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# Ability maps in the context of curriculum research

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## Background

As mathematics teachers and course planners, we have hands on experience, negotiating learning objectives with our colleagues and students. One important challenge we have noticed in this process has been overviewing and disambiguating potential learning objectives (Hansen, 2018). We have attempted to address this challenge by drawing what we call ability maps – network representations of potential learning goals. The ability maps have the purpose of structurally relating knowledge and skills within a certain field – a subset of this would then be the curriculum. The notation involves a simple syntax. Any potential learning objective, no matter how small, is considered an ability and is represented by a node. Whenever we agree that one ability includes another ability, we represent this with an arc pointing from the including ability to the included ability. There are additional rules about redundancy and layout to make these networks easier to explore.

Our experience from initial workshops is that these maps help co-located participants to identify and discuss potential learning goals. Furthermore, implemented digitally, the above is aided by interactive support, dynamic layout, and remote participation. More ambitiously it supports a process of online social evaluation of individual includes arcs to enable emerging consensus on what is considered important. We have developed a basic prototype and are currently considering a number of research and design questions involving ability maps. These workshops were held with mathematics teachers, but we think of ability maps as context independent both regarding subject and nationality. An additional challenge we have noticed in the process of negotiating learning objectives, and when introducing new users to ability maps, has to do with the proper (although often implicit) purposes of curriculum development. With this in mind, we ask: Which foundational perspectives in curriculum research explain the disagreement and how do ability maps fit into these perspectives? This question thereby investigates the different perspectives among researchers not practitioners.

## Method

Our approach is to orient ourselves in the literature to identify positions on curriculum research before considering how ability maps could be characterized by the perspectives. By reviewing the perspectives in the literature, we intend to discuss how and to what extent ability maps can address the challenges from the existing knowledge and discussions in curriculum research. In our search for literature we used the snowballing procedure. Snowballing is an approach in which a reference list, citations keywords in one or several papers are used to identify additional papers (Wohlin, 2014). The snowball methods often begin by identifying a tentative *start set* of papers. We began our search with the keywords: “Rationalistic”, “Tyler”, “Approach”, “Curriculum”, “Education”,

which we searched for in Google and Google Scholar. We read 15 abstracts and 10 full papers. As the work presented in this poster is early stage research, we use the initial insights retrieved from the start set.

Within this process we found a framework for categorizing the role of curriculum, based on few authors which proved to be helpful in pinpointing the differences in the above literature and the potential role of ability map. The literature we read suggest two ways of approaching curriculum development referred to as a rationalistic and a dialogical approach. The rationalistic approach, represented by Tyler (1949), is described as technical and linear and focuses on structuring specific learning content. The dialogical approach is on the other hand dynamic and focuses on interactivity and flexibility (John, 2006). We adopt the distinction between these approaches as central.

### **Preliminary results from the review**

The two perspectives seem to explain much of the disagreement when negotiating learning objectives, however it was not so straightforward to place ability maps in either of these perspectives. At first glance, ability maps may seem to epitomize a rationalistic approach as it involves a high degree of structuring, detailed breakdown of objectives and has ambitions of technical implementations. However, the structure is not linear, but captures rich relations that are the result of negotiation and collaboration. Also, the structure does not dictate how teachers teach but only provides a map within which they can navigate. Furthermore, the identified abilities are not necessarily objectives. Deciding on which abilities to consider as objectives are an independent step from working with the maps and may not even happen until in the classroom. Finally, the ambition of technical implementation must not be interpreted as enforcing a mechanistic approach.

Ability maps thereby seem to transcend the dichotomy of a rationalistic approach and a dialogical approach. Although the division of rationalistic and dialogical approaches are beneficial in segregating views on curriculum, it is not helpful in categorizing ability maps. On the contrary, the dichotomy between these notions can represent a barrier in developing novel approaches to curriculum development. In this respect, ability maps seem to contribute with nuances that can support the practical aspects of curriculum development.

### **Further exploration**

To further explore and qualify these findings, a more comprehensive literature review is needed. This will contribute in nuancing and better understanding ongoing discussions in curriculum research and development and the potential contribution of ability maps. Further, ability maps are still at an early stage and experiments on its usage and usability is needed.

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