MSPnet: Nested Communities Interacting Online

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Introduction

MSPnet is an electronic community of practice (http://mspnet.org) that provides the MSP program with a web-based, interactive electronic community of practice. Its goals are to

- Provide a vehicle for all NSF MSP projects to access and to share resources, emerging research, tools, best practices, obstacles, and strategies.
- Provide each project with an interactive website that will allow for the sharing of resources as well as communication tools to enhance and sustain dialogue between constituents and partners at a distance.
- Enhance the public's access to and knowledge of the MSP program.
- Deepen the research and knowledge base on electronic communities of practice.

In order to design our web environment to accomplish these goals, we needed to undertake two kinds of analysis. First, we needed to develop a model of the community we were to serve. Second, we needed to design a web space that reflected our best understanding of the structure and needs of the MSP community. We fully expected that our initial analyses would enable us to serve the MSP community well, but that experience would provide us with indications for improvement, either in our understanding of the community, or in the tools designed to serve the community. In this paper, we briefly describe our community model, relate that to the resulting website design, and then examine data from the first year and a half of MSPnet's service, to reflect upon aspects of this large, innovative virtual community.

A Model of the MSP Community

As we examined the mandate of the MSP projects, we developed a view of the MSP "world" as a complex of nested communities, While some of these nested communities were explicitly built into the site architecture to be fully functioning portals (e.g. each individual MSP project has its own project URL with structures to support a home page, library, resource center, group mail, discussions and file sharing) other sub-communities (e.g. teacher leaders across projects) were expected to arise as needed through the use of working groups which support sharing of files and discussions. The figure below offers a view of nested communities within the MSP program (Figure 1).

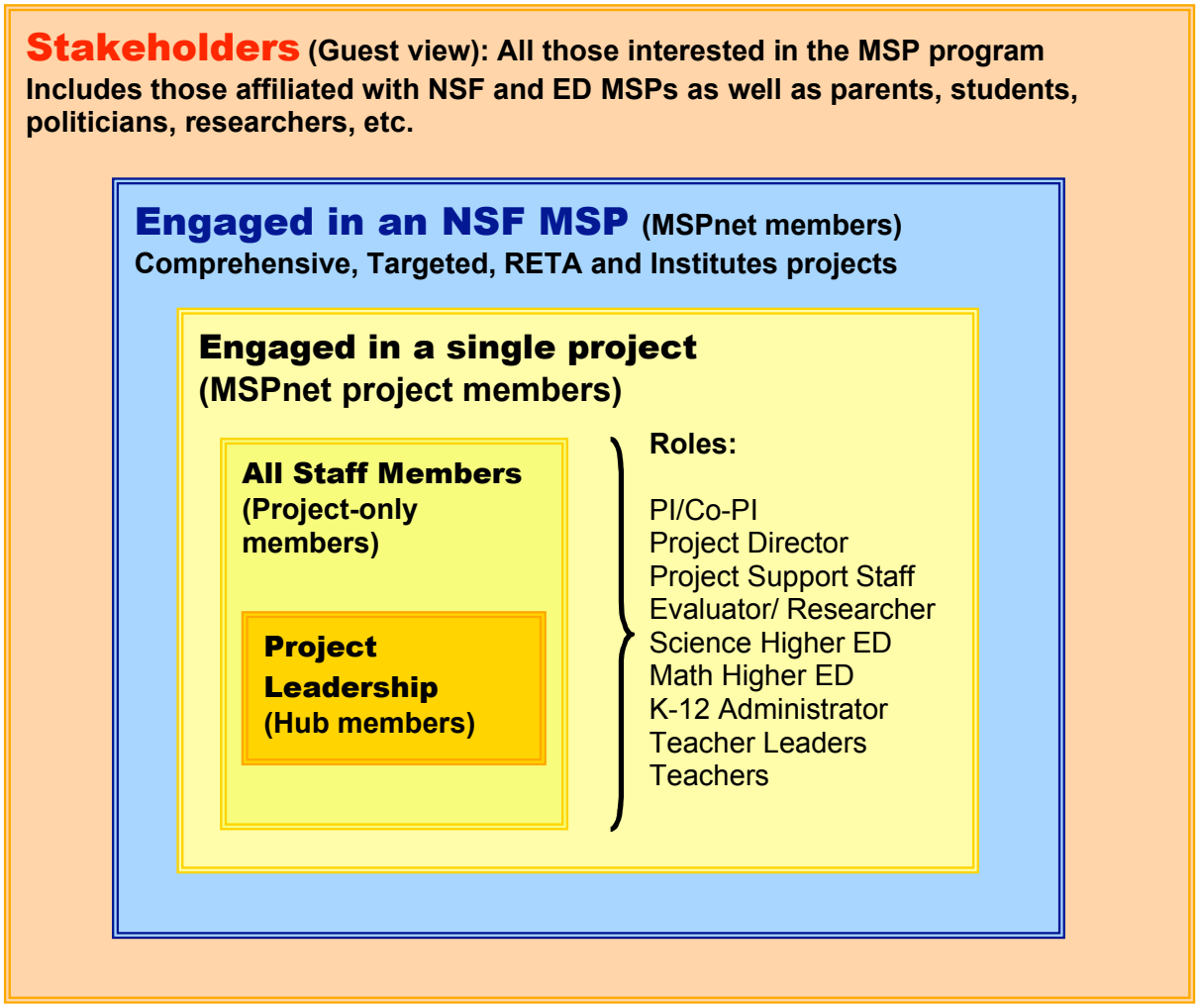


Figure 1. **MSP communities (with MSPnet access status)**

Stakeholders

The largest and most inclusive group that MSPnet serves includes stakeholders and the public who are interested in learning more about efforts of the Math and Science Partnership program. This group is complex and unbounded. It embraces not only those who are directly working on an NSF or ED funded MSP, but also parents, researchers, graduate students, politicians, and other members of the public interested in STEM reform. While this group is heterogeneous and difficult to define, except by a common interest in the MSP program or in one of its projects, we will see below that data suggest that this "stakeholders" community is a substantial one which is increasingly accessing MSPnet. When this group views MSPnet they see a guest view which allows them to read many resources, research, library articles and information provided by each MSP project for the public in the project showcase. However, unlike MSPnet members they cannot contribute to the site, post to or read discussions, comment on articles, or send mail to members of the community.

People engaged in an NSF MSP project (MSPnet members)

A more circumscribed, and clearly defined community, which is a subset of the broadest group described above, are people who are directly affiliated with one of the 71 NSF funded initiatives. These 71 projects include RETA, Comprehensive, Targeted, and Institute Initiatives. While people within this group have different visions, goals, and tasks, they share several commonalities: All of these projects come under the NSF umbrella and have similar reporting structures and demands for data collection. Members of these projects meet at workshops and conferences designed to share their work with other MSPs. All of these projects are engaged at some level with the five key features of the NSF MSP program, which are: teacher quality, quantity and diversity, sustainability, evidence based design, challenging courses and curriculum and partnerships.

People within this community are eligible to receive MSPnet membership. As an MSPnet member they see a different view of the site which provides greater access both to content and interactive features. When a member logs in s/he sees a customized home page with updates on new additions to the site. Members will also see two tabs (blue and yellow) representing two communities to which they have access (Figure 2).

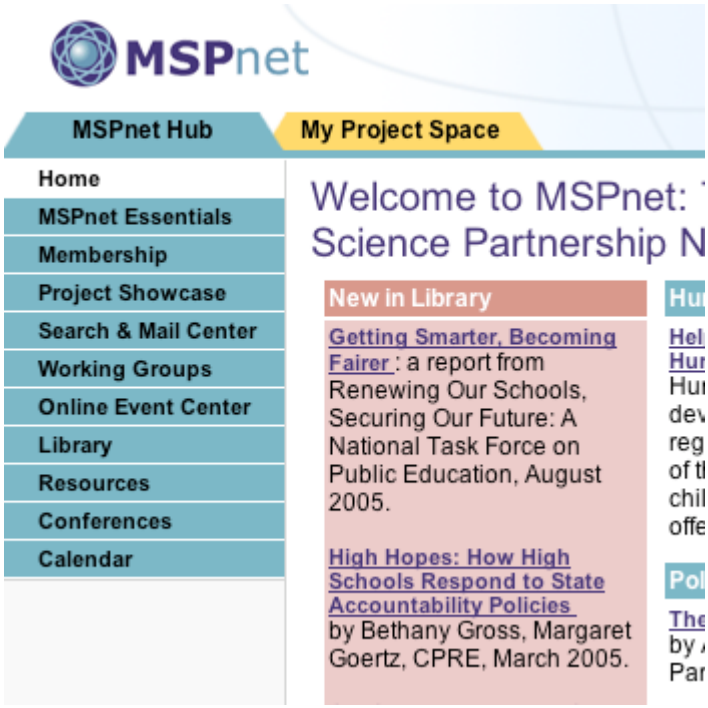


Figure 2. **A screen shot of the MSPnet homepage with two tabs**

The first tab (blue) takes the members to the MSPnet Hub. Here they will find resources, library articles, news, events, discussion groups that are shared amongst all 71 projects. Individuals contribute to building the content of the site. TERC members administer this area, facilitate discussions, solicit resources, and announce new additions to the site. The second tab (yellow) will take the members to their own project's space. Here they will find library and resource items, news, calendars, and discussions that are particularly pertinent to their own project.

Members that are part of a single MSP project

An even more circumscribed community within the MSP structure are those affiliated with an individual MSP project. A singular project can be described as a more tightly knit community, defined in the first instance by the grant proposal which constituted it. While members of a single project may have different roles, institutional affiliations, and expertise, they share a dedication to a common vision described in their proposal and strategic plan. Some projects build on longstanding institutional partnership, and others are forging new relations. Most include multiple partners, and multiple sites of activity, even if the core of the project is a single municipal area.

Members of an individual project will have full interactive capabilities within their project space. Hence they can send individual or group mail to other project members of their own project, constitute private working groups with other project members, leave comments offering their opinions of particular papers within the library. While members of other MSP projects can visit another project's space they will not be granted the above interactive functions.

A project's space is administered by members within the project. Hence each project controls its membership, its content, its facilitation of their community, and the tools with which they will choose to interact with. Whereas some project spaces are well tended, with much effort going towards facilitating discussions, archiving documents, and sharing files, other projects use their space more sparingly. This may be because a project has developed an independent external site, or because there is a lack of technical capacity within the project to tend to the site's upkeep. Hence while the experience within the Hub will be equivalent for members of different projects, the activity within a project space will vary as some projects devote a great deal of energy to create a vibrant online community while others do not.

Communities within a project

Every MSPnet member within a project is assigned one of two forms of membership, (Project-only membership or Hub membership) which reflects one's position and level of involvement within a project.

Project-only membership: The least exclusive community within a project is that of all staff members. This group may include many teachers within multiple districts, teacher leaders, advisory board members, and even some parents. People with "Project-only" membership can read resources in the Hub but have limited communication opportunities to speak cross-project. Within their own project space, however, they can both read and communicate.

Hub membership: Hub membership is granted to the leadership team of each MSP. Each project can elect to have up to 50 people with Hub membership. Hub members receive material that is specifically of interest to leaders (such as invitations to conferences usually sent to principal investigators, policy news, or announcements related to documentation efforts required by NSF. Hub members can not only read resources on the Hub but they can also use the Hub to communicate with leaders across all of the projects, through Working Groups, and by sending mail to individuals or groups who are on multiple projects.

Other emergent communities within an individual project

A single MSP project is itself constituted of many smaller communities (or potential communities); each of the projects is rather different, so we give examples here which suggest but do not exhaustively list the diverse possibilities. There may be groups that share particular roles such as evaluators, or lead teachers. There may be groups that arise from a particular institutional affiliation (e.g. a vertically integrated team of teachers, teacher educators, linked to math/science faculty at a nearby IHE); there may be a leadership team that is composed of members from multiple affiliations. These groups within an MSP may be or become communities (or communities of practice) defined by a particular set of challenges, tasks, processes, and products which they work on over time.

Such groups can create online "Working Groups" which can accommodate large numbers of participants or just a few. Each working group has an assigned moderator, and can make use of tools that enable file sharing and discussions. Moderators may choose to allow all MSP members (even those on other MSP projects) to apply to join, they may restrict access to only members or their own project, or they may choose to make it entirely private and visible only to the specific members within the project who were invited.

The Working Groups structure both within the Hub and within each project space was developed in order to accommodate such emergent groups of long or short duration. Working groups can be created as the need arises. These working groups can include participants from more than one project who share a similar role (e.g. teacher leaders), or they can be topic driven (e.g. discussion of challenging curriculum). They can be created within a project space (e.g. a working group for a project's leadership team).

MSPnet's Design for Community

This general model of the NSF/MSP program, for which MSPnet was to serve as infrastructure, was derived in part from our experience with other large reform projects, and in part from our study of the proposals and other founding documents available to us during MSPnet's design phase. We were also aware that, if these groups and partnerships were at all active and successful, these predictable structures of association and collaboration were likely to be joined — or sometimes replaced — by emergent groups, so that MSPnet should be designed in such a way that such groups could also find a place on the website, and in our community and technical support.

MSPnet is built on top of a complex database which keeps track of each member's access status, and in fact the website that you see when you log in to MSPnet reflects your access status: people from the same project with different access status encounter the site differently, though the differences may be subtle.

As MSPnet has now been live for 18 months it is a great time to pause and investigate how our model of "communities within communities" plays out in practice. Is there a difference in the way the public and stakeholders use MSPnet and the way that members affiliated with an MSP project use it? Are there differences between the way Hub members and Project-only members use MSPnet? How are projects making use of MSPnet for their own needs? Finally, are there differences between people assuming

different roles across the MSP (e.g. evaluators, PIs, co-PIs, teacher leaders, teachers). The data below is a first attempt to investigate some of these questions.

Data Sources

MSPnet developed a Web log data "reports" system which is designed to provide a wide range of data on MSPnet use. The database can be queried for information about user activity in the aggregate, and also disaggregated by individual, role, and project for any period of time. This allows us to identify areas in which projects or individuals are becoming more or less active, as well as other evidence about frequency and level of use.

MSPnet designed and administered a member survey to enable us to look beyond usage patterns, to study the value that MSPnet provides to the community at large. We sent the online survey to a stratified sample of 100 high-end MSPnet users (having been on the site over 25 times between January-June 2005), 100 mid users (having been on the site 7-10 times between January-June 2005) and 100 low-end users (having been on the site only 2-3 times between January-June 2005). Over a seven-week period, we have received 165 completed surveys, 72 from high users, 52 from mid users, and 41 from low users.

Research Questions

This paper will explore use patterns within MSPs nested communities. We will explore the use of stakeholders (public) vs. MSPnet members, use by projects across the MSP program, use of project members who have different roles (e.g. PI, evaluator, higher ed) and differing levels of access (e.g. Project-only member vs. Hub member.)

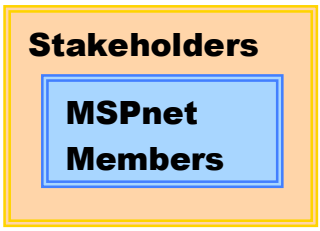
We use this opportunity to examine more deeply what is meant by the term “use.” In order to do so, we explore both breadth of participation as well as depth of participation. We will look at how nested communities are evolving, in their membership, frequency with which they interact and the extent to which they explore once at the site.

Further, we look at the different aspects of the site with which community members interact. This yields insight on the nature of participation.

Last we examine participants’ assessment of the value of this online community to their work.

Results

Differences in Patterns of Use between Stakeholders and MSPnet Members



First we investigate the pattern of use of public stakeholders vs. MSPnet members over a 12 month period from June 2004 to June 2005. In doing so, we will look at the number of unique guests, how many sessions they have, and how many pages they view on average. The number of guests tells something about the breadth of interest, the number of sessions tells us whether these are people who come for a single visit or repeatedly visit the site, and the number of pages viewed indicate how deeply they explore the site once they are online.

As the graph below (Figure 3) indicates, cumulatively the number of unique guest visitors impressively increased over this period from 5,295 people to 89,628, a 17-fold increase. When members of the public visit MSPnet they do not log in, but we are still able to approximate the number of unique individuals who visit the site by using an algorithm that combines information about users IP addresses in combination with their Internet Browser information.

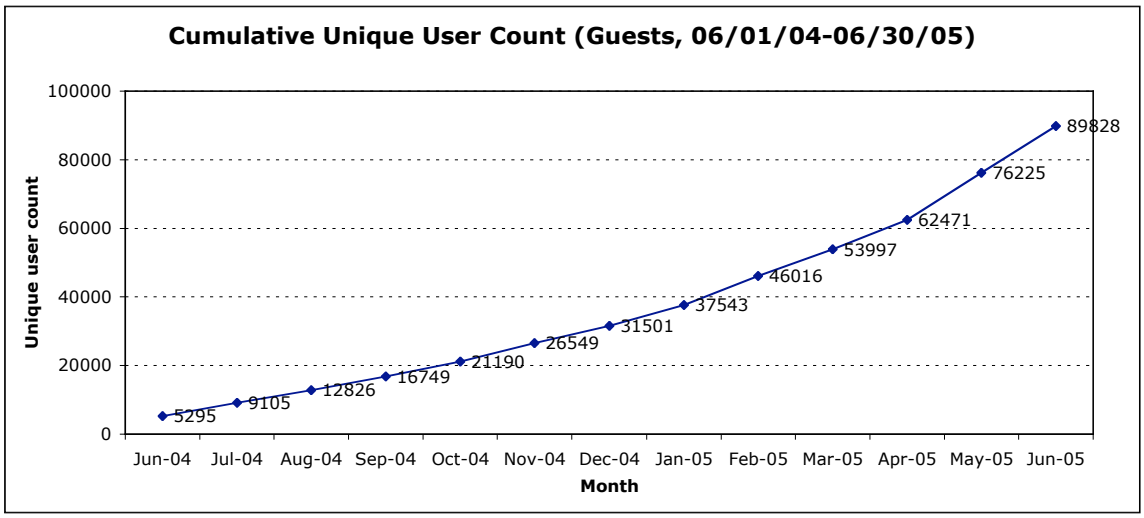


***Figure 3*. Cumulative user count for Guests**

The graph below (Figure 4) shows an upward trend in the number of guests from month to month, with May and June 2005 showing over 15,000 guest visitors during a single month.

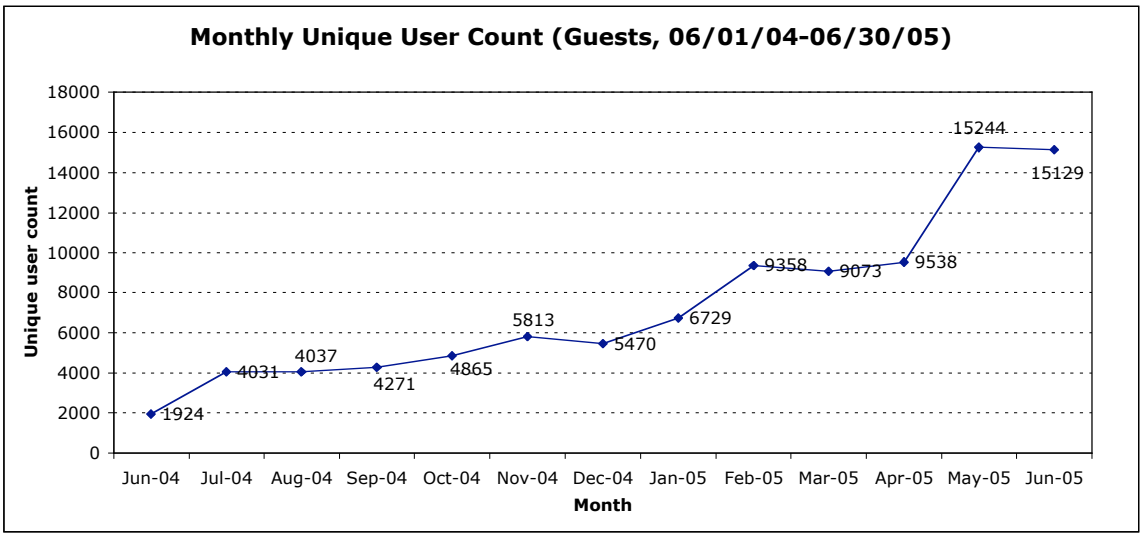


Figure 4. **Monthly unique user count for Guests**

During this same period of time membership within MSPnet also increased but the rate of increase was slower (Figure 5). As the graph indicates, membership increased from 1,039 to 2,516, a growth of almost 142% but still significantly less than the 1,593% increase shown by guests.

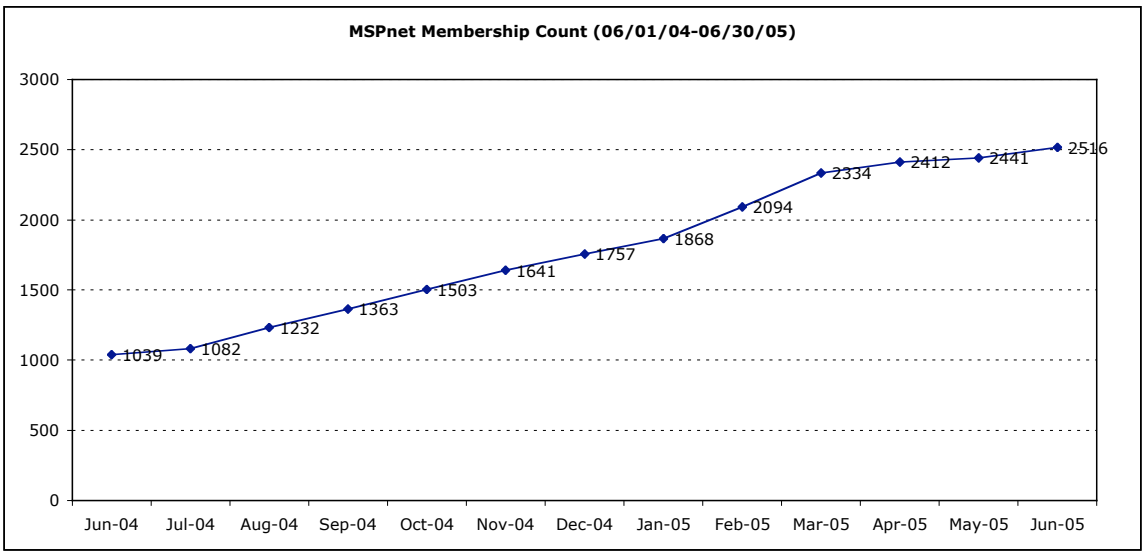


Figure 5. **Cumulative MSPnet membership count**

MSPnet membership can only be obtained by people engaged in an NSF funded Math and Science Partnership initiative. Hence it is not feasible for many members of the public to become MSPnet members. Further, member applicants need to be approved by administrators within one of the 71 NSF funded MSPs. Hence, while stakeholders can be considered (in the broadest of definitions) as part of the community of people interested in Math and Science Partnerships, many of them will never be able to obtain MSPnet membership status and hence their view of the site will be largely restricted to a "read only" view of the site. When guests view the site they only see documents which

projects have chosen to share with the public. While they can view an extensive library of over 500 articles on STEM education and educational change, they are not able to post or view comments of members. Last, they do not see a weekly updated home page which points members to activities of interest to the MSPs and newly added resources.

Despite the greater rate of growth of the public guests as contrasted with the rate of growth of MSP members, further examination reveals that their patterns of interaction with the site differ considerably. On average MSPnet members visit the site far more frequently than guests. Whereas guests have on average 1.3 session counts per user, members have an average of 15.3 sessions (Figure 6). A session begins when a user logs in and ends when he/she logs out or has been inactive for more than 20 minutes.

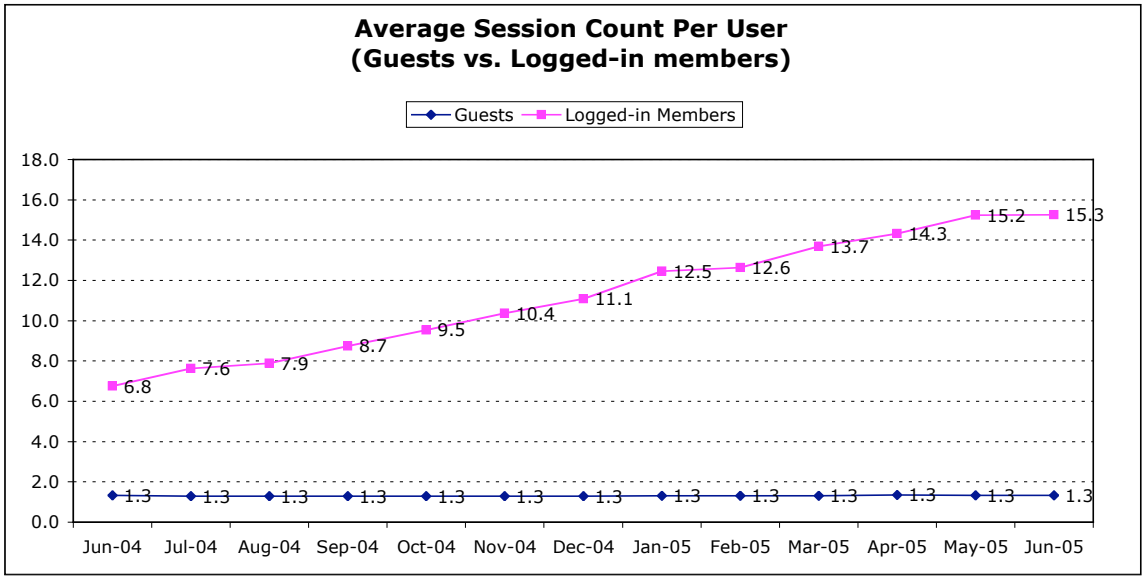


***Figure 6*. Average session count per user (Guests vs. MSPnet members)**

If we examine participation on a month-by-month basis, the data reveals further differences between guests and members. Cumulatively, members have had over 20,169 sessions since launch. Their monthly session count (Figure 7) reveals an upward trend with peak activity around and immediately after the MSP Learning Network conference (January-March, 2005).

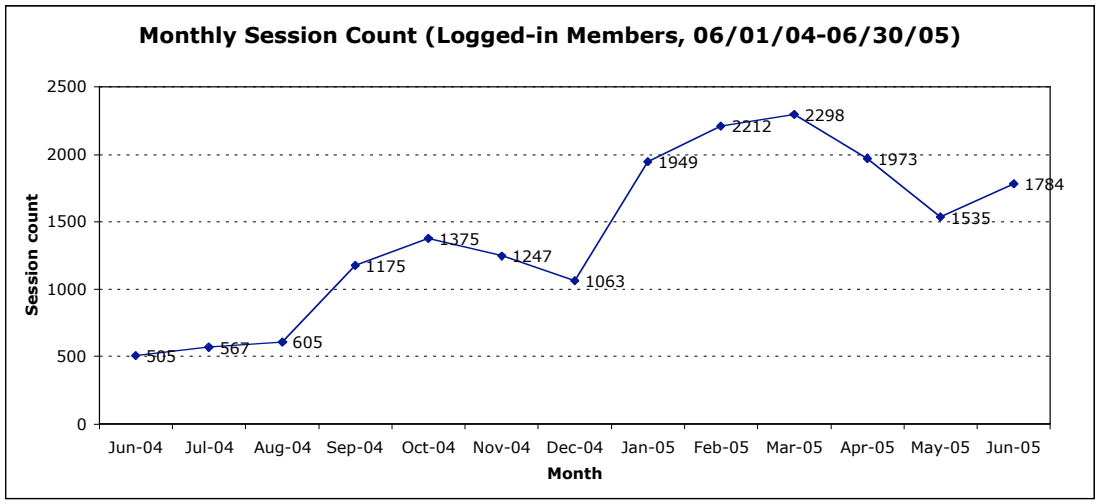


***Figure 7*. Monthly session count by MSPnet members**

In contrast the monthly session count for guests does not show this peak from January through March, and instead reflects a general upward trend (Figure 8).

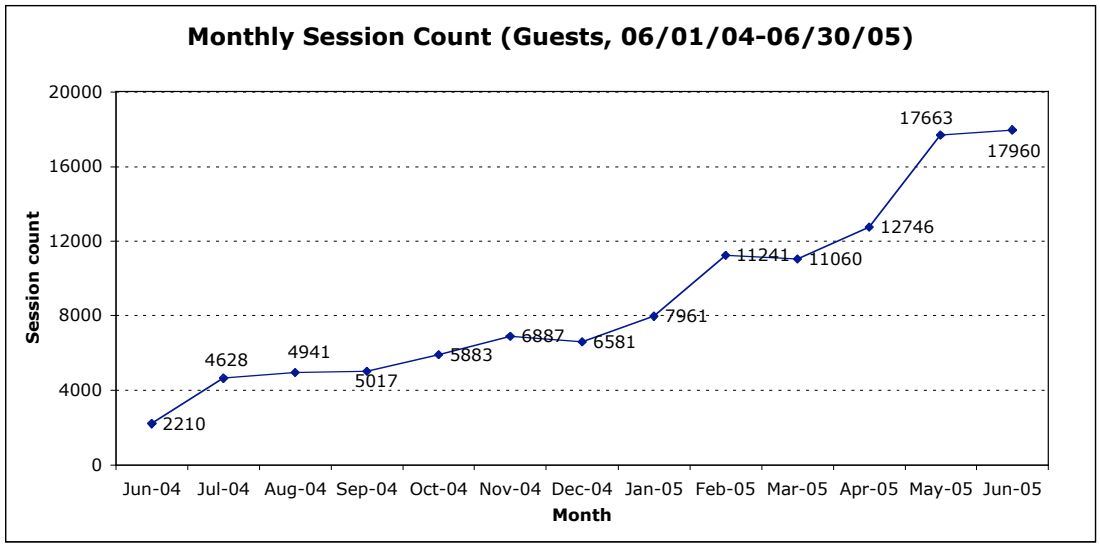


***Figure 8*. Monthly session count by Guests**

In addition to members having more sessions, they tend to read far more pages per visit than guests do. In fact over the last 18 months (since launch) members have read over 227,915 page views, which is an average of 172 pages per logged-in member. On the other hand, when guests come to the site they tend to be far more superficial in their use of the site. Since launch, guests have had a total of 268,644 page views, which is on average 3 pages per guest (Figures 9 & 10).

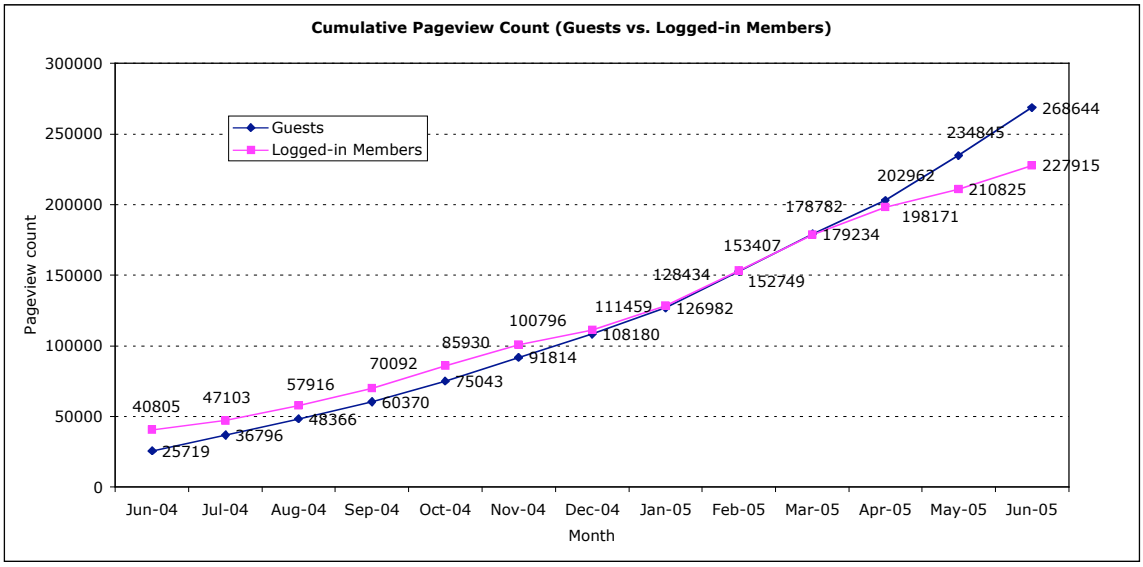


***Figure 9*. Cumulative pageview count by Guests vs. MSPnet members**

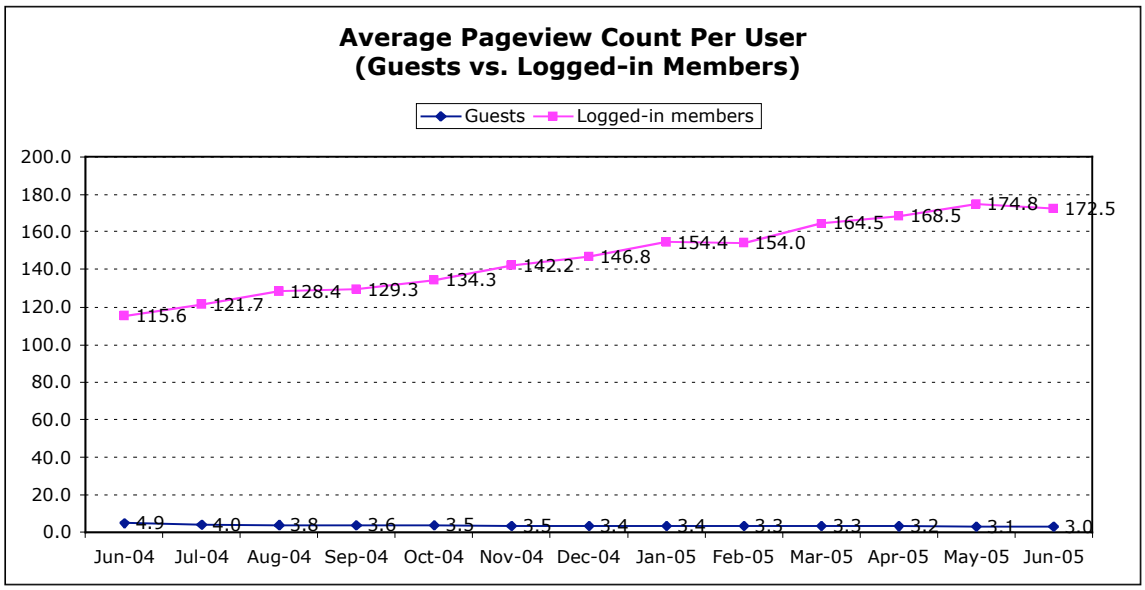
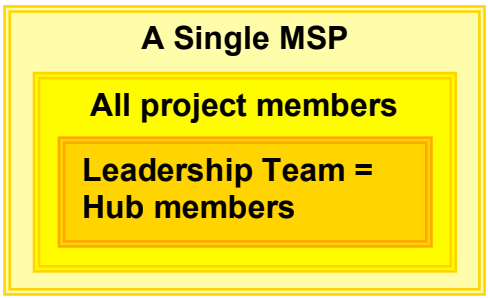


***Figure 10*. Average pageview Count per user (Guests vs. MSPnet members)**

Hence, while the rate of growth in membership for guests far exceeds that of MSPnet members, members' interactions are more frequent and show greater depth. Further, members' patterns of interactions are influenced by face-to-face events offline.

Differences in Patterns of Use between Hub Members and Project- Only Members



Just as the patterns of use differ between Guests and MSPnet members, we see differences between those members who have been assigned Hub membership and those who have been assigned "Project-only membership." Each project was invited to add up to 50 members of its leadership team as "Hub members" whereas other staff and participants in a project are added as "Project-only members." It was assumed that the leadership teams would have more of an interest in communicating cross project with other leaders. From talking to project leaders, we understood that the teachers that they added would be primarily interested in the work going on within a particular MSP, and would not necessarily wish to be informed of meetings, conferences, and research shared between MSPs. While both Hub members and Project-only members could read the material within the library and resource centers of both Hub and Project spaces, Hub members were able to send mail to groups of colleagues across the MSPs where as Project-only members were restricted to sending mail within their project space. In addition Hub members were invited to participate in a cross-project working group where as Project-only members were not.

Hub members are more likely to assume on-line leadership roles facilitating dialogue, adding content, adding and recruiting new members, and updating project information. They are most likely to be the project contact and the project administrator.

When looking at the growth of these two communities over the last year, we see that the community of project members is expanding more than twice as rapidly as the community of Hub members. Hub members had a 2.9 fold increase whereas project members had a 7.3 fold increase (Figure 11).

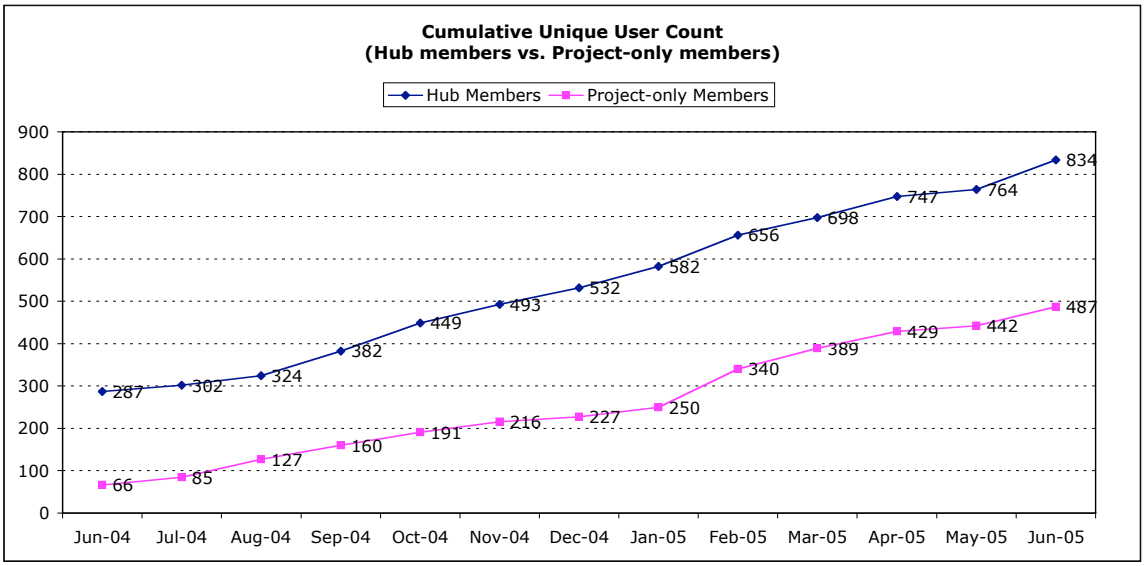


***Figure 11*. Cumulative unique user count (Hub members vs. Project-only members)**

This is likely due to the fact that senior staff of several projects are now interested in extending the online community to teacher leaders and teachers within their districts.

Yet (as with the differences between Guests and Members in general) Hub members are likely to visit the site more often and read more once they are there as seen in the following graphs (Figures 12 & 13). In June 2005, while Hub members have had on average 19.8 sessions and 208.8 pageview counts per user, Project-only members have had on average 7.6 sessions and 110.4 page view counts per user.

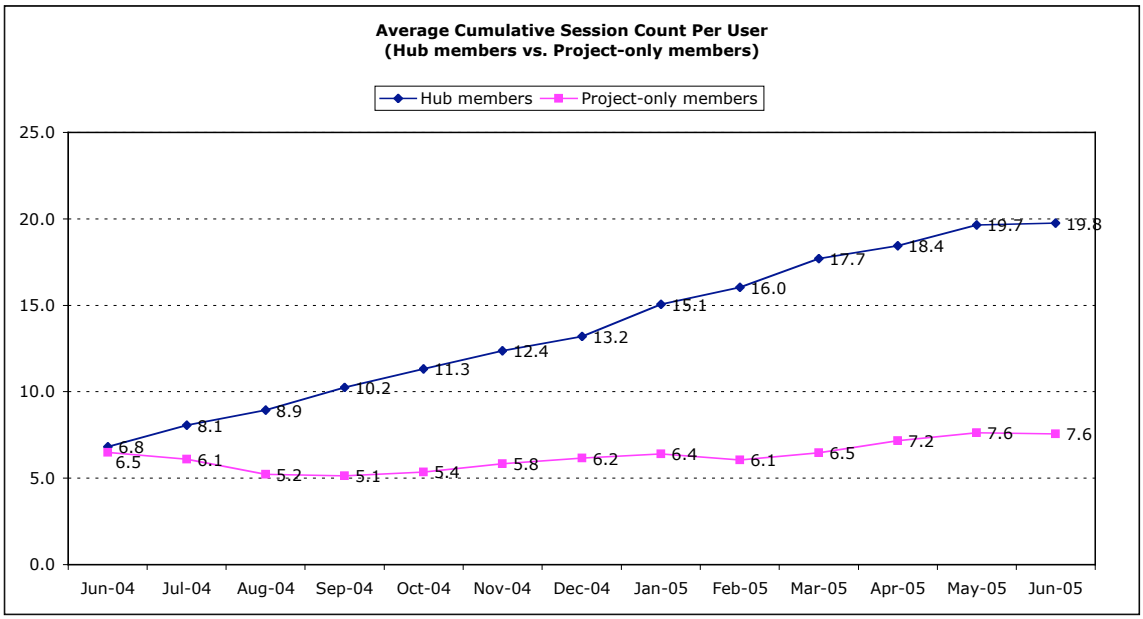


***Figure 12*. Average cumulative session count per user (Hub members vs. Project-only members)**

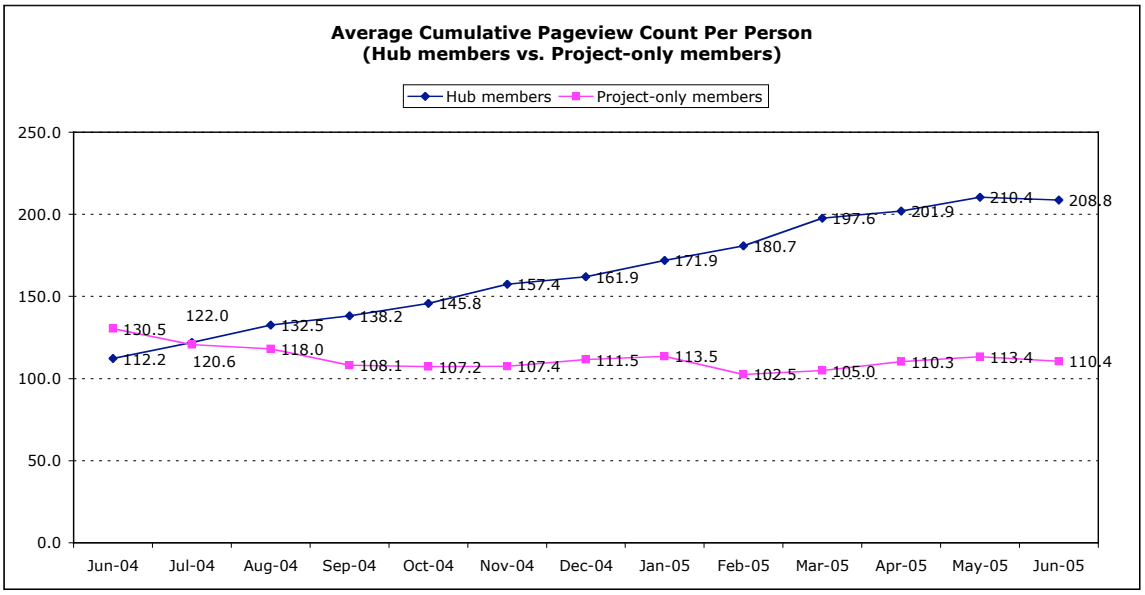


***Figure 13*. Average cumulative pageview count per user (Hub members vs. Project-only members)**

It is interesting to note that whereas Hub members are most likely to frequent the Project Showcase and the Library, Project-Only members are most likely to frequent Working Groups (Figure 14). This suggests that those staff, more removed from the leadership team, are exhibiting an even greater level of interest in collaboration than Hub members. Perhaps these members value online communication as it is more difficult for them to be included in face-to-face meetings held by the leadership cohort.

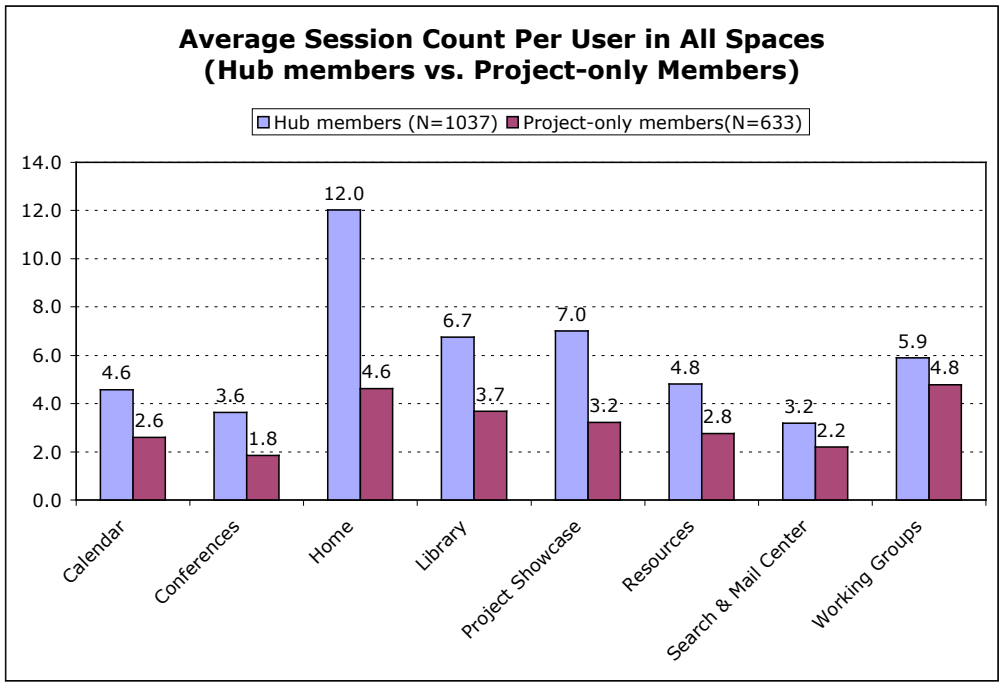


***Figure 14*. Average session count per user in different areas of the site**

Examination of Patterns of Use at the Project Level

MSPnet was launched in January of 2004 when NSF had awarded 51 MSP projects. During the last 12 months 20 new projects were funded. All 71 projects, including all recently funded projects, have logged into MSPnet within the last year. On average 92% of projects log in each month (Figure 15).

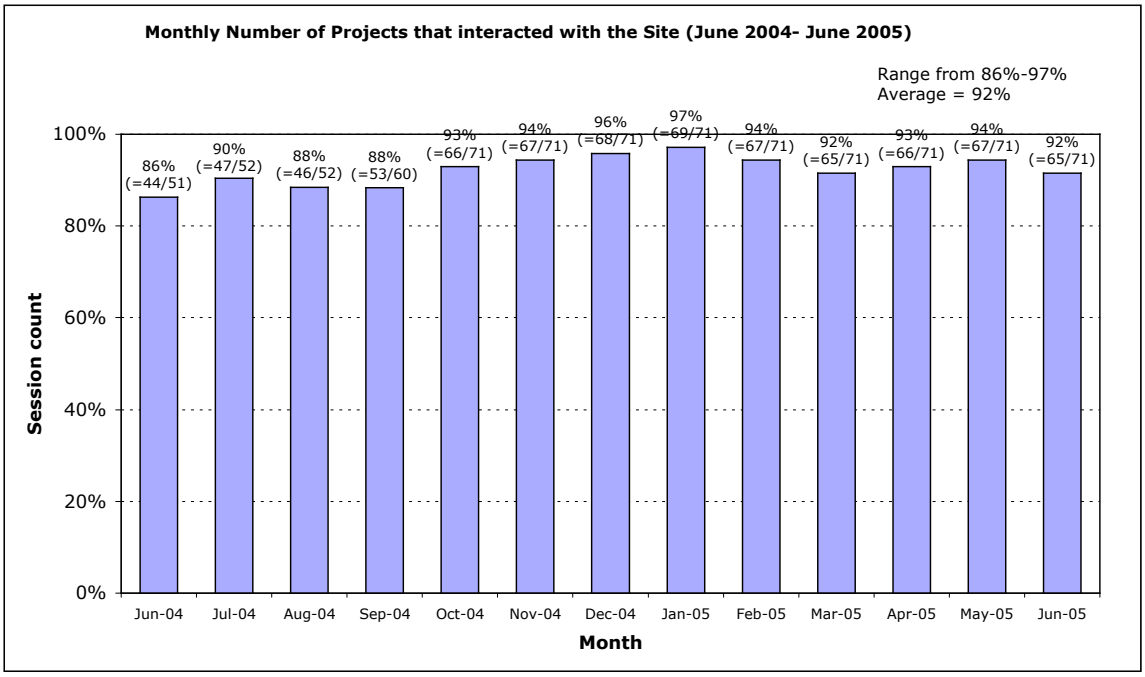


***Figure 15*. Monthly number of projects that Interacted with the site**

Yet, despite the participation of all projects within MSPnet, participation has varied markedly between projects. At the high end, one MSP project has 451 members on the site. On the low end, one project has only 2 members. Factors that affect membership include the size of a particular MSP, the engagement and interest of the leadership within a project of having their members participate in an on-line community, and the need of a project for an on-line community (since some projects have their own independent websites.) Further exploration of factors that affect use are explored in the discussion.

In addition to variation in membership we see variation in the degree of involvement. At the high end one project has had over 2,189 sessions and 22,167 page views, while at the low end an MSP project has had only 3 sessions and 173 page views. These discrepancies cannot be explained by the size of project membership alone. For instance, at the high end one project has had over 70 sessions and 998 page views per unique user, at the low end an MSP project has had only 1.5 sessions and 86.5 page views per unique users.

Participation on the site also varies by role. Within the MSP community there are PIs, co-PIs, Math Higher education faculty, Science Higher education faculty, evaluators, teacher leaders, and teachers. The graph below shows percentage of participation for each of these groups (Figure 16).

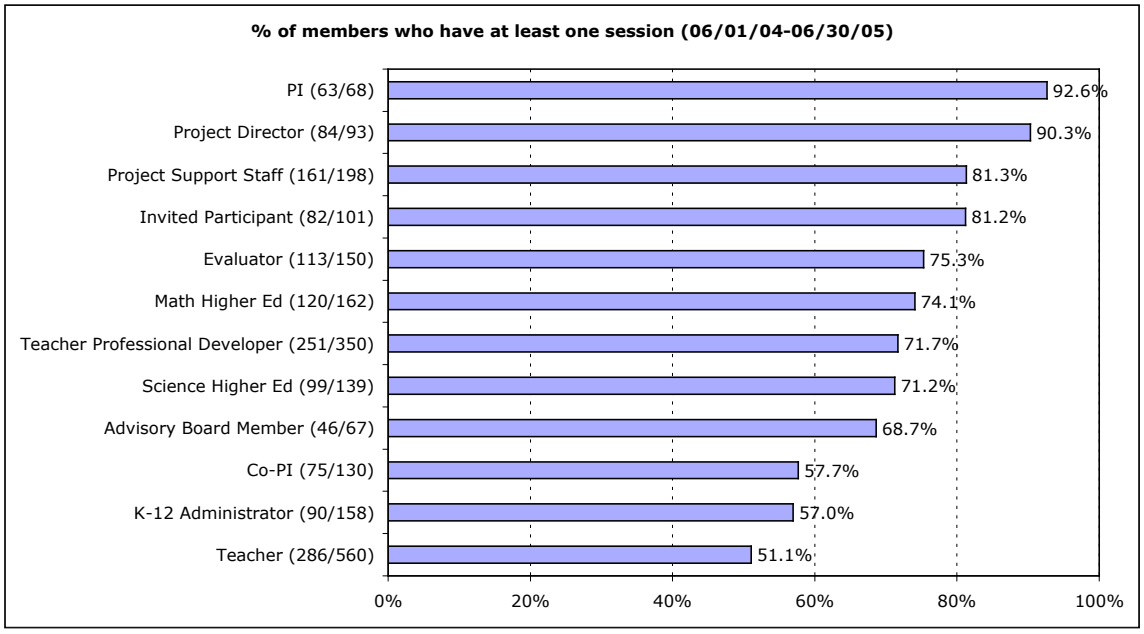


***Figure 16*. Percentage of members who have at least one session**

As might be expected participation is the highest for PIs and Project Directors. These people may have been engaged with MSPnet from the very start and have an interest in following news on the site related to all of the MSPs. It is unclear why co-PI engagement in the site is comparatively low at 57.7%. It is possible that some co-PIs represent an institutional affiliation or partnership but their weekly participation in the project is limited. There is also a discrepancy in the involvement of teacher leaders/ teacher professional developers (71.7%) and teachers (51.1%). While several projects added hundreds of teachers to the site, they may not have yet thought sufficiently about how to engage their participation.

Areas of the Site that Attract Use

For the public who explore MSPnet, the Project Showcase is the most popular destination followed by MSPnet's Library. Both of these provide information on the program and resources. The public is restricted to a "read only" view of MSPnet and therefore they do not have access to the more interactive areas within the project such as Working Groups and Mail functionalities (Figure 17).

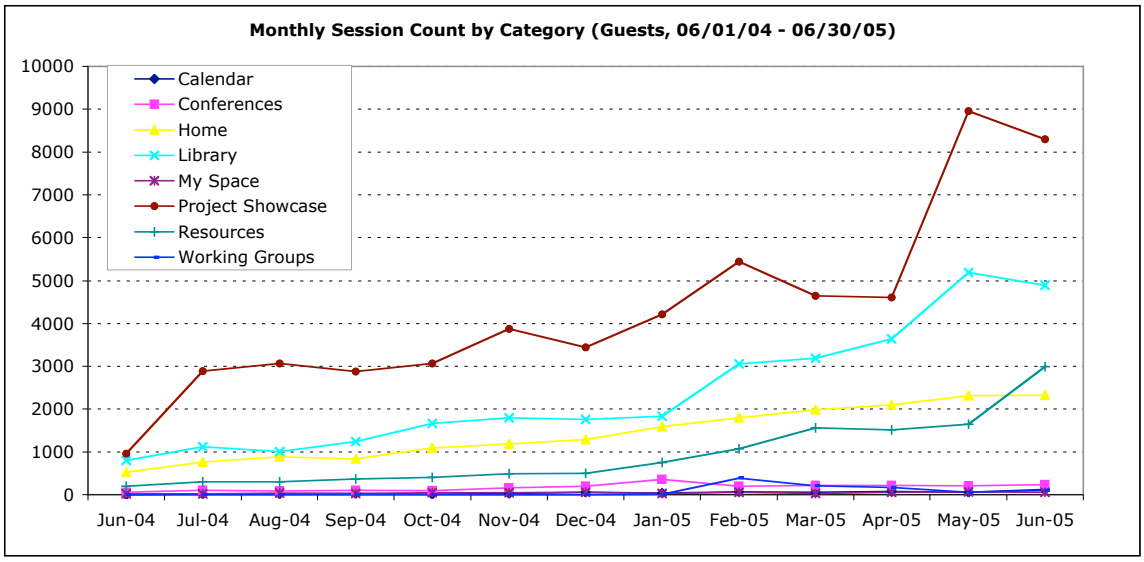


***Figure 17*. Monthly session count by category (Guests)**

In contrast members interact with many areas of the site, those that provide resources as well as those that provide opportunities to communicate and collaborate (Figure 18). The blue line which rapidly ascends in January reflects the introduction of a new functionality "Working Groups" where projects were able to exchange files and initiate discussions with groups of their own choosing.

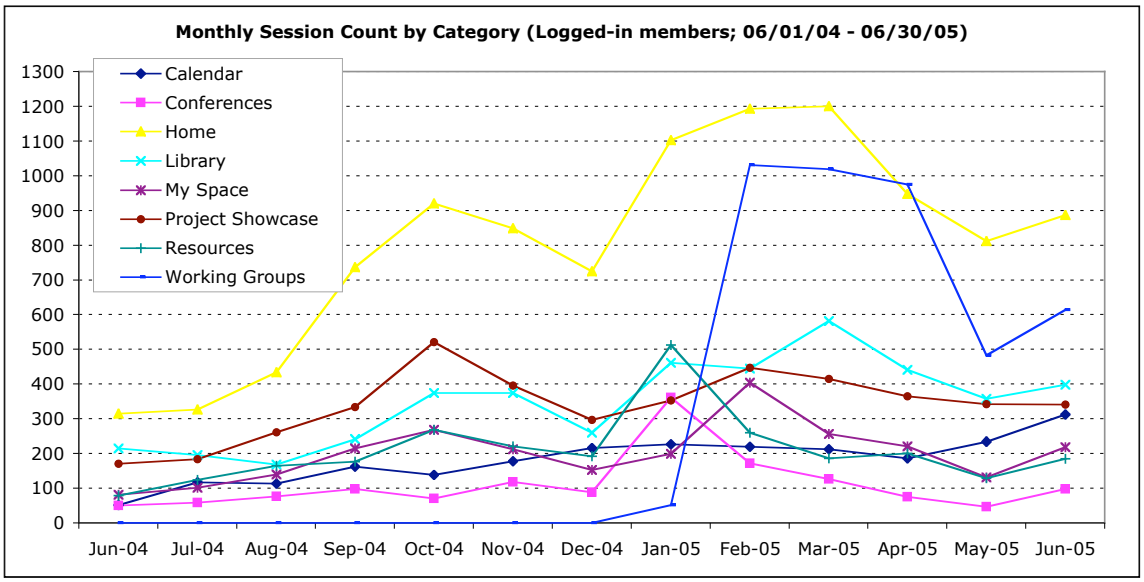


***Figure 18*. Monthly session count by category (Guests)**

The graph below (Figure 19) shows the percentage of MSPnet Members who have visited each section within the MSPnet site. The graph reveals that although the Library, Project showcase, and Resources are visited by the greatest percentage of people, Working groups and the Calendar receive significant participation as well. Hence members are not only using the site to read but also to communicate within and across projects.

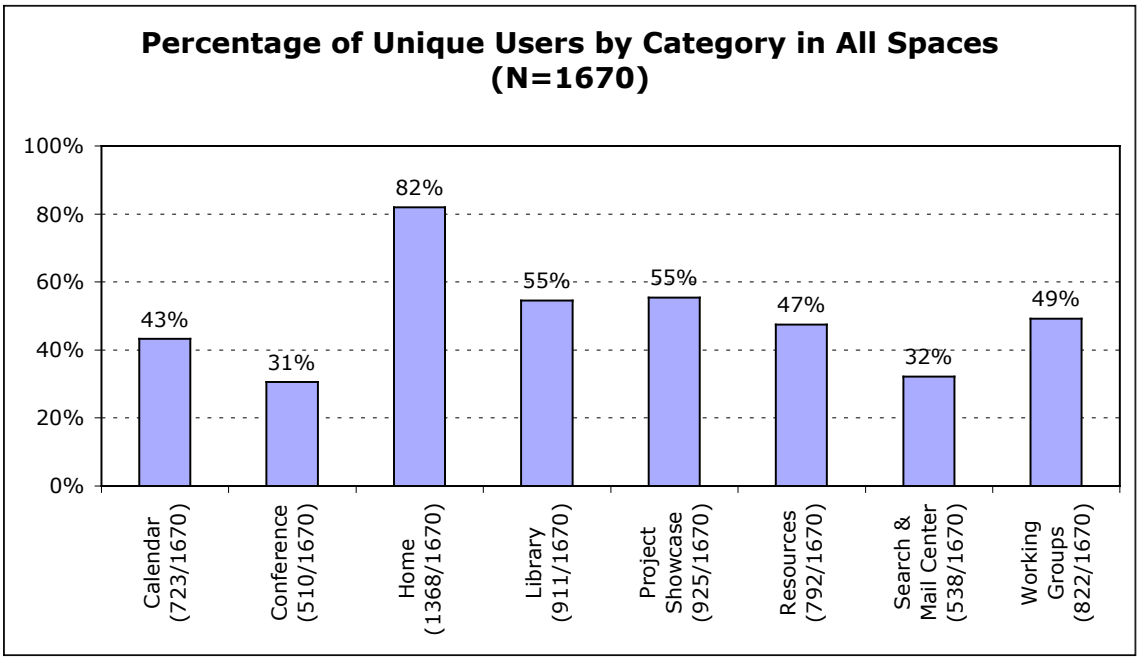


***Figure 19*. Percentage of unique users in different areas of the site**

Assessing the Value of the Site to Members of the Community

One hundred sixty five responses were received from a survey sent to a stratified sample of 300 users (100 high-end MSPnet users, 100 mid users, and 100 low-end users. Of the 165 responses 72 were received from high users, 52 from mid users, and 43 from low users. Hence the results are somewhat over-representative of more frequent users of the site and should be interpreted with caution.

Overall 83.0% of respondents (N=165) felt the site was very easy or easy to use. 15.8% were neutral, and only 1.2% found the site difficult to use. High end users, in general, rated the site as easier to use than did low users. (Group difference was statistically significant at $p < 0.05$).

Eighty three percent (82.5%) of users found the site to be very informative or informative, 16.4% were neutral, and 1.2% found the site to be hardly or not informative. Also, high end users rated the site as more informative than did low users ($p < 0.05$).

Other survey results revealed that the majority of users 'strongly agree' or 'agree' with the following statements (Figure 20).

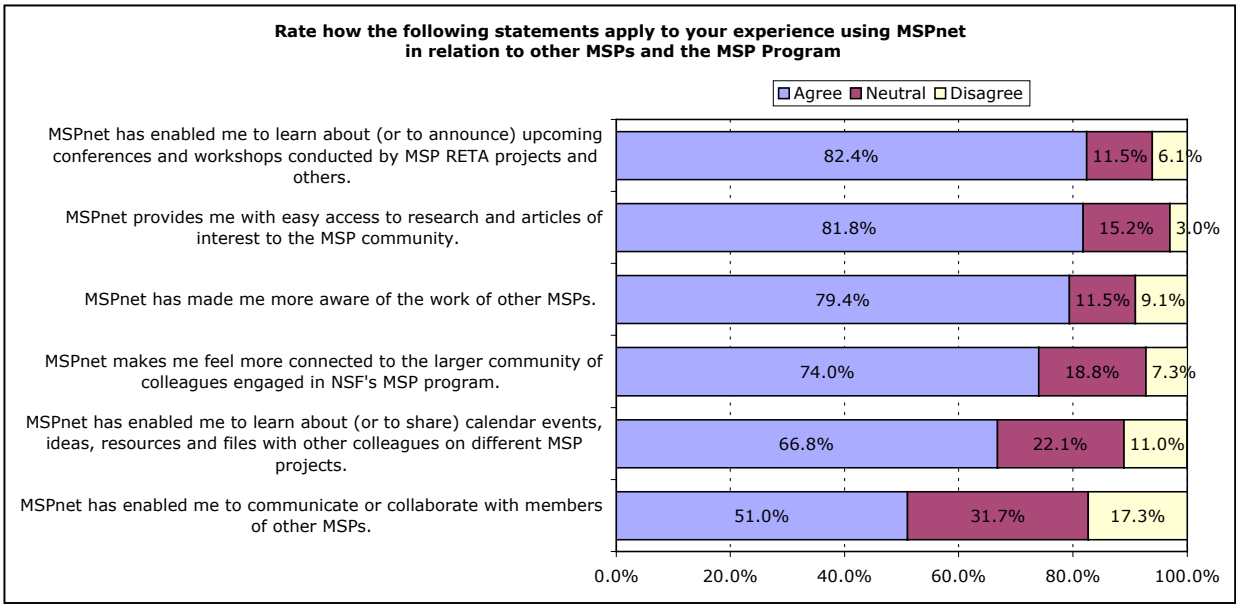


***Figure 20*. Members' experience using MSPnet in relation to other MSPs and the MSP program**

About half of the respondents reported using MSPnet enabled them to collaborate with members of other MSPs. Our experience shows that many users are willing to read, browse, print and share information before they are willing to collaborate online with other MSPs. Yet, still 51.0% of respondents agreed with the statement that MSPnet has enabled me to communicate or collaborate with members of other MSPs. (31.7% were neutral, and 17.3% disagreed.)

Respondents in general were more positive about the value that MSPnet provided to them in relation to the MSP community as a whole, and in being informed about other projects than they were about the value that it provided to them within their community. While some projects have been early adopters and have made significant use of MSPnet within their projects other projects have not done so. Whereas the level of inter-project communication and services is the same for all members regardless of project, use of project spaces on MSPnet varies greatly.

Even so, the figure below indicate that MSPnet is seen as enhancing project work for a significant proportion of users (Figure 21).

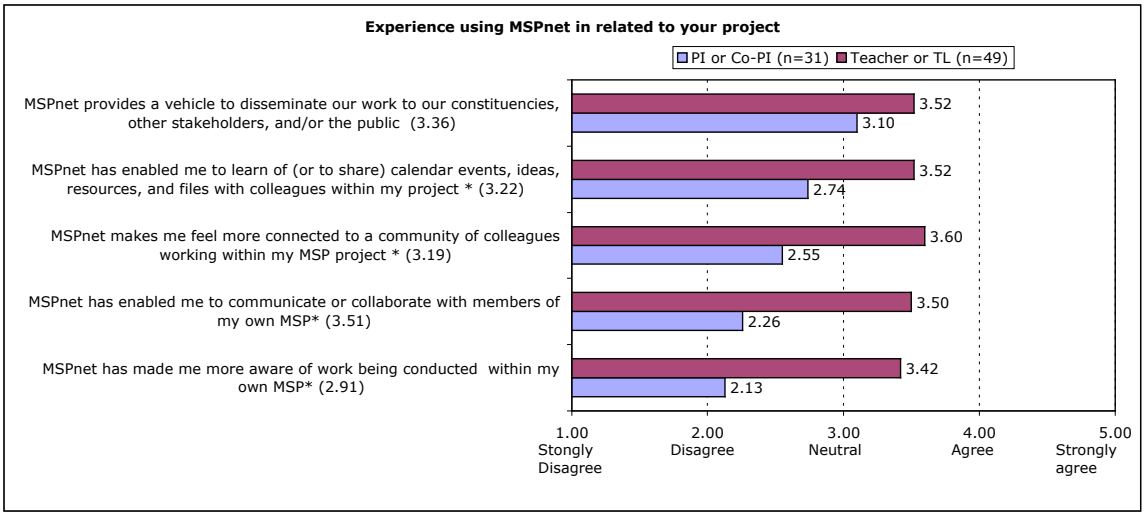


***Figure 21*. Members' experience using MSPnet in relation to their own MSP**

The survey asked respondents to indicate what MSPnet features were most useful. Responses indicate significant variation in what is perceived as being useful (Figure 22). It is clear that with the multiplicity of functionalities, individuals pick and choose those which they will engage with. None-the-less, the six features that were rated most useful for members were: Library, MSP News, Resources, Project showcase, Conferences and Homepage.

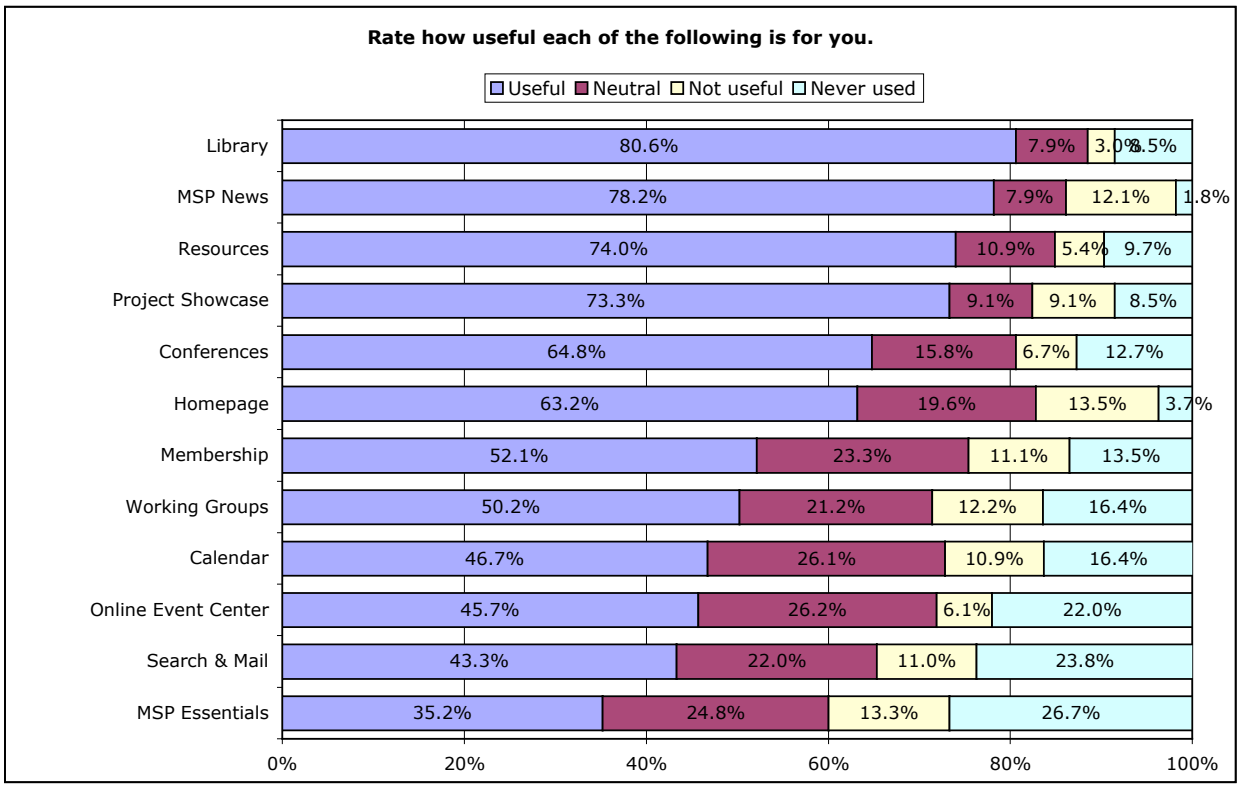


***Figure 22*. Usefulness of MSPnet features**

Ninety-six respondents identified a particular way in which MSPnet has been valuable to their work. In coding their open-ended responses we found that they could be grouped into the following 6 categories:

1. Keeps me informed and up to date on research, articles, and tools emerging in the field.
2. Keeps me connected to events, conferences and work of others in the MSP community.
3. Provides an archive of files and events that are accessible anywhere.
4. Increases collaboration across the MSPs.
5. Increases collaboration within my project.
6. Valuable for dissemination.

We provide some sample quotes representing each category:

1. Keeps me informed and up to date

- "It has connected me to various articles and talks that I would not otherwise have known about."
- "MSPnet has been useful in several ways but access to library resources is wonderful. The articles are pertinent and much easier to access than using a search engine. I appreciate the staffs attention to finding articles and reports related to MSP work. "
- "MSPnet has connected me to articles that I have used not only in our MSP work, but in other projects as well, including a state-funded (Dept of Ed) MSP."
- "It has provided information of various assessment tools that we have found useful."
- "It has helped me learn more about the five key features."
- "I have read more than a dozen articles in the MSP library, which I find to be an excellent resource pertinent to our work."
- "I often look to MSPnet for research to support or spark my own ideas."

2. Keeps me connected to the work of others in the MSP community.

- "I use the Hub to track MSP-related conferences and activities. It is the main source of information on upcoming events."
- "MSPnet provides the big picture. It allows a researcher to keep up to date on general MSP activity."
- "The periodic e-mail that I receive have made me aware of conversations that are ongoing within other MSPs. This has raised my awareness of these issues in our own MSSP and has helped give perspective on the challenges we have faced."

3. Provides an archive of files and events that are accessible online.

- "Easy access to project documents and calendar from any location."
- "The site allows participants to communicate by updating/posting information. The format allows for everyone working on a project to see the latest version and make changes while avoiding duplication of work. "
- "Information on last years conference."

4. Increases <u>collaboration across the MSPs:</u>

- "I find MSPnet to be an invaluable avenue to communicate with other colleagues in the MSP community."
- "It has been most valuable in enabling me to connect with staff from other projects (email, discussions, shared readings, etc.)"
- "I have found out about other teachers and what they are doing in their schools."
- "I have just joined a working group and the messages that have been posted are very useful to me."

5. Increases <u>collaboration and communication within my project.</u>

- 'The project calendar has enabled me to stay on top of events within my project. "
- "We are able to use Working Groups to post and archive files available to a select audience within our MSP."
- "It's been useful to see the different documents that have been created in different activities within our MSP."

6. Valuable for <u>dissemination.</u>

- "MSPnet has allowed me to advertise our workshops to the entire MSP community."
- "I very much value the ability to post press releases on MSPnet and am graceful for the opportunity to reach other MSPs and share news. I also appreciate that once PR is posted it is featured as a highlight on the main MSPnet page. "
- "I love the project showcase feature as it allows us to show to other MSPs (and beyond) the work we do. It is nice to also have an external source timestamp the notice…."
- "As a RETA, I have found the search & mailing and calendar features valuable for disseminating information and events that might e useful for the MSPs. "

Discussion

MSPnet was designed to serve the NSF-MSP world, conceptualized as nested communities. While modern theories about community tend to stress the symbolic construction of a community's boundaries, extent, and internal structure (Cohen 1985, Shumar and Renninger 2002), the MSPnet model of the MSPs is in part anchored by organizational givens: some people are directly engaged in the NSF MSP initiative, and most of the world is not. This membership boundary is a political fact that establishes a clear marker between "inside" and "outside." Moreover, there are other "hard" boundaries within the NSF/MSP component, for example, the boundaries between projects. Members of a particular MSP have a closer relationship than members in different MSPs. The leadership team within an MSP has particular work in common not share by all members of a project. Some emerging communities, however, may in fact, traverse geographic and project boundaries. For example, PIs of all projects may have an interest in sharing management strategies, and teacher leaders across all projects may have an interest in sharing how this role is evolving across projects.

Our data suggests that to a considerable degree the community model (see Figure 1) is reflected in the sites architecture and in patterns of use, over the first 18 months. Furthermore, with substantial activity at every level of the virtual community, it is evident that MSPnet is in fact accomplishing its mission to serve each project, the program at large as well as the public, to a significant degree. Yet we also are seeing interesting dynamics at work, revealed in the differences in behavior of different constituencies.

For one thing, the rate of growth of members increases the further one moves from the center to the periphery of the nested communities. Thus, the number of unique guests is increasing faster than the number of unique members. Likewise the number of "Project-only" members is increasing faster than the number of Hub members (leadership team).

By contrast, the frequency of participation as well as the depth of participation is greater, the closer one approaches the membership of the most nested group: Hub members participate the most, in frequency of visits, number of pages visited, and number of contributions to the site. In turn, MSPnet members (people affiliated with one of the 71 MSP projects) participate more frequently, and with greater depth than do guests. Guests, the most peripheral group, visit the most briefly, and cannot contribute to the site content.

The dramatic growth of the guests visiting the site (representing the non-MSP member Stakeholder community) suggests that public interest in the MSPs is high, and that the MSPnet mission to serve this public is an important one politically, increasing public understanding of the MSPs' efforts and achievements in science and math education reform. Such public understanding is an essential support if the changes instituted by the MSPs are to survive to contribute to education for the future. Though our research on the guest community is in the early stages, our data suggests that Guests come to the site with characteristic interests which MSPnet and the member projects can address effectively. Our current case study work with selected MSPs will provide more insight into the way that these MSPs are conceptualizing their "public" personae, and ways that MSPnet can facilitate an increasingly interactive and informative relationship with the Guest community, which we believe does in fact represent Stakeholders in the reform movement.

Members seem to be using the site for multiple purposes. They are both posting to and accessing the library, resource center and project showcase. Hence the site may be seen as a supplemental resource to those available within each MSP project. In addition they are using the site to share and archive files, to announce and document events, and to share, plan, and collaborate on the creation of documents and events. For active members, MSPnet is being integrated into their work as another, and perhaps unique, resource connected with the other MSP communities. In addition they are beginning to use the site more frequently as a mode of continuing communication, collaboration, and professional development.

We see that members with different project roles show differential activity patterns on the site. This supports the conjecture, embedded in our Web site structure, that such labels as "PI" or "teacher" reflect differences between in the needs of these groups. Yet the evidence also suggests that many of these groups to a large extent do not yet see each other as communities of practice, at least as visible from MSPnet. An

important exception is the teacher-leader group, which over the past 6 months has shown considerable activity on the Hub, as represented by the discussions that have occurred (and continue).

The definition of Hub membership with reference to "project leadership" seems also supported. Hub members tend to be more active, and tend to volunteer more for facilitator or other community roles, than "Project-only" members. Hub members have a higher rate and depth of participation (as defined by session counts and page views, respectively) than Project-only members.

It is possible that Hub members participate in greater depth than project members (and both in greater depth than Guests) because they have the most to gain, in the sense that they see it as useful in supporting their community leadership. On the other hand, it may be that Hub members participate at greater depth because they have receives the most facilitation from TERC staff, who are in direct contact with Hub members in a way that they are not with Project-only members.

This suggests an important area for future work. If Hub members, as they add more members to their project spaces, want their project colleagues to benefit from MSPnet, they will need to give more attention to facilitation on their project space. Project members will need to be encouraged to contribute content to the site, and facilitators will need to give the organization and technical support that will help Project-only members participate in depth. This in turn means that MSPnet needs to provide support to the emergent facilitators in each project; in fact, this is the focus of a new effort to give professional development to people designated as Project Administrators for all the project spaces.

The organizers or creators of on-line communities often struggle to identify ways of evaluating the operation and success of their projects. This paper which draws data from an automated (customized) web log report system in conjunction with survey data attempts to evaluate multiple dimensions of use and success. The log data provides a powerful way to explore the behavior of various constituencies on the site and to see how their patterns of interaction change over time. The community structures that are embedded within the database allow for analysis at a range of granularities, from individual (unique) user up to whole-project, and across all categories of participation and areas of the site. This data, while rich can only present how the site is being used, and where on the site is being accessed. However it does not reveal why the site is being used, and what value members are deriving for its use. To answer those latter questions the survey provides an initial glimpse.

While our data cannot answer all the questions that one might ask about the nature, functioning, and evolution of online nested communities, it provides initial information as to breadth, depth, and frequency of communication, patterns of communities within communities, areas on the site that are attracting attention, and the value that the site has for those who use it. As MSPnet continues its research it will complement our current understanding with case studies of individual projects. These in depth portraits will allow us to further understand communication and collaboration patterns in context, as well as to explore the role of leaders and facilitators in face-to-face and online settings.

References

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