Scaffolding the Scaffold: Creating Graphic Organizers to Support Your Students' Learning

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Abstract
Graphic organizers (GOs) such as Venn diagrams are tools that help instructors support students at all levels of learning in making sense of content. What happens when the readily available GOs or similar tools do not meet the needs of your specific class or your specific content? When we couldn't find a tool that scaffolded our students' ability to create language objectives, we created our own content and context-specific graphic organizer tool as a way to mediate student understanding of a complex concept, specifically a form/function analysis of clauses. This paper describes students' need for scaffolds and our process of creating a very specific tool for analyzing clauses and sentences. We also lay out the steps others can take to create their own tool for their classroom. These steps include guiding principles and questions to support faculty across higher education disciplines and contexts in their own analysis and creation of scaffolds for their classrooms.

Keywords
graphic organizers; scaffolds; scaffolding; mediation; objectives

Introduction

In this article, we explore the process of creating a content and context-specific graphic organizer tool as a way to mediate student understanding of a complex concept. We share our specific experience as an exemplar, contextualized in broader guiding principles and questions we hope to be useful to faculty across higher education disciplines and contexts.

This article and the larger ongoing study behind it draw on the Scholarship of Teaching and Learning (SoTL), which is both scholarly thought and action at the postsecondary level where

faculty consider the relationship between teaching and learning to improve student learning (Boyer, 1990). Of the four main areas of research within the Scholarship of Teaching and Learning (SoTL)—what works, what is, visions of the possible, and conceptual framework (Hutchings, 2000), we wanted to spend some time digging into visions of the possible in the English Language Learner/Bilingual Education Endorsement (ELL/BE) program at our university concerning text analysis to identify language objectives. Rather than viewing our students' struggle with this task as a negative, we wanted to ask, as Hutchings (2000) suggests, "How might we think of teaching practice, and the evidence of student learning, as problems to be investigated, analyzed, represented, and debated?" (p. 3).

Our particular context is a College of Education teacher preparation program, and more specifically, a PreK-12 endorsement program in English as an additional language. A central competency students must develop in our endorsement program is the ability to *see* disciplinary language (in the way that we might endeavor to help a fish *see* water). By disciplinary language we mean not only the technical language one might first associate with different subjects (for example, when one hears "geometry" one might think of *hypotenuse, vertex,* and *perpendicular*), but even more so the ways of organizing meaning in sentences, paragraphs, and multimodal means which are unique to certain disciplines and genres. To continue our geometry example, think of how a poem would be a poor guide for a geometry proof, and vice versa. So, this is the first challenge, guiding students to awareness of disciplinary language, and in fact, all language, as it is typically invisible to us during meaning-making.

Building on this awareness, we then must help our future teachers learn how to *identify which disciplinary language to focus on* and then *make related and specific pedagogical moves* which will support PK-12 student development of that disciplinary language. And herein lies the problem of practice we take up in this paper: How might a graphic organizer mediate the development of any given skill or concept?

Mediation and Scaffolding

In our work we draw on sociocultural theory (SCT). A genetic, developmental theory, SCT maintains that human activity (including learning) can only be understood in its cultural-historical context. In general, sociocultural theory holds that "human action is mediated by language and other symbol systems within particular cultural contexts" (Lewis et al., 2007, p. 5). Put differently, "the goal of a sociocultural approach is to explicate the relationships between human mental functioning, on the one hand, and the cultural, institutional, and historical situations in which this functioning occurs, on the other" (Wertsch et al., 1995, p. 3). Relevant to work in higher education are two key concepts of SCT: mediation and the related idea of the zone of proximal development. *Mediation* is the idea that humans use physical (e.g., a hammer, a dishwasher) and symbolic (e.g., language, number systems, etc.) tools to engage with the physical world, as well as with self and others. These tools, adapted and passed down over time, become cultural artifacts with histories of use, and which organize "social and mental activity" (Lantolf, 2000, p. 1) in simultaneously concretizing and dynamic ways. Put differently, speech and thought are not synonymous, nor are they separated; rather, they are dialogically related to one another. Vygotsky theorized that "social forms of mediation develop(ed)" at the metaphorical site he called the *zone of proximal development* (Lantolf, 2000, p. 17), that is, the "place" in which an individual is able to do more

(through the scaffolding of social interaction) than they could do independently. Vygotsky argued that "higher mental functions" (e.g., problem solving) came into being first in these zones of proximal development (i.e., with cognition distributed across individuals) and then later within the individual's own mind, through internal symbolic mediation.

In PreK-18 education, these dual concepts of mediation and the zone of proximal development (ZPD) are embedded within the idea of *scaffolding* (Stone, 1998). Like the scaffolding used to work on a building during construction or renovation, which is removed when no longer needed, scaffolding in the educational realm supports students as they learn to think, talk, write, etc. in new ways, but is removed as they internalize and gain independence in those knowledges and skills.
One of the quintessential examples of scaffolding is a graphic organizer; though a "physical" tool, we could also say it is a symbolic mediating means for the schematization of knowledge. "Graphic organizers (GOs) are spatial displays of text information that can be provided to students as study aids (i.e., adjunct displays) that accompany text" (Robinson et al., 1998, p. 17). In other words, GOs can display information that visually shows various relationships between concepts that are more opaque in the linear format of prose. Some common formats for GOs are lists, processes, cycles, hierarchies (e.g., trees), relationships (e.g., Venn diagram), and matrices. An easy place to find examples of these is in the "SmartArt" in Word documents.

Graphic organizers in higher education have been shown to support a variety of reading and writing academic tasks to varying degrees (e.g., Colliot & Jamet, 2019, 2020; Katayama & Robinson, 2000; Nussbaum & Schraw, 2007; Robinson & Kiewra, 1995; Shaw et al., 2012).
For reading, research shows that readymade GOs which are already completed lead college students to use strategies other than memorization in studying, and to ultimately receive higher test scores (Robinson et al., 1998) in part because they are more efficient than linear texts (Shaw et al., 2012). If the right GO is used, students can see the relationship between ideas more easily than in a text.

While pre-filled GOs can be helpful, research is mixed on the benefits of having undergraduate students complete their own GOs. Colliot and Jamet (2020) found no difference between students who were given a pre-filled GO or who filled in their own when placed in a dual-task situation (i.e., they were completing the task while learning the information). This was attributed to cognitive overload. However, students who were instructed to fill in the GO first and then told to study the information did better on both memorization and comprehension. Although the sequenced version took more time, the outcome was better. One criticism of this and similar studies about GOs is that students took the test immediately after reading the material rather than having time to return to the material later to study, as is normally the case in undergraduate learning. When there is delayed testing, which is more consistent with normal practice, researchers have found that students who take notes by filling in a GO did better with applying the information learned than students who used outlines (Katayama & Robinson, 2000; Robinson & Kiewra, 1995). This was attributed in part to the encoding benefits in that students were more involved with the text processing.

GOs do not always need to function as study aids. They can also help students organize their writing. Nussbaum and Schraw (2007) noted that argumentation (argument-counter argument) is used across all academic fields, and that college students are often still learning how to argue

effectively. They suggest that having a visual display of the two-sided argument (a GO) could help provide the complex schemata because it could help lower the load on working memory while supporting cognitive organization. In their study, they found that students who used the GO increased their number of rebuttals much as in debate instead of what the instructors wanted—which was the development of both sides of the issue and then producing a final position. They noted that some of the structural features of the GO may have been the issue. They are considering how they might redesign their GO to help students with argumentative writing. Graphic Organizers are most effective when their design matches the objective.

The Development of a New Scaffold

In the section that follows, we describe seven design steps for creating a meaningful graphic organizer and give examples from our own process in developing a new graphic organizer. We have also created a graphic organizer to give a visual representation of the process. The PDF can be found in Appendix. The steps are:
1. Develop a learning target for the graphic organizer
2. Determine what type of process or concept you are focusing on
3. Make decisions about how to represent that process/concept visually
4. Determine needed background knowledge
5. Test and adjust the graphic organizer with colleagues
6. Plan rollout and modeling of the graphic organizer
7. Gather feedback from students and make further revisions

Step 1: Learning target for the graphic organizer

In teacher education, we often frame curriculum planning in terms of backwards design (Wiggins & McTighe, 2005). The basic premise is to begin thinking about what you want students to be able to do at the end of a lesson, unit, or course, and then plan backwards about how to get there. Backwards design is a helpful framework in higher education, just as it is in PreK-12.

In this first step, consider your goal(s) for student understanding/performance. What is it that you hope students will be able to better understand and/or do through using this graphic organizer? You may find it helpful to start by thinking about gaps that you currently notice. How might a visual representation of material improve student understanding?

Here are a few questions to get you started:
- What process(es)/concept(s) do you want to see students improve in their ability to understand, demonstrate, internalize?
- What have you tried doing with your students to help them learn? Where are you noticing "hiccups"? These are often clues about where more scaffolding may be helpful.
- Do they need to learn many things at once, or can the skill(s) be broken down into smaller pieces? If so, start with one step/piece/skill.
- Do you have a colleague who would want to be part of this dialogue? Two or more brains allow for more ideas.
- Have you considered reviewing the Revised Bloom's Taxonomy (Anderson et al., 2001) to help you think about what types of thinking you are asking students to do? This link

gives a helpful overview https://www.celt.iastate.edu/teaching/effective-teaching-practices/revised-blooms-taxonomy/ (Iowa State University, n.d.).

After you have considered these questions, create a learning target using this frame: *Through using this GO, students will be able to (Bloom's Taxonomy verb) (process/concept).*

Our foray into creating a completely new tool was motivated by two overlapping impetuses. First, we found that our existing instruction just wasn't adequately helping students to make sense of either disciplinary language or language-specific pedagogy. At the same time, and in large part because of the first issue, we adopted Systemic Functional Linguistics (SFL) as the guiding theory of language in our program (e.g., Derewianka, 2011; Gebhard, 2019; Humphrey et al., 2012). SFL, a theory of language developed by Halliday (1975), views language as a culturally embedded "social semiotic system" in which meaning is central and structure (grammar) is concomitant.
SFL provides a helpful metalanguage to talk about this relationship between meaning and structure, consisting at the broadest level of three metafunctions: the experiential, interpersonal, and textual. The experiential metafunction, also called *Field*, refers to how we marshal the full range of language to express what is happening, who/what is involved, and the circumstances surrounding those happenings. The interpersonal metafunction, or *Tenor*, relates to how we shape language in different ways depending upon our audience. Finally, the textual function, or *Mode*, refers simply to how we weave language together to create cohesive messages to be delivered across a range of spoken and written mediums.

For our graphic organizer, we wanted students to be able to write relevant language objectives in their lesson plans. Content objectives—or learning targets, like we are talking about in this section—have long been a part of lesson planning. Within teacher education, our students learn to think about *what* they want their students to learn about math, history, health, or any other subject they are teaching and to make that an explicit part of their lesson plan. *Language objectives*, on the other hand, name the language required for learners to be successful in comprehending and showing their understanding of content.

With the shift to SFL in our English grammar course, we noticed improvement in student ability to *see* disciplinary language; our next challenge was to better scaffold student ability to *identify which disciplinary language to focus on* and then *make related and specific pedagogical moves.* To accomplish this complex task, students needed to be able to analyze a text and consider the different language features they might want to explicitly address in a lesson. And to do that, they needed to identify and understand how those language features functioned to create meaning.
We asked ourselves questions that would stimulate our design thinking: What do we want students to consider when looking at a text for Field? What are the important things they need to know to be successful? We concluded that students should be able to break clauses down into *Participants* (primarily subjects and objects), *Processes* (verb groups), *Circumstances* (prepositional phrases and adverbs), and *Connectors* (conjunctions and text connectives). At the same time, we realized that many of our students had had very little exposure to explicit language and grammar lessons in their own PreK-12 experience, and therefore, were still learning how to identify and name various parts of a clause. With this in mind, it was crucial that the tool be designed strategically to mediate student understanding on a variety of levels.

Our learning target: Through using this GO, students will be able to *analyze* (Bloom's taxonomy verb) text clauses (concept) and *identify* (Bloom's taxonomy verb) patterns for instruction (process).

Step 2: Process/Concept Type

Next you want to consider whether your learning target is centered around a process, a concept, a set of concepts, or some combination of these. If conceptual, you'll want to determine what sorts of relationships and patterns you want to guide students to see. Some common examples of conceptual relationships are: cause and effect, hierarchical, comparison, contrast, and chronological. Cycles can be helpful ways to think about both content (e.g., life cycles) and processes that students will engage in (writing and revising).

Here are a few questions to get you started:
-    Am I trying to build conceptual or procedural knowledge?
-    What type of process/concept is it you want students to better understand?

In our case, we realized that our learning target contained both conceptual and procedural knowledge; we wanted students to improve their ability to analyze texts (conceptual), and then apply the findings of that analysis to pedagogical decision making related to creating language objectives (both conceptual and procedural).

Step 3: Visual Representation Decisions

Now that you have determined *what* you are focusing on (Step 1), and what *type* of relationship, pattern, or process it is (Step 2), you can begin making decisions about the visual design of the graphic organizer. Whiteboards—whether physical or digital (e.g., Lucidchart, Mural)—are indispensable in these early design stages, as they allow you to experiment with how to use space. There are already a number of commonly used graphical displays that you can use and/or adapt to fit your learning target. A few examples are: Venn diagrams to show comparison/contrast relationships, T-charts to show cause/effect or idea/example relationships, or timelines to show chronological patterns. You can find many examples online. Some universities, like the University of Akron (https://www.uakron.edu/etrain/pedagogy/graphic-organizers.dot), have links to many resources. In our GO in Appendix A, we have included more examples of graphical representations for you, mapped to particular relationships, patterns, or processes.

Here are a few questions to get you started:
-    How can I make representations and patterns visible through the use of:
     -    space and the organization of text in space
     -    color, underlining, bolding, italicizing, highlighting, etc.
-    What are ways to visually represent/organize information so that what I want students to understand becomes clear?
-    Will students complete the GO by hand or digitally?

In our case we wanted two particular elements to visually "pop": a) that words tend to glom together into groups with shared functional meaning (e.g., In the sentence, "The fluffy white dog

is running *in the forest*" all the underlined words stick together to give us information about the "who," whereas all the italicized words stick together to give us information about "where"), and b) which of these functional groupings tended to occur more frequently in a particular text or add particularly important meaning. With this in mind, we designed the GO so that students would be able to visually "chunk" words together into groups, align those groups with their functional names, and then—using color-coding—make observations about frequency and placement of particular functional groups.

You can see how we did this in Figure 1, which is our current iteration of this tool. For our students, we have them complete it by hand or in Word.

Figure 1
The Form/Function Mapping in Field Analysis Tool (F3 Tool)

> *Note:* We encourage you to explore an interactive version of the F3 Tool to learn more about our thinking for the different parts of it as well as suggestions for your own tool development. https://drbethdillard.wordpress.com/the-f3-tool/

Step 4: Background Knowledge

A scaffolding tool bridges the gap between what students know and what they are learning. Therefore, it is important that students draw on their knowledge—but what is that knowledge? If we gave our tool to most education students, or even most practicing PreK-12 teachers, they would not be able to fill it out. The terminology is likely unfamiliar, and the process is very specific

to language analysis. That does not mean it is ineffective. In fact, as Malik (2017) points out, scaffolding is done with the instructor and the tool together. The tool itself is a "secondary component" (p. 1). The instructor is critical, as both work in tandem as mediating means.

In our case, students need to have learned about the SFL concept of Field. They should be familiar with certain terms, but we also recognize that they have not internalized all of the information yet, so they need reminders (e.g., Functional Labels and Grammatical Labels in Figure 1).

For other disciplines, the background required and what will need support will be very different. Each instructor needs to have a sense of what students will have available to them when they use this tool. What do students need? How will you create something that doesn't provide too much or too little support?

Here are a few questions to get you started:
- What general background knowledge in the content do you expect students to have?
- What recently taught concepts need to be included in the scaffold?
- What content needs to be taught prior to using this GO?
- What terminology will students need to know?

Step 5: Testing and Adjustment

Once you have a prototype of your GO, have a colleague try it out. This is a low-stakes way to determine what further adjustments you may need to make before involving your entire class in using the GO.

Here are a few questions to get you started:
- Is there enough room for students to write what you want them to write?
- Does it make sense for the GO to be partially/fully pre-filled?
- Are your instructions clear?
- What seemed like it would work, but actually doesn't?

Initially, we made it to Step 5 with our first prototype. We had decided to simply modify an existing GO (Ranney et al., 2014) as there are already some available organizers created to support students and teachers in considering the language features in their lesson (e.g., Gottlieb & Ernst-Slavit, 2014; Rutherford-Quach et al., 2015; Walqui & van Lier, 2010).

Our modifications consisted mainly of adding guiding questions to help students think about language at the levels of discourse (i.e., organizational features), syntax (grammar), vocabulary (this included phrases, idioms, etc.), and function (e.g., comparing, identifying, synthesizing). For example, in guiding students to analyze the textual metafunction (Mode), we asked: "How is this text cohesive?" In thinking about the interpersonal metafunction (Tenor), we asked: "Is this a formal or informal text?" and so on. We quickly found, however, that the organizer was quickly overtaken by too many questions. Furthermore, there was nothing on the tool that helped students answer those questions. If they didn't remember all the ways a text could be cohesive or what circumstances do, these questions would just add to the frustration and confusion. In short, we had an overwhelming and unhelpful "scaffold."

In addition, we realized that while we eventually wanted our students to be able to analyze a text for all three metafunctions, for students fairly new to the content, this was too much all at once. This in mind, we decided to narrow our focus to only one area—Field. It was here that we realized we needed to make more changes and returned to Step 2 and began the process again. Please note that it is the current version that is described in the previous steps, not the prototype. However, we wanted to share that this is an iterative process and that returning to previous steps may need to be part of the process.

Step 6: Rollout and Modeling

Once you have determined what students need to know in order to use the tool and what supports need to be part of the tool, then comes the time to introduce the tool and the processes to your students.

Here some questions to get you started:
- How will you make it clear to students *how* to use the GO?
- How will you model using the tool (video, live, both)?
- Will students use the GO first in groups or individually?
- What examples will you share with students?

Prior to introducing our tool, we introduced the individual elements of the experiential metafunction (Field) and gave students practice identifying those elements in a variety of sentences. We also spent time blocking clauses using color coding. This combination of instruction and practice was the first in a series of mediating means designed to support student growth towards our long-term goal: the ability to create language objectives.

Gebhard (2019) recommends that teachers need to model what they want students to do. If you want them to complete a scaffolding tool that is very specific, it is best if you show students what you want. Towards this end, Green created an annotated video. In it, she talked about the different parts of the tool and then demonstrated filling it out. She added text overlays and annotations to the finished video with additional thoughts and elements for students to notice. This video was another mediating means.

Like any task you plan to give students, you will want to try out your scaffold several times before modeling it. For us, that meant finding a variety of texts to see what complications might arise. Those models are now available to students for reference, including a few on the tool itself. These

models serve as further mediating means.
Finally, we also found that it was more effective for small groups of students to work together to fill out the tool the first time. They could talk through the concepts together and also help each other in figuring out how to complete the task. Thus, we saw that interaction served as a critical mediating means in this overall process.

Step 7: Gather Feedback and Revise

It is disheartening to think that you might put in all this effort only to discover that students do not find it useful, or that it causes more confusion.

Don't despair. First, have students try it out and give feedback.

Here some questions to get you started:
- How will you ask for feedback?
- What will you do with the feedback?
- What does success look like? How will you know if/when your students are able to engage in the practice you were hoping to scaffold?

Anecdotally, we have found that students were able to identify specific, valuable language features for language objectives using this tool. It gave students the space to dig into language at the level of the clause. However, we also received feedback that some of the technical aspects, such as merging and dividing cells, were cumbersome.

Conclusion/Final Thoughts

Scaffolding is a critical part of teaching. It is important to include bridges that take students from what they can do on their own to what they are still learning to do. In our case, that is being able to analyze language at a deep enough level to help with meaningful language objective creation. The development of such a scaffold takes both time and a willingness to take a critical look at how you have been teaching what it is you want your student to do. With such a willingness to take a risk in exploring what we could do better, deep and thoughtful conversations, and multiple trials and iterations, we were able to design a new pedagogical tool for our students that helps them determine appropriate language objectives for their units of study and lesson plans.

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Appendix
Process to Create Graphic Organizers

1 — Learning Target for Graphic organizer

What process(es)/concept(s) do you want to see students improve in their ability to understand, demonstrate, internalize?

Write a learning target: Through using this GO, students will be able to (Bloom's Taxonomy verb) (process/concept).

2 — Process/Concept type

What type of process/concept is it you want students to better understand?

3 — Visual Representation

What are ways to visually represent/organize information so that what I want students to understand becomes clear?

Will students complete the GO by hand or digitally?

How can I make representations and patterns visible through the use of:
- space and the organization of text in space
- color, underlining, bolding, italicizing, highlighting, etc.

Chronological — Timeline

Temporal

Cycle

Hierarchical

Relational

Matrix

Cause / Effect

Concept / Example — T-chart

Compare / Contrast — Venn diagram

4 — Background knowledge

What general background knowledge in the content will students need in order to successfully make use of this GO?

What recently taught concepts need to be included in the scaffold?

What content needs to be taught prior to using this GO?

What terminology will students need to know?

5 — Testing & Adjustment

Have a colleague try to use the GO. Some questions to consider:

Is there enough room for students to write what you want them to write?

Does it make sense for the GO to be partially/fully pre-filled?

Are your instructions clear?

What seemed like it would work, but actually doesn't?

6 — Roll-out / Modeling

How will you make it clear to students *how* to use the GO?

How will you model using the tool (video, live, both)?

Will students use the GO first in groups or individually?

What examples will you share with students?

7 — Gather feedback / Revise

How will you ask for feedback?

What will you do with the feedback?

What does success look like?

How will you know if/when your students are able to engage in the practice you were hoping to scaffold?

1   **Learning Target for Graphic organizer**

What process(es)/concept(s) do you want to see students improve in their ability to understand, demonstrate, internalize?

Write a learning target: Through using this GO, students will be able to (Bloom's Taxonomy verb) (process/concept).

2   **Process/Concept type**

What type of process/concept is it you want students to better understand?

3   **Visual Representation**

What are ways to visually represent/organize information so that what I want students to understand becomes clear?

How can I make representations and patterns visible through the use of:
- space and the organization of text in space
- color, underlining, bolding, italicizing, highlighting, etc.

Will students complete the GO by hand or digitally?

4   **Background knowledge**

What general background knowledge in the content will students need in order to successfully make use of this GO?

What recently taught concepts need to be included in the scaffold?

What content needs to be taught prior to using this GO?

What terminology will students need to know?

Temporal
- Chronological — Timeline
- Cycle

Hierarchical

Relational
- Matrix
- Concept / Example — T-chart
- Cause / Effect
- Compare / Contrast — Venn diagram

5   **Testing & Adjustment**

Have a colleague try to use the GO. Some questions to consider:

Is there enough room for students to write what you want them to write?

Does it make sense for the GO to be partially/fully pre-filled?

Are your instructions clear?

What seemed like it would work, but actually doesn't?

6   **Roll-out / Modeling**

How will you make it clear to students *how* to use the GO?

How will you model using the tool (video, live, both)?

Will students use the GO first in groups or individually?

What examples will you share with students?

7   **Gather feedback / Revise**

How will you ask for feedback?

What will you do with the feedback?

What does success look like?

How will you know if/when your students are able to engage in the practice you were hoping to scaffold?