



Figure 6. GeoGebra software

At the same time, user-friendly attribute is not the only one when GeoGebra is used. The name itself ‘Geo’ (from Geometry) and ‘Gebra’ (from Algebra) explains the software’s purpose to correlate these mathematics areas as in Figure 6. On the other hand, it is also possible to correlate and variety of others mathematics disciplines which certainly causes more comprehensive mathematical knowledge which could be further generalized and correlated with other sciences. Still, how do visual aspects of computer technology in case of GeoGebra software change the dynamics of learning mathematics and what exactly makes imagery effective in mathematics remains a significant research topic.

3.2. Self-regulated learning and e-Course

Self-regulation of cognition is an important aspect of learning and positive academic performance in general, according to Paul R. Pintrich’s and Elisabeth V. De Groot’s result of the study. Their research instrument - Motivated Strategies for Learning Questionnaire (MSLQ) that was used in their study, as reported in [10], measured student’s motivational beliefs and self-regulated learning included topics as: Self-Efficacy, Intrinsic Value, Test Anxiety, Cognitive Strategy Use, Self-Regulation, etc.

Created e-course of Differential Calculus is designed to foster student’s motivation and self-regulated learning through numerous examples as shown in Table 5. Therefore, it is essential to investigate the extent to which the aspects of created e-course influence self-regulated learning, including student’s metacognitive strategies for planning, monitoring, and modifying their cognition, student’s

management and control of their effort on classroom academic tasks and maintaining their cognitive engagement (for example, student’s capability to persist at a difficult task or block out distracters i.e. noisy classmates, etc), using conceptualization to learn, remember, and understand in order to describe how personal characteristics are related to cognitive engagement and academic performance in general according to [10].

There are several limitations to findings of Paul R. Pintrich and Elisabeth V. De Groot in [10], since motivation and cognitive components have been measured with a self-report instrument and haven’t replicated with other measures, such as think aloud protocols, stimulated recall procedures, structured interviews, etc. Therefore is crucial to motivational both self-regulated attributes of e-course investigate not only with Paul R. Pintrich’s and Elisabeth V. De Groot’s instrument, but also and with other qualitative measures.

Table 5. Self-regulated learning components in e-Differential Calculus course

Paul R. Pintrich’s and Elisabeth V. De Groot’s MSLQ instrument	Fostering self-regulated learning components in eCourse
<i>Self-Efficacy</i>	<i>frequent</i>
<i>Intrinsic Value</i>	<i>common</i>
<i>Test Anxiety</i>	<i>infrequent</i>
<i>Cognitive Strategy Use</i>	<i>frequent</i>
<i>Self-Regulation</i>	<i>frequent</i>

Although the e-material stimulates intrinsic value and motivation in students as in Table 5, it is important and to teachers to socialize student’s intrinsic value since individual differences have facilitative role in learning and academic performance according to [10].

4. Future study

All of the challenges, potentials and influences in particular case of teaching and (or) learning supported by created e-course of the Differential Calculus and GeoGebra software in mathematics education at undergraduate university level are left to be revealed in future study.

Mixed methods research will investigate issues as: influence of personal students and teachers

characteristics, mathematicians conceptions, actual use of e-Differential Calculus material at Universities and socio-cultural differences within and among cases. Results should be obtained from treatment and control group with pretest and posttest for each group and qualitative instruments as a self report, think-aloud protocol, stimulated recall procedures and structured interviews in order to measure not only students academic performance but also and motivation and cognitive components. Case studies of mathematics departments and mathematicians, different levels of technology integration, exemplary practices and possible extension of the study to the other countries should ensure the determination of the main indicators of good teaching practices and learning strategies in mathematics education.

Under assumption that teaching is provided by well trained teachers and properly implemented e-material, study should provide answers to all relevant questions about the effects and contribution of created e-course in improvement of self-regulated learning, teaching process in a way that teachers can progressively construct generalizations, knowledge and students motivation.

Important aims of the study are to reveal if the major purpose of designed e-material to build a foundation for greater understanding mathematical concepts is fulfilled and which personal characteristics have the greatest impact on mathematical knowledge.

5. Conclusion

Teachers in Serbia generally have many opportunities to involve technology i.e. ICT in education process. National Center for the Advancement of Education and National Center for Professional Development in Education for the last several years have been promoting and conducting many seminars and workshops that are supposed to help teachers to modernize their lessons. At the same time, for the purpose of individualization and differentiation of the teaching/learning process, numerous programs are available (for example NetSupport School). These programs enable advanced management of classroom performance with variety of advantages for teaching and learning process: ability to create and use existing interactive lessons and materials, to organize activities and resources for the class, as well as evaluate the progress of students in real time, etc. On the other hand, problems as a lack of adequate teaching materials and applications (as per subject, teaching topics and content type) in Serbian language that teachers can use and display to the students in this

way are not supportive in dealing with modernization of education process. Also, teachers mostly have been training to use computers, but not and how to integrate them in teaching process and the lack of examples of good ICT integrations in teaching practice are the top reasons for disuse of e-teaching both e-learning tools in classroom environment. Still, there are numerous examples of teachers who successfully integrate ICT in their lessons and furthermore, win awards on national and international level.

S.O.S. indicators of need for change of Serbian education system are numerous, as the results of PISA testing, which testify that the enormous number of students are mathematical functionally illiterate. What will happen with educational system in general if the traditional training stays basic teaching approach and how will it affects the Serbian student's academic performance in the future - time will show.

E-course of Differential Calculus is made to help pupils and teachers in order to foster their motivation, accomplishments and as example of educational e-material which can easily be incorporated in classroom environment. For consideration, it remains an open question how visualization applied in designed didactic e-material helps mathematical abstraction and generalization of the mathematical field of Differential Calculus. In order to ascertain how widespread a phenomenon of the role of dynamic visual imagery in mathematical problem solving at all levels is, it is necessary to investigate use of appropriate statistical tools and quantitative designs.

However, first of all needed is this modernized version of the mathematical area of Differential Calculus comes to life in the classroom!

6. References

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