mAIchart: A Learning Analytics Tool for Primary School Educators

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Technological and scientific advancements in AI in education enabled academic researchers and edtech companies to develop learning environments that are used by students in and outside the classroom for various tasks, such as solving exercises that address their learning goals, self-regulating their learning progress or taking exams to test their ability in a given topic [4]. Although initial efforts were more focused on higher education, schools for primary and secondary education now also use digital platforms to support learning particular subjects, in particular for mathematics and language learning, see e.g. [2]. In the Netherlands, many primary schools use several digital learning environments, both for daily practicing exercises and for assessing, usually twice per year, if students have achieved the expected progress on their learning goals. Each of these systems provides benefits for learning, but they are typically provided by different companies, and the data about the learning progress of students appears in different dashboards with varying interfaces. This implies that teachers have to manually consult different dashboards to obtain an overview of the progress and problems of a student. To tackle this, we develop mAIchart, which is a learning analytics tool that collects data from various digital learning environments, applies learning analytics methods to analyse the collected data, and makes inferences to provide detailed information about the learning progress of students to the teachers with a dashboard.

Figure 1 depicts the flow diagram of the main components for mAIchart. First, student activity data from the learning environments involved is pseudonymized to not contain any personal data when retrieved from the source. Then, it is periodically collected from the data source to be securely stored in a repository, which provides access control to ensure each party (i.e., the learning analytics component and the repository access control management) to only access the required data they have the right to access, in anonymized form for a certain period. The learning analytics component queries data from the repository, to analyse student learning progress, model student behavior and infer outcomes such as the learning progress of a student compared to their class, predictions about success or failure in future exercises or exams. Then the processed data is stored on the secure repository, and available to be queried for the teacher dashboard. The teachers can query information about their pupils, and the data

is depseudonymized in the dashboard for the teachers, ensuring the privacy of student data by never giving access to personal information to any party other than the teacher of the queried students.

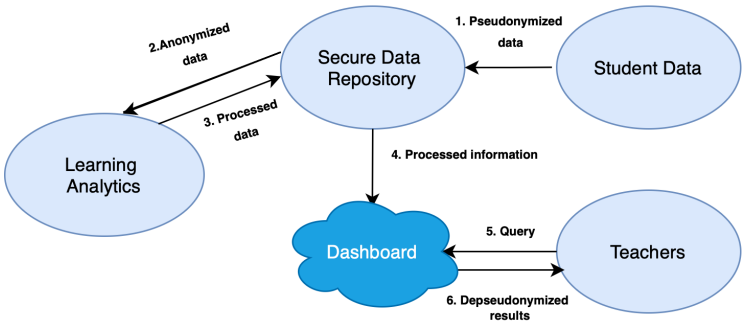

Fig. 1. Flow diagram for mAIchart components.

Data Collection and Psuedonymization : The data collection is done by retrieving periodical data dumps from the adaptive learning applications used in primary schools. The data is pseudonymized in the retrieval process via the data connectors, where a unique identifier number is given instead of the personal information for privacy protection. Each company uses the same unique identifier to ensure mAIchart can match the data from different sources for further analysis. Data is then anonymized via the data connectors from the data repository to the learning analytics (LA) module, to ensure that the LA module does not have access to the unique identifiers for data safety. The pseudonymized data is encrypted in the repository, and stakeholders only get access to the data they have the right to access, for only the time period they need it.

Learning Analytics : We aim to combine information from various applications using established methods for constructing a model of a learner, such as *item response theory* [1] and the *ELO rating system* [3]. We use these models to determine and track the learning progress of a student. Moreover we aim to identify and match the learning goals from the different adaptive learning sources to provide an overview of student learning activities, and predict success and failure of the students for their learning goals.

User Interface : The user interface is planned to be an interactive dashboard, with which teachers can track the learning progress of an individual student or a group of students for a given learning goal, while providing levels of granularity to check sub goals of larger subjects. To achieve this, face-to-face interviews are being done with the teachers to understand their needs for the dashboard, and to provide easy-to-use and efficient visualization to monitor student progress.

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