Applying Social Networking and Math Trails to Third Grade Mathematic Class

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***Abstract*—Since the emergence of social networkings and their characteristic of user-generated contents, they are being widely used among the young generation. In addition to the original purpose of networking and friending, social networking can be taken advantage and be implemented in educational settings. On the other hand, for decades, mathematical trails have been implemented among schools because students can be taken out of classrooms and link mathematical to their daily lives. Therefore, they go well beyond knowing only textbooks and enjoy the learning-by-playing process. These activities focus on stimulating students' learning motivation. In this article, it mainly aims at sharing and communication which fosters students' attitude towards collaborative learning in mathematical education. Thus, it will help students learn better. Along with social networking, students could interact with each other or with instructors in both asynchronized and synchronized way. Moreover, to diagnose students' misconcepts and enhance their concepts, formative assessment is used as an instrument. As this article is some inspiration of the author, there is no empirical data. However, it is expected that the combination of social networking and mathematical trail would be helpful for students' mathematical learning.**

***Index terms*—formative assessment, mathematical education, math trail, social networking.**

I. Introduction

Gradually, the traditional model of face-to-face teaching-and-learning has been revising. It has become more student-centered and technology-enhanced. When it comes to a Web 2.0 classroom, instructors will have problems as follows. To what extent do teachers use Web 2.0 tools when teaching? To what extent do students participate in and interact with instructors online? How do students contact with each other or with instructors? Moreover, the educational use of social networking is an emergent multimedia expression format. Hence, this article tries to answer questions above and briefly describes the following key concepts.

II. Mathematical Learning

Learning is such a common human experience and an enduring change in the mechanisms of behavior that result from prior experience with similar stimuli and responses [1]. Some of the students in Taiwan are often afraid of learning mathematic.

Without thoroughly understanding, all they do is just memorizing it, not to mention the problem patterns, or the problem-solving processes. This is an effective way while there are only few concepts to learn. As there are more and more concepts or the concepts become more complicated, the above mentioned way becomes less useful. It is also harmful for students' learning because mathematical concepts are hierarchical, that is, the higher level concepts contain the lower ones. Students who have bad performances in mathematic may easily get lost in a variety of concepts due to lack of conceptual understandings. For example, it is usually difficult for students to identify that those equivalent definitions are actually identical. Since learning is a process of changing the "novice's" understandings, argument is one of the essentialities in meaningful learning of concepts and processes [2]. Besides, small-group argument is anchored. From investigations, purposeful and authentic opportunities are created for students. Therefore, they have the chance to oscillate between expert and novice roles [3].

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III. Some Problems in Mathematical Learning

It is found that typical science lessons rarely promote social negotiation of meaning while students are in small-group or whole-class discussions [4]. Instead, the interaction was mainly dominated by instructor's exposition and question/answer sessions. While group work is founded, it is poorly organized and not extensive. Primarily, discussion is focusing on procedures whereas students' discussion is rarely fostered. Often, it seems that mathematical has been taught as dogmatic and unquestionable truths provided by instructors [5].

For example, it has been a long tradition that elementary classes are lecture-based in Taiwan. Students learn only from their textbooks with repetitive practice at solving problems in such classes. In addition, most of the students go to cram schools after regular classes at school because of parents' expectation. As private schools in Taiwan are considered to be better than the public ones, parents mostly expect their children can go to private schools. While there are entrance examinations in private junior high schools, elementary students need to pass these examinations. Afterwards, while they are in junior high schools or participating in the national entrance examination, these students are expected to have higher achievement than students in public schools. This is so called test-guided-learning, which has been criticized for decades.

When it comes to the problem-solving process, the most widely-used strategy for Taiwanese students is referred to as "chug and plug". Students first find formulas, put the data, and accept answers come out of the calculation. This will induce students merely memorize the process and automated skills without total understandings. When they are taken out of the pencil-and-paper, for example, they are asked to

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design solutions which are related to certain daily problems given by the instructor. As been seen, some of those perform well in regular classes may fail to do so. Part of the reason may be that their thinking is restricted to the problem-solving process frequently used in the textbook-problems. As they encounter real problems which they are unfamiliar with, their thinking is stuck in the same way, rather than doing trial-and-error. They are a little bit passive and afraid of making mistakes. This leads them to be good problem-solvers only in the textbook contexts. It is crucial to think about how to deal with these problems. Thus, students need to develop systems of concepts which help them learn better. Students have to broaden applications and to connect ideas across different areas of mathematics.

Take the learning unit "shapes" as an example. If a shape can be folded in half and one half exactly covers the other one, then it is said that the shape is symmetrical. Besides, the axis of symmetry is just the fold line. While some shapes have lots of distinct axes of symmetry, others have only one or none. Then students can calculate the area of each shape. After calculating, they can recognize the area of a given shape belongs to odd or even numbers. Besides, it is quite simple to implement and understand when it comes to making geometrical models with flexible plastic drinking straws. Students only need several bags of straws and masking tape. Then, they squash straws to make them narrower and insert them into the other half ones. Joining three straws together, a triangle is made, and four, a square. In this way, three-dimensional models are able to be made, such as cubes and pyramidal.

IV. Math Trails

A math trail aims at encouraging people to seek out specific concepts while they are on the trail. The first official Math Trail was developed by Dudley Blane, an Australian educator. Kay Toliver is a K-12 school teacher who is known for her efforts devoted to math trails in the United States [6].The Math Trail began in 1992 is as a way to get students out into the community and to raise their appreciation of the things in the ordinary surroundings. Besides, this helps students to discover mathematical applications in the real world. As her students work on the math trail, Toliver has found that they begin to have a feeling of ownership for their community. Besides, a sense of pride in the things around them is cultivated [7].

When it comes to math trails, first of all, instructors need to understand reasons for using math trails. It is due to adding a sense of fun and adventure to math topics; offering an alternative to formal and written assignments; and stimulating those who have previously experienced difficulties in mathematical from a different perspective. It is also shown students that how mathematic is useful throughout the curriculum. What is more, it is a socially interactive activity, which allows every student to observe and record, so their responsibility will be cultivated equally. An opportunity is provided to revise aspects of many strands and to assess progress in an integrated way.

Next, how to organize a mathematical trail has to be known. Instructors should select topic and venue. Then, instructors need to make choices as follows. Will presentation of the assignment to the students be written or drawn? Will the recording be done while on the trail or in the classroom? Instructors need to notice that equipments must be organized in advance and the time allocation must be clearly defined. Moreover, the aim of the exercise should be explained to students and follow-up activities should be organized.

V. Social Networkings

Social networkings are regarded as key roles in the web 2.0 era. So far, it has been widely discussed if social networking has transformed the landscape of the web. In fact, social networking has not only changed the ways of consumers' communication and gathering on the web, but also has an impact on content discovery and navigation. The world now spends over 110 billion minutes on social networks and blog site, which is equal to 22 percent of all time online [8]. When it comes to the media use of young people, it is remarkably different from that of older generations. They are more connected and tech-savvy, and prefer using personal digital devices, such as smart phones and laptops. According to Nielsen's Asia Pacific Social Media Report, there has been unprecedented growth in Asia Pacific, which is one of the most critical trends in the online sector currently [9]. By social networkings, users are allowed to create their own profiles. Through networking, it increases the feeling of community among people. There has been embraced an approach of generating and distributing web content in an open, decentralized, and conversational fashion by and for end users [10].

Generally, each user's profile, social links, and a variety of additional services are components of social networkings. Most of them are web-based which provide paths for users to interact with each other on the web. For example, e-mail, instant messaging, sharing ideas, activities, events, and interests within their individual networks are major functions. Some of the social networkings have additional features, such as creating groups which share common interests or affiliations, upload or stream live videos, and hold discussions in forums.

While the popularity of using social networking is on a constant rise, there are also novel uses for the technology being observed. There is one of the trends in social networkings, that is, the concept of real time. While users are contributing their-own-generated-content, they then can broadcast as this content is being uploaded.

VI. Some Learning Theories

People are now facing big challenges because of transition and popularity of using technologies. While accessing to information is easier and easier, the current patterns of teaching and learning may be different with the previous ones. Thus, not only instructors but also educators should reconsider and rethink the educational objective from an innovative perspective. However, there are some learning theories are regarded to be very important.

First of all, Piaget has presented his Cognitive Developmental Theory. In his theory, he argues that there are different stages in children's cognitive development.

Besides, interactions between external environments and children are helpful for constructing individual's knowledge. Afterwards, students learn how to get used to the new environments by accommodating existing schemas [11]. Then, Vygotsky presented his view point of social constructivist. It is emphasized that individual's structure of knowledge is based on the social contexts where ones are located in [12]. Vygotsky's learning theory has been applied in follow-up models. As been stated in Bruner's Discovery Learning theory, students' cognitive structure and prior knowledge should be recognized before teaching. While instructors are teaching, it should be coordinated with students' development of cognitive representations. Then, structural materials are provided for students to enhance their understanding [13]. It is also argued that most students cannot apply what they have learned to real-world problems or situations. For these reasons, they argue that the model of cognitive apprenticeship and situated cognition are helpful for students' learning transfers [14].

Nowadays, information and communication technologies are facilitating both emergence and growth of learning communities. These members interact from remote corners or anywhere to online learning communities, such as accessing learning through participation in communities. As Vygotsky's theory of social constructivism points out that it is from an individualistic focus to the contribution of others to individual's learning. Thus, knowledge is commonly socially constructed through collaborative efforts which towards shared objectives or by dialogues [15]. Besides, knowledge is regarded as being constructed through dialogue and discussion. This is also one of the main concepts taken up by collaborative learning [16]. While being under student-centered models, students use their own experiences to construct understanding which makes more sense than understanding knowledge in already organized forming [17]. Students then actively and constantly engage in the process of constructing meaning from their experiences.

VII. An Exampler: A Trail in Our School

In this part, an exemplar is proposed. The main idea of the educational activity is to set various stages in the school then a math trail is formed. The learning objectives are as follows: first, to identify quantity and number as well as solving the real-problems with the use of simple multiplication equation; second, to know how long one meter actually is and use one meter as a unit to measure other things; third, identify, describe and classify various shapes. Besides, the most important is to cultivating students' ability of doing preliminary records of events and activities in their daily lives. The followings are three stages and linked areas of the math trail.

Due to time limitations, the instructor lets children to construct their own account on Google. Then the Buzz item is on the left side without additional settings. Here, Google Buzz is not a replacement of traditional face-to-face learning but is regarded as a tool for enhancing learning. Buzz is the social networking provided by Google this February (http://www.google.com/buzz). The reasons for using Google Buzz will be further discussed in the analysis part. Each of the students constructs their Google account and begins to use Google Buzz. Before implementing this activity, the instructor posts questions related to students' prior knowledge. This also provides students an opportunity of reviewing of their learning. Given a period of time, students should post their answers which are set private at the beginning. By doing so, it makes students who are shy engage more in the mathematical class and what they are thinking about and their level of understanding would be investigated.

Stage 1: Count the numbers.

Venue: In the school building.

1. Please count the number of classrooms in the third grade.
2. As each door of the classrooms in the third grade become old now, re-painting is needed. How many doors are there to be painted?
3. Suppose a bucket of paint could cover up with three doors; to finish painting the doors of the classrooms in the third grade, how many buckets do I need?

Stage 2: What is a meter?

Venue: In the school yard.

4. Recall 100 centimeters are equal to one meter. Please show me how long a meter is by the use of materials around you.
5. Choose one of the lanes in the school yard; can you use above mentioned materials as a unit to measure the length of the lane?

Stage 3: Find out shapes.

Venue: In the playground.

6. Please draw the shapes and write down their names while observing the recreation equipment.
7. How many different types of shapes are there?

Fig. 1. Questions and the name of each stage are listed.

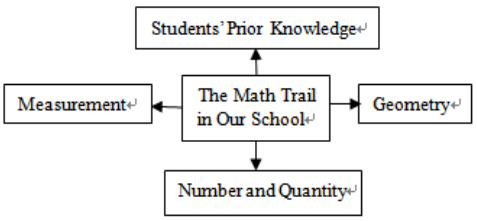

Fig. 2. The linked areas of the math trail are shown.

The process of implementing the activity of the math trail is as following description. To make students understand what they are going to do, the instructor first introduces the activity to them. Then, related worksheets are provided both in class. While on the math trail, students need not only to walk and look around, but also to think about the questions asked by the instructor. They are encouraged to have discussions with their classmates. After the implementation of going to the math trail, here are the follow-ups.

There will be three articles with the title of the stage names. The instructor posts questions which are same as those on the worksheets. The instructor sets a deadline for these questions. Each student should post their answers on Buzz which are initially set private in order to prohibit copy among students. Of course, students can use whatever they

want, such as information on the web and paper-based references, but citation is required in a given style. Copy and paste is strictly prohibited. Students should rewrite and organize the information they found. After answers are collected, the instructor can focus on the part of common mistakes and try to correct these mistakes. Once mistakes are diagnosed, it is an opportunity for the instructor to point out the conceptual basis to students. In addition, the instructor should be aware of which one of the knowledge that a student is lacking. By correcting their mistakes, the instructor will review these answers again. In addition, students can add something related to the activity, such as their own-drawing, hand-written, and pictures taken on-site. Related academic resources can also be posted. Besides, why they think these resources are useful should be explained.

When it comes to the presentation, it mainly focuses on the attitudes toward the math trail and what they have learned. Students are also encouraged to design their math trails and introduce to their classmates. While presenting and demonstrating in class, both feedbacks from peer and instructor are available. Students then choose which part of activities above is their favorite or which is the most useful for them, no matter in the previous math trail or students-designed ones. As they want, comments can be posted on Buzz. After finishing the process, the instructor draws a conclusion.

VIII. Analysis

In this paragraph, the activities above are analyzed. First of all, the Google Buzz needs no installation and is free of charge. Though the functions are also similar to other social networking, it has quite a simple and plain setting in contrast to other ones. Moreover, it is without a restriction of minimum age. Thus, the use of Google Buzz becomes zero barriers of entry for elementary school students. Moreover, there are applications which are easy to use, such as RSS matters for keeping track, tagging, and open APIs. Besides, Google is the most popular browser and other applications powered by Google are widely used. The integration among Buzz and other apps, such as Google Calendar and Gmail, is available now. Text chats are saved and searchable. However, when it comes to the killer application, it has not been developed so far.

From the learning and teaching perspective, it is very inconvenient for educators and students to search online by their own. Though the current search engine is very powerful, students and instructors without information training are often bad at using it. Since many resources are repeatedly categorized and the amount is exploring, users usually cannot find out what exactly they want. Hence, most of the students have barely used online resources for active learning. Social networking thus plays a role of information filter and navigation. On the other hand, the formative assessment is implemented as a diagnostic instrument for students' learning. It is also helpful for the instructor to identify students' concepts and misconcepts. Besides, due to taking scenes and objects in the school, students are familiar with those items. This activity will be held in the school setting. All of the objects in the surrounding provide opportunities for students' learning. With the experience of the life, it can be seen that mathematics is everywhere. This activity is also regarded as a way of assessment while reviewing mathematical knowledge that students have already learned. While incorporating formative assessment into classroom practice, it provides the information for adjustment of teaching and learning. Thus, formative assessment informs not only instructors but also students for students' understanding at a point. What is more, timely adjustments can be made. These adjustments help ensure students achieve targeted standards-based learning goals within a set time frames [18].

IX. Conclusion

Mathematic is one of the long traditional sciences regarded as being everywhere in people's daily lives. It is a great way to take students on a math trail. While being on the trail, they get to see the world through the eyes of mathematics. A math trail brings an opportunity of taking students out of the classroom to solve various math problems related to shapes, structures and numbers in the surroundings. Though there are rapid changes in modern society, the importance of mathematic and mathematical learning never decrease. By contrast, mathematic is still the tool which aims at communicating and navigating other subject areas of sciences. In other words, it is the language of science which implies thinking, reasoning, modeling, and representing.

Since the Grade 1-9 Curriculum Guidelines are implemented in Taiwan, as well as the environmental and contextual change, trends of mathematical education are as follows. First, the content needs to be a linkage of real life and school. Since students may encounter mathematical problems at any time and everywhere, without combination of daily experience, mathematical education is none of sense. Next, related resources need to be organized. While similar experiences of knowledge are aggregated and organized, students would learn those contents systematically. This also avoids wasting of time on those repeated contents. Moreover, learning in a collaborative, game-based, and student-centered way could be viewed as a strategy to improve students' performance.

By considering students' abilities and interests, instructors need to organize the subject matters and design educational activities appropriately and carefully. Since the use of multiple assessments is available and helpful, assessments should not be restricted to written tests. Under multiple assessments, students' interests and passions in exploring mathematic will be developed and what they learned will be applied to real-life situations. In addition, their perception of interacting between human beings and technologies will gradually be cultivated.

When it comes to the use of digital technology, it is not a replacement of traditional learning, but rather an extension and enhancement. Digital multimedia content is created for the main purpose of expressing ideas, representing knowledge, and communicating information. Indeed, it is an effective strategy because of integrating various forms of content. Since there are patterns all around us, mathematic is never the thing on textbooks. To engage more in learning

mathematic, students need to appreciate the patterns and explore not only the meaning but also the implication. Furthermore, students need to generalize what they have learned to other situations. Since the technology-enhanced learning is dynamically redefined, it should be kept in mind that the best has not come yet, thus instructors should update themselves in order to keep up with the times and global trends.

REFERENCES

[1] M. Domjan, *The principles of learning and behavior*, Thomson: Wadsworth, 1998.

[2] L. S. Vygotsky, *Mind in Society: The development of higher psychological processes*, Cambridge: Harvard University Press, 1978.

[3] A. Cavagnetto, B. M. Hand, and L.Norton-Meier, "The Nature of Elementary Student Science Discourse in the Context of the Science Writing Heuristic Approach," *International Journal of Science Education*, vol. 32, no.4, pp.427 − 449, 2010.

[4] P. Newton, R. Driver, and J. Osborne, "The place of argumentation in the pedagogy of school science," *International Journal of Science Education*, vol. 21, no. 5, pp. 553–576, 1999.

[5] C. B. Cazden, *Classroom discourse: The language of teaching and learning*, Portsmouth: Heinemann, 2001.

[6] FASE Productions. (2006). The Math Trail. [Online]. Available: http://www.nationalmathtrail.org/ktmathtrail.html

[7] FASE Productions. (2006). About Kay Talivorl. [Online]. Available: http://www.nationalmathtrail.org/ktabout.html

[8] Nielsen Wire. (2010). Social Media Accounts for 22 percent of Time Oline. [Online]. Available: http://blog.nielsen.com/nielsenwire/global/social-media-accounts-for-22-percent-of-time-online

[9] Nielsen Wire. (2010). Social Media Dominates Asia Pecific Internet Usage. [Online]. Available: http://blog.nielsen.com/nielsenwire/global/social-media-dominates-asia-pacific-internet-usage

[10] C. D. Huang and R. S. Behara, "Outcome-Driven Experiential Learning with Web 2.0," Journal of Information Systems Education, vol. 18, no.3, pp.329-336, 2007.

[11] J. Piaget, *The psychology of intelligence*, New York: Routledge, 1963.

[12] L. S. Vygotsky, *Mind in Society: The development of higher psychological processes*, Cambridge: Harvard University Press, 1978.

[13] D.Wood, J. Bruner, and G. Ross, "The role of tutoring in problem solving," *Journal of child psychology and psychiatry*, vol. 17, pp. 89-100, 1976.

[14] J. S. Brown and P. Duguid, *The social life of information*, Boston, Harvard Business School Press, 2000.

[15] R. D. Pea, "Distributed intelligence and designs for education," in G. Salomon Eds., *Distributed cognitions: Psychological and educational considerations*, pp. 47-87. Cambridge: Cambridge University Press, 1993.

[16] W. Doise and G. Mugny, *The social development of intellect*, New York: Pergamon Press, 1984.

[17] K. E. Watkins and V. J. Marsick, "Schools as learning communities: Sculpting the learning community: New forms of working and organizing," *National Association of Secondary School Principals, NASSP Bulletin*, vol. 83, no. 604, pp. 78-87, 1999.

[18] C. Garrison and M. Ehringhaus. (May 2007). Formative and summative assessments in the classroom. [Online]. Available: http://www.nmsa.org/Publications/WebExclusive/Assessment/tabid/1120/Default.aspx

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