Improving skills in dosage calculation

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Learning environment Sigma

- Since 2006 Arcada has developed a safe and supportive learning environment for dosage calculation
- The calculation problems are based on patient cases, mostly, from hospital settings
- Sigma is a web application, available and easy to use
- The pedagogic approach has been to offer the user model solutions instead of correct answers

The aim of the current study

- to develop the learning environment Sigma from a user perspective regarding technical usability, pedagogical usefulness and support for learning dosage calculation.

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Research questions

- The research questions covered both the technical usability and the pedagogical usefulness of the learning environment:

1. How did the technical and graphical solutions of the user interface meet the needs of the user?

2. To which extent did the students find practising drug calculation in Sigma useful?

3. How did working in the Sigma learning environment improve learning in dosage calculation?

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Target group and data collection

- Pharmacy students at the University of Helsinki tested the Sigma environment (n=171).

- The students were given a questionnaire with both attitude items on a visual analogue scale and open ended questions. Response rate 96,5% (n=164).

- Log data collected from Sigma
    - # of solved problems, correct/false answers
    - generated correct answers ratio =
        - correct answers / solved problems

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Analysis of data

- The approach in the analysis was both qualitative and quantitative
- The material collected from the open ended questions contained 50 pages. This material was analysed by qualitative content analysis

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Estimated skills and experienced difficulty level

- corr. .567 at Sig. .000

- Estimated calculation skills
    - all grades between 5 and 10, $\underline{M}$ = 8.21

- Experienced difficulty level
    - 1 to 80 (out of 100), $\underline{M}$ = 29.7
    - low-graders (grade 5-7) $\underline{M}$ = 45.44
    - high-graders (grade 8-10) $\underline{M}$ = 25.16

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Estimated skills, activity level and success

- between 1 and 90 solved problems, $\underline{M}$ = 19.5 problems
- variation
    - low-graders (grade 5-7) $\underline{M}$ = 13.36 problems
    - high-graders (grade 8-10) $\underline{M}$ = 21.17 problems
    - low-graders should practice more, but …

    - correct answers ratio between 0 and 100%, $\underline{M}$ = 76%

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Results - pedagogical usefulness

- Most of the students were content with the learning environment and found it easy to use. Students also appreciated the availability of the tool, being able to use it at any computer and without time restrictions.

- A majority of the students expressed in their comments that Sigma as a learning environment supported them in improving their skills in drug calculation.

- Some students criticized the fact that the user is not allowed to review an earlier question and does not get the correct answer.

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Results - pedagogical usefulness

- Some students wanted more challenging problems and problems more related to their specific area of interest – pharmacy
- Usefulness
  - all scores from 0 to 100, $\underline{M}$ = 45.5
- The problems containing 2-3 sub-questions were experienced as the most challenging
- intravenous medication made the students curious to investigate an area that might be important for only a few of them in their future working life.

Results – technical solutions

- The following features in the Sigma user interface were especially focused upon in the open ended questions:
- A more inspiring graphical interface
- The dropdown list for choosing unit was bothersome to use
- Describing the problem solving procedure in the input field was difficult
- Lack of a calculator.

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Future research

- appreciation of model solutions varied
    - appreciated by high-graders?
    - connection to abstraction ability?

- low-graders practised less
    - reasons?
    - repulsive features in Sigma?

- support for learning?
    - longitudinal log analysis

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