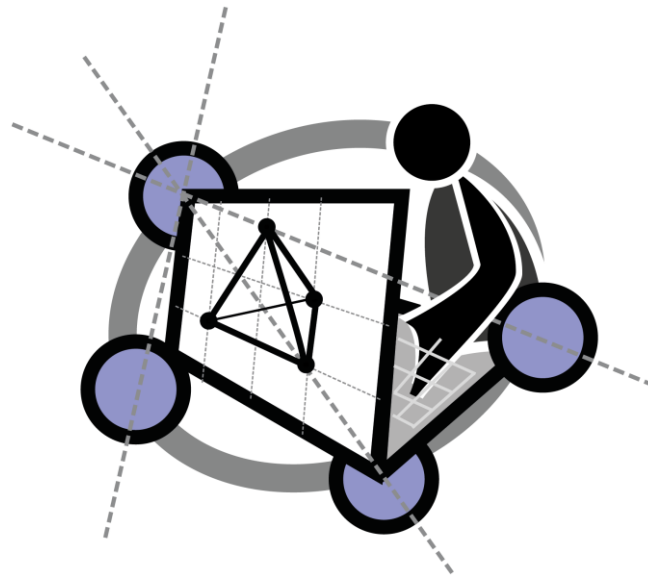
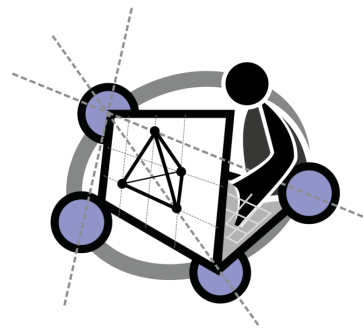


MTAII – MATH TEACHERS’ ADVENTURE OF ICT INTEGRATION



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ABOUT MTAII



Funded by the
Erasmus+ Programme
of the European Union

- MTAII - Math Teachers' Adventure of ICT Integration
 - Erasmus+ project funded by the EU
 - Professional development for mathematics teachers
 - Focus on integration of Information and Communication Technologies (ICT) in mathematics education
 - www.mtaii.com

■ Project Partners

- Hacettepe University, Dept. of Computer Education & Instructional Technology, Ankara, Turkey
- Johannes Kepler University Linz, Dept. of Mathematics Education, Linz, Austria
- GeoGebra Institute Association of Botoşani, Romania



ICT IN MATHEMATICS EDUCATION

- Research studies show that technology integration can play an effective role in tackling the challenges of teaching mathematics

(Li & Ma, 2010; Cheung & Slavin, 2013)

- Barriers of technology integration for teachers
 - Resources - technology, time, support
 - Institution - school leadership, time tables
 - Subject culture - practices and expectations
 - Attitudes and beliefs towards technology
 - Knowledge & skills - technology, pedagogy, classroom management
 - Assessment: requirements for exams

(Hew & Brush, 2007)

ICT IN MATHEMATICS EDUCATION

- Strategies to overcome these barriers
 - Shared vision and technology integration plan
 - Overcome the scarcity of resources
 - Change attitudes and beliefs
 - Reconsider assessments
 - Conducting professional development

(Hew & Brush, 2007)

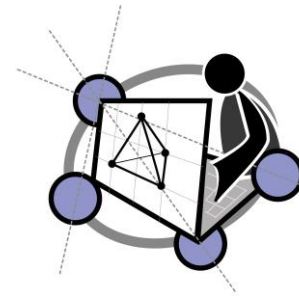
- Important role of professional development activities for technology integration

(Bingimlas, 2009; Kopcha, 2012)

- Potential of active communities for professional development

(Arkün & Aşkar, 2013; Duncan-Howell, 2010; Vrasidas & Glass, 2004)

PROJECT OUTPUTS

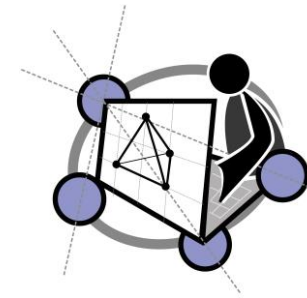


MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

- Aim of MTAII: Help teachers overcome barriers of knowledge and skills in relation to ICT integration

(Hew & Brush, 2007)

- Design a professional development environment for teachers by combining three intellectual outputs
 - Output 1: Open Online Course (OOC)
 - Output 2: Open Educational Resources (OER)
 - Output 3: Online Teacher Community (OTC)
- Series of face-to-face workshops
 - Targeting needs of math teachers in different countries
 - Advertisement and dissemination of project's outputs



OUTPUT 1: OPEN ONLINE COURSE

- Design of an Open Online Course
 - Online professional development opportunity
 - Potential benefits of ICT integration for teaching mathematics
 - Development of interactive instructional materials
 - Process of planning a technology-integrated lesson
 - Support with ICT integration for teachers

- Structure of OOC
 - Module 1 – ICT use for learning and teaching
 - Module 2 – Design and development of instructional materials with GeoGebra
 - Module 3 – Implementation and evaluation of ICT integration

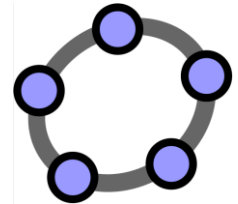
OOC – MATHEMATICS SOFTWARE

- Necessity of easy access to technology for teachers

(Hew & Brush, 2007)

- GeoGebra Math Apps

- Set of educational mathematics software apps
- Developed for teaching and learning mathematics
- Freely available all over the world in multitude of different languages
- www.geogebra.org



- Accompanying GeoGebra Materials platform

- Sharing of free educational resources
- Creation of interactive instructional materials
- GeoGebra Groups - simplified LMS
- Support for GeoGebra users

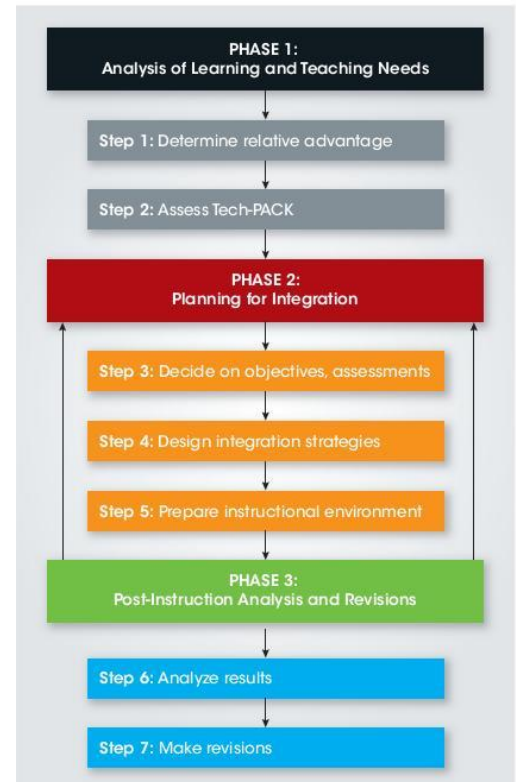


OOC - THEORETICAL FRAMEWORK

THE TIP MODEL

■ Technology Integration Planning (TIP) model (Roblyer & Doering, 2014)

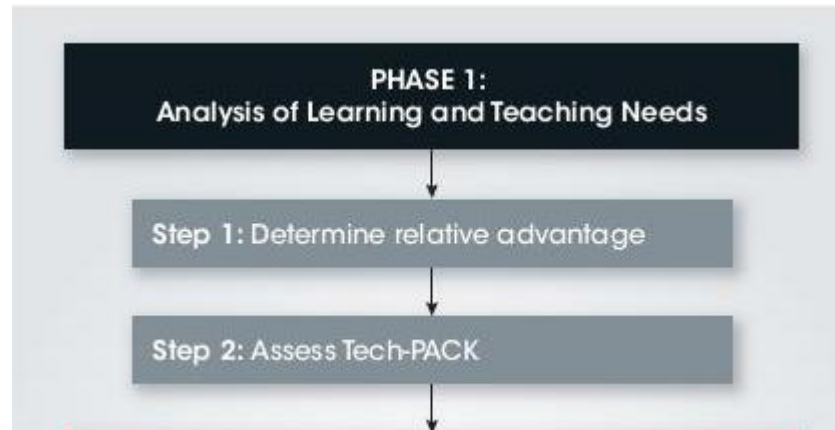
- Practical approach of lesson planning
- Methods and strategies of effective ICT use for teaching
- Identification of potential challenges involved in this process



Roblyer & Doering, 2014, pg. 67

OOC - THEORETICAL FRAMEWORK

THE TIP MODEL



Roblyer & Doering, 2014, pg. 67

- Will a technology-based method offer relative advantage?
- What is my technological pedagogical content knowledge?

OOC - THEORETICAL FRAMEWORK

THE TIP MODEL

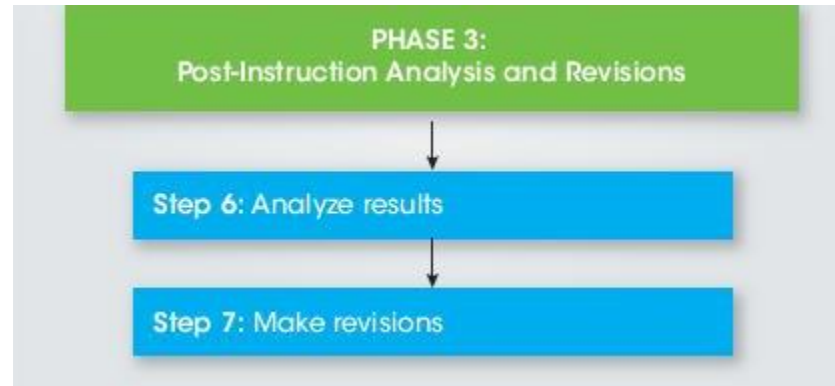


Roblyer & Doering, 2014, pg. 67

- How will I know students have learned?
- What teaching strategies and activities will work best?
- Are essential conditions in place to support technology integration?

OOC - THEORETICAL FRAMEWORK

THE TIP MODEL



Roblyer & Doering, 2014, pg. 67

- What worked well? What could be improved?
- Revisions

OOC - THEORETICAL FRAMEWORK

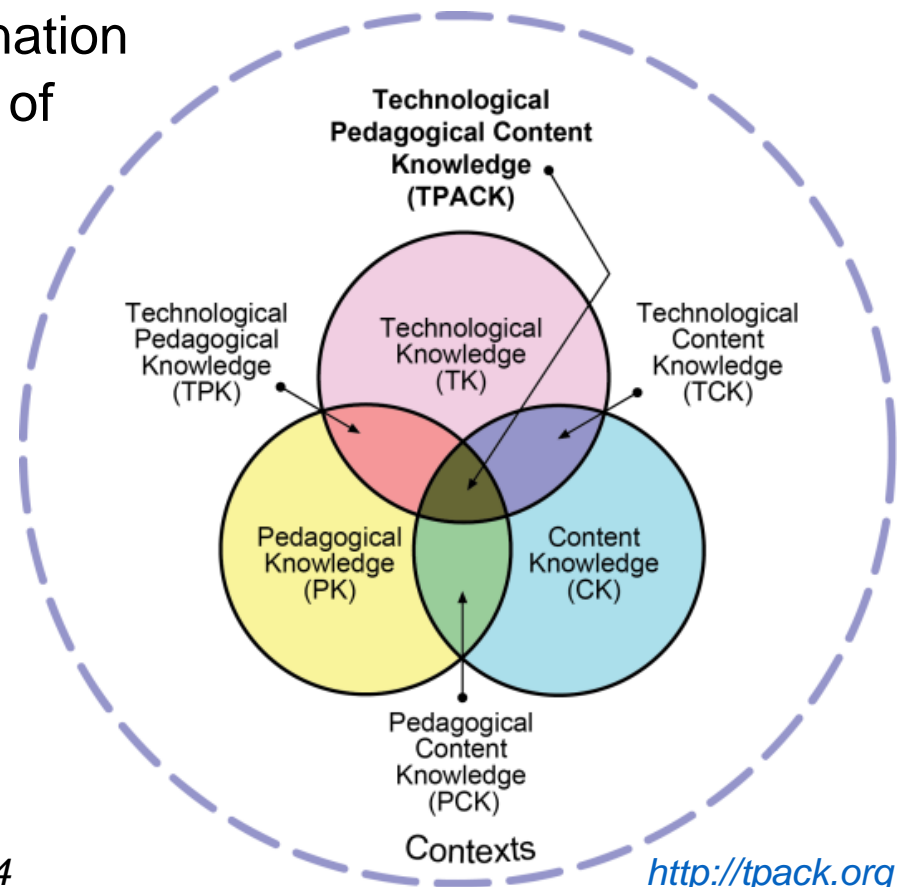
THE TPACK MODEL

■ Technological Pedagogical Content Knowledge (TPACK) model

(Koehler & Mishra, 2009)

- Teaching = complex combination of teacher's Knowledge (K) of
 - mathematical Content (C)
 - Pedagogy (P)
 - Technology (T)

- TPACK = combination of technological pedagogical content knowledge required for most effective instructional practice in a technology based learning environment

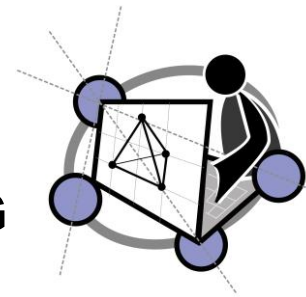


Roblyer & Doering, 2014

<http://tpack.org>

OOC – MODULE 1

ICT USE FOR LEARNING & TEACHING



MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

- General information about ICT
 - Potential benefits of ICT integration for mathematics education
 - Introduction to technology applications
 - Best practice examples of effective ICT integration

- Analysis of learning and teaching needs

(TIP model, phase 1 - Roblyer & Doering, 2014)

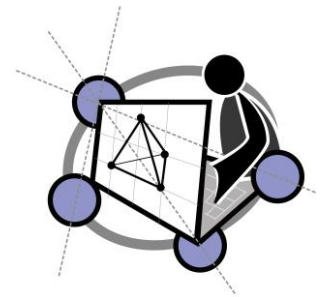
- Assessment of teachers' technological pedagogical content knowledge

- Identification of additional knowledge areas needed

(TPACK framework - Koehler & Mishra, 2009)

OOC – MODULE 2

DESIGN & DEVELOPMENT OF INSTRUCTIONAL MATERIALS WITH GEOGEBRA



MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

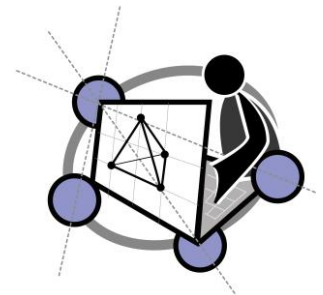
- Selection of relevant topic for classroom teaching

- Guidance through the planning of technology-supported lesson
 - Objectives of the lesson
 - Assessment strategies
 - Analyze technological teaching environment
 - Tech support during lesson
 - Effective instructional strategies and adapt for students
 - Plan implementation of lesson
 - Design and create instructional materials

(TIP model, phase 2 - Roblyer & Doering, 2014)

OOC – MODULE 2

DESIGN & DEVELOPMENT OF INSTRUCTIONAL MATERIALS WITH GEOGEBRA



MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

■ Deepen teachers' TC Knowledge

□ Introduction to GeoGebra Math Apps

● Content of tutorial components

- Learn about basic features
- Apply and deepen new knowledge
- Solve challenge examples

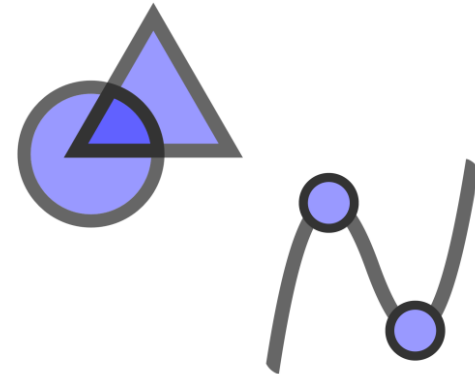
● Structure of tutorial components

- Series of interactive worksheets with increasing difficulty level

- NEW: Automatic and immediate feedback

Examples: <https://ggbm.at/ub6qEjXr>

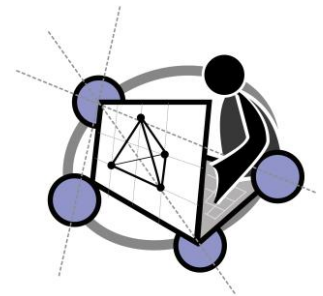
- Additional support through course moderators



(Preiner, 2008)

OOC – MODULE 2

DESIGN & DEVELOPMENT OF INSTRUCTIONAL MATERIALS WITH GEOGEBRA



MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

- Deepen teachers' TC Knowledge

- Introduction to GeoGebra Online Editors



GeoGebra
Worksheet Editor

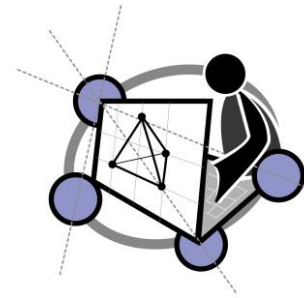


GeoGebra
Book Editor

- Actual design and development of own lesson plan
- Feedback by course moderators and peers (optional)

OOC – MODULE 3

IMPLEMENTATION & EVALUATION OF THE ICT INTEGRATION



MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

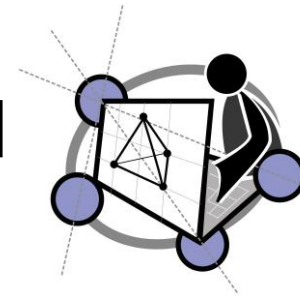
- Implementation of first lesson with ICT
- Analysis of lesson plan implementation
 - Reflection about teaching experiences
 - Improvement of strategies, environment and technology integration



(TIP model, phase 3 - Roblyer & Doering, 2014)

- Feedback by and discussion with moderators and peers
- Revision of original lesson plan and interactive materials
- Sharing of revised lesson plan and materials

OOO - IMPLEMENTATION



MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

■ Guidelines for increased participation in online courses

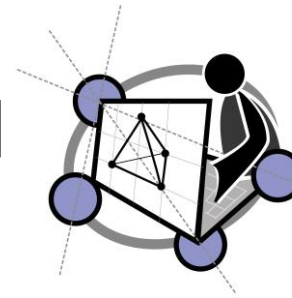
- Limited number of participants
- Small group communities
- Interaction in native language
- Taking into account participants' direct needs
- Providing feedback
- Gamification of online environment
- Limited workload
- Explicit instructions, aims and expectations

(Çoban & Arkün-Kocadere, 2016)

■ OOC in four language branches (EN, DE, TR, RO)

- Local needs of teachers
- Easier communication and feedback
- Creation of lesson plans and materials in native language

OOC - IMPLEMENTATION

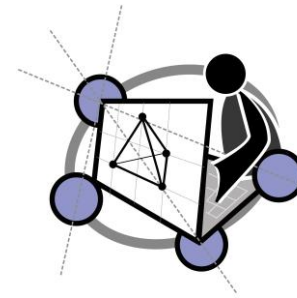


MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

- Support and individual feedback by
 - Course moderators
 - Experienced authors of instructional materials

- Gamification (planned)
 - Encourage continued involvement and active participation
 - Minimize potential drop-out-rate
 - Increase motivation
 - Examples for gamification elements:
rewards, badges, leaderboards, progress bars, levels
(Borras-Gene, Martinez-Nunez & Fidalgo-Blanco, 2016; Çağlar & Arkün Kocadere, 2015)

OUTPUT 2: OPEN EDUCATIONAL RESOURCES



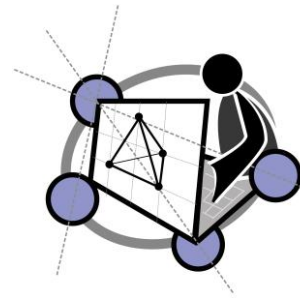
MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

- Overcome scarcity of resources for ICT integration

(Bingimlas, 2009; Hew & Brush, 2007)

- Collaboration of researchers, experienced authors and teachers
 - Development of high quality interactive instructional materials
 - Development of accompanying lesson plans
 - For different technology settings
 - Considering variety of teaching methods
 - Translation of resources to multiple languages
- Online dissemination of instructional resources through GeoGebra Materials platform

OUTPUT 3: ONLINE TEACHER COMMUNITY

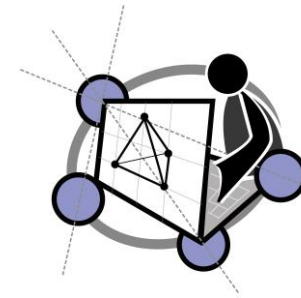


MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION

- Need for ongoing support of ICT integration into the teaching and learning process

(Arkün & Aşkar, 2013)

- Online platform: GeoGebra Groups
 - Infrastructure and expertise for online teacher community
 - Ongoing social, instructional and technical support
 - Separate language branches for easier communication
 - Self-sustaining network of local teacher communities
- Development of high-quality instructional resources
 - Translation to other languages
 - Adaptation to teaching methods of different countries



**MATH TEACHERS'
ADVENTURE of
ICT INTEGRATION**

CONCLUSION

- MTAll project's main aim:
Design and development of a professional development environment for mathematics teachers that helps to overcome different barriers of ICT integration into teaching and learning
- Project outputs
 - Open Online Course
 - Guidance through developing technology-integrated lessons
 - Support during classroom implementation and subsequent revision
 - Open Educational Resources
 - Development of high-quality open educational resources
 - Translation and adaptation to different languages
 - Online Teacher Community
 - Combination of expertise of researchers and classroom teachers
 - Network of local communities with continuous support

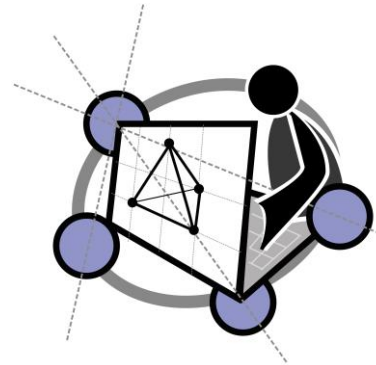
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THANK YOU VERY MUCH FOR YOUR ATTENTION!



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