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Expanding Classroom Discussion with an Online Medium

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This article outlines the use of the online *SpeakEasy* communication package in two sections of a mathematics methods course in an elementary education teacher certification program. The instructional uses of *SpeakEasy* are described, with specific attention to the manner in which it was woven into the fabric of the course and made central to the instructional format. Specific data were collected to determine the various effects of extending classroom discussion into the virtual realm in this context. These included the promotion of reflection on the teaching of mathematics and increased "vocality" of students who provided little or no input in the actual classroom. The students also possessed positive attitudes to the use of *SpeakEasy* in the course. Recommendations for instruction and instructional design are provided.

THEORETICAL FRAMEWORK

Basic to developmental theories of learning are the two notions of communication and reflection (Hiebert, 1992). These take on different forms and roles in an online setting. Given that "what drives the use of technology is a vision of how educational technologies can solve instructional problems (U.S. Congress, 1995)," it is important that "problems" be framed in the context of the use of electronic communication in the promotion of individual and group reflection. Further, as Clarke (2000) stated, "to teach *is* to reflect" (p. 201, emphasis in original).

Electronic communication is not normally face-to-face and is often textual, and asynchronous communication evolves over irregular time intervals. Therefore, educators must consider solutions that use electronic communication in ways that accommodate the contexts and properties, which define the technology.

How can educators design instructional activities using electronic communication that incorporate the social interactions and reflective processes that have become part of constructivist classrooms and promote professional growth? Researchers are beginning to claim that the use of an electronic discussion forum can promote active participation, student self-reliance, and increased levels of reflection on the part of the students in teacher education classrooms (Dutt-Doner and Powers, 2000; Creed, 1996). Dutt-Doner and Powers (2000) discussed results of using an electronic discussion forum in a sophomore-level elementary education course. They claimed that electronic discussions are:

> a "faceless" communication system in which students are not as intimidated to participate as they would in face to face discussion even though their name appears in their postings...it allowed students to feel comfortable enough to share things with each other and participate in ways not possible during a class discussion (p. 21).

Nonis, Bronack, and Heaton (2000) also noted that the instructor must create a supportive environmental structure (actual and electronic) for meaningful discourse to occur. As with any pedagogic change, simply inserting electronic discussion into the course is not enough to ensure the enhancement of that course (Espinoza, 2000; Johnson, 1997; Leu & Leu, 1997; Partee, 1996).

Teacher education courses that use electronic communication must design the interactions in ways that facilitate meaningful reflection around course goals. This article examines a specific technology used to promote reflection in a teacher education classroom, describes the nature of its use, and then discusses the results of a study that examined the impact of the technology on students' reflective and communicative abilities in the context of thinking about the teaching of elementary mathematics.

THE TECHNOLOGY

SpeakEasy was designed by a team of faculty and staff at the Center for Teaching, Learning, and Technology (CTLT) at Washington State University to support instructors who wish to use online classroom communication.

SpeakEasy is currently being used by more than 5000 students throughout the United States and Asia. *SpeakEasy* is designed to facilitate asynchronous classroom chat centered on topics designated by the instructor and students. The *SpeakEasy* manual states that, "The *SpeakEasy Studio & Café* is a flexible, interactive online space designed to enable the formation of a community independent (to some extent) of the constraints of time and place." The structure of *SpeakEasy* can be gleaned from the following online description:

> *Speakeasy* is an interesting place to be. You'll have a lot of fun chatting with each other, working on assignments together, and finding out new things about your own ideas. You'll probably be surprised at how well you'll get to know your instructor or facilitator through this space, not to mention the other students you're working with. That's because it's set up to encourage conversation and interaction among students and instructors in a setting that's more social than a traditional classroom.
>
> Think about a community. A neighborhood, even. A bunch of houses and shops and streets, a place where people get to know the same environment, and know where to hang out for some good conversation.
>
> That's the *Speakeasy Studio and Café*. You, your facilitator or instructor, and the other students you're working with are going to establish yourselves in one of the local hangouts. You'll set the rules, you'll participate in events, you'll sit around tables and have conversations about those events. In other words, if you're a metaphorical thinker, it might help to think of the whole *Speakeasy* program as a community of scholars like yourself all over the World Wide Web...For your class's studio, your instructor or facilitator will set up a playbill, or syllabus, or schedule of events that will happen in your studio & café. You can think of those events as units in your class's syllabus, or main topics that your class will address over the course of the semester (there may be only one event). The events actually take place in the café, which is downstairs in the studio. You know, a café, like Starbucks. Each event can take place around any number of tables in the café, which are roughly comparable to activities, or discussions, or exercises, or assignments, or whatever fits with the way your particular class is organized. Tables are where you actually do most things in the *Speakeasy* program.

SpeakEasy was written to be an easily navigable, nonthreatening virtual forum that can directly support classroom interactions.

USE OF THE TECHNOLOGY

In the elementary mathematics methods course, Dr. Slavit primarily used the *SpeakEasy* program to extend course discussion. Specifically, 10 tables were created that enabled an asynchronous, virtual discussion of various course foci. The following topics were included in at least one table: (a) Learning theories; (b) The National Council of Teachers of Mathematics' Curriculum Standards and Washington State Essential Academic Learning Requirements; (c) Mathematics education reform; (d) Classroom communication; (e) Mathematical knowledge, learning, and understanding; (f) Problem solving; (g) Lesson planning; (h) Assessment; (i) Equity; (j) Number sense and estimation; (k) Single-digit addition and subtraction; (l) Place value; (m) Multi-digit addition and subtraction algorithms; (n) Multiplication and division of whole numbers; (o) Fractions; (p) Decimals and percents; (q) Measurement; (r) Geometry; and (s) Algebraic thinking. Focus questions were provided, and space was made for student-generated issues related to the course topics.

The students received specific instructions on the nature of their weekly participation in the *SpeakEasy* forum. The students were instructed to make weekly posts to *SpeakEasy*, to balance the number of their initiation-type postings (comments that start a strand) with the number of their response-type postings (comments that respond to an existing posting), and to be reflective and thoughtful in their content. The following excerpt is taken from the course syllabus:

> Your participation in the *SpeakEasy* discussions should also be professional and thoughtful—have fun, reflect, and learn. You will be expected to respond to at least one *SpeakEasy* table EVERY WEEK. Please try to keep your comments to the focus topic, but also feel free to add any relevant insights that may extend the direction of the discussion. Try not to comment just to comment—hopefully, the topic of the discussion and your fellow students' comments will be interesting enough to really stimulate a genuine discussion.
>
> Be sure to participate over the course of the year in the discussion by providing some initiating comments that start a discussion string as well as providing reactions to your classmates' comments (i.e., initiate and respond). At the end of the year you must have at least one comment every week, but I hope you get caught up in the discussion and "respond to a response of a response."

> Your grade for *SpeakEasy* and Classroom Participation will be based on your WEEKLY contributions and the professional and reflective nature of those comments.

While most of the *SpeakEasy* tables were intended to extend course discussion, some were set up to support course assignments, which included problem construction activities, reflective writings, and a three-day teaching experience in their pre-internship classroom. *SpeakEasy* and classroom participation collectively comprised 25% of the course grade.

All of the students in the course were enrolled in an Educational Technology course the previous summer that introduced them to *SpeakEasy*. Therefore, every student was trained and experienced with the technology. However, significant computer glitches and the presence of a network hacker, which caused system-wide delays and shutdowns, created problems for some students, particularly those who accessed *SpeakEasy* from home. While this caused frustration in some, most of the students persevered through these issues without significant change in their participation or perception of the activity. Those students who entered the course with a degree of discomfort regarding the technology were most effected by these events.

STUDY DESIGN

Any instructional innovation needs a feedback mechanism to continuously monitor progress and adjust to student demands. In addition, because virtual communication is in its infancy, research is needed to support related instructional initiatives. To satisfy all of these needs, a comprehensive research plan was designed that analyzed the nature of student comments and any effects the *SpeakEasy* platform had on student development.

Two levels of analysis were conducted in the target course. First, an analysis of the perceived usefulness of *SpeakEasy* was conducted. A classroom survey was conducted in the middle of the semester that solicited student thoughts on the effectiveness of *SpeakEasy*. *SpeakEasy* automatically documents the quantitative nature of student activity, and frequency counts were made in regard to students' weekly participation, total number of postings and number of reaction-type responses, and total number of logins to the *SpeakEasy* Studio. Also, weekly checks of the utility of the *SpeakEasy* program were made through conversations with individual students. In addition, the instructor personally monitored the chat activity each week and participated as needed.

Second, an analysis of *SpeakEasy*'s impact on student learning was conducted. The *SpeakEasy* platform establishes a natural archive of all chat activity that occurs in each of its studios. Student comments were analyzed for their relevance to course topics, theoretical and/or practical nature, depth in reflection, who is initiating conversational threads, and any changes in the "vocality" of individual students in the real and virtual media. Analysis of differences in the amount and nature of student communication due to the technology were specifically noted, as were any connections between classroom and virtual discussion of course topics.

RESULTS

A brief overview of the amount of communication facilitated by *SpeakEasy* over the course of the semester is presented, followed by a more detailed discussion of its impact on student development. During the course of the semester, the students made an average of 11.7 posts during the 10 weeks of *SpeakEasy* activity. The average number of entries was approximately two per week for the first two weeks of the semester, but this level of input dropped incrementally over the course of the semester. The number of initiation- and response-type postings was nearly identical over the course of the semester. On average, the students logged in to the *SpeakEasy* Studio approximately twice per week over the course of the 10 weeks for the purpose of either reading and/or posting entries. Sixty-nine percent of the students made at least one entry during each of the 10 weeks, and the 17 students who failed to do so averaged three missing *SpeakEasy* weekly entries during the course.

The results of the mid-semester survey suggested that the students found the *SpeakEasy* sessions to be supportive of their development and were glad it was part of the course (Table 1). For example, 88% of the students felt that the *SpeakEasy* discussions were relevant and connected to classroom discussions, and only 9% agreed with the statement that *SpeakEasy* added little to the value of the course. Student comments on the survey suggested that those who did not respond as favorably to *SpeakEasy* did so because of numerous activities with significant time demands to which the students were committed during this period of their teacher preparation programs. Informal conversations with students throughout the year confirmed these findings.

Table 1

Results of Student Survey on Use of *SpeakEasy* in Elementary Mathematics Methods Course

The *SpeakEasy* discussions have allowed for significant reflective moments about issues related to mathematics teaching and learning.		
No! & No	Maybe	Yes & Yes!
8	16	7
The *SpeakEasy* discussions have been relevant and connected to classroom discussions.		
No! & No	Maybe	Yes & Yes!
0	6	44
The *SpeakEasy* discussions have allowed me to participate in the development of ideas that I may not have been able to do otherwise.		
No! & No	Maybe	Yes & Yes!
7	20	23
SpeakEasy has added little to the value of this course.		
No! & No	Maybe	Yes & Yes!
27	14	9

Overall, the students provided lengthy and reflective comments on *SpeakEasy* the majority of the time. Because the online topics of discussion centered on issues previously discussed in class, the students had the opportunity to extend their own thinking as well as the collective thinking of the class. A specific example of this will now be provided that occurred halfway through the course. This example illustrates the depth of reflection that was frequently found in student comments, the extension of ideas from course discussion, and the manner in which *SpeakEasy* provided a forum for reflection and conversation that would be much more difficult in a time-constrained setting such as a class session. The interaction begins with a student posting, a response, and then a rebuttal by the initiator. Mark was a highly vocal student, and Renee was a student who provided little input into classroom discussions. The student-generated titles of each post are also included.

The discussion arose out of the following *SpeakEasy* prompt:

PROMPT: *"Language and Thought"*

> Do you agree with the statement: The two main components of Problem Solving are language and thought.
>
> If so, then elaborate on the role that each of these play. Try to be specific and contextualized - in other words, talk about these things in the context of (or provide examples involving) specific mathematical content. You are free to choose the math topic, but clearly discuss how problem solving utilizes (depends on?) thought and language.
>
> If not, what other things are involved in problem solving. Again, try to talk about these things in the context of specific mathematical ideas.

The purpose of this prompt was to expand on the classroom discussion that was centered on this very issue. The students had been exposed to a variety of sources related to this issue by this point in the semester. These included Vygotsky (1978) to address this issue theoretically, and the National Council of Teachers of Mathematics (NCTM) (2000) Standards and local state standards (OSPI, 2001) which incorporated language into curricular and assessment recommendations for mathematics in general, as well as problem solving in particular. During classroom discussion, the topic of the assessment of problem solving emerged frequently due to its emphasis in the preinternship classrooms in which they were simultaneously placed. Several students expressed concern in regard to the effects on mathematics scores for less than adequate writers, deficits to student populations such as second language learners, and contrasts with more traditional paradigms. Other students felt that language plays an important role in the construction of mathematical knowledge and shouldn't be separated from assessment. The students had also been asked to undergo mathematical problem solving experiences on their own, discuss their processes, and then discuss the articulation of their processes. Mark uses the latter as the entryway into his posting.

> MARK: *"Thinking about talking, and talking about thinking"*
>
> Okay here goes. . .
>
> In order to solve a problem, be it math, science, or matching clothes to wear to work (a major weakness of mine), one must first have a mental framework that he/she can use as a basis to view the problem. Utilizing that framework, which was built on past knowledge and experience, a person can analyze the problem and develop an approach to solve the problem. The only route to a solution which a person can use is one which is built on the mental categories which the person

possesses. A person cannot add/subtract etc. using numbers unless he/she knows what those little marks (1,2,3. . .) symbolize. In order to understand a regression, a person must first understand probability. Therefore to be an effective teacher we must be aware of what our students know coming in.
So the thought process used in solving a problem is based on a person looking at a problem and, utilizing their previous knowledge, analyzing it. Have I ever seen anything like this before? If so, what do I remember about it? What information does this problem give me that will help me solve it? What do I already know that will help me solve this problem?

The geometry problem Renee brought in on Friday was an excellent example of how this process works, and works differently for different people. One solution was to diagram the problem, and figure out a solution from a visual/geometric perspective. Another solution (the one I used) was to solve it from an algebraic perspective: this is what I know about a variable, let's call it "x:" it is 75 more than the cube of some number and 16 less than the cube of another number. Can we write an equation using this information which will allow us to determine the value of this unknown? Two very different approaches, both equally valid, and each based on the mental framework of the individual problem solver.
I don't know if I am clear on what is meant by the word "language" in this context. As was made clear to us in our literacy class, the way a problem is phrased can have a tremendous impact on a person's ability to solve that problem. Before you can answer a question, you have to understand what that question is and your understanding is based on your knowledge of language, math, etc. Therefore language used in the question plays a crucial role in someone's ability to solve the problem.

Language also plays an important role in communicating what the solution is and how you arrived at it. This is obviously important in assessing a student's knowledge. We were able to assess and understand the solutions to the problem on Friday only to the degree that the problem solver could communicate their thought process to us.

What I don't see is the importance of language in solving a problem. Do we think in English when we are thinking about a math problem, or do we think in "math?" I don't think I think in English when I am solving a problem: I visualize the problem and the solution in math symbols and then translate it. And therein lies the problem with assessment: you can only assess my translation, you cannot assess my

> thought process. The translation is important to your understanding of my understanding, but it has little to do with my understanding. Therein lies the major flaw in assessing students based on how they tell you they solved the problem.
>
> And that is why some evaluator sitting in a bunker in Iowa will never be able to provide as accurate an assessment of a student's math knowledge as a dedicated teacher who understands the culture, background, and thinking style of the student.
>
> Okay, off my soapbox. As always my opinions are strongly held but easily changed, so help me out.

Mark is articulating his struggles with three aspects of the role of language. First, he is identifying the role language plays in articulating the meanings involved in a given question, and draws on his experiences in literacy to support this. He also is struggling with the role language plays in solving a mathematical problem, and does not currently see a connection there. Finally, he is discussing the role of language in relating one's meanings regarding a given solution process and product. He finally grounds this by discussing the role context plays in the identification of student meaning in a classroom. Renee attempts to address Mark's question regarding the relationship between language and the process of solving a mathematical problem.

> RENEE: *"Using language helps the thought process!"*
>
> Mark, I thought you did a great job answering the question. However, I believe language, and being able to explain the solution to a problem language does aid in the solvers own understanding of a problem. The act of trying to explain the geometry problem brought me to the realization that there were aspects of the problem that I still didn't fully understand, making it difficult to articulate the process for my solution.
>
> You used language to show your thought process when you translated the ½ of a ½ divided by a ½ problem *(NOTE: This refers to a division of fractions problem)*. At first I was confused by what you were saying, but as you restated it another way, I began to understand….language at work.
>
> Also, isn't math and it's "language" a part of the English language to be used in the explanation of our problem solving process? I don't see

> the need to separate the two. Do you really think in math, or is math a part of our language?
> So, yes, I guess I'd have to agree that language and thought are two main components of problem solving.

Renee has used Mark's in-class problem-solving process, as well as her own, to address the question he raised. As can be seen from Mark's response, Renee was able to illustrate to Mark her belief in the important role of language in the process of mathematical problem solving.

> MARK: *"Consider me converted"*
>
> Okay, okay. . .
>
> I'd love to argue with you Renee, but you're right.
>
> VDW *(NOTE: This refers to Van de Walle, the author of the course textbook)* did an excellent job illustrating the value writing had in providing a reflective atmosphere in which the nature of math could be considered and connected. That got me half way there, and trying to explain my thought process in solving the problem on Friday got me the rest of the way. The challenge I faced in class was a real eye opener.
>
> So I now see the value of literacy in achieving a deeper, richer understanding of math, and sharing that understanding with others. I still worry about the negative effect on the confidence/attitude that an emphasis on communication skills may have on the youth who has a highly developed logical-mathmatical intelligence but a less developed interpersonal intellegence, but that discussion can wait for another day.

In summary, this piece of dialogue clearly illustrates the power of *SpeakEasy* in extending course discussion as well as providing an avenue for further reflection that may not be possible using more time-dependent means. Renee and Mark were able to engage in an extended discussion of some important and complex cognitive issues that directly expanded on the course discussion and readings. The electronic forum allowed for their thoughts to be carefully crafted, unlike the "real time" dialogue that occurs in a classroom setting, which may have elevated the reflective nature of their comments. For example, Mark's final post shows a level of self-reflection on his own problem solving actions as well as reflection on the comments of Renee. Further, Mark raised several interesting questions at the end of the

post which were eventually discussed later in the course.

This interaction was quite typical of the manner in which students responded to the instructor's prompts and each others' postings. As the moderator, the instructor never edited or deleted any student postings on the basis of irrelevant or inappropriate content. This was probably due to the clear requirements and rules set forth in the syllabus on the expected nature of the discussion, students' familiarity with the technology from the educational technology course taken previously, and the manner in which the discussions extended on and were used in actual classroom discussions. In conjunction with the classroom environment, the electronic community was developed in a way that made students feel safe and valued, which also contributed to the depth and breadth of the student postings (Nonis, Bronack, & Heaton, 2000).

The following abbreviated dialogue provides another example of student reflection facilitated by the electronic discussion format. Nancy begins the discussion by framing her remarks on teachers' expectations of students.

> Nancy: My students are surprising me every day, and not just in math . . . My collaborating teacher "warned" me prior to the start of school that she would be getting the "remedial" math students. Talk about a difficult task trying to erase that message!
>
> Yesterday, it was my job to teach the math lesson prescribed by the textbook: prime and composite numbers. My first reaction was... YIKES! Will they be able to comprehend even the words coming from my mouth? Shame on me for even thinking this. I need to focus my thoughts on what to do WHEN they achieve the understanding, not IF.
>
> They took my lesson and ran with it. I started by having them list the factors for the numbers 2-29. I then asked them if they noticed any patterns in their lists (Dave, I'm sure you would be proud!). Again, shame on me for thinking I'd have to completely tell them. They shared many patterns I hadn't seen before. We discussed what prime numbers are and the difference with composite numbers. They were ready to move on mid-way through the lesson to the "Workbook" pages that I wasn't even planning on looking at for a couple more days.
>
> TRANSLATION: Set your expectations high! I need to not underestimate my students; I doesn't do me or them any good!

Because the preservice teachers had been recently focused on limitations in students' academic abilities during class discussion, Jackie, a less vocal student, uses Nancy's message to express a thought she clearly had for

some time.

> Jackie: Wow! Great insight, Nancy. I think many people in this program have come to class and expressed surprise and discouragement about where students are academically. We've shared stories about students in middle school who are stumped by multiplication, and third graders who are shakey on addition and subtraction. I think a lot of us were disillusioned. I hope we get past this, like you say. It is scary to think that our cooperating teachers aren't giving students credit for what they know and their expectations are low. It is even scarier to think that some of us might emerge from this program and never expect much from our students. Thanks for putting me back in check, Nancy. We need to look at what students do know and the progress they are making. This way we can do a better job of scaffolding the process.
>
> REMEMBER: THE BRAIN IS HALF FULL, NOT HALF EMPTY!!!

Steve reiterates these comments and provides some very nice examples, but he also adds a historic dimension to the discussion.

> Steve: Even the "little guys" can surprise you sometimes. I taught a lesson on similes last week, thinking I would really have to walk them through it. They came up with some great ones on their own! I never would have come up with "As terrifying as a tarantula" in the second grade!
>
> In fact, that brings me to my reason for responding to your listing. I believe that our students are expected to perform at a much higher level than we were at their ages. In math and in other subjects. When I was in second grade, we were still working on how to add. Now, I stand in awe as we put a number on the board, this week it was 6, and ask the children to think of as many ways as they can to come up with the number six. The answers were, well, as awsome as the Eiffel Tower!
>
> After thinking about it for a bit, and writing numbers down on their papers, there was a class discussion. One child said "100 + 100 + 6, - 200". Another offered this pithy remark, "Just add 6 to zero, and you've got six". The one that really amazed me, though, was the little guy who said, "you could just add six, six times and take away five from each". Wow. This is second grade here. It's a whole new ball game, folks. I'm looking forward to the next inning!

This interaction occurred during the "Open Mike" week of the course,

in which the students were free to make comments on any topic they wished. This format allowed these students to express thoughts that had been clearly developing over the semester during course discussions as well as experiences in their placement classrooms. The *SpeakEasy* forum provided a safe and available space for these students to speak out on this issue. Classroom observations later in the course documented a change in the tone of conversations related to students' abilities and expectations after this time.

Of the 29 students who made more than the 10 required postings over the course of the semester, the instructor rated 8 students as being highly vocal in class, 13 students as providing adequate classroom input, and 6 students were judged to provide little or no classroom input during classroom discussion. The average number of postings by the highly vocal, adequate, and little or no input groups were 14.2, 11.6, and 9.3, respectively. These data indicate that student "talkativeness" does transfer over to a virtual setting, but that the virtual arena does help to even out the "level of vocality" of the students. The instructor also noted several occurrences during the course of the semester where students referenced each others' postings, which helped to balance the level of vocality in the classroom during those times. By having their postings referenced, less vocal students were given prestige and a platform that led to their participation in the classroom discussions, something that would probably not have happened otherwise based on the observed normal sequence of classroom discourse.

SIGNIFICANCE

This study describes the use of an online discussion forum in an elementary mathematics methods course. Specific data have been discussed which highlight the effects of asynchronous chat on preservice teachers' reflections and group construction of knowledge and beliefs related to classroom practice.

The data indicate that *SpeakEasy* was successful at providing conversational areas with which students were able to develop their understandings of issues relevant to the teaching of mathematics. These data indicate that the students also perceived of *SpeakEasy* as a useful mechanism for extending class discussion. The level of input into *SpeakEasy* was greatly dependent on the time constraints of the students at given points during the semester, and while students who were more vocal in normal classroom discussion were correspondingly more vocal in the *SpeakEasy Studio*, this difference was not felt to the same degree.

Several structural factors were present that allowed the instructor a

means of extending course discussion into the virtual realm in a rather seamless and purposeful way. *SpeakEasy* allowed the structure of the conversational areas to be imbedded into the course structure prior to its onset; but *SpeakEasy* also possessed the flexibility to alter the structure as the students' needs dictated. Because the instructor monitored and participated in the conversation over the course of the year, adjustments to the make-up of the weekly *SpeakEasy* tables could be readily made. The instructor defined all topics of discussion and asked for reactions from students, so the discussion was able to stay more focused than with a less-defined structure, although the students were still able to both initiate and react to various ideas, assertions, and questions.

Just as in developing an actual classroom community, instructors who use electronic media to facilitate course discussion must do so in a way that establishes a safe and provocative environment. This study shows that using classroom discussions to generate the bases for electronic discussions can be beneficial to the reflective and communicative processes of preservice teachers.

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