Investigations about the Effects and Effectiveness of Adaptivity for Students with different Learning Styles

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Learning Styles

• Many learning style models exist in literature
• Considering learning styles in education has potential to make learning easier
  – Argued by educational theorists
  – Based on these arguments, several adaptive learning systems have been developed
  – Several evaluations of these systems has been conducted
  – Some results confirm that adaptivity can help students in learning, others do not
Aim of our Research

• Most evaluations check whether considering learning styles in online courses helps students in learning or not
• Our evaluation investigates the effects and effectiveness of adaptivity for students with different learning styles
  – Does students with different learning styles benefit from adaptivity in different ways?
    → Effects of adaptivity for students with different learning styles
  – Which students can be supported more effectively by using adaptivity comparing their learning styles?
    → Effectiveness of adaptivity comparing different learning styles
A Concept for Providing Adaptivity

- This study is based on and uses data from a project about adaptivity in learning management systems.
- Moodle has been used as prototype for the developed adaptive mechanism.
- Felder-Silverman learning styles model has been used to describe learning styles.
Felder-Silverman learning style model

• Each learner has a preference on each of the dimensions

• Dimensions:
  – Active – Reflective
  – Sensing – Intuitive
  – Visual – Verbal
  – Sequential – Global

• Differences to other learning style models:
  – Combines major learning style models
  – New way of combining and describing learning styles
  – Describes tendencies
  – Describes learning style in more detail
Adaptive Mechanism

• Main aim was to keep the effort of authors/teachers as little as possible
  → excluded visual/verbal dimension

• Incorporates only common kinds of learning objects
  – Content
  – Outlines
  – Conclusions
  – Examples
  – Self-assessment tests
  – Exercises
Adaptive Mechanism

• Adaptivity is provided on a general basis
• Adaptive features include
  – Changing the number of types of LOs
  – Changing the sequence of types of LOs
• Adaptive courses were recommendations, students could access all LOs and go through them in whatever sequence they preferred
Study Design

• Course about object oriented modelling
• Lecture and practical part where students had to submit 5 assignments
• Randomly assigned to 2 groups:
  – Courses that fit to the students’ learning styles (matched group) [75 students]
  – Courses that do not fit to the students’ learning styles (mismatched group) [72 students]
• Procedure
  – Students filled out the ILS questionnaire
  – Adaptive course was automatically generated and presented
Effects of Adaptivity

• Comparing data from matched and mismatched course with respect to learning styles and behaviour/performance variables (using ANOVA)

• Learning Styles:
  – Two groups for each dimension (e.g., active and reflective)

• Performance
  – Scores of final exam

• Behaviour
  – Time spent on learning activities
  – Number of logins
  – Number of visited learning activities
  – Number of requests for additional LOs
# Effects of Adaptivity - Results

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**Means:**
- Matched: 3.81 h
- Mism.: 6.00 h
- Matched: 624.73
- Mism.: 433.83
- Matched: 413.33
- Mism.: 545.17
- Matched: 6.07%
- Mism.: 8.27%
- Matched: 6.25%
- Mism.: 8.99%

**Means:**
- Matched: 4.45 h
- Mism.: 6.29 h

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*Note: * indicates significance at the 0.05 level.
Effectiveness of Adaptivity

• Which students can be supported more effectively by using adaptivity comparing their learning styles?

• Looking only at data from matched course and comparing the students’ performance and behaviour with respect to their learning styles
## Effectiveness of Adaptivity

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### Means:
- **Act.**
  - final_exam: 166.07 points
  - time: 3.81 h
  - numlogin: 27.24
  - numALO_p: 415.21
- **Ref.**
  - final_exam: 184.37 points
  - time: 6.68 h
  - numlogin: 31.08
  - numALO_p: 624.73
Conclusions

• Adaptivity based on learning styles can help students in learning
• Adaptivity has different effects for learners with different learning styles
• Findings give a deeper insight in the effects and effectiveness of adaptivity
• Findings show that for some learning styles adaptivity works better than for others, in terms of encouraging them to use the course more intensively and/or letting them achieve better scores.
Future Work

• Investigating interactions of the three learning style dimensions

• Investigating whether combinations of learning styles exists which have more impact on supporting learners

• How generic are our results
  – Do they show only possible benefits of adaptivity depending on the concept used for providing adaptivity?
  – Does results appear in general when adaptivity is provided?