

**Complicating Scripted Curriculum:
Can Scripts be Educative for Teachers?**

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This paper examines how designers of mathematics curriculum guides for elementary teachers communicate with teachers about their instructional roles and actions. We focus, in particular, on the ways that curriculum authors provide scripts for teaching, considering their place in educative curriculum materials. In so doing, we hope to interrogate commonly held and potentially oversimplified views of “scripted curriculum” and pursue new questions about how curriculum authors can support teachers in their critical roles as curriculum designers and enactors.

EMPIRICAL AND THEORETICAL BACKGROUND

Over the last two decades of curriculum development and research on teachers’ use of curriculum materials, a great deal of attention has been paid to how and what curriculum designers communicate to teachers. The driving hypothesis has been that curriculum materials could possibly serve as facilitators of pedagogical, as well as curriculum, reform efforts. Because they are used so widely by teachers across the U.S., curriculum materials have been seen as a primary vehicle for instructional change in classrooms.

Many argue, however, that in order to influence teachers’ pedagogical routines, curriculum developers might need to think differently about how they communicate to teachers. Ball and Cohen (1996) speculate that “curriculum materials could contribute to professional practices if they were created with closer attention to processes of *curriculum enactment*” (p. 7). This proposition is premised on a stance shared by several scholars of teaching that even when following curriculum guides, teachers play a fundamental role in enacting curriculum in the classroom with their students (Ben-Peretz, 1990; Remillard, 1996; Snyder, Bolin, & Zumwalt, 1992; Stein, Grover & Henningsen, 1996). Thus, in order to contribute to change, curriculum materials need to be written with teachers’ enacting roles in mind.

Jerome Bruner (1977) recognized the significance of the teacher as curriculum enactor when writing a preface to a second edition of *The Process of Education*. Originally published in 1960, Bruner’s text argued for curricular and pedagogical approaches to education that were at the heart of curriculum reforms of the late 1950’s and early 1960’s. Looking back on the largely unsuccessful attempts to drive instructional change through new curriculum materials, Bruner wrote:

A curriculum is more for teachers than it is for pupils. If it cannot change, move, perturb, inform teachers, it will have no effect on those whom they teach. It must be first and foremost a curriculum for teachers. If it has any effect on pupils, it will have it by virtue of having had an effect on teachers. (p. xv)

Building on Bruner’s (1977) view of how curriculum materials might have the greatest impact on students, other researchers began to consider ways that these materials could support teachers in enacting instruction. Noting that conventional teachers’ guides focused primarily on directing teachers’ instructional actions, Remillard (1999; 2000) argued that curriculum authors might give greater attention

to communicating directly with teachers about the aims and ideas in the materials. Remillard (2000) used the term “speaking *through* teachers” to characterize the approach adopted by most curriculum developers. It communicates with teachers by guiding their actions, providing them with a collection of tasks to present to students and questions to ask.

The idea that the primary role of curriculum materials is to direct teachers’ instructional actions is viewed as problematic on a number of levels. Critics of institutional efforts to control teachers’ work (e.g., Apple 1986) argue that such an approach seeks to manage teachers’ activities by constraining their autonomy and authority. Shulman (1983) has referred to this approach as “the remote control of teaching.” In this process, teachers are “deskilled” or treated as conduits for the ideas of others. The label “teacher-proof” is often used to characterize curriculum materials that attempt to override teacher authority and decision making in their design. In recent years, the term “scripted curriculum” has been invoked to depict teachers’ guides that tightly structure or direct teaching actions. In some cases, the guide literally takes the form of a script; in other cases, teacher actions are not fully scripted but the guide provides a narrowly prescribed path for instruction.

Other concerns about curriculum materials that speak primarily *through* the teacher focus on their limited capacity to actually support teachers. As Ball and Cohen (1996) point out, the work of teaching is complex and enacting curriculum in one’s specific classroom involves interpreting students’ difficulties, assessing the mathematical viability of partial solutions, and responding to them in the moment. Scripts are unlikely to support teachers while they engage in these activities of teaching. Furthermore, curriculum materials that take the form of scripts are often seen as taking a “one-size-fits-all” approach to instruction and are not amenable to adaptation for one’s particular students.

In contrast to scripting or directing teachers’ actions, Remillard (2000) suggested that curriculum designers speak *to* teachers.

In addition to suggesting to teachers what they might say or do, text writers need to talk to teachers about these suggestions, about the mathematical and pedagogical ideas underlying them, and about students’ likely reactions to them. In doing so, they need to make their agendas and perspectives accessible to teachers. (p. 347)

Schneider and Krajcik (2002) used the term “educative” to refer to curriculum materials designed to support teachers’ learning to enact new kinds of pedagogies. The notion that curriculum materials should be educative for teachers has prompted research and design work around what such a resource would look like.

Davis and Krajcik (2005) further developed this idea by offering a set of design principles curriculum developers could follow to develop teachers’ guides that are educative for the teacher who uses them as well as the students. Building on the

work of Ball and Cohen (1996), they propose that educative curricular materials could potentially (1) help teachers attend to student thinking, (2) provide subject specific content support, (3) help teachers connect ideas within a given discipline, (4) communicate curriculum designers' rationale for pedagogical choices, and (5) foster teachers' ability to effectively mobilize curricular materials within a specific classroom context.

Some researchers have studied how teachers use the educative features in curriculum resources and the impact of these supports on teachers and their instruction. Teachers varied in how they used these supports; at the same time, when used, different kinds of educative features led to notably different outcomes. Stein and Kaufman (2010) found that when teachers read descriptions of the big mathematical ideas in the teachers' guide, they were more likely to maintain the intended level of cognitive demand of the task. Beyer and Davis (2009) found that preservice teachers who read expository descriptions of science concepts were able to identify principles of practice they could apply to other lessons. Those who read narrative supports gleaned information that was specific to the particular lesson, but less generalizable. Interestingly, Beyer and Davis also found that preservice teachers were much more inclined to read the lesson-specific narrative supports than those offered in an expository format. Remillard and Bryans (2004) also found differences in what teachers chose to read when working with educative curriculum materials. They examined 8 teachers using an elementary program containing a number of features designed to support teachers using practices that align with the NCTM *Standards*. They found that the extent to which teachers attended to these educative features varied tremendously and was influenced by their overall orientation toward curriculum materials in teaching.

Grant, et al. (2009) studied teachers using the same program, focusing on their use of supports related to facilitating classroom discussions. They noted that the supports in the teachers' guide were more effective at helping teachers elicit student thinking than they were at helping them extend their thinking to general understandings. A careful analysis of the supports in the teachers' guide, led Grant et al. to conclude that the supports in the curriculum "conveyed a somewhat general image of the role of the teachers as questioner and facilitator of student discussion. There were few instances, however, in which teachers were provided with examples of questions designed to pursue student thinking" (p. 113). Taken together, these findings suggest that (1) educative designs in elementary teachers' guides have the potential to support teachers in their teaching, and (2) in order for this potential to be realized, educative components must be presented in a manner that compels teachers to read them. More research is needed to identify the types of designs that are most accessible to teachers and to uncover the type of support they offer.

FRAMING CONCEPTS

Researchers studying educative curricular material have, for the most part, adopted the assumption that educative materials are curriculum supports that necessarily

speak *to* the teacher. Studies of teachers using mathematics curriculum materials designed with educative components suggest that teachers vary with respect to whether and how they engage with this type of educative support, leading us to consider whether the conception of educative materials can be expanded to include support that speaks *through* the teacher.

This paper presents findings from our analysis of the different kinds of scripts in four elementary mathematics teacher guides. The questions guiding our analysis were: (1) What are the different ways curriculum authors direct teachers' actions in relation to enacting mathematics lessons? and (2) To what extent might these approaches be educative for teachers? The goal of this paper is to offer an approach to conceptualizing these different kinds scripts and their potential based on a subset of the data analyzed for the larger study.

METHODS

For this preliminary analysis, we examined teachers' guides from four curriculum programs, focusing on the instances where the curriculum authors directed teachers' actions through some form of a script. We defined scripts as instances where the curriculum authors spoke *through* the teacher by directing his/her action. Even though these actions were not necessarily "scripted" in a literal sense, we thought about supports that directed teachers' words and actions as being akin to scripts in contrast to the portions of the teachers' guide that speak *to* the teacher.

Two of the curriculum programs were developed with NSF funding to align with the goals set forth by the National Council for Teachers of Mathematics in the *Curriculum and Evaluation Standards for School Mathematics* (NCTM, 1989, 2000). These two programs, *Investigations in Number, Data and Space* [INV] (Wittenberg, Economopoulos, Bastable et al., 2008) and *Everyday Mathematics* [EM] (Bell, Bretzlauf, Dillard et al., 2007), are both designed to be educative. Recognizing that many of the pedagogical practices intended in the curriculum represented a considerable departure from typical instruction, the authors consciously included components designed to coach teachers as they use the program. We also examined one commercially developed curriculum program: *Scott Foresman Addison Wesley Mathematics* [SFAW] (Charles, Crown & Fennel, 2008). Finally, we included *Math in Focus: Singapore Math by Marshall Cavendish* [MiF] (Kheong, Sharpe, Soon et al., 2010), because, through other related analysis of curriculum guides, we found that the *Math in Focus* curriculum guide provides extensive support in directing teachers' action.

We randomly selected one lesson from each of the grades 3-5 that focused on number or operations. Lessons were coded based on a coding scheme developed for a study of the demands and support in elementary mathematics teachers' guides. (See Remillard, et al., 2011). For this analysis, we identified the portions of the curriculum guide that could be considered scripts because it was designed to direct teachers' actions during the lesson.

Examining these scripted portions sentence by sentence, we developed emergent categorical labels for the various types of scripting we encountered. Through this process, a distinction between literal scripts and less explicit scripts became immediately evident. A number of action categories emerged as well, including questions to ask, instructions to communicate, or ideas to convey. We also detected a distinction between actions that all teachers were to follow and those that the designers intended as optional. In the next section, we use these coding categories to frame our description of the types of scripts encountered in this collection of curriculum guides.

APPROACHES TO SCRIPTING

Our analysis of the scripting present in teachers' guides surfaced two distinct dimensions along which the scripts varied: the level of specificity and the approach to customization. Level of specificity refers to the degree to which the intended or imagined teacher and student actions or dialogue are made explicit. The approach to customization, on the other hand, captures the types of opportunities and supports for adaptation within curriculum. The variations along this dimension include the manner in which the curriculum guide prompts teachers to make lesson adjustments or other kinds of decisions appropriate for one's particular teaching situation. These two dimensions are further elaborated, along with examples from all four programs analyzed, in the following sections.

Levels of Specificity

We found considerable variation in level of specificity within the guidance intended to direct teachers' words and actions. Some scripts, for instance were very explicit in nature, indicating precise words or actions expected of the teacher. Other scripts offered descriptions of the intended teacher actions, leaving the teacher to fill in the details of what exactly to say or do. In our analysis, we used the categories *explicit scripts* and *descriptive scripts* to distinguish between these two approaches.

Explicit Scripts

Explicit scripts provide a high level of detail. This type of direction specifies exact sentences for teachers to deliver verbally, exact words to write on the board, or specific visual models to demonstrate. Often, explicit verbal scripts are signaled in the curriculum guide with the use of bold, italics, or colored text. For example, *SFAW* indicates explicit verbal scripting for the teacher with bold text, as in the following excerpt:

We can also subtract 24 bars for each basket. Show the repeated subtraction. How many fruit bars are left over? (8) Is that the answer to the problem? (No, the answer is 3 baskets.)" (Grade 5, Chapter 1, p. 42a).

Statements or illustrations to display on the board are sometimes provided within the body of the paragraph of the curriculum guide. Often, though, this type of scripting is communicated through illustrations in the text that clearly demonstrate both content and layout. In the following excerpt from *EM*, for example, the authors demonstrate that they intend for the multiplication problem to be presented in vertical form using an asterisk as the operational symbol:

Write the following problem on the board:

$$\begin{array}{r} 869 \\ * 6 \\ \hline \end{array}$$

(Grade 5, Chapter 5, p. 339)

Explicit scripting can also provide specific actions for the teacher to perform. For instance, the following excerpt from *MiF* specifies a visual demonstration to perform in front of the class: “Count in thousands while placing some place-value chips one at a time on the thousands column of the place-value chart.” (Grade 4, Chapter 1, p. 5).

The primary ways that explicit scripts vary across the four programs is in the frequency with which they are used and the quantity of script provided. None of the programs used explicit scripts exclusively. In fact, all four favored descriptive or blended scripts (both described below) and relied on explicit scripts somewhat selectively and in moderation. *MiF*, *EM*, and *SWAF* all tended use this type of scripting periodically in the form of a single sentence or two. *INV* is unique in its extensive use of explicit scripts to communicate precise language the teacher could use at regular places in the lesson. Some of the scripts contain a statement followed by a question to ask, other scripts are 6-7 sentence paragraphs like the following:

Both of these solutions are algorithms. Algorithms show a clear sequence of steps that can be used to solve a certain kind of problem. Some of you may have seen Solution 2 before. It’s a way to solve an addition problem that many American adults learned when they were in school and may still use now. Adults from other countries may have learned a different way when they were in school, so this method is sometimes called the U.S. algorithm. Many people use this algorithm, so let’s compare these two strategies and see whether you can make sense of them. (Grade 4, Unit 5, p. 81)

Descriptive Scripts

Descriptive scripts, on the other hand, do not provide specific words to say or illustrations to show. Rather, descriptive scripts guide teachers’ and students’ actions or dialogue by describing what should be said, written, visually demonstrated, or done. An example of a descriptive script intended to direct teacher and student talk comes from the *INV* curriculum guide:

Ask students to share examples of notation that is especially clear. Ideas discussed should include these:

- If notation is clear, the student can easily keep track of the steps in the solution process, see what parts of the problem are completed, and see what is still to be done.
- If notation is concise, steps are combined, using as few steps as possible. It includes all the necessary information and does not need to include information that can be assumed. For example, if a student thinks of this problem as $179 + 283 = 180 + 282$, the student might not record $179 + 1 = 180$ and $283 - 1 = 282$ because he or she could easily do that step mentally. (Grade 4, Unit 5, p. 80)

Descriptive scripts that communicate words or actions to the teacher do not specify precisely what to say or do, as in the following excerpt from *SFAW*: “Have a volunteer write the names of the days of the week on the board. Make a chart to show how many days begin with each letter of the alphabet” (Grade 4, Chapter 1, p. 128). Similarly, descriptions of visual demonstrations with models indicate the idea to model without specifying exact actions: “Use connecting cubes or counters to represent stars and demonstrate the division of 56 paper stars into groups of 8 paper stars each” (MiF, Grade 3, Chapter 6, p. 178). In both of these cases, the curriculum provides a description of what should be done or shown, but it is up to the teacher to determine exactly how to follow the recommendation.

Across the four programs, we found that the descriptive scripts varied in level of specificity and detail provided. Some descriptive scripts are fairly minimalist in nature, lacking specificity and detail. The *SFAW* curriculum guide, for instance, recommends that the teacher should “Review addition of four addends” (*SFAW*, Grade 4, Chapter 1, p. 12). This approach, which is typical of the *SFAW* teacher’s guide, provides little guidance about how the teacher might enact the script or the intent of the particular recommended activity. Other descriptive scripts are more specific about the intended teacher actions without indicating precisely what should be said, as in the following excerpt from *EM*:

When students are explaining the steps in the partial products algorithm, watch for students who say, “6*8”: The 8 in the problem to the right in the hundreds place and has a value of 800, not 8. Encourage students to think and say “6[800s]” or $6*800$. (Grade 4, Chapter 5, p. 339)

Many descriptive scripts are less specific about the particular moves teachers should make, but provide considerable detail about their character or intent. Even though these descriptive scripts leave the details about how to enact the plans to the teacher, the narrative description can reveal a sense of the purpose and intended flavor of the teacher moves. Below are several examples that illustrate the different ways descriptive scripts can capture underlying intent.

Use your slate procedures to practice division facts and their extensions. Dictate problems like the following, varying your language. For example, ask: What is 63 divided by 7? How many 7s are in 63? If necessary, give a clue, such as, think: 7 times what number equals 63? [This script is followed by 16 different division exercises that vary in difficulty from $48/4$ to $4,900/70$.] (*EM* Grade 5, Chapter 4, p. 231)

Collect and record several different ways that the adults at home solved the homework problem so that students can see a variety of solutions. (*INV* Grade 4 U5, 2-4)

Guide students to simplify algebraic expressions in the same way as in the previous exercise, but without the model. (*MiF*, Grade 5, Chapter 5, p. 220)

We refer to this approach to descriptive scripting as *elaborated* because of the detail provided. What these scripts lack in specificity, they make up in detail. These details communicate a sense of tone and intent of the designed instruction. From the first example (*EM*), we learn that the developers value a flexible understanding of division and that the teacher should support students by providing hints that relate division to multiplication. We also learn that the slate procedure is commonly used routine for practice in the *EM* class. In the second example (*INV*), the phrase “*so that students can see a variety of solutions*,” suggests that seeing a variety of solutions is valued and should be made accessible to students. The final example from *MiF*, communicates the role and purpose of modeling in that curriculum; they can support the learning of algebraic procedures, but should be removed as students learn the routines.

Blended Scripts

Each of the lesson guides we analyzed contained both explicit and descriptive statements; sometimes both types of script were used together within the description of a single classroom activity. This type of blended scripting usually contained descriptive statements followed by explicit statements, as illustrated in the following excerpt from the *INV* teacher’s guide:

“Have students solve these problems mentally, if possible:
What is $620 + 50$? $620 + 100$? $620 + 200$? $620 - 50$? $620 - 60$?
Write each answer on the board. Have students compare each sum or difference with 620. Ask students:
Which places have the same digits? Which do not? Why?” (Grade 4, Unit 5, p. 79).

In this example, the statement “have students compare each sum or difference with 620” describes only what the aim of the teachers’ actions should be. The sentence that follows supplies explicit support in the form of exact questions that the teacher might ask.

Approach to Customization

The second dimension along which scripts vary is the way flexibility and customization is treated. Many scripts, whether they were descriptive or explicit, were not designed to be used in a flexible way. They specified the content or activity to be enacted by the teacher. Other scripts were written to communicate that the teacher had role in adjusting or adapting the task to the particular situation. We found three different approaches to customization.

Illustrative Examples

One way a curriculum guide might provide flexibility and specific support is through the use of illustrative examples. In this type of scripting, used frequently in the *EM*, a number of possible explicit scripts are provided and the teacher is invited to choose among them, as in the following example:

Pose questions such as the following.

- In a related division fact, which number is the dividend?...
- Which 3 numbers are in the fact family for $9 \times 6 = x$?...
- What number is in the multiplication/division fact family with 20 and 5?" (EM, Grade 5, p. 231)

We refer to this kind of script has an illustrative example because the guidance is provided explicitly, but framed as exemplars, which together illustrate the type of question to be asked.

Contingency Scripts

A second approach to providing customization options for the teacher is through the use of what we call contingency scripts. These statements require teachers to make an assessment about the situation in the classroom and select an action based on the outcome. These statements often take the form of "if [condition], then [action]," as in the following case from *SFAW*:

If students think they need to regroup to find $37 - 14$, then ask:

When do you need to regroup? (When you can't subtract) Can you subtract 4 from 7? (Yes)" (Grade 3, Chapter 3, p. 148).

Contingency scripts can be explicit or descriptive. The previous example was explicit; descriptive examples provide less specific direction in the "then" clause, as demonstrated in the following example from *INV*:

If you have time and all students seem to be understanding how such an expression as $(100 \times 3) + 4$ represents the situation, ask students to change the expression so it represents the height for 200 years or 300 years. (Grade 5, Unit 8, p. 47)

Other contingency scripts direct the teacher to provide supplemental support for certain types of learners in the classroom. Each of the curriculum guides, for instance, offers specific supports for English language learners. The following is an example from *Math in Focus*: “For English Language Learners: Introduce a short word form as a transition for writing the word form of a number. For example, 13,079 can first be written as 13 thousand, 79” (Grade 4, Chapter 1, p.8)

Pedagogical Options

A third approach to customization involves the use of pedagogical options. These take the form of a collection of optional tasks and activities made available in each program for the teacher to use at his/her discretion. This type of scripting does not include descriptions of conditions that might precipitate the need for the given strategies; only recommendations are provided. Some are suggestions for how to support students as they work: “While you are observing, you may need to help some students articulate their thinking aloud to you before they write it on the page.” (*INV*, Grade 4 5.2.4) Others are framed as “best practices”, as is the case frequently in *MIF*:

You may wish to assign groups of students to become ‘experts’ at the different forms taught throughout this lesson: Standard Form Experts, Word Form Experts, and Expanded Form Experts. As you work through the lesson, have expert groups answer questions related to their expertise. Change expert groups throughout the lesson.” (Grade 4, Chapter 1, p. 6)

This type of support for customization ranges in specificity. An example containing both descriptive and explicit scripting is found in *INV*:

To focus on the rate of change, you might follow up by asking students to visualize what would happen if the two children continued growing at the same rate.

What if Tara and Nat kept growing at the same rate? Would Tara ever be as tall as Nat, or would Nat always be taller?” (Grade 5, Unit 8, p. 36)

HOW THE SCRIPTING APPROACHES ARE USED

The matrix in figure 1 illustrates the two dimensions and the possible ways that these two approaches to scripting could co-exist and interact. Level of specificity is represented along the vertical axis; degree of flexibility as captured by the type of customization is along the horizontal axis. Conceivably, scripts could belong in any of the eight cells, although certain combinations are more common and others are less likely.

	Specified content	Types of Customization		
		Illustrative examples	Contingency script	Pedagogical options
Explicit Script				
Descriptive script				

Figure 1. Matrix showing how levels of specificity and flexibility could interact.

The most common type of scripting in the four programs analyzed, although to varying degrees, is descriptive-specified content. All four programs also use some explicit scripting-specified content, but *INV* is the only text that uses it extensively. And, all four blend descriptive and explicit scripts to communicate the intended specified content.

An examination of how the different approaches of customization are handled across the four programs reveals that each program uses each type of customization. However, overall, *EM* is designed with the greatest amount of flexibility in mind. The designers of *EM* make extensive use of illustrative examples by routinely providing a set of sample problems (in explicit form) the teacher might pose students and recommends that s/he determine which use. Although these illustrative examples are situated with descriptive scripts about how to use them, guidance about how to select among them is infrequently provided.

All four programs make use of contingency scripts, although they are found more frequently and are the most extensive in *EM* and *INV*. *SFAW* makes regular, but minimal, use of contingency scripts through its “If-then” statements (described above). These scripts tend to be comprised of a single sentence and lack detail. Contingency scripts within *MiF* are generally found in separate boxes that describe desired responses to common student errors or modifications to the lesson for certain types of learners.

With the exception of illustrative examples in *EM*, customization is generally introduced through descriptive or blended scripts. All four programs provide pedagogical options sprinkled throughout each lesson and then routinely at the end and these almost always take the form of descriptive scripts.

CAN SCRIPTS BE EDUCATIVE FOR TEACHERS?

In this section we return to the question of how the different approaches to directing teachers' actions in these four programs might be educative for teachers. Ball and Cohen (1996) suggest that curriculum materials need to support teachers in the process of enacting curriculum in the classroom, which includes managing instruction as it unfolds, assessing the viability of students' answers and responding to them in the moment. Davis & Krajcik (2005) recommend that educative curriculum materials should be designed to: (1) help teachers attend to student thinking, (2) provide subject-specific content support, (3) help teachers connect ideas within a given discipline, (4) communicate curriculum designers' rationale for pedagogical choices, and (5) foster teachers' ability to effectively mobilize curricular materials within a specific classroom context. Can scripts provide any of these kinds of supports?

Can Explicit Scripts be Educative for Teachers?

Explicit scripts are most likely to be characterized as “un” educative because they represent the extreme case of speaking through teachers. Scripted curriculum is generally considered to be teacher-proof and often reflects efforts to deskill and control teachers. In our analysis of the way explicit scripts are used in these four programs, we considered their possibilities for support. Since none of the programs use explicit scripts exclusively, we wondered what intermittent and in some cases extensive (*INV*) use of these scripts might offer teachers.

In all cases, it is evident that explicit scripts offer something that descriptive scripts cannot: an image of the developer designed curriculum as it might be enacted. These scripts can help the teacher to create a mental image of her role during a particular instructional sequence. Such a resource would be especially useful for inexperienced teachers or teachers trying out practices that are unfamiliar. Whereas a description of what should be asked invites a teacher to enact his or her own existing repertoires, explicit scripts have the capacity to offer new pedagogical repertoire and routines, allowing teachers to consider and try out new questions to ask, words to use, and instructional moves to make. This is especially evident in the extensive scripts provided in the *INV* curriculum. These scripts offer entire paragraphs they might use during classroom interactions. Through use of these scripts, teachers might begin to develop new instructional repertoires and styles of interacting with students.

In some cases, the explicit scripts provide possible students' responses along with teacher questions. These student scripts can help teachers anticipate how students are likely to respond during a lesson. In an analysis of teachers planning lessons using curriculum materials, we found that teachers relied heavily on their ability to

predict how a particular instructional routine might play out and, in particular, how students might respond (Reinke, Hoe, & Remillard, 2011). Sample students responses might not only help teachers make predictions that would guide their planning, but might also foster the inclination and ability to make these predictions while planning.

Both Ball and Cohen (1996) and Davis and Krajcik (2005) argue for educative curriculum materials that include content-specific support for teachers and emphasize connections across the disciplinary domain. Indeed, all four programs include a number of references and notes about the relevant mathematical concepts and relationships. Most of these supports are in specially placed boxes or places on the page and are labeled as “content note” or “teacher note.” These additions provide examples of how curriculum developers have increased efforts to speak *to* teachers, however might also be skipped over by many. Close analysis of some of the explicit scripts in the programs revealed ways that valuable content information could be communicated to the teacher through scripts. We found this approach to be especially the case in *INV* and *MiF*, where specific visual representations and language were crafted for teachers to use in ways that could be educative for them as well.

Clearly, explicit scripts have limitations in what they are able to convey. When presented alone, they are not transparent in their purpose or intent. Whether or not teachers read these scripts, it is unclear if they will come away from the interaction with an increased understanding of the underlying intent. This concern is particularly relevant to the scripts that allow for customization. All three approaches to customization require teachers to make decisions about how and when to use these options and in the case of illustrative examples, which examples to use. We suspect that explicit scripts are unlikely to be able to support the level of decision making required for high quality customization. As described earlier, a number of the illustrative examples provided in the *EM* curriculum lacked descriptive guidance in how to make selections among the options provided. In most cases, we found explicit scripts to be used in conjunction with description, rather than alone, which is likely to enhance the potential learning.

Can Descriptive Scripts be Educative for Teachers?

In many cases, descriptive scripts have the potential to offer the support that explicit scripts do not. In addition to detailing the intended instructional moves, descriptive scripts can communicate the intent of these actions, support teachers in managing student responses, and offer subject matter support. In this sense, they have the potential to speak *to and through* teachers.

As described above, descriptive scripts can provide insight into authors’ intent and purpose to a greater degree than explicit scripts. When descriptive scripts elaborate the type of actions the teacher should take or the type of problem she should pose, the author is providing a level narration about the instructional activities that has

the possibility to “talk to teachers about these suggestions. . . [and] the mathematical and pedagogical ideas underlying them” (Remillard, 2000, p. 347) This type of scripting supports teachers in interpreting and making sense of a particular set of instructions. By weaving elaborating descriptions into the directions for teachers, these scripts have the potential to deliver this information to teachers who may not feel compelled to read notes about the designers’ rationale presented in a separate box in the margin.

Descriptive scripts can provide teachers with support in enacting a lesson that goes beyond what is offered by explicit scripts. Elaborated descriptions, like the earlier examples, can communicate to the teacher a sense of the parameters for the task. Descriptions can specify the general path that the teacher should lead the students down, and provide guidance about how to stay on the path. The elaborated descriptions in *EM* and *INV* often identify important points that should be touched on during class discussions as well as occasional reference to possible conversational side-roads that should be avoided. This type of support seems critical during class discussions, where the role of the teacher is to facilitate the discussion, rather than simply tell. These supports allow for flexible use of curriculum designs and instruction that is responsive to students during the lesson. In this sense, it can increase a teacher’s capacity for customizing the instruction for the conditions in her particular classroom while adhering to curriculum designers’ intent. This type of support is akin to what Davis and Krajcik (2005) refer to as fostering teachers’ ability to effectively mobilize curricular materials within a specific classroom context. Similarly, contingent supports help teachers attend to student thinking by delineating common misconceptions or difficulties and supplying appropriate responses. Helping the teacher prepare for these common obstacles helps teachers to smooth the way for students.

Similar to explicit scripts, detailed descriptive scripts can provide content area support and help in connecting subject area concepts across and within lessons. *INV*, *EM*, and *MiF* each contain descriptive scripts that supply content area support and cue teachers to emphasize the connections between related lessons and concepts. In contrast to the possibilities for explicit scripts, however, the potential for speaking both to and through teachers allows descriptive scripts to provide richer content area support than is possible through exclusively explicit scripting. Descriptive scripts are not limited to content that is suitable for elementary school students. Descriptive scripting, for example, might reference formal mathematical terms (e.g. commutative property, inverse) that may not be developmentally appropriate for elementary students but help the teacher understand where given concept might lead.

The limitations of descriptive scripting are conversely related to the strength of explicit scripts. Without explicit images of how exactly to carry out the actions described in the script, the teacher is left to come up with the details. Descriptive scripts can cue the teacher toward fruitful strategies for engaging with mathematical tasks, but they do not offer clear images of the teacher’s role. Reliance

on this type of support alone assumes that all teachers can imagine what the enactment of these directions would look like.

CONCLUSION

Through this analysis of the types of scripting utilized by curriculum designers, we have attempted to complicate the common view of scripted curriculum. The assumption in the literature is that, in order for material to be educative, it must speak to, rather than through the teacher. Our analysis hypothesizes that scripted curriculum can contain each of the types of educative support recommended in the literature. These findings suggest that scripts might offer a way to deliver educative support to teachers who would not engage with other components of the curriculum.

Our findings raise several questions for future and continued research. First, it is not clear how teachers engage with these types of lesson supports. Is educative material delivered in this manner taken up more readily than supports presented outside the lesson script? Second, Davis and Krajcik (2005) propose that educative support has the potential to help teachers to “integrate their knowledge base and make connections between theory and practice” (p. 5). It is unclear to us whether this type of scripting, which is focused on a specific lesson, can leave lasting residue for general application in teachers’ practice. Research into these questions has the potential to provide further insight into how curriculum materials can be used to promote instructional change in classrooms.

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