

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

Sabine Graf

Athabasca University, Canada

Chung Hsien Lan

Nanya Institute of Technology, Taiwan

Tzu-Chien Liu

National Central University, Taiwan

Kinshuk

Athabasca University, Canada

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

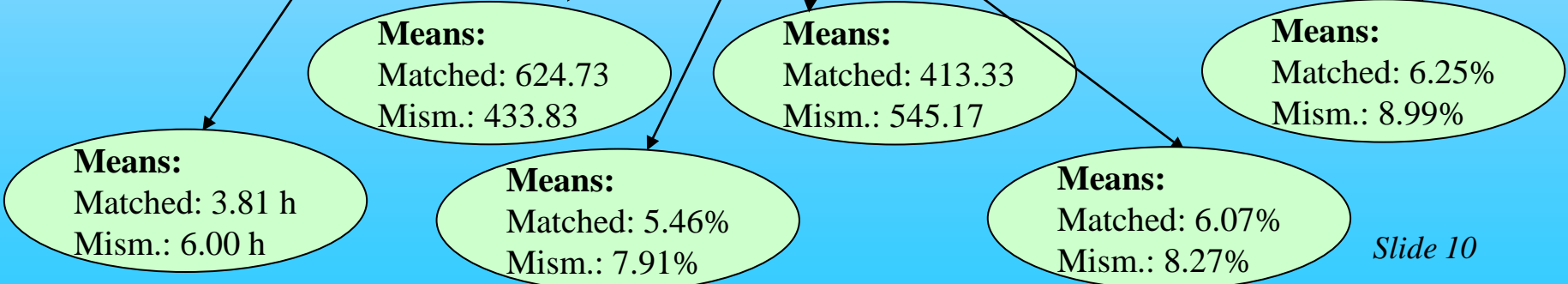
Effects of Adaptivity

- 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
	p	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
	p	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
	p	0.219	0.035	0.047	0.479	0.145	0.592
numALO_p	F	1.486	4.531 *	4.442 *	1.668	0.867	5.741 *
	p	0.227	0.037	0.038	0.202	0.41	0.019



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

		act/ref	sen/int	seq/glo
final_exam	F	8.862 *	5.127 *	0.490
	p	0.004	0.027	0.486
time	F	8.063 *	0.018	0.180
	p	0.006	0.893	0.672
numlogin	F	4.586 *	3.866	2.806
	p	0.036	0.054	0.099
numLO	F	6.635 *	1.370	0.003
	p	0.012	0.246	0.953
numALO_p	F	2.649	0.131	0.055
	p	0.108	0.718	0.816

Means:

 Act.: 166.07 points
 Ref.: 184.37 points

Means:

 Sen.: 169.98 points
 Int.: 185.43 points

Means:

 Act.: 3.81 h
 Ref.: 6.68 h

Means:

 Act.: 27.24
 Ref.: 31.08

Means:

 Act.: 415.21
 Ref.: 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?