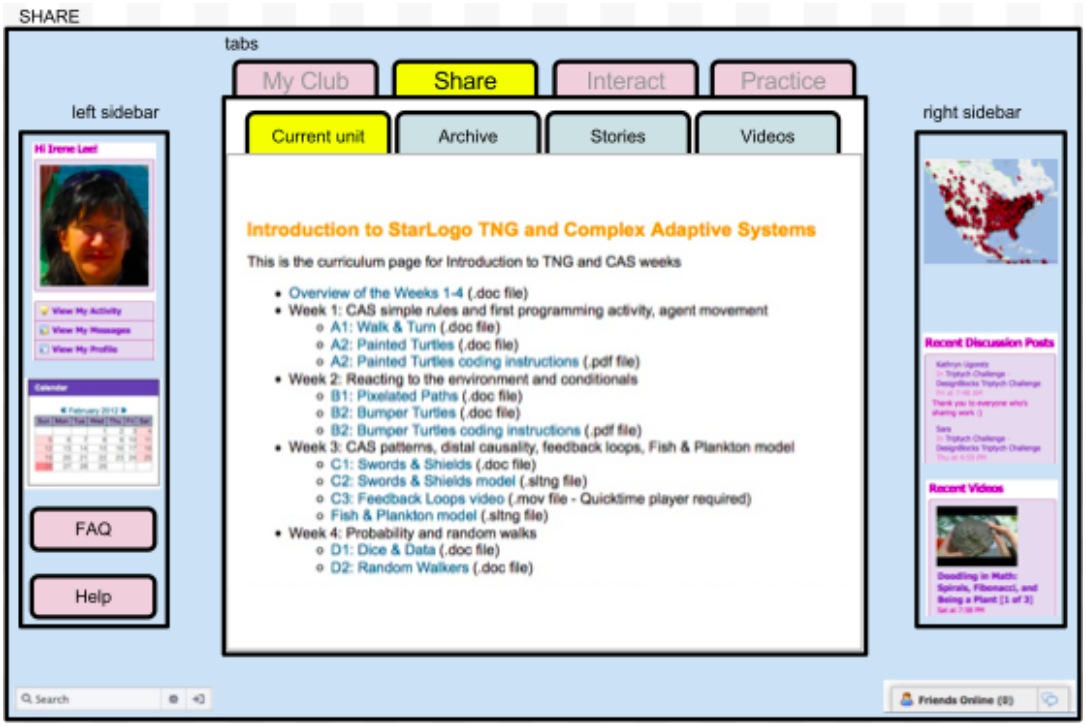
Interface Design of the Project GUTS Online Professional Development Network.
The conceptual design led to an interface design featuring high level tabs / headings for Share, Interact and Practice along with an always-present side bar with the "always available" features. Each high level tab corresponds to a webpage with the specific functionality for that heading. Two interface design elements or metaphors were suggested by IWG participants for quick access and ease of use of materials and functions on the network. The first was a workspace that helped teachers keep track of lesson plans /assignments and online activities for the week, the second was a backpack to hold bookmarks and links to favorite materials, resources, and videos. One suggestion was that the workspace could serve as a metaphor for a users' home/landing page, and the backpack could be accessible from the users' workspace.

Note: Sketches of the interface were constructed from the notes from the IWG. The sketches aim for functional accuracy rather than visual accuracy. All of the graphical elements and colors are placeholders.

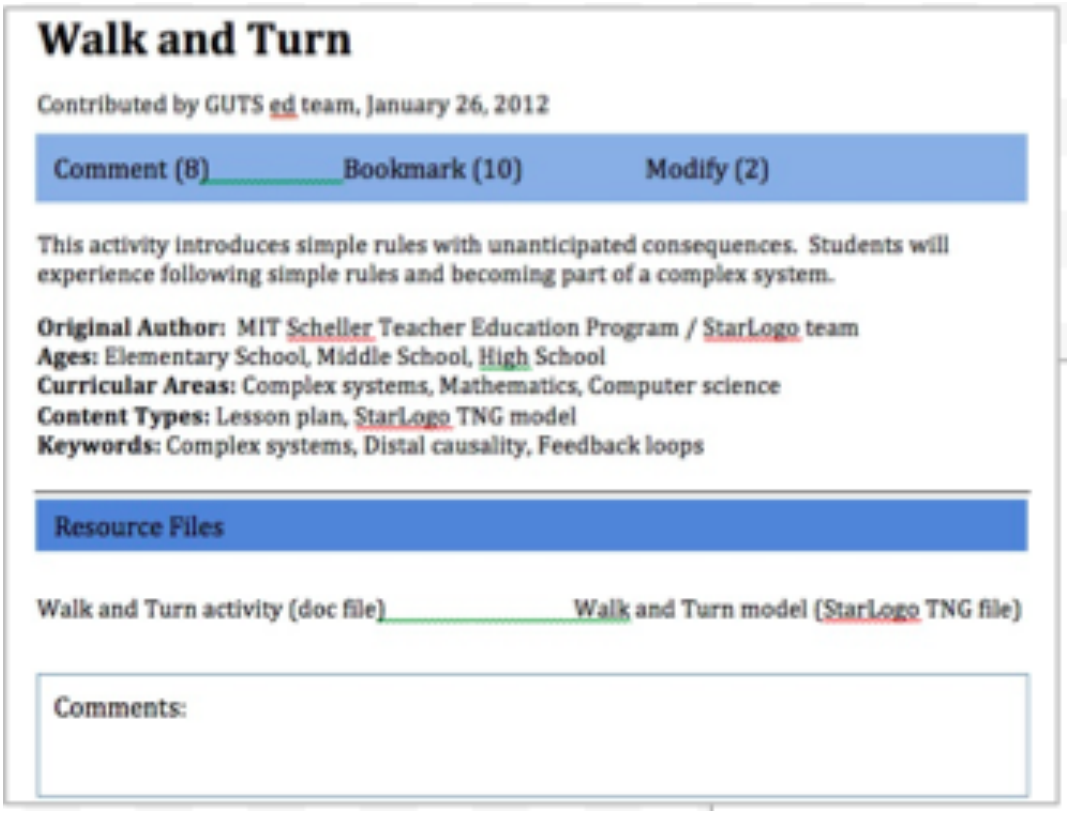


This is the user landing page (My Club) that is seen upon logging in. The user sees that upcoming club activities, logs, and actions possible within the Share, Interact and Practice areas. These actions serve as both checklists and links to other pages.

Selecting the Share tab brings the user to the Share page from which the user can access the current unit, archived units, club leader stories and video. Clicking on an activity within the current unit brings up an activity page.

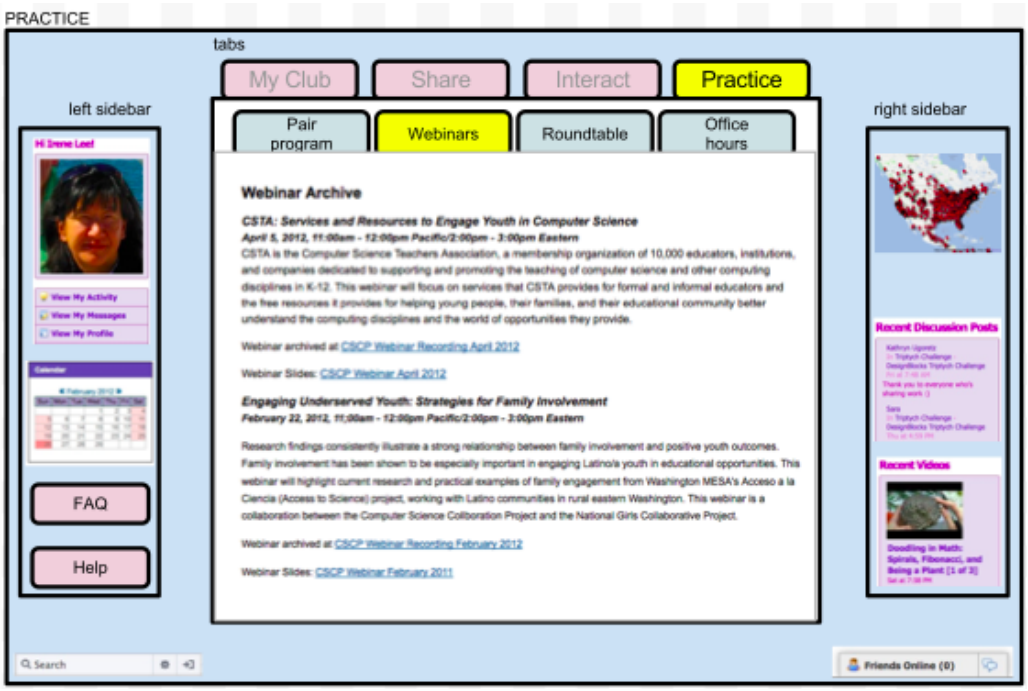


On the activity page (below) the user can download the activity, comment on the activity, and/or post a customization of the activity. All resources will have pages that offer this functionality.



The Interact tab will bring the user to the Interact page. This page has the look and feel of a social network with the ability to contribute to Forums, Blogs, and post updates to the newsfeed.

The practice tab will bring the user to the Practice page. From here the user can sign up for a pair programming session, view recorded Webinars, view recorded Roundtable presentations and view office hours and call in numbers. At this point, the webinars, pair programming practice, roundtables and office hours will be conducted in another online venue using tools such as Google+ Hangouts or Visimeet then recorded and posted to the site. It is unclear how these live online sessions would be sunk into the GUTS OPDN in real-time.



Technical Design of the Project GUTS Online Professional Development Network.
The technical design team at the IWG (Lee, Dynes, and Huang) had several considerations when selecting a technical design. First and foremost, the team felt it was to use as many readily available, open source tools and/or components as possible to reduce costs and development time. Another consideration was the viability of the chosen platform. Established software platforms with large user bases and communities were preferred to newer or less adopted (and tested) platforms.

After considering a number of options the IWG technical group agreed that there were two main candidates for the development platform of the Project GUTS online professional development network. The first option was to use a content management system as the base of the OPDN and then add in social networking features via plug-in modules. Drupal is a flexible open source choice for the content management system and many social networking plug-ins to Drupal currently exist. Many site developers use Drupal and it is free! The current Project GUTS website is developed in Drupal and GUTS development team has experience with installing new Drupal plug ins.

The second option was to use a social networking engine as the base of the OPDN and then add in content pages. The GUTS y Girls online social network is built upon a tool called SocialEngine. SocialEngine offers some simple interfaces for setting up new users, monitoring activity, and posting updates but developing new functionality has proven difficult. Also, while plug-ins are

available at a cost, the quality of the plug ins varies greatly. SocialEngine has a one-time $500 fee for download and installation but the full code base is included allowing for customization.

The technical design team decided that implementing the OPDN in Drupal and adding the necessary social network functionality via plug-ins was the safest way to proceed. Developing a full technical design was beyond the scope of the IWG but the technical design team felt that the progress made on developing the interface design and functionality of the OPDN would lead to clear specifications in the future. The technical design team will monitor developments in new platforms that combine the functionality of social networks and content management sites. If a better tool arises prior to the implementation of next steps, the technical design will change to use that tool.

Specifications:
Drupal is an open source content management platform. To install and run Drupal your web host must meet certain minimum requirements:

- Disk space of 15 Megabytes
- Web server, either Apache 1.3, Apache 2.x, or Microsoft IIS
- Database server: Drupal 5 requires MySQL 3.23.17 or higher, Drupal 6 requires MySQL 4.1 or higher, PostgreSQL 7.1, and Drupal 7 requires MySQL 5.0.15 or higher with PDO, PostgreSQL 8.3 or higher with PDO, SQLite 3.3.7 or higher
- PHP installed: Drupal 5 requires PHP 4.4.0 - 5.2.x (5.2 recommended, 5.3 not supported), Drupal 6 requires PHP 4.4.0 or higher (5.2 recommended), and Drupal 7requires PHP 5.2.5 or higher (5.3 recommended).

These minimal requirements are met by SFI's web servers that house the current Project GUTS site.

Drupal Plug-ins for social networking currently available on the Drupal website:
Activity, Activity Log, Advanced Forum, Advanced Profile Kit, Application Toolbar (Appbar), Author Pane, Buddylist: list your social network, CiviCRM: manage community contacts, relationships, and activities, CiviNode CCK: Tools For Integrating CiviCRM Contacts Into Drupal Content, CiviRelate: Dynamic Relationship Creation in CiviCRM, Comment Notify, Drutalk, FOAF: friends of a friend, Facebook Share, Facebook-style Micropublisher, Facebook-style Statuses, Flag Friend, FriendList, Front: Show group membership and events, Notice Feed, Profile Setup, Question/Answer, Taskbar (communitity builder toolbar), Tellafriend Node, Tray, and User Relationships.

Implementation Plan
As the implementation of the Project GUTS online professional development network is currently unfunded we will reassess the implementation plan as time progresses to keep abreast of technological advances.

Step 1. Reserve the domain name GUTSed.org
Step 2: Request Web Server Space at SFI.
Since we will be using SFI resources we will need to speak with the IT department to reserve and set up the server. We will need an estimate the disk space needed to house the site and all of its content.
Step 3: Review the design specifications: clarify the needs and priorities for development.
Assess which content on the current Project GUTS site will be moved to the GUTSed site.
Step 4: Review the OPDN structure and navigation.
Layout the structure of the site. Create a map or diagram of the site detailing the pages and navigational flow between pages.
Step 5: Implement a barebones skeleton of the site and test the navigation.

Step 6: Review the social networking functionality needed on the site. Assess the suitability of the existing plug-ins for implementing the necessary functions. Once selected, download, install and test out the plug-ins with a barebones site.

Step 7: Reassess the design based on availability and functionality of the plug-ins.
If necessary specify the functionality missing and consult with Drupal developers on the cost and time estimates for developing new plug-ins to specification for the GUTS OPDN.

* REPEAT steps 3 – 7 as needed until design and tools/plug ins are aligned.

Step 8: Prepare the theme and elements for the site.
Define a graphic theme (choose color scheme, design navigational buttons, create a global background image)

- Assemble page text content in a standard format
- Assemble graphic elements in GIF and/or JPEG format
- Gather sound or other media elements that will be used in the site
- Design input forms to collect data
- Collect URL (locations) for any external links from your site.

Step 9: Plug in content (move teacher/club leader resources from projectguts.org to GUTSed.org)

Step 10: Publish & Test

- Post content
- Test navigational structure, links, forms, and look & feel
- Ask others to review and critique the site.
- Proofread site content
- Fix all errors.

Timeline, Budget and Resources needed:
It is estimated that the proposed implementation plan would take 3 months to complete.
A Drupal programmer and resource manager/designer would be needed. The estimated budget is 50K.

Contribution to the CE21 proposal

The design of the Project GUTS OPDN was used to inform an NSF-CE21 proposal called "New Mexico CS for All". In the proposal submitted on April 27, 2012, the following paragraphs were included.

Online Professional Development Network: A NM-EPSCoR funded Innovative Working Group on developing an online network for teacher professional development in computational science was held in February 2012. The PI (Lee) brought together experts in teacher PD, computational science, and online tools for community building, and educators who represent our target audience to design an OPDN. The design took into account current best practices in teacher professional development, new technologies for supporting online communities of practice, and the needs and use scenarios of teachers within the Project GUTS and SC community. An outcome of the working group was the conceptual design of the OPDN that would support a community of practice. It included three functions: Share, Interact and Practice. The "Share" feature incorporated typical aspects of a content management systems for organizing and downloading resources with the added features of commenting on and rating individual resources (videos, lesson plans, and activities) and sharing modifications to existing resources. The "Interact" feature integrated social networking tools for communication (updates, blogging, chat) and for accessing member information. Participants in the IWG suggested the use of badges to show expertise in different content and/or pedagogy areas, experiences, as a means towards asking for help from appropriate persons. The "Practice" feature supported scheduling of three types of practice sessions: pair-programming, group project work, and office hours. While the practice sessions themselves would take place using free conferencing and

document sharing tools, IWG participants needed a way to schedule partners and work times. Two interface design elements or metaphors were requested by teachers for quick access and ease of use of materials and functions on the network. The first was a workspace that helped teachers keep of track assignments and reporting out for the week, the second was a backpack to hold bookmarks and links to favorite materials, resources, and videos. We anticipate that this OPDN design will be implemented using the Drupal content management system with the addition of social networking plug-ins for the NM CSforAll OPDN.

We will sustain teachers' interest and involvement in CS by creating a network of support both in person and online. Building supportive relationships with fellow teachers, and education and CS professionals and being mentored by them is an important element of our plan to retain teachers' interest in CS disciplines and sustain teachers' participation in NM CSforAll. Quarterly one-day workshops and summer intensive workshop bring together participants face-to-face to strengthen bonds within the community while achieving program objectives. The combination of online and face-to-face interactions was found to mutually reinforce the development of relationships, understanding of practice, and building of capacity among teachers (De Souza & Preece, 2004; Goodfellow, 2005; Hew & Hara, 2007; Kirschner & Lai, 2007; Vaughan, 2004).

Included in the NM CSforAll budget was 52K for the development and content management of the OPDN.