A Brief Introduction of Mathematics Education Using GeoGebra in Korea

Kyeong-Sik Choi
Gyeonggi-Buk Science High School, Korea
mathcare@gmail.com

Abstract

This paper provides an introduction of mathematics education using GeoGebra in Korea. Because there are not previous researches using GeoGebra in Korea, researches of DGS are explained. Then GeoGebra’s projects in Korea are introduced. GeoGebra is used for teaching in Institute of Gifted Students and supervising teams in Gyeonggi-Buk Science High School as tools for exploration of mathematics. An experience of mathematics class using GeoGebra is also mentioned. Finally Korea’s unique internet environment is examined and alternative solutions for spreading GeoGebra in Korea are proposed.

1 Previous Researches of DGS in Korea

Many researchers and teachers have been interested in DGS (Dynamic Geometry Software) in Korea. Specifically, GSP (Geometer’s Sketchpad) is the most famous DGS in Korea. Kang and Choi-Koh investigated the development of instructional materials. They constructed some examples of regular polyhedrons and their development figures using GSP. They argued that the examples would be able to help teachers’ instruction in their geometry classes (see [5]). Kim researched the use of GSP in the view of problem solving. He asserted that GSP materials in Korea were only the introduction for constructing some GSP files. So he showed GSP examples according to Polya’s problem solving steps (see [7]).

On the other hand, Kim and Cho studied functional definitions using JavaMAL (see [6]). JavaMAL was developed by Han-Hyuk Cho in 2000 (see [1]). JavaMAL is Java applet that has functionalities of DGS and LOGO. So JavaMAL is able to draw its turtle geometric figures and dynamic geometric figures simultaneously. JavaMAL’s basic interface is command input system but also provides context menus. It can define functions and use recursive definitions.

Cho, Choi and Kim constructed some dynamic examples using DGS on the internet. They suggested three examples, i.e., algebraic bar model, dynamic geometry model and graph model. Specifically, algebraic bar model was designed for children who didn’t understand variables and equations (see [2]).

Although many studies of DGS, the proposed examples haven’t applied to mathematics classes in secondary schools in Korea. The reason is that there are some barriers, i.e., curriculum scope, accessibility of computers and accessibility of programs. It was stated by Little (see [8]) for description of obstacles of implementing dynamic geometry in the classroom of UK. But it seems very similar to Korea’s education situations.

2 GeoGebra Projects in Korea

I translated GeoGebra into Korean from September 2008 to April 2009. So there have not been existing GeoGebra projects yet.

I am teaching mathematics at Gyeonggi-Buk Science High School[1] and Institute for Gifted Students. Science High School is a special school for Math & Science gifted students of 16 – 18 years old and

Institute for Gifted Students is for 13 – 15 years old in Korea. They have some gifts in mathematics or science, therefore I can’t provide materials for basic concept understandings. So I am writing new materials for students to learn mathematics by problem solving activities using GeoGebra. When this materials is done, it will be submitted to Gyeonggi Provincial Office of Education and provided as mathematics materials for the gifted students.

Whenever I make GeoGebra’s materials for the gifted students, GeoGebraWiki gives me very useful materials and ideas. After I collect materials in GeoGebraWiki, I modify it for the gifted students to explore in mathematics knowledges. For example, when I searched in GeoGebraWiki for teaching symmetry and I found Girih pattern (see [9]), my mind was inspired with the idea about symmetry and point movement. It was that if I made an islam figure using Girih pattern on moving point, that the figure would be moved in the Geometric view of GeoGebra (see [4]). So I made the material about that, I will provide to the gifted students.

In this year, I supervise two teams that should research their themes and write articles. One team is consisted of four high school students, the other two middle school students. These teams should have public meetings with me and must submit a report for each one meeting. They should determine themes for their research. I showed them GeoGebra with its tools and they had interests in GeoGebra. They will determine themes for their article using GeoGebra soon.

I hope that many teachers in Korea know about GeoGebra and use it for their instructions of mathematics with deeper understanding about DGS and mathematics.

3 GeoGebra in the Mathematics Classroom


My topic was Point and Coordinate that was about Cartesian coordinate and point’s traces. I decided that my teaching place should be a computer classroom, because there was enough computers to my students. They were 20 freshmen in my school and learned GeoGebra for an hour before.

I presented a brief introduction of Descartes, Coordinate system and traces of points. After that, I gave six problems to my students. Especially, the sixth problem was taken from GeoGebraWiki (see [3]). I planned the process that students would construct geometric model using GeoGebra, claim some conjectures about the curve shape and prove their own claims. In this case, they constructed geometric model and found that the curve seemed elliptic. But for the lack of time, their claim was not able to be proved. The mathematical proof was given to the students as their homework.

I started my class with other teachers’ not very positive opinions of using computers and DGS, but their opinions were changed to the positive. And some students told me that my class was interesting.

Other mathematics teachers and vice-principal pointed out that using GeoGebra in the mathematics class might ...

- be needed time for the students to be familiar with GeoGebra
- have the constraint of selecting mathematics problems for class to be suitable for GeoGebra
- be attraction to the students from solving mathematics problem to operating GeoGebra

I think that the problems which was pointed out from other teachers would be solved soon. Because technology is developed persistently, and many researchers and teachers make their endeavors to solve the problems.

In the future, mathematics classes using GeoGebra should be more, so the proposed problems should be solved and using GeoGebra in the mathematics class be improved in Korea.

4 Constitution of GeoGebra’s Community on the Internet Environment in Korea

Internet connection penetrates every house and everyone’s life in Korea. Especially, Korea’s internet environment is different from other countries’. For example, many people in the world search knowledges that they need at Google but most of the Korean search knowledges at Naver. Naver is a Korean question & answering portal similar to Yahoo! Answers. Many Korean thinks that Naver provides more appropriate informations that they want to know than Google. Korean also register to Cyworld instead of Facebook. In this sense, Korean is building up their own internet communities which is not connected to the worldwide communities.

Therefore, there are some obstacles in spreading GeoGebra’s Communities, i.e., GeoGebraWiki, GeoGebra User’s Forum in Korea. Namely, many Korean don’t know how to use Wiki and Forum, Wiki and Forum might be very strange to Korean teachers and students. There is no doubt that using GeoGebraWiki and GeoGebra User’s Forum would be good to so many teachers and students, but there are difficulties for them to use. Moreover, language is another obstacle to Korean teachers and students, so that they have the difficulties of participating in GeoGebraWiki and GeoGebra User’s Forum.

I have recognized these problems and thought that these must be overcome. To begin with, I decided to take advantage of Naver cafe which is the community of Naver’s providing. In other words, I opened a community of GeoGebra on Naver cafe and introduce GeoGebra through the community now. For Naver’s popularities, people’s awareness of GeoGebra is increasing in Korea. But I have plans to lead my community’s members to GeoGebra’s communities soon. Because Naver cafe is not substantial solution about that, I will lead many teachers and students who are interested in GeoGebra to GeoGebra’s communities.

5 Conclusions

GeoGebra is being introduced to mathematics teachers and students in secondary schools for the first time in Korea. Previous researches about other DGS contained materials that teachers could not use at once or examples which was not applied to the mathematics class. It was not a help any more, so they couldn’t use DGS in their mathematics classroom.

So I think that any DGS for the education is...

- easy-to-use
- familiar with teachers and students
- possible to be used with practical instruction materials in the mathematics classroom

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3http://www.google.com/
4http://www.naver.com/
5http://answers.yahoo.com/
6http://www.cyworld.com/
7http://www.facebook.com/
8http://cafe.naver.com/
GeoGebra is the very software and it has good user communities having vast materials for instruction and exploring mathematics for different ages. But for Korea’s unique internet environments, Korean users feel strange to GeoGebraWiki and GeoGebra User’s Forum. As an alternative solution, I opened an community of GeoGebra on Naver. But Korean users should be helped to adapt to GeoGebra communities.

And a model for the mathematics class using GeoGebra in Korea is needed to be proposed, and according to this model teachers will write materials and instruct students in their classroom in the future.

References