Cognitive Loads and Training Success in a Video-based Online Training Course

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Introduction

• Online learning is established besides the traditional ways of learning and teaching (e.g., Allen & Seeman, 2016)

• Still existing problems
  – high dropout rates (e.g., Lee & Choi, 2011)
  – supporting students in successful learning (e.g., Jo, Park, Yoon, & Sung, 2016).
Learning situation
- at any place
- at any time
- online training course
- etc.

Introduction

Features of the online learning environment
- usability

Learner activities
- extraneous load
- germane load
- intrinsic load
- usability experience

Features of the learner
- experience with online learning
- domain-specific prior knowledge
- computer attitude
- computer anxiety

Objectives / Effects
- subjective success of learning
- number of completed modules
Research questions

1. Could the learner characteristics be used to model the learning process?

2. Could the learning process variables be used to model outcome variables?

3. Could the learner characteristics be used to directly model the outcome variables?
Research questions

- **Domain-specific prior knowledge**
  - computer usage, information processing, performance (e.g., Amadieu et al., 2009; McDonald & Stevenson, 1998)
  - Expertise reversal effects / Expertise effects

- **Online learning experience**
  - knowledge about online learning portals and their usage, typical course processes, and adequate learning strategies
  - performance, and course persistence (e.g., Dodd et al., 2009; Hachey et al., 2014; Lee & Choi, 2011; Park & Choi, 2009)

- **Attitude towards computers**
  - consist of affective, conative and cognitive components
  - beliefs that are organized in topics (computer as an instrument for working and learning)
  - performance, course usage, and persistence (e.g., Bernard et al., 2004; Stiller, 2009, 2015)

- **Computer anxiety**
  - comprises both cognitive and affective components such as feelings of anxiety and worrisome thoughts (Richter et al., 2010)
  - performance and course usage (e.g., Hauser et al., 2012; Saadé & Kira, 2009; Sam et al., 2005)
Research questions

Domain-specific prior knowledge

Online learning experience

Attitude towards computers

Computer anxiety

Intrinsic load

Germane load

Extraneous load

Usability

Subjective success of learning

Number of completed modules

Green arrows could be interpreted in the sense of positive correlations, orange arrows in the sense of negative correlations.
Research questions

- Domain-specific prior knowledge
- Online learning experience
- Attitude towards computers
- Computer anxiety
- Intrinsic load
- Germane load
- Extraneous load
- Usability
- Subjective success of learning
- Number of completed modules

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Intrinsic load

Germaine load

Extraneous load

Usability

Subjective success of learning

Number of completed modules
Method - Participants

58 employees participated seriously (worked on at least one module task)
• 28 provided full sets of data
• mean age 38 years ($SD = 12$)
• 23 female (82.1%) and 5 male (17.9%)
• post-secondary school diploma ($n = 16$, 57.1%) and secondary school or commercial college certificate ($n = 9$, 32.1%)

Size of the enterprises
• one-(wo)man enterprises (21.4%)
• two and nine employees (39.3%, $n = 11$).
• Having more than 250 employees (10.7%, $n = 3$).

The most reported branches
• freelance, economic or technical services
• information and communication,
• health and social systems
Method - NiceDesign4SME

1. self-learning environment
2. purely online -> greatest possible freedom in regards to the time and place of learning
3. modular design in respect to contents
4. instructional videos (problem-based)
5. based on individual tutorial supervision
6. asynchronous tools for communication (such as internal message board)
Method - Measurements

1 week before

1st Questionnaire
OL-Experience
Computer attitude
Computer anxiety
Richter et al. (2010)

start

5 weeks after

2nd Questionnaire
Usability
Prümper & Anft (2009)

12 weeks after (end)

3rd Questionnaire
Subjective success of learning

13 Video Questionnaires
Prior knowledge
Intrinsic load
Extraneous load
 germane load (elaboration)

Other
Completed modules
Method - Measurements

1st Questionnaire
OL-Experience
Computer attitude
Computer anxiety
Richter et al. (2010)

2nd Questionnaire
Usability
Anft (2009)

3rd Questionnaire
Subjective success of learning

How much experience do you have with online training?

Have you ever used instructional videos for learning (e.g., from YouTube or CD)?

When I use the computer for work, I constantly worry that it might break down.

Working with the computer makes me uneasy.

12 weeks after (end)
Method - Measurements

1 week before

1st Questionnaire
OL-Experience
Computer attitude
Computer anxiety
Richter et al. (2010)

start

5 weeks after

2nd Questionnaire
Usability
Prümper & Anft (2010)

12 weeks after (end)

3rd Questionnaire
Success

13 Video Questionnaires
Prior knowledge
Intrinsic load
Extraneous load
Germaine load (elaboration)

Other
Completed modules

It is complicated to operate the learning environment.
Method - Measurements

1 week before

1st Questionnaire
OL-Experience
Computer attitude
Computer anxiety
Richter et al. (2010)

5 weeks after

2nd Questionnaire
Usability
Richter & Anft (2009)

12 weeks after (end)

3rd Questionnaire
Subjective success of learning

My level of knowledge about that domain was ... (very bad – very good)

I tried to imagine how I could set the learned into practice.

How easy or difficult would you consider the content?

How pleasant or bothersome would you consider the presentation format?
Method - Measurements

I have expanded my knowledge by working through the modules.

1st Questionnaire
OL-Experience
Computer attitude
Computer anxiety
Richter et al. (2010)

3rd Questionnaire
Subjective success of learning
Prümper & Anft (2009)

13 Video Questionnaires
Prior knowledge
Intrinsic load
Extraneous load
Germane load (elaboration)

Other
Completed modules

1 week before
start
5th
end
12 weeks after (end)
# Results - Correlations

**Table 1**

<table>
<thead>
<tr>
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</table>

*Note.* + p < .10, one-tailed. *p < .05, one-tailed. **p < .01, one-tailed. ***p < .001, one-tailed.
Results – Multiple regression (backward)

Table 2
Summary of models

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
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Table 3
Results of the multiple linear regression analyses

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<th>β</th>
<th>t</th>
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</tbody>
</table>
Discussion

• No modelling by learner characteristics
  – Learners dropping out
• Loads model success of learning

• small sample size
• non-experimental study
• motivation was not considered

• Overall, approaching authentic online learning scenarios under a cognitive load perspective in a broader way was shown to be fruitful.
Any questions?
Introduction

Learning situation
- at the workplace
- in a school class
- integrated in a training course
- etc.

Features of the online learning environment
- technique
- domain
- type of presentations
- design
- didactical method

Learner activities
- cognitive processes
- motivational processes
- emotional processes
- behavior

Features of the learner
- physical
- cognitive
- affective
- motivational

Objectives / Effects
- cognitive
- affective
- motivational
- social-communicative
- psychomotoric
- time, errors
- etc.

- technique
- domain
- type of presentations
- design
- didactical method
Kurs: Bildgestaltung

Themen dieses Kurses

1. Modulsteckbrief

Modulsteckbrief

Um was geht es eigentlich in diesem Kurs?

Kurzinfo:

Ein Bild sagt mehr als 1000 Worte. Diesen Ausspruch kennt wohl jeder. Damit ein Bild aber tatsächlich die ihnen zugesprochene bzw. gewünschte Wirkung entfalten kann, sind bestimmte Aspekte wie Perspektive, Bildkomposition und Farbgestaltung bei der Gestaltung eines Bildes zu beachten.

Lernziele:

1. Sie lernen die unterschiedliche Wirkung von Bildern in verschiedenen Kulturen kennen.
2. Sie beschäftigen sich mit den grundlegenden Gestaltungspunkten von Bildern, u.a. mit Perspektive, Schärfe/Unschärfe, Linienführung und der Bildkomposition und lernen, diese gezielt einzusetzen.
## Method - NiceDesign4SME

<table>
<thead>
<tr>
<th>Graphic and colors</th>
<th>Print media</th>
<th>Digital presentations</th>
<th>General basics</th>
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</thead>
<tbody>
<tr>
<td>image design</td>
<td>typographical basics</td>
<td>presentation according to Zen</td>
<td>how to write the correct way</td>
</tr>
<tr>
<td>image processing</td>
<td>business letter according to DIN 5008</td>
<td>social media</td>
<td>open source</td>
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<td>logo design</td>
<td>designing flyers and posters</td>
<td>content strategy</td>
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- NiceDesign4SME focuses on various aspects of design, including graphic and colors, print media, digital presentations, and general basics.

- The table summarizes key topics such as image design, typographical basics, presentation according to Zen, business letter according to DIN 5008, social media, designing flyers and posters, content strategy, and content management systems.