Learning Analytics: Personalizing and Adapting the Learning Process

George Siemens and Sabine Graf
Athabasca University
Canada
Adaptivity and Personalization in Learning Systems

How can we make learning systems more adaptive, intelligent and personalized

- Based on a comprehensive student model that combines learner information and context information
- In different settings such as desktop-based, mobile and ubiquitous settings
- In different situations such as for formal, informal and non-formal learning
- Supporting learners as well as teachers
- Develop approaches, add-ons and mechanisms that extend existing learning systems
Concept of Providing Adaptivity

Gathering & Analysing Data
- Learner Profile/Model
- Context Information
- Device Information
- Student Interactions
- Sensors

Providing Adaptivity & Personalization
- Adaptive Feedback
- Personalized Advices
- Adaptive Courses
- Adaptive Learning Material/Activities

Learning Experiences
- Reading Learning Material
- Conduct Learning Activities
- Look up Information
- Desktop-based environment
- Mobile/Ubiquitous environment
Adaptivity and Personalization in Learning Systems

- Adaptivity based on learning styles
  - Automatic identification of learning styles based on students’ behaviour
  - Dynamic identification and updating of learning styles
  - Adaptive course provision based on learning styles
Identifying Learning Styles

- Automatic Approach

- Identifying learning styles is based on patterns of behaviour

- Commonly used types of learning objects were used (Content objects, Outlines, Examples, Self-assessment tests, Exercises, Discussion forum) and relevant patterns were derived from these types of learning objects

- Calculation of learning styles is based on hints from patterns

- A rule-based mechanism is used for this calculation (similar to the approach used in the questionnaire)

- Evaluation with 75 students showed that the instrument is suitable for identifying learning styles (results: accuracy of 73% – 79%)
Tool for Identifying Learning Styles

- Developed a stand-alone tool for identifying learning styles in learning systems
Adaptive Course Provision

- Developed an adaptive mechanism
- Incorporates only common types of learning objects
  - Content
  - Outlines
  - Conclusions
  - Examples
  - Self-assessment tests
  - Exercises

- Adaptation Features
  - Adaptive sequencing of examples, exercises, self-assessment tests, outlines and conclusions
  - Adapting the number of examples and exercises

- Teachers have to:
  - Provide learning objects
  - Annotate learning objects (distinguish between the objects)
Adaptive Course Provision

- Evaluation with 437 students showed that:
  - Matched Group: less time and equal grades
  - Mismatched Group: ask more often for additional learning objects

→ Demonstrates positive effect of adaptivity

- Extension with respect to
  - Include more types of learning objects
  - Make adaptive mechanism adaptable for teachers