

# DigiTeaMap: A Digital Map to Represent Addressed Competencies in Digital and Computer Science Education in Austria

Stefan Pasterk<sup>1</sup>, Corinna Hörmann<sup>2</sup>, and Andreas Bollin<sup>1</sup>

<sup>1</sup> University of Klagenfurt, 9020 Klagenfurt, Austria  
{stefan.pasterk, andreas.bollin}@aau.at  
<https://www.aau.at/>

<sup>2</sup> Johannes Kepler University Linz, 4040 Linz, Austria  
corinna.hoermann@jku.at  
<https://www.jku.at/>

**Abstract.** The relevance of digital and IT education in today's working world is increasing noticeably, and numerous associated competencies are required. For this reason, subjects, courses, or training programs that teach digital and IT skills are currently of great interest to everyone involved. As topics are dealt with differently due to various disciplines and locations, Austria has no uniform or coordinated formats. This makes it challenging to obtain an overview of the content taught or competencies achieved. A real-time indicator is urgently needed for political reasons, among others. The objectives of the project *Digital Teaching Map (DigiTeaMap)* are the collection of data on taught content about digital and IT competencies via an interface developed for this purpose and a clear presentation of this data, which enables the comparison at the level of individual universities and regions, as well as at the national level. This poster describes the idea and background of the project and first experiences with the platform.

**Keywords:** Digital Education · National Curricula · Data Representation

## 1 Introduction

Universities and other educational institutions currently find themselves in a situation where the overview of courses on offer and the boundaries between subject areas are unclear. For example, similar content in digital and computer science education is addressed independently and not in a coordinated manner in various curricula. On the one hand, this is due to the confusion of terms such as 'digital skills,' 'media skills', or 'IT skills' [1, 2]. There is a clear overlap, meaning that skills can be located in several subject areas. On the other hand, various curricula and study plans also follow different focal points and, for these reasons, sometimes cover different competencies [3]. While this is undoubtedly in the interests of education and the education system, it tends to hinder a clear

view of the range of courses offered locally, like for example in Austria, or even internationally. The points mentioned concern the higher education sector and are also an issue in the school environment. In computer science alone, the example of Germany becomes complex regarding an overview of this subject in the various federal states. For this reason, the German Informatics Society (GI) has published the *Informatics Monitor*<sup>3</sup>. This clearly shows, in the form of a map and using color coding, which federal state is introducing computer science and when and in what form. However, the data is based on static data sets. The objectives of the project *Digital Teaching Map (DigiTeaMap)* are (a) to ensure the collection of data on digital skills in education via a low-threshold interface, (b) to create a clear presentation of the content taught, and (c) to enable the possibility of a comparison - also graphically - at the level of individual universities, regions, but also national level. To achieve these goals, the *DigiTeaMap* platform is being developed, which is based on an existing system for recording competencies (GECKO) and offers an interface for recording, displaying, and comparing taught competencies suitable for each user group.

## 2 Background and Details of the Project

### 2.1 Goals and Benefits

The project is relevant from several dimensions arising from the different use perspectives. On the one hand, it can serve as a tool to clearly communicate the current state of IT and digital education to education policy-makers and thus accelerate decision-making. For teachers at universities and in the general education sector, the project supports the planning of content and offers. Furthermore, the search for synergies, coordination between teachers, and cooperation between them will be promoted. From a scientific perspective, the collected data provides a basis for further research into digitalization's socially relevant components and sustainability. In addition, the project results will provide learners and companies with a basis for decision-making. Students can understand which universities focus on their areas of interest and thus receive help in their selection.

### 2.2 Related Work

The project was inspired by the *Informatics Monitor* but differs from existing work in several respects. For example, no national skills database currently records the digital and IT services offered by educational institutions, initiatives, and associations. This would provide a basis for further research and additional information gathering. The very diverse picture of education in Austria is broken down into a straightforward form of presentation (zoomable map). Although such a representation has already proven worth in similar contexts (e.g., *Informatics Monitor*), it is not currently used in Austria. The representation as a map and comparison platform is not static but offers a 'real-time status' similar to Google Maps. In comparison, the *Informatics monitor* is based on static data.

<sup>3</sup> <https://informatik-monitor.de/>

## 2.3 Competency-based Education

Another current topic in the educational landscape is competency orientation. The teaching of competencies is assumed, which means, among other things, it is stated what learners should be able to do after individual units or entire courses. This is becoming the standard in Austria, primarily in the school context but also increasingly in higher education [4]. The GECKO (Graph-based Environment for Competency and Knowledge-Item Organization) environment from the Institute for Informatics Didactics at the University of Klagenfurt enables the collection, management, and analysis of competencies and their dependencies. The DigiTeaMap uses GECKO as a basis for the data collection.

## 3 First Results

### 3.1 Collecting the Data

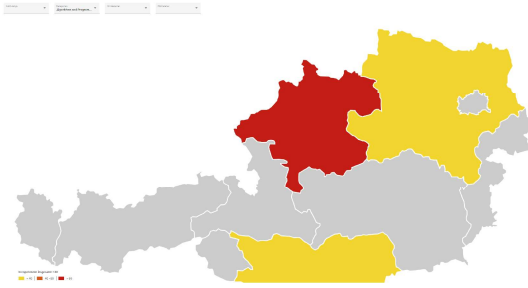
An interface was developed and integrated into the GECKO platform to record and integrate the teaching sequences. It uses a split screen to display the sequence on the one hand and the pool of selectable competencies on the other hand. Teachers can search for suitable competencies and drag and drop them into their sequence, arranging them in the order in which they teach them. If a competency can not be found, a new one can be generated and stored. Competencies can be grouped into topics, and the time used to teach these topics can be added.

### 3.2 Displaying Collected Data

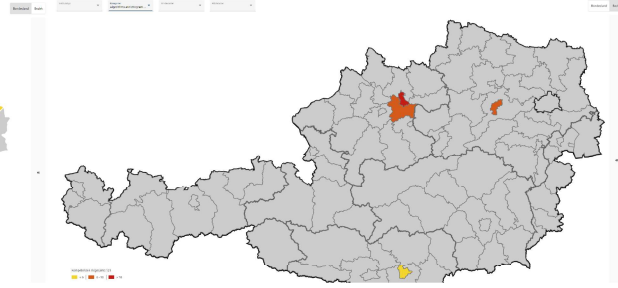
The collected data is displayed in a filterable map of Austria, which can be viewed at the state and district levels. In the GECKO environment, competencies are stored with attributes, which are used as options to filter the interactive map. A color code similar to a heat map is used to reflect the different frequencies of occurrence of the individual attributes. For example, one main filter option is the category. Each competence is assigned to one of the following five areas: *algorithms and programming*, *data representation*, *digital applications*, *digital device and infrastructure*, and *humans and computers*. Users can now filter on the map how often competencies belonging to one of the five categories occur in learning sequences in the Austrian area: a red state or district indicates a high occurrence. In contrast, a yellow state indicates rare references to competencies in a particular area. This can be seen in Fig. 1 and in Fig. 2.

### 3.3 User Experience

The data was collected using existing lesson plans from teachers in different states in Austria. Since lesson plans in Austria must include competency descriptions, these could easily be converted into learning sequences and incorporated into the platform. When writing this article, 33 learning sequences have already been collected and are shown on the map. Participating teachers liked



**Fig. 1.** Interactive map at state level



**Fig. 2.** Interactive map at district level

comparing their plans with others, and the representation form was also mentioned as enjoyable. The feedback from testing the platform will be considered for subsequent releases.

## 4 Conclusion and Future Work

In recent years, many different offers concerning digital education have come up. It is becoming increasingly difficult to maintain an overview and compare content. The project DigiTeaMap aims to develop a fast and easy way to collect necessary data and to represent the results in a valuable and representative way. Based on competencies included in learning sequences, different data can be shown on an interactive map of Austria. First tests and data collections indicate that the format is well-chosen and valuable for users. In the project's next steps, further data will be collected to fill the map with information. Further steps will include an expansion to an international level.

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