Flexible Learning Environments

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Definition

• Starting point for the design of effective and flexible learning environments are the limitations and possibilities of human memory.

• The instructional design of these environments considers:
  • 1) the transiency of sensory memory and working memory,
  • 2) the limitations of working memory and
  • 3) the organization of long term memory.
Theory

• Human-memory models

• Cognitive theory

• Instructional design theory
Human memory models

- Atkinson and Shiffrin’s ‘multi-store’ memory model (1968)
Human memory models

- Baddeley’s working memory model (1986, 2000)
**Human memory models**

- Craik and Lockheart’s ‘levels of processing’ memory model (1972)

![Diagram of the levels of processing model]

Human memory models

- Anderson’s schema theory (1977)
Theory

- Human-memory models
- Cognitive theory
- Instructional design theory
Cognitive theory

- Mayer’s cognitive theory of multimedia learning (2001)
Theory

- Human-memory models
- Cognitive theory
- Instructional design theory
Instructional design theory

• Sweller’s cognitive load theory (1999)
Instructional design theory

- Van Merriënboer’s four component instructional design model (4CID; 1997)

Supportive information

Part-task practice

Just-in-time information

Learning tasks
Flexible learning environments

• Most important feature: dynamic personalisation

• Components: student model, domain model and instructional model

• Issues: no clear guidelines

• Our angle: personalisation through learner control

• Issues: self-directed or self-regulated learning is difficult for novices
Shared control over task selection

• Corbalan (2008), Kester & van Merriënboer

• Theoretical background: cognitive load theory, four component instructional design model

• Research question: Does adaptive learning with shared learner control in a hypermedia environment lead to a higher task performance, a higher learning efficiency and a higher task involvement as compared to non-adaptive learning with or without shared learner control?
Shared control over task selection

• **Method**
  
  • Participants: first year students in Dutch Vocational Education and Training
  
  • Materials: hypermedia environment (75 learning tasks; performance measure; mental effort measure); conceptual knowledge mc test; learning efficiency; task involvement
  
  • Design: 2x2 factorial design with the factors adaptation (yes, no) and shared control (yes, no)
Shared control over task selection

• Results
  • Main effect for adaptation on the conceptual knowledge test
    • Adaptation > non-adaptation
  
  • Main effect for adaptation on learning efficiency
    • Adaptation > non-adaptation

  • Main effect for shared control on task involvement
    • Shared control > system control
Shared control over task selection

• Conclusions
  • Adaptation positively affects performance
  • Shared control positively influences task involvement (motivation)

Following advice in hypermedia environments

• Gorissen (2013), Kester, & Martens

• Theoretical background: cognitive theory of multimedia learning, self-determination theory (Deci & Ryan, 2000; Ryan & Deci, 2000)

• Research question: Does a shared control hypermedia environment increase task motivation and performance as compared to a learner controlled or a system controlled environment?
Following advice in hypermedia environments

• Method
  • Participants: 69 grade five students from a primary school
  • Materials: hypermedia environment (30 videos); Academic Self-regulation questionnaire; 8 essay questions; factual knowledge test; in-depth knowledge test; Intrinsic Motivation Inventory
  • Design: academic self-regulation style (continuous independent variable); shared control, learner control or system control
Following advice in hypermedia environments

• Results

• main effect of hypermedia environment on the delayed in-depth knowledge test
  • Shared control or system control > learner control

• main effect of hypermedia environment on controlled task motivation
  • Shared control < learner controlled or system controlled

• main effect of ASRS on controlled and autonomous task motivation
  • ‘Autonomous learners’ < ‘controlled learners’ for controlled task motivation
  • ‘Autonomous learners’ > ‘controlled learners’ for autonomous task motivation
Following advice in hypermedia environments

• Conclusions

  • Following advice positively affects performance

  • Shared control decreases controlled task motivation (extrinsic motivation)

  • Academic self-regulation style influences task motivation
Advisory models in on-demand education [1]

• Taminiau (2012), Kester, Kirschner & van Merriënboer

• Theoretical background: cognitive load theory, four component instructional design model

• Research question: Does procedural advice on task selection help learners develop domain-specific skills?
Advisory models in on-demand education [1]

• Method
  • Participants: 30 students Business and Economics
  • Materials: e-learning environment (81 tasks); task-selection advice; test tasks; knowledge test
  • Design: randomized two group design > task-selection advice (yes, no)
Advisory models in on-demand education [1]

• Results

  • Significant differences between groups on the test tasks
    • no task-selection advice > task selection advice

  • No significant differences between groups on the knowledge test
Advisory models in on-demand education [1]

• Conclusions

  • Straigthforward procedural advice hampers performance

Advisory models in on-demand education [2]

• Taminiau (2012), Kester, Kirschner & van Merriënboer

• Research question: Does procedural advice on self-assessment and task-selection help learners develop self-assessment and task-selection skills?
Advisory models in on-demand education [2]

• Method
  • Participants: 63 students Business and Economics
  • Materials: e-learning environment (81 tasks); self-assessment advice; task-selection advice; self-assessment test tasks; task-selection test tasks
  • Design: randomized four group design with the groups self-assessment and task-selection advice, only self-assessment advice, only task-selection advice or no advice
Advisory models in on-demand education

• Results

  • Significant differences between groups on the self-assessment test tasks
    • no self-assessment advice > other groups

  • No significant differences between groups on the task-selection test tasks
Advisory models in on-demand education

• Conclusions
  
  • Straigthforward procedural advice hampers self-assessment performance
Overall conclusions

• Dynamic personalisation in flexible learning environments still seems wise

• Transferring the responsibility over learning to learners does not necessarily enhance their performance despite of the fact that it increases their motivation

• Advice that helps learners find their way in flexible learning environments works as long as it is not too prescriptive
Thank you for your attention!

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