

Bulletin Board Systems - Another Supporting Channel for Helping Students Work on Mathematics

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Abstract

Riley, former educational minister in U.S.A., claimed that computers are new basics of American education, and the internet is the future blackboard. He claimed the future classroom will be completely related to the function of network. In fact, the internet can create an efficient and capable environment at anytime and anyplace for anyone, because it could eliminate disadvantage (i. e., limited time and space) of traditional classrooms. Moreover, students will be interested in learning, and will increase the abilities in solving problems and communicating with others under this environment. The internet is very popular now, especially the bulletin board systems (BBS) to students. It is easily learned and used; even the 5th and 6th graders are familiar with the usage of a BBS.

For several years the researcher of this study has engaged in investigating mathematical activities of 5th and 6th graders through different BBS. The themes of her activities were mathematical problem solving (e.g., Ma, 1999a), mathematical problem developing (e.g., Ma, 2000a), and reasoning (e.g., Ma, 2003). The original purpose of using a BBS, chatting, will be given an educational meaning. This article will present some examples in the researcher's projects to illustrate the role of a BBS while students work on mathematics. It showed that students could work on the mathematical activities by expressing and communicating with others via BBS. Thus, BBS can be viewed as another channel for supporting students to work on mathematics.

Key Words: bulletin board systems (BBS), communication, the internet, mathematics.

Introduction

Technology is truly making education an exciting and changing world. The power and utility of a computer can be significantly enhanced through an electronic communication link with other computers (Merrill, et al., 1996). Riley, former educational minister in U.S.A., claimed that computers are new basics of American education, and the internet is the future blackboard. He also claimed the future classroom will be completely related to the function on preparing for k-12 graders' technological attainments in June, 1996. The Bulletin Board System (BBS) is one of the most frequently used networks by students, which plays a very important role in students' daily life, especially in communication behaviors such as gathering, exchanging, and discussing information.

A BBS technology is not only easy to learn and easy to use, but also a good vehicle for broadcasting information by the instructor (Muzio, 1992). In fact, several researches have indicated that BBS-based instruction can have positive benefits and potential. Although it is not a panacea, it has reported to be useful in

adults' educational activities (Ellsworth, 1991) and in training writing or increasing writing skills (Johanson, 1996; Zoni, 1992). In recognition of the fact that the BBS might have the potential attributes. Thus, for several years the researcher of this study has engaged in investigating mathematical activities of 5th and 6th graders through different BBS. The themes of her activities were mathematical problem solving (e.g., Ma, 1999a), mathematical problem developing (e.g., Ma, 2000a), and reasoning (e.g., Ma, 2003).

As a result, the BBS which original purpose, chatting, would be given an educational meaning. This researcher's studies denoted that the students' interests and confidence in mathematics would be promoted and developed due to the fun surfing the net and the benefit of using the BBS (Ma, 1999b, 2000b, 2000c, 2001, 2002, 2004). In addition, The BBS can eliminate disadvantage (i. e., limited time and space) of traditional classrooms. Thus, when students work mathematics on a BBS, it might motivate and stimulate students to express and communicate with others. A BBS can be viewed as another channel for supporting students to work on mathematics. This article will present some examples to illustrate the role of BBS in mathematical activities, such as expressing and communicating with others.

Bulletin Board Systems and Communication

The internet was developed from an America military project, ARPANET, of the Department of Defense during 1960s. The purpose of this was to connect all computers from different places in the synchronal communicative way. The number of the local internet, the workstations, and personal computer were raised during 1980s. Many organizations hoped to connect the regional internet with ARPANET in order to share the information with the main educational research institutes of America. The foundation of network was not settled down until former U.S. president Clinton declared to develop National Information Infrastructure (NII) in March, 1993. After that, the information exchanges from country to county blossomed. Community at education has achieved successfully in connecting with the whole world by the internet.

The internet in Taiwan has three main nets at the beginning, Taiwan Academic Network (TANet), HiNet, and Software Engineering Environment Development Network (SEEDNet). National Sun Yat-Sen University built the first Chinese Bulletin Board Systems (BBS) on TANet, October, 1992. From then on, the BBS creases and prospers in other universities, colleges, organizations, even the high schools and primary schools. The BBS has become the most popular and effective service on TANet. BBS provides on-line communication, e-mail and all kinds of discussion groups for the users to participate. It also has several functions, such as exchanging views, sharing experiences, solving problem, and making friends.

A traditional BBS can only show the texts while BBS on World Wide Web (WWW) can display more. BBS on WWW can display texts, graphs, tables, and so on. Thus, the BBS on WWW is active and attractive. More and more people indulge themselves on BBS.

BBS is popular among the young. Besides the flexible boundary of time and space, the user can appear anonymously. Lee (2000) claimed the anonymous environment is more effective compared to a signed environment. The anonymous environment in assisting instruction system could make the learning process much lively. In addition, it could motivate students' interest and stimulate interactions among students (Lee, 2000). The participants could have lower psychological press, and could interact actively in this anonymous environment. Therefore, the users are not afraid to offer their informal strategies or rough opinions. Because of this

anonymous characteristic, the low mathematics achievers show their ideas on a BBS with less concern (Ma, 2001, 2004). Most users enjoy using the anonymous community (Murfin, 1993).

It is varied and flexible to learn via the internet. Three learning styles of the internet could be collaborative problem-solving project, information collection, interpersonal exchanges (Harris, 1996). Results from several studies (e.g., Chang, Li, & Parnes, 1989; Chang & Tavakolian, 1989) denoted that students would be interested in learning under the internet environment. It would also increase students' abilities in solving problems and communicating with others.

The BBS could be very useful in the educational setting. The BBS offers (a) the e-mail service for the educators, students, and other users, (b) the share software for students' curriculum and educators' researches, and (c) data for specific or related topics for the users (Eslick, 1993). The students working on mathematics via BBS can induce 5th and 6th graders' interest, and motivate low-achieved students' confidence (Ma, 1999b, 2000b, 2000c, 2001, 2003b, 2004a, 2004b).

Hoyles (1985) claimed that communication could (a) form individual mathematical opinions, (b) promote individual to reflect these mathematical concepts, (c) be used suitably and flexibly, (d) be do effectively with others, (e) reflect other's ideas, and (f) combine other's ideas to individual opinions, or reasonably reject others' idea. Communicative discussion might be helpful to mathematical understanding which children generate (Hoyles, 1985). The national curriculum for nine years joint curriculum in Taiwan (Ministry of Education, 2000) denotes that expression and communication are the basic skills on learning mathematics. In fact, "Mathematics is communication" has already been one of the five procedure standards in Principles and Standards for School Mathematics (NCTM, 2000).

NCTM (2000) furthermore indicated that technology products (e.g., computer screen) are another good channel to communicate. It is easy for students to correct their mistakes or to change their records using computer technology. The screen can display these changes easily. Cobb, Yackel, and McClain (2000) denoted that technology tools can be used to facilitate the students' communication of the mathematical problem-solving strategies and supported the mathematical agenda.

Research Methods

This article is based on three projects funded by National Science Council in Taiwan. The purpose of these projects were, respectively, to study mathematical problem solving (e.g., Ma, 1999a), mathematical problem developing (e.g., Ma, 2000a), and reasoning (e.g., Ma, 2003a), through different BBS. BBS in these projects was viewed as a supporting channel for helping students work on mathematics.

The participants of the first project were 24 sixth graders from Taichung County, Taiwan. They had basic computer skill. They were given two non-routine problems of a type every other week on a traditional BBS. The participants solved 14 problems, belonging to seven types. They worked on mathematical problem-solving activities through communicating with others. The activities had lasted from September, 1999 to May, 2000.

The participants of the second project were 24 sixth graders from Taichung County, Taiwan. They had basic computer skill. The participants developed their own mathematical problems based on four types of material regarding addition and/or subtraction. The four types were imitation, equation, equation within an unknown part, and unrestricted form. The teacher sequentially posed an item of material every week or every other week on a

traditional BBS. The participants continuously developed 32 items of material. They worked mathematical problem-developing activities through communicating with others. The activities had lasted from September, 2000 to February, 2001.

The participants of the third project were 24 fifth graders from Taichung City, Taiwan. They had basic computer skill and used internet regularly. The participants were asked to plan a trip with their family on weekend according to their themes (e.g., hiking, picnic, etc.). They had to apply their mathematical skills and knowledge to do reasoning for daily real-life situation. The teacher monitored the interactions among participants, and also kept them on track on a BBS on WWW. The participants collected information surfing the net in addition to collaboration and interpersonal exchanges. This activity had lasted from October, 2003 to June, 2004.

Each participant in these projects had a specific account, password, and anonymous user name. The teacher presented some materials on a BBS. Students then had their conversations on the same BBS, in order to preserve the problem-solving, problem-developing or reasoning processes. The participants were allowed to express ideas and communicate with others at anytime and anyplace. Students used their time between classes and/or time after school to work on these projects.

Results

Examples of problem solving

The following example is from the first project (Ma, 1999a), "A Study of Mathematical Problem Solving of Elementary School Students through Bulletin Board Systems". The focus of this project is for students to solve mathematical problems. The following examples are part of students' conversations on the BBS, when they were solving the problem "How many squares are there in an 8×8 chessboard?"

The following examples showed how students communicated with others. Some information appeared for help on the BBS.

A: Can we view a grid as a square?

B: Can a grid and a grid form a square?

The rescue information appeared on the board.

C: Sure. A grid is a square which the side is one.

D: Think about the definition of a square.

E: Let's count with the 2×2 chessboard first.

Some responses to the above question still appeared, even when most solvers had proceeded to the different topics

F: What did you mean about what you posed last time?

G: Are there only 64 squares or more?

H: Could we have any rules to solve this kind of problem?

Furthermore we can examine students' ambiguous definitions of mathematics on the visible screen "Sure. A grid is a square which the side is one" is mentioned above. Yet, until the end of the study, none questioned the concept. It seemed that students thought the length at a grid is always one.

Some careless mistakes (e.g., typos or miscounting) could be corrected by others or themselves easily.

I: We can get the volume of the square.”

J: Why did you use “volume” here?

K: No. No. It's a typo. It should be the “area”, not “volume”.

Later, there was another message asking for help.

L: Can someone tell me why we should use “area”. I really don't understand it.

Examples of problem developing

The following example is from the second project (Ma, 2000a), “A Study of Developing Mathematical Problems of Elementary School Students through Communication in Computer Network”. The focus of this project is for students to develop mathematical problems. The following examples are part of students' conversations on the BBS, when they were developing problems based on (a) the equation, $5/3 - 1/4 = 17/12$, and (b) an unrestricted form.

The following examples showed how students communicated with others. Some information appeared for question on the BBS.

A: I have $5/3$ dollars. After I spend $1/4$ dollars, I still have $17/12$ dollars.

B: What do $5/3$ dollars, $1/4$ dollars, and $17/12$ dollars mean?

C: If you have $5/3$ cake, and you eat $1/4$ of it. You will only have $17/12$ cake left.

Some careless mistakes (e.g., typos or miscounting) could be corrected by others or themselves easily.

D: Mom has 300 dollars. She gives the younger brother 90 dollars and than the older brother 100 dollars. She has only 110 dollars left.

E: You have a typo. It is “then”, not “than”.

F: The brother have 10 dollars; he spends 2.5 dollars to buy a pencil. He still has 6.5 dollars.

G: You are miscounting.

Examples of reasoning

The following example is from the third project (Ma, 2003a), “A Study of Reasoning of Mathematical Connections in National Curriculum for Nine Years Compulsory Education”. In the study, students work on the life-related reasoning. The following examples are part of students' conversations on the BBS, when they were planning their budget for buying bottled water. Among them, “.....” expresses some deleted content by the researcher.

【ydi05152】 (a anonymous name for one participant):

In consideration of buying bottled water

The economic way is to buy the big ones.



【ydi05151】 : *I was wondering.*

If we buy three big ones, how can we divide equally as there are more than three people on this trip. It would be very inconvenient. I suggest that we do not consider saving money simply; buying the little ones would be more convenient.

【yco05036】 : Re: ydi05151 : *I was wondering.*

I suggest that the most important stuff when hiking is water. Why don't we bring water bottles ourselves, and we don't have to buy water.

We should buy some chocolates and foods which can provide us energy.

If there are 4 persons in a group,.....

Maybe we can buy some instant noodles in case that we are hungry. The retailed price is $7 \times 4 = 28$ dollars, so it is better that we buy a big package with five small packs and costs 30 dollars.

$300 + 38 + 24 + 30 + 128 + 30 = 540$, each person will pay $540 / 4 = 135$ dollars.

【yco05036】 : Re : ydi05152 : *In consideration of buying bottled water.*

.... .That is a good idea, but I still believe buying the small ones will be better. You need to consider the inconvenience on the hill. If you don't mind, you can bring cups.

Discussion and Conclusion

From the above examples, the researcher gained some insights about how students expressed and communicated with others via BBS. The participants were not afraid to ask for help using the anonymous names. Such as “Can a grid and a grid form a square?” or “Can someone tell me why we should use “area”. I really don't understand it.” They could show their ideas, casual or rough opinions, with less concern at the same time. Such as: “Sure. A grid is a square which the side is one.” or “I have $5/3$ dollars. After I spend $1/4$ dollars, I still have $17/12$ dollars.” Furthermore, they could develop or stimulate some new opinions for and against through a visible screen. Such as: “Let's count with the 2×2 chessboard first.” or “You need to consider the inconvenience on the hill. If you don't mind, you can bring cups.” or “The retailed price is $7 \times 4 = 28$ dollars, so it is better that we buy a big package with five small packs and costs 30 dollars.” Any typos or counting mistakes also could be found and corrected through a visible screen. Such as: “The brother have 10 dollars; he spends 2.5 dollars to buy a pencil. He still has 6.5 dollars.” or “No. No. It's a typo. It should be the ‘area’, not ‘volume’”. The teacher could be aware of students' mathematical understanding, clear or ambiguous concepts. For example: Someone knew that buying three big bottled waters would be more economic than buying five small ones. The reason was the following: $1250 \times 3 = 3750$ c.c.; $23 \times 3 = 69$ NT dollars. $750 \times 5 = 3750$ c.c.; $15 \times 5 = 75$ NT dollars. Or students thought that the length at a grid is always one.

Shifting the mathematic activities to a BBS treated the BBS as a channel for students to express and communicate with others. Participants could be “solver”, “discussants”, or “observers”. The “solver” expressed their opinion and/or communicated with others. They offered some useful ideas. The “discussant” read others' opinions and also participated in discussion, yet they did not offer any useful ideas. The “observers” simply read others' opinions but never participated in discussing or offered any ideas. The opinions of “solver” and “discussants” were seen in the electronic discussion board while the “observers” were not.

There was no doubt that the “solver” participated in the mathematical activity via BBS. The “discussant”

also provided their ideas, so they were treated as the participants in the activities. The two types of the participants engaged in the learning situations. Even though the “observers” did not participate in any discussion, they learned other’s viewpoints/opinions. The “observers” engaged in the learning situations still. No matter what students did, such as expressing their viewpoints, discussing and sharing opinions, or even just reading without posing any idea, they all were involved in the learning situations.

This article presented examples to illustrate the role of a BBS while students work on mathematics. We saw students’ interaction during the problem-solving, problem-developing, and reasoning process. The participants of these projects can take the advantage of the convenience of the internet to share multiple ways and strategies in solving problems given them. They could express and communicate with others at anytime and anyplace. In addition, the participants in the third project had learned to collect, organize and share information by surfing the net. They furthermore worked reasoning activities collaboratively. These projects, especially the third one, supported Harris’s (1996) three learning styles of the internet (i.e., collaborative problem-solving project, information collection, interpersonal exchanges).

Students working on mathematical activities via BBS could help students to develop skills of using technology and collecting information, as well as how to express and communicate with others. In addition, all participants in the activities could be involved in the learning situations. As a result, the BBS can be viewed as another channel for supporting students to work on mathematics.

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