Wiki as a professional development tool

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Abstract:

This paper examines how wiki technology can be used to support teacher professional development. Wiki is a type of interactive web site that allows users to contribute content and editing to the site. This technology can be used in a number of ways, but in each case the contributions of the participants are the key source for information on the site. Wiki technology can provide a space for the social construction of knowledge of a community. The study looks at wiki use in the teacher professional development and by a class of high school students. All users had some concerns about the process but most viewed it favorably. Teachers were much more reluctant to edit each others' work than the high school students. Recommendations for future use include strong scaffolding of the process in the early stages on what to contribute and when to edit pages.

Effective teacher preparation should help teachers improve their knowledge of their subjects, their understanding of students thinking, and of different instructional practices. A key component of many successful teacher preparation programs is the development of a community of teacher-learners (Borko, 2004). Several projects have used technology as a way to support communities of teachers (Barab et al, 2001; Renninger & Shumar, 2002; Schlager, Fusco, & Schank, 2002). This paper looks at wiki, a new technology for online communities. Wiki describes a type of web site (or a feature of a site) in which users are allowed to add and edit the content on the site. Many wikis are collections of information, such as the popular Wikipedia (www.wikipedia.org – an encyclopedia created by web users). Rather than relying solely on experts, wiki resources are created and edited by users until the community is satisfied with the information on the site. Putting together information on a particular topic requires research, synthesis and presentation of the idea for others, which can also be a powerful learning activity for members of a community.

The purpose of this paper is to explore how wiki technology can be used to support preservice teachers as they learn about teaching. Although not developed for education, wiki technology has features that can be particularly helpful for teachers. We discuss the implications of the wiki technology for learning and look at an example of how it is being used in teacher professional development at California State University, Northridge (CSUN).

Online Communities for Teacher Preparation

In her review of research on teacher professional development, Borko (2004) cites the need for teachers to develop their knowledge of the content, or their students, and the practice of teaching. She also notes the success of programs that emphasize creating a community of teacher-learners. Such communities can provide a way for teachers to exchange ideas and experiences as they consider new ideas. Successful learning environments emphasize the participation of the teacher-learners rather than the role of the professional development instructor. Barab et al. (2001) argue that this approach is superior to more didactic instruction because it acknowledges the complexity of real classrooms and supports teachers taking ownership of pedagogical ideas. One goal for teacher preparation is to develop teachers to be leaders in the classroom and among their peers. Having teachers take more responsibility for their learning supports this goal.

Technology can be an important tool for supporting communities of teacher-learners. The first research to explore technology to support learning communities was Scardamalia and Beriter's work on CSILE (Scardamalia & Beriter, 1994; Scardamalia, 2004). Their research demonstrated how computer networks and collaboration software enabled student groups to work cooperatively and publish their work to the community. Both aspects of the software served to motivate students. This ground breaking research identified key features of knowledge building software. Researchers found that having students publish their work was actually more motivating for many students than turning work in for a grade. Students often value their standing within their peer group more than the opinion of an instructor. CSILE used networks and collaboration software to support community building.

As the internet has grown, new technologies such as blogs and wikis provide new ways to help people communicate and learn (Goodwin-Jones, 2003). Researchers have begun to take lessons of CSILE and apply it to different types of learning communities including preservice teachers. The Inquiry Learning Forum (ILF, ilf.crlt.indiana.edu; Barab et al. 2001) provides an environment for teachers to share information about their classroom including videos of their teaching and reflect on it with other teachers through the use of discussion forums. TAPPED-IN (tappedin.org; Schlager, Fusco, & Schank, 2002) is a site for teachers to chat with other teachers and exchange ideas. Both the ILF and TAPPED-IN provide opportunities for working teachers to connect with others with similar experiences and challenges. In both of these programs, a great deal of the information on the site is provided by the teachers themselves. This is seen as a critical part of community building and allowing the users to take ownership of the online environment.

In contrast to the tools for inservice teachers, technology to support preservice teachers often focuses on instruction and providing examples of teaching for teachers to explore. Videos of classroom situations and examples of different teaching styles are often used to support novice teachers with limited knowledge of theory or practice (Hiebert, Gallimore, & Stigler, 2002; Foley, Livne & Beck, 2004). One of the most comprehensive tools for preservice teachers, eSTEP (www.estepweb.org; Derry et al., 2004) combines videos as part of an extensive web of knowledge about teaching and learning for teachers and

support for project based learning. The eSTEP site integrates many of the community development tools with the information that novice teachers need. But unlike the tools for inservice teachers, the preservice teachers are not able to add to the knowledge base.

Many of these projects (CSILE, ILF, eSTEP) have a number of different features to help teachers share their experiences and learn more about instruction. But the complexity of the sites also create inflexibility. It is not easy to adapt these tools to specific needs of a group of students. The motivation for using wikis in professional development is the ability to provide some of the same interactions while remaining flexible for different situations and contexts.

Wiki: Editable Web Pages

Wiki technology provides a way for groups to collaborate on the generation of online resources and documents. The term 'wiki' describes a type of interactive website where the webpages are editable by the users of the site. Users are able to append or edit existing pages and add new pages to the site. This allows groups to collaborate on the generation of web based information. Technically, a wiki is a dynamic website created with a scripting language such as perl or php, and database on the web server. A large number of wiki systems (>40) have been created and many are distributed freely as open source projects. Some of the more popular wiki systems include MediaWiki (www.mediawiki.org), TWiki (twiki.org) and Moinmoin (moinmoin.wikiwikiweb.de). Wiki technology has been in limited use for several years, but is now gaining widespread use with the popularity of Wikipedia. All the wiki systems share the two central features which define wikis: the ease of adding information to the web, and the ability for different people to contribute to the same site.

Wikis can be used by single users or groups to collect and present information. The strength of wiki is the ease with which users can add and edit the content ('wiki' comes from a Hawaiian word for fast). Linking within a wiki is as simple as putting a work into "camel case" (words with alternating capitol and lowercase letters, e.g. CamelCase) or with double brackets ('[[double brackets]]'). Including this code within a page generates a blank page ready for editing. A similar method allows users to add pictures and other media or to link to websites outside of the wiki. So an entire site can be developed without needing to use a web page editor or upload any files. This ease of generating pages and adding linked content in wiki systems make it easy to create a web of related information. Similar to a concept map tool, a wiki can be a useful tool for brainstorming, collecting the thoughts of a group or organizing knowledge (Tonkin, 2005).

The truly revolutionary feature of wikis is their openness to be edited by different people. While most websites on the internet are secured from editing, wikis are open to the world, allowing anyone to alter the content. Because every page is open to editing, every reader is also a potential writer. Thus the structure of the wiki supports and encourages everyone to contribute. This is in contrast to traditional websites where the instructor – as the source of information – creates the web site and the students are simply readers. Wiki can be used in a class to get students to take an active role in creating the content of the site. Students can summarize readings, make arguments, interpret data, or post

questions onto a wiki. On a traditional discussion board, when a student posts information, other students can only reply. On a wiki, students do not reply, but edit the information. They edit what is written to add what they think is missing or create new pages on related topics[†]. The resulting website is a social construction of the knowledge within the community (Goodwin-Jones, 2003). By creating a tangible representation for this knowledge, the wiki supports reflection and consensus building within the class. This is particularly supportive of the teacher-learner community in its effort to develop socially constructed knowledge about teaching practice.

Because wikis are public documents, any work that students do on the site is viewed, not just by the instructor, but by the entire community. Publishing work in this way can be more motivating for many students than simply turning in writing for a grade (Scardamalia & Beriter, 1994). Wiki may put more pressure on the writer because they know that others may come and edit their page if they see mistakes. Wiki users report that creating pages that do not require significant editing is a point of pride among wiki users (Wales, 2005). Unlike discussion boards where each person's writing is clearly identified, there is no clear identification on a wiki page of whose work is whose. This has the advantage of creating a public document which everyone can share. But this also can cause problems for a teacher who wants to assess student's contributions to the site. Most wiki systems provide ways of looking at the history of edits of an individual page. This can be used to see who contributed to an individual page. The history feature also makes it easy to recover a page in case information is deleted inadvertently (or intentionally).

Wikis for Learning

The features of wikis create a number of possible uses for education. At the simplest level, a wiki page can be a useful tool for an instructor who wants to put information about classes on the web. It is possible to add information to the web site often from almost anywhere, even in the middle of class (wiki as a presentation tool). It can be used for individual students to post work to the class, or for groups to collaborate on creating reports (wiki as a collaboration and publishing tool). Beyond groups, the wiki could be used to create a knowledge base for the entire class or larger community. The use of wikis for education may be a powerful tool for students at every level. But it is particularly appropriate for preservice teachers to be engaged in this activity because they have a great deal of personal experience to contribute, and because we expect them to take a leadership role in understanding pedagogical principles in our preservice classes.

Would information generated by students be as good or accurate as that generated by the instructor? Probably not on the initial attempt, but the process of continued editing by others, including the instructor, has the potential to create a more accurate and complete document than the instructor would have done themselves. Wikipedia demonstrates this principle. Anyone is able to provide information to the online encyclopedia regardless of their knowledge or experience. But each post is subject to editing by other users, allowing mistakes to be identified and corrected. A recent study of the accuracy of

[†] Most wiki systems include discussion boards so people can discus issues where there is a disagreement on what information should be posted.

Wikipedia found it to be as accurate as the professionally created Britanica and Encarta encyclopedias (Giles, 2005). Another common concern about wikis is the potential for abuse or loss of information by careless or malicious users. Many wiki systems include tools for locking pages or saving editing information to make it easy to retrieve previous versions. Such abuse is probably not common in many situations. Wikipedia reports very few incidents of problems on their system which is open to all users (Wales, 2005). But the Los Angeles Times had to shut their wiki after only a few days because of offensive comments (Kinsley, 2005). In a classroom situation, editing of wikis may need to be limited to students (who would have to login to the system). This may eliminate most of the abuse seen by the Times.

Wiki use at CSUN

In an effort to explore ways of using wikis in different types of classes, instructors at California State University, Northridge have been using wikis in five different teacher preparation classes. The classes included both preservice courses and masters level courses for both single subject and multiple subject teachers. In addition the wiki was tested in a local high school history class. The classes completed a survey about the wiki asking about the pros and cons of using wiki, and how it compared to discussion boards.

MediaWiki (mediawiki.org) was used for all the CSUN wikis to date. The MediaWiki system provides several features valuable for teachers including several ways to look at the history of a page and the total edits made by an individual user. In most cases each class had a separate wiki, but two classes (SED514 and SED619) shared a single wiki. Having a separate wiki is easier for the teacher to get a report on who has been working on the site. Sharing a wiki is useful in cases where you want to be able to cross link pages created by the classes. It is also less work to set up a sub page within a wiki than to install a separate wiki for a class.

Course	Description (N of students completing the survey)	Wiki Use
SED514	Educational Technology for Secondary Teachers*	Student groups used a wiki for a collaborative creative writing exorcize
SED619	Developing Educational Websites (N=7)	Teacher used a wiki for class notes kept including notes on class discussions
SED690	Educational Technology Seminar (N=19)	Students used a wiki to create a knowledge base from the class readings and to document research done by groups
EED602	Applications of Educational Technology for Elementary Teachers (N=13)	Students used a wiki to produce guides for using different technology tools.
AP US History	High school class (N=34)	Student groups used a wiki to produce reports on presidents during track break.

Table 1: Descriptions of the different courses and wiki applications (N=73)
*These students were not asked to complete the survey of wiki use.

Wiki Usage

Each class used the wiki in a different way so that we could compare different types of implementations. Table 1 shows the different types of implementations and the different class types. The four different applications of wikis ranged from a short demonstration of the software to a semester long project to create a knowledge base. Key aspects of wiki use included the ability to support group work and the creation of information resources for the class.

Group work

Three of the classes had groups of students working together on wiki tasks. In the creative writing assignment (SED514), students took turns contributing to a story of their choice. The wiki helped students to take turns with the story and continue the process outside of class. These stories ended up being rather short, but the students reported that process was fun. Groups in the SED690 class prepared reports on topics in education technology (e.g. integrated learning environments). Groups used the wiki to store their notes as they went and when finished as a written product to go with their oral report. The US History class used the wiki for group reports on US Presidents. They did the initial work in class, but most of the assignment was completed over the break (in a year round school, students break for 6 weeks at a time). The classroom teacher was very impressed with the work that these students produced.

Producing Resources:

The goal of the SED690 class and the US History class was the creation of an online resource that would be a useful resource. In SED690 the wiki was intended to be a knowledge base for the course. All of the readings and discussion topics had a section on the wiki to document the ideas. The instructor created the structure for the pages and did some editing, but students were expected to contribute the content of the pages. This approach attempted to recreate the Wikipedia model within the class. The resulting resources in SED690 include a large amount of student generated work with several good insights. But the instructor felt that the pages that the class produced were neither very coherent nor complete in their description of course readings and discussion topics. The work of small groups in US History seemed to be better.

Students Taking Leadership

The goal of the EED602 class was to create instruction pages for different educational technologies. This class used an alternative approach by designating individuals to "facilitate" on specific pages. The facilitator set up the initial structure of the page with questions that they felt needed to be answers. Facilitators monitored what was added and edited when necessary. All students were required to contribute to several different pages about technologies that had already learned. The facilitator was expected to complete the page and add any missing information.

Each class had different requirements in terms of the amount of use of the wiki. Wiki use or the resulting work was graded in all classes except SED514 and SED619. In SED690, where the students collaborated on the knowledge base, the instructor looked at the log of

edits to assess student's participation on the wiki assignment. In other classes the instructor simply judged the completed work of the groups or individuals. Actual information produced by the different classes varied greatly.

Students' Reaction to the Wiki

The work produced by students on the wikis was generally good. But there was a range in the number, depth and frequency of contributions made by different users. In order to understand some of the reasons for the different uses and to get students overall impressions of the tool, we created a survey of wiki use. Survey questions asked students about their contributions and what problems as well as advantages they see with wiki use in their class. Students were asked to compare wiki use to discussion boards and which type of tool they would prefer to use in the future. Questions included both multiple choice and free response. Free response questions were categorized to see the frequencies of the comments.

Students from the classes described above, except for the SED514 class, were asked to complete a survey about their use of the wiki within the class (SED514 had only a single class with the wiki – not enough experience for the survey). A total of 39 teachers and 34 high school students completed the survey. The survey for high school students did not include any questions about teaching with wiki or comparison with discussion boards.

Teachers reported using the wiki less than the high school students. Only 23% of the Teachers (students in SED619, SED690 and EED602) reported using the wiki more than twice a week. In contrast, 50% of the high school students (AP US History) used the wiki more than twice a week. The lowest usage was in the SED619 class where the wiki was used for the teacher's notes and the student's input was optional.

Students' Concerns

Students were divided in their thoughts about the wiki. Some (especially the high school students) were mostly positive about the experience while others felt out of their comfort zone. Two things were particularly problematic, learning the syntax for formatting information on the wiki and knowing what to contribute on a site that is completely open. In a multiple choice question asking what the hardest part was about using a wiki, 44% found the text-formatting syntax to be the hardest while 32% said that knowing what to write was the hardest part. An open ended question ("What problems do you see with using the wiki?") also noted the problems with knowing the software but less people mentioned knowing what to write (see Table 2). Another problem was issues with connecting to the website or bugs in the software. In the open ended question few students (4%) mentioned confusion about what to write.

Main Problems with Wiki	% Responding	Example Quote
Technical problems with formatting	24%	"Couldn't figure out how to get an image in. Can't figure out how to show a link with words; it inserts a number." (EED602)
Other technical problems (e.g.	33%	"Sometimes the Wiki page was down and people were unable to get to

connecting to server)		there page." (US History)
Knowing what to write	4%	"It is often too vague as to what to post where. There does not seem to be discussion, or a list of what has been talked about." (SED690)
Problems with other users contributions or edits	3%	"many contributers were overly verbose there wasn't much room to add to discussions " (SED690)
None (Stated)	15%	"none" (SED619)
Other	5%	"Access to a computer for long periods of time is difficult. Having to spend long hour at the library is a nuisance." (US History)
Blank	16%	
Total	100%	

Table 2: Descriptions of the problems students had with the wiki (all quotes sic)

We also asked students what they felt the advantages and disadvantages of using the wiki. The disadvantages question (see Table 3) could be interpreted as similar to the question about what problems (Table 2). But on this question students tended to write about the fundamental attributes of wikis. Students were more likely (29%) to talk about conflicts or discomfort with the collaboration on the wiki pages. The concern about their peers work was especially true of the US History students (38% cited it as a disadvantage compared to 23% for the other classes).

Main Disadvantage of Wiki	**% Responding**	**Example Quote**
Technical problems with formatting	5%	"Because it is rather frustrating with trying to guess how to get text to appear differently (I can't even find a way to change the font, maybe it's not possible)" (SED690)
Other technical problems (e.g. connecting to server)	12%	"It\'s frustrating when the system is slow." (SED690)
Knowing what to write	5%	"I believe the main disadvantage is that the wiki is too undirected and unfocused." (SED690)
Problems with other users contributions or edits	29%	"A disadvantage is that people could delete or change what you have written. Also that your name isn't on your work." (US History)
None (Stated)	19%	
Other	8%	"I think we wasted a lot of valuable time looking at the Wiki rather than having real, live discussions." (SED690)
Blank	21%	
Total	100%	

Table 3: Descriptions of the disadvantages of using the wiki in class

The issues related to the collaborative nature of wikis are fundamental to the value of this tool. Students articulated three types of concern about the collaboration: 1) that another student would delete or change their work, 2) the lack of direct feedback on their ideas 3) that they would be the only one taking the assignment seriously. These issues are highlighted by the comparison of the wiki to online discussion boards (e.g. Yahoo groups) where each contribution is identified as new or a reply to a specific post and identified by time and who the author is. Several students commented on the limitations of the wiki in contrast to discussion boards.

> Because the discussion board is more clearly definied, and doesn't require constantly rereading the entire thing to know what was changed. Changes are usually at the bottom, and what was said earlier is usually still visibile. It's very chronological. (SED690)

Others saw advantages in wikis as well as discussion boards. Several articulated that there is a place for both types of communication tools. Some articulated how the wiki board is intended to forge consensus and produce a finished statement.

> I think that as I become more fluent with the syntax of the wiki, it will be useful in ways that a discussion board cannot. For example, if a group is building a reference page for something, any member can insert information at any time. As time passes and new ideas are presented, it can easily be inserted appropriately to give the wiki page a 'complete' look. (SED690)

A second key concern fundamental to wikis is that students were not clear what they were expected to do. This was particularly common in the SED690 class where students were expected to "contribute" to the wiki without any specific assignment. The intentionally vague assignment was intended to force students to be the editors and decide what was needed on the page. However not all students embraced this role. Some students were uncomfortable editing others work. One student wrote, "I do not like to change others words. They have a right to express themselves the way that they prefer. The whole premise is to have many editors. i was not much of an editor" (SED690) Another comment simply stated "It seems unprofessional" (SED690). Clearly this role of shaping the outcome of a collaborative document was uncomfortable for some students.

We realized that the editing of peers work would be a particularly difficult aspect of wiki use, so we asked specifically if the users had an occasion to edit others' work and why. On this question we see a clear difference between the teachers and high school students. Teachers were very reluctant to edit each other's work. For the teachers 38% never edited another and 18% did several times. In terms of what reasons they gave for editing, only one comment (1 of 20) indicated that they saw something factually wrong that needed correcting (3 of 20 edited to add missing information). Most of the comments referenced grammar, formatting, moving text from one section to another. One teacher articulated the problem:

> A major problem for me with the editing aspect is that I don't have the mindset or ethos that I am inherently entitled or obligated to change someone else's ideas or writing without some kind of specific reason or permission. Editing someone else\'s contribution seems to put me in a judgmental role that I don't feel inclined

> to assume with peers. Do I need a bigger ego? Another major problem with the wiki concept in general is that I'm also not inclined to utilize other people's contributions simply because I don't know who they are. How can I assess their background in the subject area, and therefore, the quality of their knowledge? And how do I know, in short, their contributions are equal to or superior to other sources where I can more easily check and evaluate credentials and credibility… (SED690)

In contrast, the high school students were more comfortable with changing others work. Only 24% of the high school students had "never" edited another's work and 47% edited others "several times". This may be due to these students working in small groups and the getting a grade which would depend on the accuracy of their pages. These students were more likely to mention correcting incorrect information (4 or 23) or seeing missing information (14 of 23). Two student comments:

> I deleted some information that was incorrect and something that I thought was needed. (US History)

> I changed/edit someone else's information on wiki because i felt that it needed more specific details and that they were missing some important information on their page (US History).

Students' Positive Reactions

While the emphasis of the survey was to identify problems so they could be addressed in future wiki uses, students had a number of positive things to say about the wiki. Students were asked what the advantages of the wiki are, how difficult the wiki is to use, and whether they are interested in using wikis in the future. Most of the students found using the wiki to be "very easy" (29%) or "easy" (51%), suggesting that only a few of the students had difficulty.

Main Advantage of Wiki	**% Responding**	**Example Quote**
Creates a useful resource for students	21%	"At the end of the class you have a good record of all that was learned or researched." (SED690)
Encourages students to contribute or participate in learning activity	12%	"… students are challenged to be creative in designing their pages and they also improved as researchers." (US History)
Allows students to communicate and get feedback	21%	"It involves students that are too shy to participate verbally." (SED690)
No advantages (stated)	9%	"None compared to other available technologies, maybe cost I guess." (SED690)
Other	17%	"It's better than writting the essays on a paper. You can just post it and not worry about the computer not printing." (US History)
Blank	19%	
Total	100%	

Table 4: Descriptions of the advantages of using the wiki in class

Table 4 shows the types of advantages that Teachers and students see with the wiki in their class. Many of the students mentioned the ability to create an online resource (21% - including 32% of US History students). They indicated that the results of their work would then be useable for themselves and others. Students were also encouraged by the ability to communicate with other students and to have their voice heard (21% - including 28% of teachers). Other comments included noting that the tool in inexpensive and easy to make pages. The follow quote cites several of these reasons as well as the ability to collaborate without being physically together:

> "I enjoy hearing other people's thoughts and ideas and that definitely occurs on the wiki. I also like how a group of people can create a project or a report without everyone being present. I also feel the wiki page ends up being a great resource for everyone in the class." (SED690)

All the teachers (SED619, SED690, EED602) were asked how interested they were in using the wiki again in future classes. The question asked students to respond on a 5-point scale (5 very interested - 1 not interested at all). All the classes gave a mixed response to this question (Table 5). Despite many negative comments, the SED690 class was actually more positive about using wikis in the future. The other classes rated discussion boards higher than wikis though both had a slightly positive impression (mean greater than 2.5).

Class	Interested in using wiki in future	Interested in using discussion boards in future
EED602	2.85 (1.8)	3.38 (1.3)
SED619	2.86 (1.2)	3.86 (0.7)
SED690	3.21 (1.4)	3.21 (1.2)

Table 5: average ratings for the questions about using wiki or discussion boards in future classes

Discussion

Wiki is not really a new technology – simply web pages that include tools to allow users to edit the content. But this deceptively simple idea can have powerful implications for students. By distributing the responsibility for developing content for the site, the wiki empowers the students and creates a forum for socially constructed knowledge. It seems likely that wikis will find a number of uses in education at many levels. Teacher professional development in particular may benefit from wiki technology because of the sophistication of the students, the value of developing a community with common language and standards and the need to empower teachers to take ownership of the ideas discussed in their classes.

This study shows that wikis have a number of professional uses in education, but there are a number of issues to be addressed when using this technology. Integrated systems such as CSILE or eSTEP are far more powerful, but do not have the same range of uses as wikis do. Users new to wikis need support both for the technical aspects of the tools

(esp. syntax for formatting) and in how to participate in the collaborative editing process. Small groups and designated editor/facilitator roles may be the most effective use of this technology. The results of this study should be taken as initial data points rather than a final statement about the value of wikis for professional development.

Of the different ways in which the wiki was used, the open-ended contribution to the knowledge base in SED690 was most problematic. The attempt here was to recreate the model of the Wikipedia in a smaller scale. For something like this to be highly effective, the users need much more guidance in how and when to edit each others work. In order for this knowledge base approach to work, students will need to take greater ownership of the ideas and recognize that there are incorrect statements and misinterpretations of education literature that should be corrected. But this is precisely the type of perspective that we are looking for teachers to obtain with their experience in professional development courses. They need to go beyond communication and develop consensus about key topics. A free sharing of ideas is valuable, but a critical examination of differ rent perspectives affords more learning possibilities. Online chat and discussion boards can be valuable tools, but they do not require the development of consensus. The challenge of using wiki in this way may be a valuable tool in pushing teachers in a positive direction.

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