SciVis MAKING SCIENCE VISIBLE

Erasmus+

Programming mobile devices in App Inventor 2

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Introduction

- Mobile devices (MD) – part of the lifestyle of youth (communication, fun, education, ...)
- Informatics education – expanding role of pupils from consumer to producer of mobile apps
- MIT App Inventor 2 (AI2) – most popular development environment for programming apps for MD
- Our focus – developing methodologies of teaching programming apps for MD in AI2 (formal and non-formal education)

Principles of our methodology

- focus on programming interesting and useful (STEM) apps using specific features of MD (sensors, touch screens, mobility ...)
- pupils' apps – part of their portfolios
- introducing new program concept considering problem solving situation
- stressing the problem analysis → design of solving
- creating basic apps (etudes) in a short time → ind. ext.
- demo-apps (inpiration) → etudes (experience) → mini-apps → useful (STEM) apps (creativity)

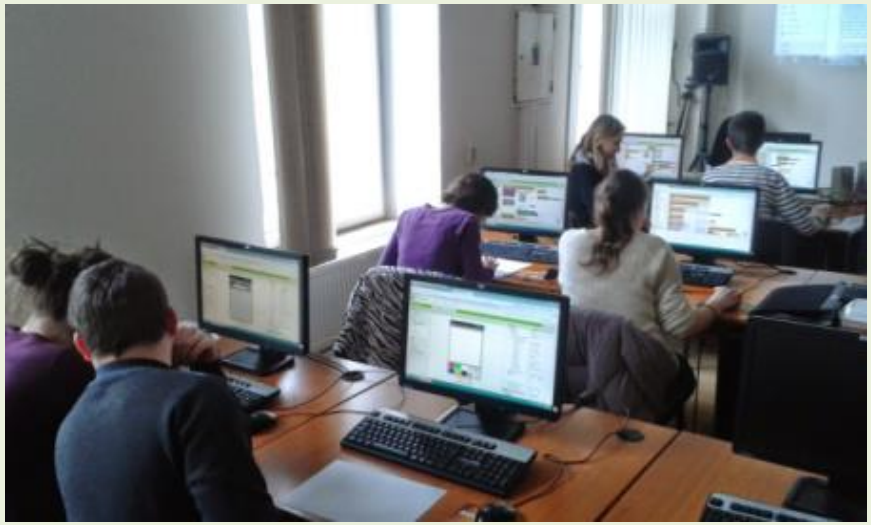
(inspired by David Wolber: http://www.appinventor.org/)

Experience in various target groups

- informatics ring & IT camp (for 13-14 age pupils)

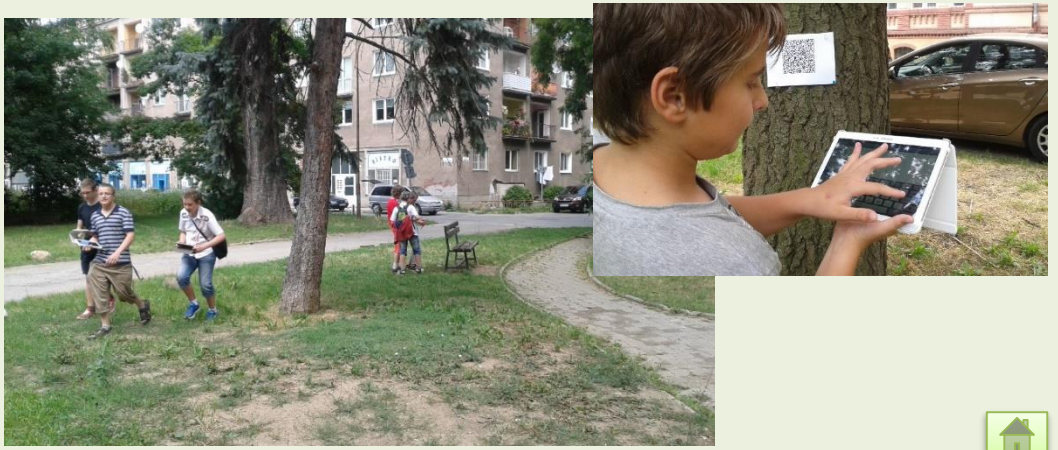
Experience in various target groups

- pre-service teachers & in-service teachers



IT camp – course

- 5-days IT camp in July 2015
- 15 pupils (only boys) aged 13-14 years
- 5 days – teaching programming two 90 minutes blocks (+90 minutes of other activities) daily
- day 1-4: programming 5 apps under the guidance
- day 5: programming and presentation pupils' own apps



IT camp – results (list of apps)

- **Drawing pad** – drawing circles on the spot where user touches the screen
- **Game Quick response** – recording the time at which the user touches the ring which is repeatedly displayed on a random location of the screen
- **QR quiz** – scanning the question using a QR reader and sending the response to the web server
- **Generator of excuses** – generating phrases in the form who – what – when – why not done
- **Game Labyrinth** – directing the movement of the ball at the target position by adjusting MD

IT camp – results (list of used programming elements)

- **Components**:
  Canvas, Ball, Sound, Clock, Button, Barcode scanner, TextToSpeech, Web, TextBox and Label
- **Sensors**:
  AccelerometerSensor and OrientationSensor
- **Events components (program inputs)**:
  Canvas.Touched, Clock.Timer, Ball.Touched, Button.Click, Screen.Initialize, BarcodeScanner.AfterScan, Web.GotText, AccelerometerSensor.AccelerationChanged, OrientationSensor.OrientationChanged
- **Change of the components (program outputs)**

IT camp – results (list of used programming elements)

- **Programming concepts and structures**:
  variable, changing the value of the variable, the variable in the expression, local and global variable, structured variable list, random numbers, the condition, branching, cycle (only in context of recalling the event handler), handling runtime error
- **Data structures**:
  number, text, logical value, color and list
- **Problem-solving strategy**:
  decomposition of the problem into sub

Discussion

- viability of the model (4 hours of programming + 2 hours of other in/out door activities during each day)
- satisfying results of 5-days IT camp in comparison to informatics ring (pupils attendance, # of projects)
- comparable its content and allocated time with State Educational Curriculum → using the model also in regular programming lessons with some modifications:
  - using worksheets and additional tasks to practice (http://ics.upjs.sk/~snajder/ai2/)
  - using the rubric for more precise apps evaluation (Sherman et al., 2014)

Discussion

- recommendation for programming
  - STEM apps using sensors developing pupils' inquiry skills and knowledge of science and math
  - apps useful for various target groups – sportsman (training), patients (rehabilitation exercises), pupils (learning, fun), handicapped (support for various activities) (Šnajder&Guniš, 2015)
- support for teachers
  - training,
  - methodology guidelines,
  - worksheets and working files for pupils

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