

Discussing Educational Standards for Digital Competence and/or Informatics Education at Lower Secondary Level

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Abstract: Participants of this workshop will be confronted exemplarily with a considerable inconsistency of global Informatics education at lower secondary level. More importantly, they are invited to contribute actively on this issue in form of short case studies of their countries.

Until now, very few countries have been successful in implementing Informatics or Computing at primary and lower secondary level. The spectrum from digital literacy to informatics, particularly as a discipline in its own right, has not really achieved a breakthrough and seems to be underrepresented for these age groups. The goal of this workshop is not only to discuss the anamnesis and diagnosis of this fragmented field, but also to discuss and suggest viable forms of therapy in form of setting educational standards. Making visible good practices in some countries and comparing successful approaches are rewarding tasks for this workshop.

Discussing and defining common educational standards on a transcontinental level for the age group of 14 to 15 years old students in a readable, assessable and acceptable form should keep the participants of this workshop active beyond the limited time at the workshop.

Keywords: Educational Standards, Digital Competence, Informatics Education, Computing, Lower Secondary Level

1 Introduction

Since computers have been implemented in schools in the 1980s, the house of Informatics education, comprising the spectrum from digital media to computer science in its core played in the course of time an increasing but still ambiguous role. This applies especially to general education at secondary level including the primary level as well. Actually, more than 30 years after an unprecedented development of computers from primitive and programmed calculators to ubiquitous, pervasive and connected endpoints of networks, Informatics as the underlying science of our digital society is still not recognized widely as a core discipline in its own right. In contrast to traditional subjects such as (native) languages and Mathematics (a global language) as the common core and corner stones of educational systems worldwide, and other obligatory educational areas with elaborated curricula for each age group, Informatics (computing) education is underrepresented. The current situation of this fragmented field is due to an unclear terminology and a comparatively short history, not to mention the inherent inertia in educational systems.

However, an overview of worldwide endeavours gives hope that Informatics will play a more significant role in lower secondary education in a foreseeable future. Widely accepted definitions related to Informatics (computing), information and communication technologies, digital literacy and technology enhanced learning, and the acceptance of existing frameworks, competence models, curricula and teaching aids should support this process.

Recently, an increasing number of position papers, frameworks and country reports explicating the wide field of Informatics at schools have been published. These activities should remedy the unacceptable situation of big distortions of computing in education even within countries, regions and schools. Incoherence from country to country, state to state and even from school to school, is not the exception but the norm. Informatics education (standards) varies widely and its picture especially at lower secondary education shows distortions and inconsistencies referring to

- different perceptions of the term Informatics which often serves for every activity with computers,
- formal Informatics education between obligation and freedom of choice within autonomous decisions of schools and regions,
- an antagonistic view on approaches to develop students' digital competence and basic Informatics education, in an integrated way across the disciplines or as a discipline in its own right,

- different structures of reference frameworks in many countries, and
- different preconditions, cultural backgrounds and requirements world-wide.

2 Structure of the Workshop

2.1 Discussing Terminology

Among many meaningful combinations of relevant keywords, ranging from media literacy to a rigorous computer science education, digital competence and Informatics education seem to be prevalent. A short discussion about Informatics and its Anglo-Saxon equivalent computer science respectively computing should be conducted.

Table 1: List of Keyword Combinations

Field	Level of Proficiency
Digital, Media IT, ICT Computer, Computing Informatics, Computer Science	Skills, Literacy, Fitness, Fluency, Knowledge, Qualification, Competence, Pedagogy, Education

2.2 Overview of Frameworks

- The seminal European Reference Framework for Key Competences for Lifelong Learning (ERF, 2007) consists of the key competences communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship and cultural awareness and expression.
- The DIGCOMP project (DIGCOMP, 2014), initiated by the EU commission with representants from many countries, published a framework for all citizens in our increasingly digitalised society. But has it the potential to serve as an important reference model like the prominent and influential Common European Framework for Foreign Languages? It comprises the main competence areas information, communication, content-creation, safety and problem solving with each area

consisting of 3 to 6 competences and the proficiency levels A (foundation), B (intermediate) and C (advanced).

- Further overviews of current models curricula and frameworks will be given and compared, e.g. the CSTA K-12 (CSTA, 2011) Curriculum comprising Computational Thinking, Collaboration, Computing Practice and Programming, Computer and Communications Devices, Community, Global, and Ethical Impacts,
- Principles and Standards for School Informatics in Germany (Gesellschaft für Informatik, 2008), comprising Information and Data, Algorithms, Languages and automata, Informatics systems, Informatics, man, and society,
- Digital Technologies within Australian curriculum development, comprising Digital Systems, Representation of data, Collecting, managing and analysing data, Creating solutions by Defining, Designing, Implementing, Evaluating and Collaborating and Managing (Australian Curriculum, Assessment and Reporting Authority (2014)).
- Other current approaches (cmp. new Computing curriculum in UK).

2.3 Discussing a Comprehensive Competence Model

As a common denominator of many regional, national and international curricula and frameworks, the following competence model can be seen as a starting point and compromise of core Informatics and interdisciplinary media education. It can be applied to nearly all stages of lower school level and can serve as a solid fundament and a preliminary basis for further Informatics education at upper secondary level.

Table 2: Reference Model for Digital Competence in Austria (Micheuz, 2010)

	Content	Levels of Competences		
		Knowing Understanding	Applying Designing	Reflecting Evaluating
Media Reflection Related Topics	Information Technology, Human and Society			
	Impact of IT in Society			
	Responsibility in Using IT			
	Privacy and Data Security			
	Developments and Vocational Perspectives			
Digital Media Knowledge	Informatics Systems			
	Technical Components and their Use			
	Design and Use of Personal Information Systems			
	Data Exchange in Networks			
	Human-Machine Interface			
Use and Production of Digital Media	Software Applications			
	Documentation, Publication und Presentation			
	Calculation and Visualization			
	Search, Selection and Organisation of Information			
	Communication and Cooperation			
Principles and Computational Thinking	Informatics Concepts			
	Representation of Information			
	Structuring of Data			
	Automatization of Instructions			
	Coordination and Controlling of Processes			

3 From Abstract Frameworks to Concrete Tasks

Competence models play a well-defined and central role in the spectrum from abstract objectives to their implementation, leading to intended learning activities and students' outcomes. Typically, they are deduced from and refer to a core curriculum, and thus form the foundation for so called educational standards. However, a competence-oriented approach aims at concrete learning outcomes and has to be substantiated by age-appropriate and illustrating tasks. In order to make abstract formulations concrete, at the end of the workshop exemplary tasks will be presented for further discussion.

4 Requirements for this Workshop and Expectations

After a compact and comparing overview of approaches provided in a comprehensive way by the organizer of the workshop, additional contributions from the participants – who preferably should be aware of the situations in their countries – are appreciated. Preparational work and tentative results of this workshop could/should be the basis for further discussions among the participants beyond the limited time at the conference. This cooperative work could result in a widely accorded position paper about educational standards and (minimal) requirements at the end of K-8, preferably together with strong recommendations for a (possibly interdisciplinary oriented) subject (area) Informatics, Computing or Digital Technologies in its own right.

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Biography



Peter Micheuz is since 1979 an Austrian teacher at the Alpen-Adria-Gymnasium Völkermarkt and since 2000 in charge of teachers' education for Informatics at the Alpen-Adria-University Klagenfurt.

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