A Flexible Mechanism for Providing Adaptivity Based on Learning Styles in Learning Management Systems

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Why learning styles?

- **Why shall we consider learning styles in technology enhanced learning?**
  - Complex and partially inconsistent field
  - Learners have different ways in which they prefer to learn
  - If those preferences are not supported, learners can have difficulties in learning
  - Previous studies showed that providing learners with course that fit their learning styles has potential to help learners in learning
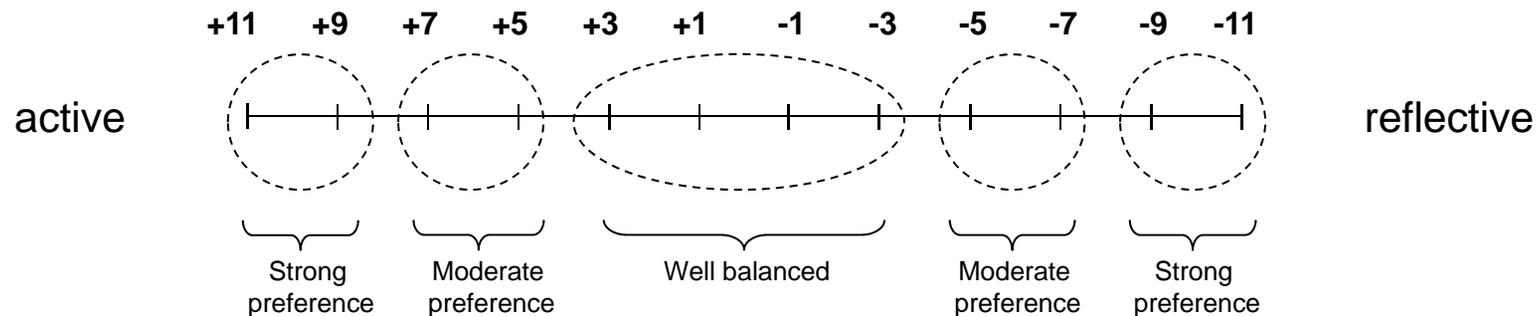
Felder-Silverman Learning Style Model

- Each learner has a preference on each of the dimensions

- Dimensions:

  - Active – Reflective
    learning by doing – learning by thinking things through
    group work – work alone

  - Sensing – Intuitive
    concrete material – abstract material
    more practical – more innovative and creative
    patient / not patient with details
    standard procedures – challenges

  - Visual – Verbal
    learning from pictures – learning from words

  - Sequential – Global
    learn in linear steps – learn in large leaps
    good in using partial knowledge – need „big picture"

Felder-Silverman Learning Style Model

■ Scales of the dimensions:

| +11 | +9 | +7 | +5 | +3 | +1 | -1 | -3 | -5 | -7 | -9 | -11 |

active ⊢───┼───┼───┼───┼───┼───┼───┼───┼───┼───┼───┼───⊣ reflective

Strong preference   Moderate preference   Well balanced   Moderate preference   Strong preference

→ Strong preference but no support → problems

■ Differences to other learning style models:
   ● describes learning style in more detail
   ● represents also balanced preferences
   ● describes tendencies
   ● domain-independent
   ● flexible stable

Why learning management systems?

- Why shall we consider learning styles in learning management systems (LMSs)?
  - LMSs are commonly used
  - LMSs typically do not provide adaptivity for learners and deliver the same course for all learners

Aim of Research

- Extend LMSs so that they can automatically generate courses that fit students' learning styles

- Make our approach applicable for LMSs in general

- Ask teachers for as little as possible additional effort

Previous Research

- Adaptive mechanism has been designed, implemented in Moodle and successfully evaluated with more than 500 students

- Adaptive mechanism was based on predefined course structure and 6 types of learning objects (Content, Outlines, Conclusions, Self-assessment tests, Examples, Exercises)

→ Works well for courses with practical focus but does not work well for courses with theoretical focus

How to make the mechanism more flexible?

- **Requirements**
  - Generic and work for different LMSs
  - Require from teachers as little as possible additional work
  - Restrict teachers as little as possible in their course design

- **Solutions**
  - Use only types of LOs that are available in most LMSs
  - Only ask teachers to annotate LO with the type once they create them
  - Use a course structure that allows many different types of LOs but does not require each type of LO to be available in each chapter/section

Considered types of learning objects

- Commentaries
- Content Objects
- Reflection Quizzes
- Self-Assessment Tests
- Discussion Forum Activities
- Additional Reading Material

- Animations
- Exercises
- Examples
- Real-Life Applications
- Conclusions
- Assignments

→ Teachers can add many different types of LOs in their courses

→ Teachers can add types of LOs whereever they feel they fit (as they usually do in LMSs)

→ Teachers does not have to add types of LOs

→ However, the more LOs are available in the course, the more adaptivity can be provided

How to provide adaptivity?

- **Adaptive Annotation**
  - Distinguishing between recommended and standard learning objects

- **Adaptive Sequencing**
  - Changing the sequence in which types of learning objects are presented

Structure of a course

Chapter 1:

Commentary

Few LOs that raise a student's interest [0..2 types of LO]*

Self-assessment tests, animations, exercises, examples, or real-life applications

Content

Conclusion [0..1]

Remaining LOs*

Self-assessment tests, animations, exercises, examples, real-life applications, additional reading material, reflection quizzes, and forum activities

Conclusion [0..1]

Assignments

Chapter 2:

...

*Sequence of LOs is based on how well the types of LO fit to the student's learning styles

Adaptivity in LMSs

Extensions of the LMS architecture
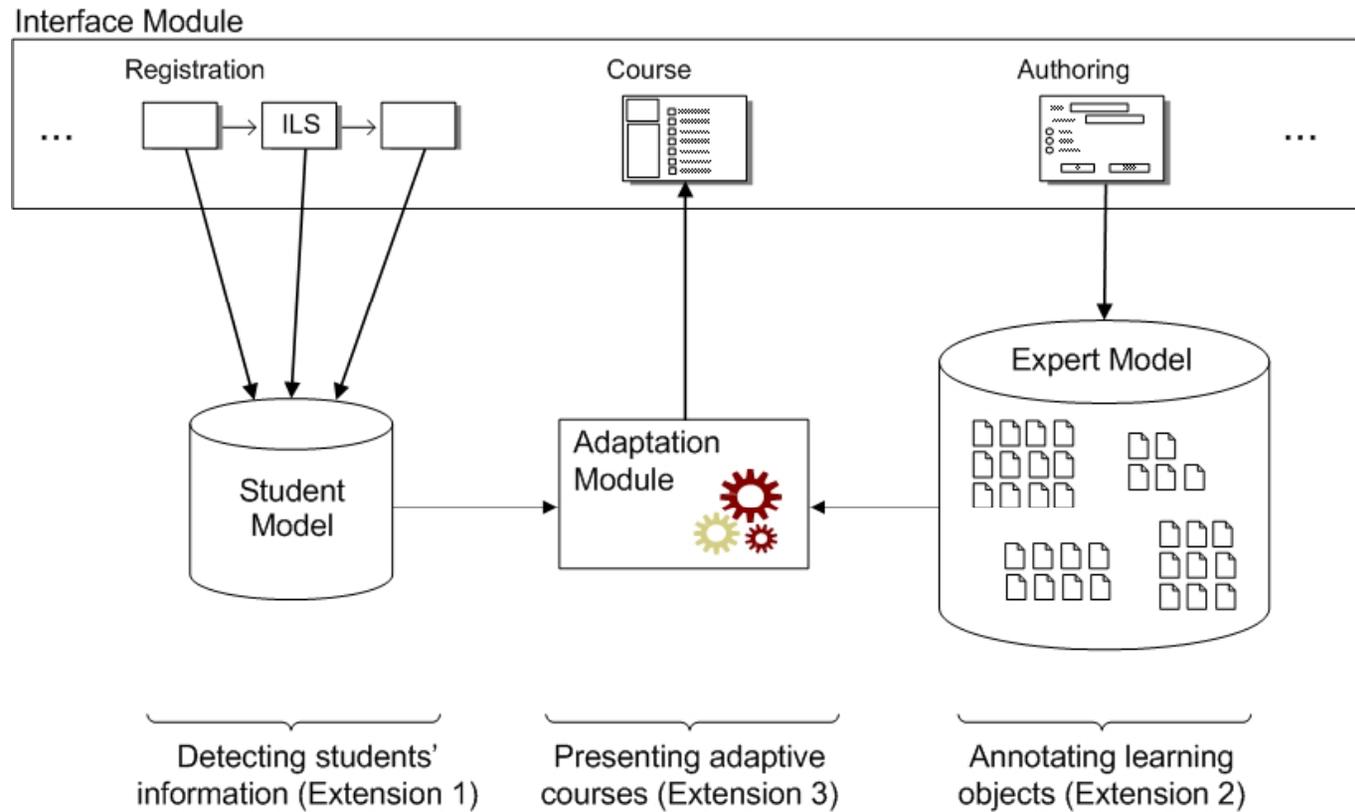
Conclusions & Future Work

- Introduced an adaptive mechanism that enables LMSs to automatically generate courses that fit students' learning styles

- Aimed at asking teachers for as little as possible additional effort

- Aimed at restricting teachers as little as possible in their course design

- Future work
  - Developing a tool that allows teachers to add additional types of LOs
  - Automatic and dynamic student modelling
  - Evaluation of our concept