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

Means:

Matched: 4.45 h

Mism.: 6.29 h

		active	reflective	sensing	intuitive	sequential	global
final_exam	F	2.276	0.451	3.613	0.174	0.793	0.937
	р	0.136	0.504	0.06	0.678	0.376	0.336
time	F	7.888 *	3.856	1.754	0.339	4.271 *	0.038
	р	/ 0.006	0.054	0.189	0.563	0.043	0.846
numlogin	F/	3.937	0.11	1.28	0.012	1.356	0.014
	/p	0.052	0.741	0.262	0.915	0.249	0.906
numLO /	F	1.54	4.639 *	4.084 *	0.509	2.173	0.29
	р	0.219	/ 0.035	0.047	0.479	0.145	0.592
numAL⁄O_p	F	1.486/	4.531 *	4.442 *	1.668	0.867	5.741 _, *
	р	0.227	0.037	0.038	0.202	0.41	0.019∫

Means:

Matched: 624.73

Mism.: 433.83

Means:

Matched: 413.33

Mism.: 545.17

Means:

Matched: 6.25%

Mism.: 8.99%

Means:

Matched: 3.81 h

Mism.: 6.00 h

Means:

Matched: 5.46%

Mism.: 7.91%

Means:

Matched: 6.07%

Mism.: 8.27%

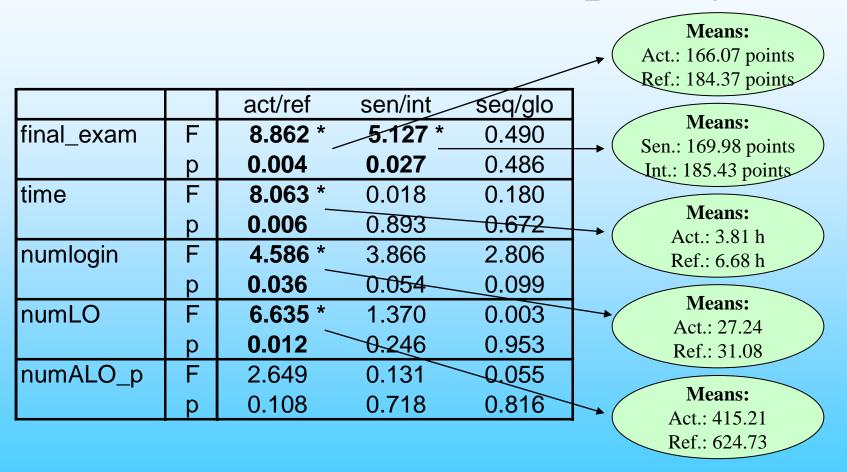
Slide 10



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



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?