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Data literacy in primary school teachers' education and training

The correct handling, assessment and interpretation of data plays an increasingly important role in the context of society as a whole. Many data-driven tools and artefacts also determine the everyday life of children. Suggestions of songs or videos based on previous interests are only one example. Therefore, the conceptual basics of data literacy should already be integrated in primary school lessons. Previous research has shown that key data literacy concepts can be didactically reduced and conveyed in a way that is suitable for primary school children. Wolff et al. (2016) for example taught children aged 9 to 10 years how to analyze, interpret and reflect the data of intelligent electricity meters.

Our understanding of data literacy is based on the definition of the German Informatics Society (Gesellschaft für Informatik, 2018). Data literacy encompasses the areas of *collecting data*, *managing data*, *evaluating data*, *application of data* and the *critical reflection of handling data* (Ludwig & Thiemann, 2020; Ridsdale et al., 2015). Data literacy can be seen as an integral part of media-related competences that, according to the strategy *Education in a Digitalized World* of the German Ministries of Education (Ständige Konferenz der Kultusminister der Länder in der Bundesrepublik Deutschland, 2016), are considered to be necessary for living and working in an increasingly digitalised world and that are a compulsory part of German school curricula.

A precondition for the integration of data literacy in primary school lessons is that primary school teachers have appropriate data skills on their own and know how to teach data literacy to primary school children. Thus, it seems to be important to integrate data literacy topics in primary school teachers' education and training.

Therefore, we developed a massive open online course to convey the basics of data literacy to (prospective) primary school teachers. The course either can be integrated in a blended-learning format in university courses or can be self-paced followed by professional teachers. Basic terms such as data types, information and knowledge are clarified, the advantages and disadvantages of digital data storage are explained, and the possibilities of learning from data using machine learning methods are shown. Furthermore, the course addresses the reliability of data that contains errors or bias, and the trustworthiness and security of data. The course provides five modules with explanatory and accompanying videos, info texts and H5P quizzes that enable primary school teachers to acquire and expand their data competences. In addition, exemplary teaching materials and game suggestions are available that allow for the integration of the topics into school lessons so that data skills can be promoted in different contexts and subjects. The teaching materials provide references to the everyday life of children and support children in handling their own data competently.

The course is accompanied by a continuous evaluation in a pre- and post-test-design. All participants of the course are asked to take part in a survey at the beginning and at the end of the course so that potential attitude changes throughout the course can be analyzed. Central aspects of the evaluation are the motivation of the participants to subscribe to the course (only measured at the beginning of the course), personal goals for completing the course (only measured at the beginning of the course), previous data literacy knowledge, personal and professional relevance of the topics covered by the course and perceived self-efficacy to explain the topics of the course.

Due to the short run of the course so far, we only present preliminary results of the introductory survey. The course started in March 2022. Until end of June 2022, 195 participants had enrolled into the course. 35 persons out of 140 who had started to work with the course materials answered the introductory questionnaire.

Motivation to take part in the course was measured by a multiple choice question with the following answers given: interest in the topics, receiving of a course certificate, sniffing, only interest in selected topics due to previous knowledge, use of contents by lectures within own university courses. 35 persons answered the question. For about 94.3% the interest in the topics of the course was the most important aspect for subscribing. 17.1% of the participants wanted to use the contents within their university lectures, 14.3% were interested in receiving the course certificate, 8.6% wanted to sniff and 5.7% already had previous knowledge and were only interested in selected topics of the course.

The personal goals for completing the course were also measured using a multiple choice question with predefined answers. 54.3% ($n = 35$) wanted to stay professionally up-to-date, 48.6% wanted to stay up-to-date with social developments, 25.7% pursue the course because of the fact that the topics were not part of their own course of studies at university and 5.7% aspire a higher professional qualification.

Furthermore, the participants were asked to rate their previous data literacy knowledge on a 5-point Likert scale (1: very high – 5: very low). Most participants (39.4% out of 33 persons) assessed their previous knowledge on an intermediate level (mean = 2.9, SD = 0.74).

To measure the personal and professional relevance of the topics covered by the course, all users of the course were asked to rate the relevance on a 5-point Likert scale (1: very relevant – 5: not relevant at all). 44.0% ($n = 25$) stated that the topics would have a very high relevance for their private and professional life (mean = 1.8, SD = 0.64).

The perceived self-efficacy to explain the topics of the course and thus to convey data literacy competences to others was also measured on a 5-point Likert scale (1: completely – 5: not at all). 64.0% ($n = 25$) answered that they would be capable to completely or at least mostly explain the topics (mean = 2.3, SD = 0.62).

Our preliminary results suggest that highly motivated teachers and teacher educators follow the course. In their opinion, data literacy is not only important for their private but also for their professional life. They want to stay up-to-date with actual social developments and take part in the course for their professional development. A quarter of the participants had not acquired data skills during their own professional education. Overall, the participants rate their data skills on an intermediate level. However, most of them are convinced to be able to convey data literacy competences to others – at least after completing the course. The results indicate that a massive open online course may be a suitable way

- 1) to integrate data literacy in in teacher education and training and
- 2) to enable the integration of data literacy aspects in primary school education.

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