



RESEARCH REVIEW

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Design principles guide educators in choosing and using curriculum materials

► THE STUDY

Davis, E.A., Palincsar, A.S., Smith, P.S., Arias, A., & Kademian, S.M. (2017, August-September). Educative curriculum materials: Uptake, impact, and implications of research and design. *Educational Researcher*, (46)6, 293-304.

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Elizabeth Foster (elizabeth.foster@learningforward.org) is associate director of standards, research, and strategy at Learning Forward. In each issue of *The Learning Professional*, Foster explores a recent research study to help practitioners understand the impact of particular professional learning practices on student outcomes.

In this issue, we take a look at an area of emerging interest: curriculum materials and the role they play in the daily work of educators and leaders. Educators, researchers, and policymakers are interested in what materials schools and districts use and how best to develop and share them in order to understand and support improved teacher practice and student learning.

Learning Forward is particularly interested in the professional learning implications of this body of research and knowledge, and in better understanding how to increase and improve teacher professional learning related to curriculum and instructional materials, which would increase access to learning experiences for more students.

Curricular materials — the resources that support teaching, from curriculum to lesson plans — vary widely among contexts, as does their use. Educators continuously interact with, adapt, and use curricular materials, individually and collaboratively, as they engage students and implement standards.

Engaging with materials can shape the teaching experience, teachers' practices and mindsets, and, ultimately, students' learning experiences. What a curriculum's design intends can shift by the time it is enacted. Increasingly, such materials are designed to be *educative*, meaning they are designed to support teachers' learning as well as students' learning.

ABOUT THE STUDY

Davis and colleagues look at how curriculum materials impact teaching practice and student learning and suggest general design principles for educative curriculum materials. The researchers synthesized the findings of the literature, observational case studies, and a three-year empirical quasi-experimental study of educators' use of educative curriculum materials to draw implications for research and design.

They explain that educative elements can “take the form of ‘callout’ boxes with teacher tips, graphics illustrating conceptual relationships among the ideas in a unit, guides to the use of readings, or suggestions for providing students feedback on their writing” (p. 294). The researchers also looked specifically at what they call “uptake” — “the ways teachers adopt, in language and/or action, ideas or practices recommended in the educative features” (p. 294).

Two key assumptions undergird the study:

- Educative materials should support educator learning in multiple domains, including subject matter knowledge, pedagogical content knowledge, and specific teaching practices.
- The rationale for the educative guidance or suggestions should be made explicit for teachers to apply the ideas in multiple contexts.

These assumptions set the stage for

► WHAT THIS MEANS FOR PRACTITIONERS

This study clarifies how curriculum use moves from what is written and intended to what is enacted. This process is clearly happening in varying ways, making the presence of aligned and relevant professional learning especially critical.

The researchers suggest that educative features embedded in curriculum can support teacher learning as well as student learning. Although this study touches only briefly on professional learning, there are implications for educators, coaches, principals, and professional learning designers when selecting and engaging with curricular materials.

The suggestions and principles for materials developers seem especially relevant to designers and leaders of professional learning, such as the suggestion that designers emphasize the rationale for shifts in practice, or the idea that multiple explanations and examples be employed in helping teachers understand their own practice, content knowledge, and use of materials with a range of students.

This study is based on the acknowledgement that teachers adapt curricular materials as they use them. For that adaptation to further improve teaching practice and student outcomes, professional learning must incorporate and align to the existing materials and must assess how teachers are currently using them and to what effect.

The authors also note an opportunity here: “Educative curriculum materials have potential to provide sustained, scalable, job-embedded, discipline-specific professional learning opportunities that teachers need” (p. 295). The science-specific design principles point to the helpfulness of very specific guidelines and content markers in clarifying how a teacher’s use of educative features improves practice.

Mapping this study to Learning Forward’s Standards for Professional Learning (Learning Forward, 2011), two of the standards in particular stand out: **Learning Designs** and **Outcomes**.

The **Learning Designs** standard provides an entry point to thinking about implementation of the study’s design principles. The findings and design principles also align with important design elements of effective professional learning: differentiation, alignment, meaning making, and grounded



in teacher practice. The design principles developed through this research provide important look-fors for educators, coaches, and leaders of professional learning.

This study offers a better understanding of the **Outcomes** standard because it shines a light on the process by which teachers engage with their content and how they work with materials to help students achieve their goals. It follows, too, that teachers who are able to incorporate the suggestions and strategies the educative features provide expand their options for reaching and supporting students.

Given the findings that educators regularly and consistently adapt instructional materials and respond to prompts and suggestions in educative features, this is an opportunity for a connection with professional learning efforts.

Of particular interest is the finding that different teachers respond to different prompts and suggestions in the educative materials. Professional learning that is ongoing and embedded encourages teachers to not only select the guidance that is most effective in their context but also develop an understanding of the tools that are most useful to them in their own individualized practice.

REFERENCE

Learning Forward. (2011). *Standards for Professional Learning*. Oxford, OH: Author.

the Davis study and also align nicely with the way Learning Forward’s Standards for Professional Learning recognize the complexities of educators’ needs and development pathways.

Researchers looked at three questions:

1. How do teachers use and adapt curriculum materials in their enactment? What are some of the key influences on their
2. What evidence do we have of teachers’ uptake of ideas

decision-making while using curriculum materials, including educative curriculum materials?

DESIGN PRINCIPLES

► **DESIGN PRINCIPLE 1**

Teachers will adapt curriculum materials. These adaptations are likely to be informed by teachers' concerns about time and student capabilities and experiences. By anticipating these adaptations, educative features can facilitate principled and productive adaptations. Therefore, educative features should provide suggestions for adaptations of lessons that would take different amounts of time and meet a range of students' needs while still meeting the intent of the reforms embedded in the curriculum materials. Examples of such educative

features could include narratives describing choices that may reduce time needed while maintaining opportunities to learn.

► **DESIGN PRINCIPLE 2**

Educative features that provide representations of practice can support teachers' uptake of the ideas in the features. Educative features that can be used as teaching tools can support concrete changes in teachers' practice. Furthermore, sample student work can help teachers set higher expectations for their students than they might otherwise have. Therefore, educative features should be situated and grounded

in teachers' practice.

Some features grounded in practice can be directly applied as teaching tools in the classroom. Examples of educative features that are situated in teachers' practice include (a) rubrics that illustrate essential features of key ideas of reforms along with sample student work and possible teacher comments that reflect those key ideas and (b) narratives that describe teachers' enactment of lessons in ways that demonstrate key ideas of reforms. Examples of teaching tools include rubrics, examples of key scientific ideas, and student-friendly definitions of terms.

► **DESIGN PRINCIPLE 3**

As expectations for students and teachers change, demands on teachers' subject matter knowledge grow. Multiple vectors may help teachers to identify the "big ideas" to highlight in lessons. Therefore, designers should use multiple forms of support for highlighting important content. Examples include content storylines, student-friendly definitions, and graphics.

► **DESIGN PRINCIPLE 4**

Different teachers will need and take up different kinds of educative features (in terms of substance and form). Teachers' variable uptake

from educative features in the educative curriculum materials?

3. What evidence do we have of impact of educative materials on teacher and student outcomes?

METHODOLOGY

The study's methodology included three phases:

- **Year 1:** A pilot study observing how three teachers used a curriculum along with a review of literature to develop educative components to add to existing curriculum;
- **Year 2:** An expanded pilot with four teachers using the curriculum with the added educative materials; and
- **Year 3:** A quasi-experimental efficacy study with 20 elementary schools randomly assigned to use either the curriculum materials with

the educative features or the original curriculum.

The treatment group included 28 teachers, and the comparison group included 22 teachers. Researchers gathered common data for all teachers — such as lesson logs, samples of student notebooks, and pre- and post-assessments of student content knowledge — and analyzed selected video clips.

They looked for what they call "tracers" — these include particular phrases or teaching moves that were in the educative features but not in the original curriculum. Their use would indicate that the teachers were tapping into the suggestions in the educative materials.

The study focused on elementary science teachers, but the authors looked for generalizability across subject and grade level in analyzing their findings and developing their design guidance.

A helpful feature of this paper is how findings from observations and the efficacy study are clearly linked to findings from the literature.

FINDINGS

The authors report, "We found extensive evidence of uptake of the ideas and recommendations in the educative features. Yet our evidence of impact on outcomes was more limited" (p. 297).

The study found that teachers adapt curriculum materials as they use them and that this adapting process is informed by competing goals, such as time constraints, understanding of and comfort level with scientific practices, and perceptions of student abilities (p. 296).

In addition, the study illustrates that teachers' knowledge, beliefs about teaching, and beliefs about learners, as well as characteristics of the materials themselves, shape how teachers use the

will be based on the needs they perceive in themselves (e.g. their knowledge of content, assessment, or reading strategies) and their students (e.g. their typical content struggles). Therefore, designers should develop a constellation of educative features that have the potential to meet these various needs. Designers also should help teachers recognize how the recommendations differ from their current practice, in part through emphasizing the rationales for the recommendations. A constellation could be constituted purposefully using different forms of

educative features (e.g. narratives and callout boxes) with different foci (e.g. subject matter knowledge and pedagogical content knowledge). An example of an educative feature that would highlight how recommendations differ from current practice could include a reading guide that signals change from typical literacy practices.

► DESIGN PRINCIPLE 5

Teachers take up the practice of scientific explanation in a limited way. Therefore, educative features should help teachers (a) appreciate the definition, intention, and value of constructing

scientific explanations and (b) learn how to support students in engaging in explanation construction and argumentation. Examples include narratives, expository text, capstone questions, and rubrics that synergistically define, illustrate, and guide explanation construction and argumentation in the classroom.

► DESIGN PRINCIPLE 6

Certain scientific practices, including making and recording observations and making and justifying predictions, were taken up effectively by most teachers. Therefore, educative features should support easier-to-

enact scientific practices, with the idea of moving incrementally toward more ambitious science teaching in elementary classrooms. Designers should connect to teachers' existing teaching practice to create leverage points while helping teachers recognize salient differences. Examples of such educative features could include narratives and how-and-why support for prediction that reinforces the need for justification, points the path toward argumentations, and connects to ways teachers may already use prediction (e.g. in English language arts).

Source: Davis et al., 2017, pp. 297-300.

curriculum materials.

Adaptations can either augment or limit students' opportunities to learn. For instance, when teachers provide additional opportunities for students to engage with scientific practices and share practices' rationales with students, that augments students' opportunities to learn. When teachers limit students' exploration of predictions due to time constraints, that limits opportunities to learn.

These study findings "highlight the need for educative curriculum materials to anticipate and support teachers' adaptations to curriculum materials" (p. 297). The study further found that educative strategies and tools that are grounded in practice, such as those that reference student work or teaching moves, can be especially supportive.

This study sheds light on which particular educative features teachers respond to while also underlining the

idea that teachers do, in fact, respond to such features. The patterns observed (along with a review of related literature) led the authors to conclude that uptake is best when the educative features are "highly situated" — meaning that they are directly relevant to the current classroom teaching experience — and multiple methods and strategies for delivering educative guidance are important because different teachers respond to different options.

The findings on the question of evidence related to the impact of educative materials on teacher and student outcomes were directly related to the efficacy study, which did not reveal significant effects on student or teacher knowledge.

LIMITATIONS

Limitations of the study include the relatively small sample size and the fact that only a single science item was used

in the efficacy study.

DESIGN PRINCIPLES

The analysis of findings as well as the related literature led to the development of six design principles for educative features in instructional materials, which offer guidance for selecting and using materials with educative features. See the explanations and examples of these design principles on pp. 22-23.

The takeaway from the domain-general design principles is that educative features should:

- Suggest adaptations of lessons that would take different amounts of time and meet a range of students' needs;
- Be situated and grounded in teachers' practice;
- Take multiple forms; and
- Work together to meet a range of teacher needs. ■