Content Knowledge for Teaching
The concept of matter is central to understanding many scientific ideas (NRC, 2012). While more is known about student learning relevant to matter, there is currently a lack of content-specific teaching knowledge about matter in the elementary years (Smith & Plumley, 2016). Therefore, this is an important area in which teacher educators can support the development of elementary teachers’ content knowledge for teaching (CKT). CKT lives at the intersection of science content being taught and the Work of Teaching Science (WOTS).

Educative Curriculum Materials
Curriculum materials are a means of supporting teacher learning (Ball & Cohen, 1996; Davis & Krajcik, 2005), and educative curriculum materials (ECM) are specifically designed to help develop knowledge to improve instructional decision making (Davis & Krajcik, 2005). Our conjecture is that educative curriculum materials for teacher educators might similarly support teacher educator and preservice teacher learning and could support the development of CKT about matter and its interactions in teacher education.

Our Work
In our project, we ask, How might curriculum materials be designed and implemented to support teacher educator and preservice teachers’ learning?

We have been engaged in a theoretically and empirically-grounded design process (Davis et al., 2014) to develop ECM for teacher educators related to CKT about matter and its interactions. In this poster, we share our design heuristics, and examples of educative features included in the suite of CKT packets we developed. To date, we have developed six sets of materials, with two more in development (see Table).

CKT Packets have undergone several rounds of feedback, pilot implementation, and review. As a next step in our work, we will be using a quasi-experimental cohort-control design to conduct an implementation study in order to examine the use of the materials by teacher educators and the impacts on preservice teachers’ CKT.

For more information about this project and to sign up for access to our educative curriculum materials and other resources, visit http://cktscience.org

Design Heuristic #1: Supporting Teacher Educators in Engaging Preservice Elementary Teachers in the Work of Teaching Science

- Highlight the work of teaching science and provide rationales for why this work is important.
- Help teacher educators adapt and use resources with their preservice teachers in pedagogically appropriate ways, for example:
  - by making explicit how specific science teaching practices correspond to different concepts and ideas
  - providing recommendations for how those might be introduced in different contexts and courses.

Design Heuristic #2: Supporting Teacher Educators in Anticipating, Understanding, and Addressing Preservice Elementary Teachers’ Ideas about Science and Science Teaching

- Help teacher educators understand how preservice teachers develop CKT for science.
- Support teacher educators in anticipating, eliciting, and interpreting preservice teachers’ ideas.
- Provide insight into how teachers educators might address those ideas in their teaching, for example by giving suggestions of tools and activities to confront preservice teachers’ initial ideas about teaching science in productive ways.

Design Heuristic #3: Support Teacher Educators in the Development of Preservice Teachers’ Content Knowledge

- Provide teacher educators with tools for helping preservice teachers develop a deep conceptual understanding of science content as a foundation for building CKT.
- Help teacher educators support preservice teachers assess their own content ideas and understand why strong content knowledge is important for teaching.
- Key differences between the understanding required of preservice teachers and their students are emphasized.

Examples of Educative Features included in CKT Packets

| CKT Tasks - elicit preservice elementary teachers’ understanding of the WOTS (Heuristic 1) and the content (Heuristic 3) relevant to the CKT focus. | Elaborated Answer Keys - provide example preservice teacher responses and possible reasoning to help teacher educators analyze responses (Heuristic 2). | CKT Overviews - provide information about teaching practices (Heuristic 1) and NGSS alignment (Heuristic 3) relevant to the CKT focus. | Suggested Lesson Plans - (Heuristic 2) provide guidance. Call-outs on right attention to specific teaching moves to highlight WOTS (Heuristic 1) or content understanding (Heuristic 3). | Additional Resources - support teacher educator and preservice teachers’ learning about the WOTS (Heuristic 1) and content (Heuristic 3) relevant to the CKT focus. | Reading Pages - support preservice teachers’ WOTS understanding (Heuristic 1) and content knowledge (Heuristic 3) for CKT development. |

References