

Intuitive visualization of complex diagnostic datasets to improve teachers' individual support of learners based on data driven decision making

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BACKGROUND

- 6.2 million adults with low literacy in Germany (Grotlüschen et al. 2019).
- Diagnosing and supporting people with low literacy is often time- and staff-intensive.
- The diagnosis is based on a complex competency model in the areas of reading, writing, speaking fluency, and arithmetic.
- Learners need individual support due to heterogeneous competencies.
- The tool should be learned quickly and used intuitively by teachers.

CONCEPTUAL DEVELOPMENT

- Goal: Developing a tool that enables teachers to automatically and time-savingsly recognize differentiated learning levels and to derive individual support needs
- In addition to a clear design, these points were given special attention during development:
 - present relevant information:** The data sets enable us to present a wide range of information. The needs of the target group were determined and evaluated by analyses and expert interviews.
 - individual usage options:** An individual filter system which allows significant reduction of complexity without the loss of important content should make the analysis of data intuitively understandable for the user

METHODOLOGY

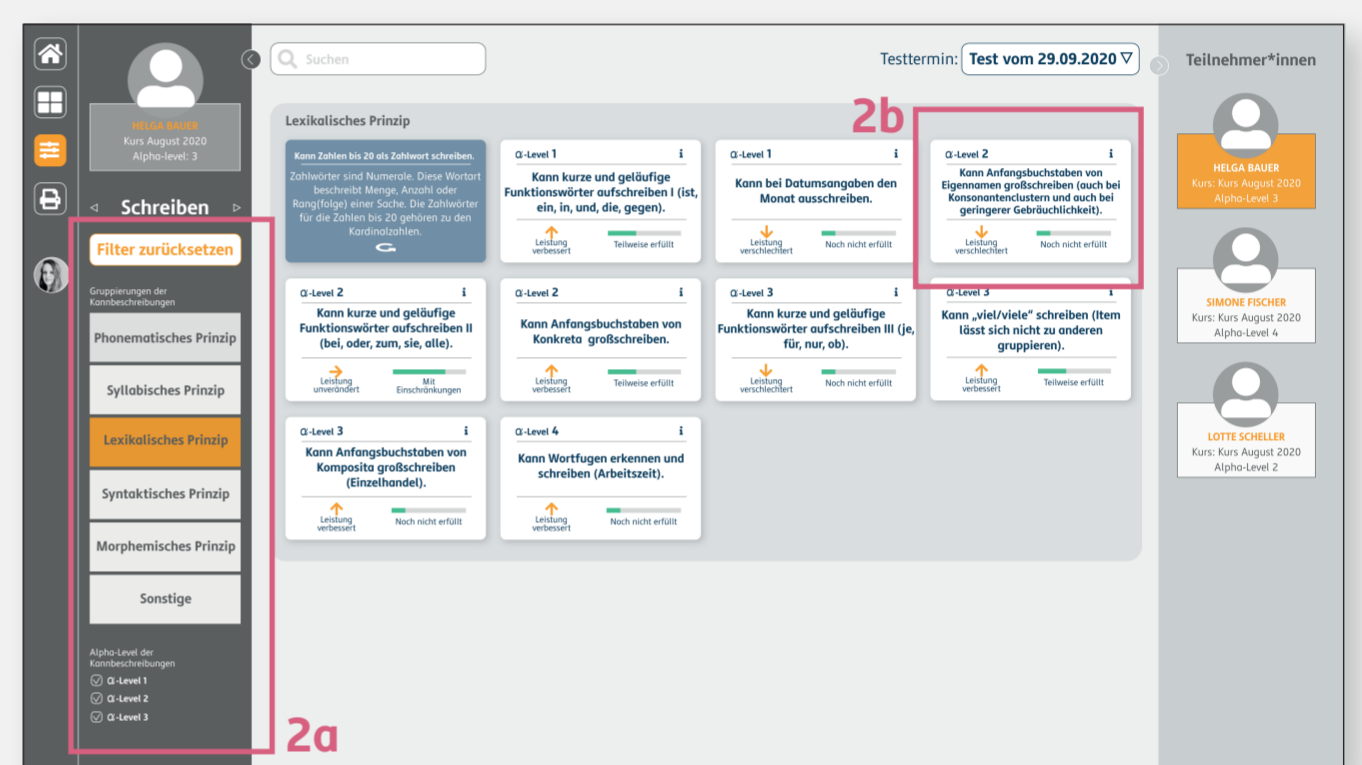
- The dashboard for teachers in literacy practice is developed iteratively using the design-based research approach (Anderson & Shattuck 2012).
- The dashboard has already been conceptualized (phase 1),
- design drafts have been created and revised based on expert interviews (phase 2),
- and an interactive prototype has been tested with the target group in a usability study (phase 3).
- 12 persons have participated in the testing.
- Think aloud method was used.

THE DASHBOARD - "COURSE OVERVIEW"



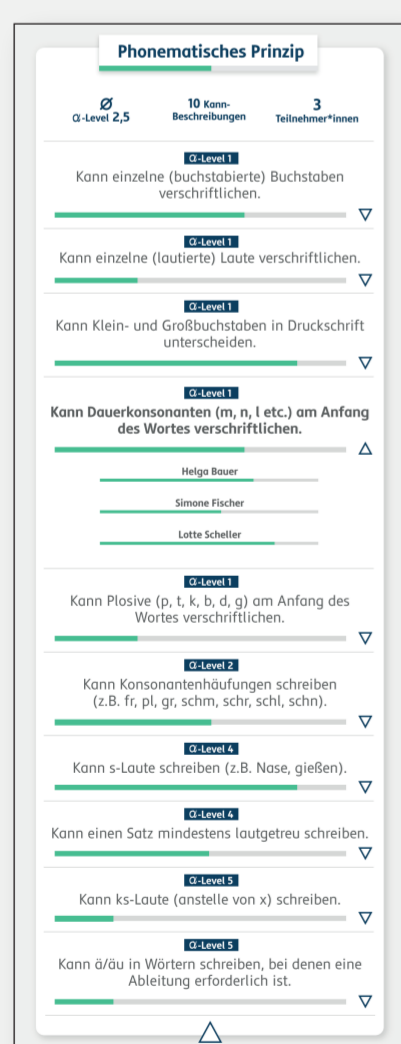
1a: Results of each participant in a course, determined on different test dates. 1b: List of individual sub-competencies with results of each student, teachers can expand and collapse the lists. Each list contains several sub-competencies of one group. 1c: Selection of the test date for the list view.

THE DASHBOARD - "STUDENT RESULTS"

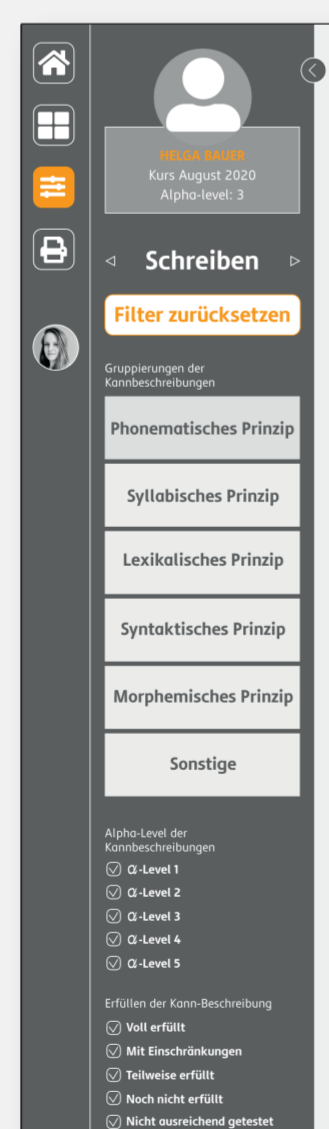


2a: Filter system. Teachers can filter the competencies presented according to their own diagnostic needs. 2b: Each competence is presented on a card. Each card shows the learning level for that competency, the difficulty of the competency, and the student's learning progress.

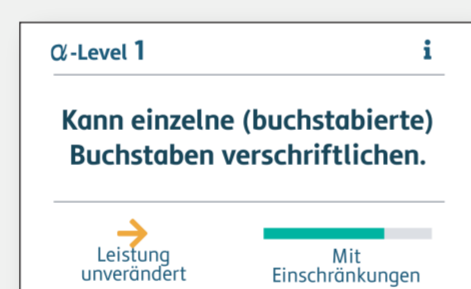
DETAILED VIEWS



3: Lists show all results for all competencies of everyone in a course. The competencies are sorted by content groups. Within the list, another list with the individual results of the persons can be unfolded.



5: The filtering system allows the user to filter cards according to certain characteristics. These can be the content groupings or the difficulty level of the competence. It is also possible to filter by how well a user has fulfilled a competency and how their performance has developed compared to previous tests.



4: A card shows a person's individual results for a particular competency. In addition, a description of the competence, a classification of the competence in a difficulty level and a comparison to previous test results are shown. On the back of each card, a more detailed explanation of the competence or a sample task is shown.

RESULTS OF USABILITY TESTING

- The small-step presentation of partial competencies as well as the coarser feedback related to individual levels were positively emphasized.
- Especially the presentation of the learning progress of individual participants was mentioned positively by the test persons.
- In the original design, the lists of competencies were expanded by default. This overwhelmed some users.
- In the original design, the progress bars were orange. Some test subjects noted that they would like to see a more "positive" color here, regardless of a learner's actual progress.
- The vocational school teachers rated the tool as innovative and useful for use with learners. However, many test persons saw a problem with the actual use in the schools.
- Literacy teachers expressed the need for more information about the scoring algorithm of the test.
- Some teachers from literacy courses expressed the wish to have concrete task sets and/or learning materials suggested and provided in the dashboard on the basis of the test results, which they can then use in class with the learners.

DERIVED MODIFICATIONS OF THE PROTOTYPE

- Lists are collapsed by default.
- The color of the progress indicators has been changed to green.
- In addition to the diagnostic test and the dashboard, a handout is being developed that provides more in-depth explanations of the diagnostics. In the future, individual sections of this handout will be linked to the dashboard via an information icon.
- The time problem for vocational teachers in supporting people with low literacy is a fundamental one and needs to be addressed elsewhere.