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Technology professional development and research collaboration: Towards an International GeoGebra Institute

Research suggests that, for the majority of teachers, solely providing technology is insufficient for the successful integration of technology into their teaching (Cuban, Kilpatrick and Peck 2001). It has been suggested that adequate training and collegial support increase teachers' willingness to integrate technology into their teaching and to develop successful technology-assisted teaching practices (Becker, Ravitz and Wong 1999). Our aim is to establish an International GeoGebra Institute (IGI) to be able to offer free structured training and support for teachers who are ready to integrate GeoGebra into their classrooms. In addition, we endeavour to organise and coordinate research projects in relation to GeoGebra to enhance the development of training and support materials. Whereas our initial plan is to establish an IGI site at Florida Atlantic University (USA), in the long run our goal is to collaborate with colleagues and set up other institutes in various locations around the world.

History of GeoGebra

GeoGebra (www.geogebra.org) is open-source dynamic mathematics software with rapidly growing worldwide popularity, especially in Europe and North America (Hohenwarter and Preiner 2007a, 2007b). The software was conceived as Markus Hohenwarter's Master's thesis project at the University of Salzburg, Austria. The basic idea of the development was to create dynamic mathematics software that incorporates geometry, algebra, and calculus, which other packages treat separately (spreadsheet and computer algebra extensions are soon to be added to the software), into a single easy-to-use package.

International GeoGebra Institute (IGI)

The unanticipated success of GeoGebra has demonstrated that non-commercial software packages have the potential to impact mathematics teaching and learning worldwide. There is an extensive self-supporting user community that shares free interactive teaching materials on the GeoGebraWiki and supports fellow users through the user forum. Volunteers from the user community have translated GeoGebra to 39 languages, offering the opportunity to use the software in local languages and in multicultural environments. The software runs on virtually any operating system as it requires only a Java plug-in and, unlike commercial products, students and teachers are not constrained with licenses to run the

software on only a limited number of computers. Moreover, GeoGebra offers the powerful feature for teachers to create interactive online learning environments by supplying not only interactive worksheets, but also the entire software package for their students through the Internet. Such customised interactive worksheets have led many teachers to foster experimental and discovery learning for their students and to share thousands of such worksheets on GeoGebraWiki.

These developments have encouraged us to start working on the establishment of an International GeoGebra Institute where teachers and researchers, regardless of their location, aim to promote the learning and teaching of mathematics by supporting and coordinating the following activities:

1. offer free software for teachers, students, and anyone with non-commercial interest,
2. continue to enhance GeoGebra's capabilities and ease-of-use based on feedback from teachers and researchers,
3. offer free workshops, professional development, and teaching materials,
4. develop an organised structure to train, support, and possibly certify teachers who wish to participate in GeoGebra-related activities in their local areas, at conferences, and within IGI, and
5. design and support research projects in relation to GeoGebra and nurture a network of researchers who wish to contribute to any aspect of GeoGebra.

The first IGI site is currently being established at Florida Atlantic University, which will be followed by other sites around the world. Although IGI sites will have specific locations, the idea of working together on open-source software, professional development and research is more important than the actual location of IGI sites. We envision nurturing an accommodating network of IGI sites with colleagues working on various aspects of GeoGebra. The overall goal of IGI is to develop a supportive environment and continuous communication among participants and sites. According to this philosophy, every IGI site would only adopt ideas and materials that serve their local needs. With respect to research we anticipate that researchers will contribute to GeoGebra according to their specific research interests. We also hope that the network of IGI sites in different countries will offer the opportunity for researchers to conduct international comparative research and for teachers to collaborate with

colleagues across borders. Moreover, we plan to support any incentives and funding applications that contribute to the objectives of IGI.

The IGI website will be a central part of this project that we hope to become the main channel of communication of interested people. Currently, we are designing this website which is likely to become available in the summer of 2008 (www.geogebra.org/IGI). The website will provide information about IGI locations, associated people, and related projects and activities. Local IGI sites can set up and maintain their own websites, which will be linked with the main IGI website.

IGI activities at Florida Atlantic University

With the support of the U.S. National Science Foundation (NSF) we are currently starting activities of the first IGI site at Florida Atlantic University (FAU). This site is currently developing GeoGebra professional development materials that can be adopted and extended by other IGI sites. The FAU-IGI site will coordinate the following activities:

- develop GeoGebra workshop and certification materials,
- offer workshops for teachers and future trainers throughout the US,
- further develop GeoGebra and implement new features of the software,
- develop an on-line support system for teachers,
- evaluate and improve the professional development activities and materials,
- design and implement research projects both on GeoGebra and IGI,
- deliver presentations at national and international conferences.

Other IGI sites will be able to base their activities on materials and experiences from the FAU-IGI site. However, all sites will be free to focus on specific elements or develop entirely new activities.

Evaluation and research activities in Florida

The activities of the FAU-IGI site will be constantly evaluated. The evaluation plan consists of four levels, the evaluation and review of

1. workshop and certification materials;
2. feedback from workshop participants;
3. workshop presenters;
4. the long term impact of the project.

The evaluation process will follow the principles of educational research methodologies, and serve as an instrument to continuously and constructively improve IGI activities. The primary goals of the evaluation are to establish standards for IGI activities and to provide constructive feedback for the IGI team. In addition, we aim to encourage team members and participants to engage in educational research to be able to improve teaching practices in a systematic and informed manner. Reports of all FAU-IGI activities, workshop materials, evaluation results, and research papers will be shared on the website of IGI. We hope that these materials will provide a foundation to assist activities at other locations.

Conclusion

GeoGebra has been rapidly gaining popularity among teachers and researchers around the world, because it is easy-to-use dynamic mathematics software that combines several aspects of different mathematical packages. In addition, because of its open-source nature an extensive user community has developed around it. However, most users of GeoGebra are currently teachers or researchers who are keen to integrate technology into their work. It is difficult to reach the ‘average’ teacher by providing free software without offering training and additional support. Hence, our aim is to develop a structure, which will manifest in GeoGebra Institutes around the world, to offer professional development for teachers and coordinate research activities in relation to GeoGebra. As the idea of the GeoGebra institute is fairly new, we are still looking for colleagues interested in participating in IGI related work in any way and at all levels.

References

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