Chapter 6:

Using Content Acquisition Podcasts (CAPs) to Improve Vocabulary Instruction and Learning for Students with Disabilities and Their Teachers

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A big challenge when teaching students with disabilities (SWD) within general education placements is providing evidence-based instruction with fidelity and the dosage needed to "move the needle" on academic performance (Fuchs, Fuchs, & Stecker, 2010). Two key barriers preventing successful student outcomes that reside beyond individual student control are (a) the purpose of content-area classrooms at the upper elementary, middle, and high school levels, and (b) how instruction is delivered within these settings (McKenzie, 2009). General-education teachers in the content areas are often underprepared for the challenges associated with teaching SWD (Brownell, Sindelar, Kiely, & Danielson, 2010; Mastropieri et al., 2005). Reasons include limited coursework on serving SWD during teacher-preparation programs, minimum support from the school district in terms of professional development, and frequently, lack of content knowledge sufficient to adequately support students' learning needs in specific content areas among special educators who may be functioning in co-teaching roles (Kennedy & Ihle, 2012). In addition, teachers are largely required to adhere closely to state- or district-provided pacing guides intended to prepare students for high-stakes assessments that determine school, teacher, and student accountability. Thus, pressures from various sources compel teachers to move quickly through content without regard for the extent to which students are

mastering it (Hallahan, Kauffman, & Pullen, 2015). The resulting mismatch between SWD needs and the delivery of content (and its associated demands) is well documented in terms of their struggles with various assessments and post-school outcomes (see Smith, Manuel, & Stokes, 2012).

A Panacea for Students' Ills?

Many researchers, educators, and other stakeholders consider technology to be a tool that can help SWD and their teachers make critical improvements for learning and other outcomes (Duffey & Fox, 2012; Fletcher, Schaffhauser, & Levi, 2012; U.S. Department of Education, 2010). For some, technology writ large is a panacea for all of the world's problems in education (hyperbole added). However, Perlman and Redding (2011) found that in order to be used most effectively, technology must be implemented in ways that align with curricular and teacher goals and must offer students opportunities to use these tools during learning. While there is documentation of student gains using technology in isolated cases (see Edyburn, 2013 for a recent review) the integration of technology at all levels remains surprisingly low (Lu & Overbaugh, 2009). In sum, relative to how widespread technology's use has become in the field, it is alarming to face up to the paper-thin empirical base for technology's use with SWD in content-area classrooms (Kennedy, Deshler, & Lloyd, 2015).

In addition to the under-implementation and utilization of technology, Kennedy (2013) offered a different critique: Using technology for technology's sake is not consistent with the requirement to provide individualized, evidence-based instruction to SWD as noted in IEPs and required by IDEA. In other words, the presence of

technology as a way to package or deliver content does not automatically inoculate against lousy instruction. This does not mean technology should not be used with SWD, far from it. Instead, stakeholders should resemble what Njenga and Fourie (2010) call technoskeptics: Individuals who insist upon a higher level of theory, empirical evidence, and patience before racing to adopt every new app or technology tool they hear about on Twitter or Facebook. The purpose of this chapter is to introduce a multimedia-based tool that can be created by teachers with technology they already have on their computers, and which meets the standard of providing high quality instruction to SWD. We provide examples of high-quality multimedia and step-by-step instructions for production.

Content Acquisition Podcasts

Content Acquisition Podcasts, or CAPs, are short, multimedia-based instructional vignettes that deliver high-quality instruction for one vocabulary term or concept at a time. There are two domains of concern when creating CAPs: 1) The looks and sounds of instruction independent of content, and 2) The shape of the instruction being delivered using this tool. To address the looks and sounds of instruction, CAPs are built using Mayer's Cognitive Theory of Multimedia Learning (2009) and the accompanying 12 evidence-based instructional design principles (2008). CAPs can be used in a variety of flexible ways. Teachers can show CAPs during traditional lectures; students can watch CAPs at home with or without parents; CAPs can be viewed before exams or quizzes as a review, ahead of lectures as an advance organizer, or really anytime students have a couple of minutes to receive high-quality instruction. We feel CAPs' greatest strength is that they can be repeatedly and flexibly

used among students and teachers in perpetuity once the upfront cost of production (i.e. time) is paid.

Figure 1 contains a list of Mayer's principles, a description of each, and effect sizes based on Mayer's research. A sample CAP (that simultaneously introduces these principles) is available at https://vimeo.com/89716786. A sample CAP that delivers vocabulary instruction for students can be seen at www.qmediaplayer.com/?103. As you watch this CAP, note the pace, the use of visuals, the repetition of the key definition and information, the use of embedded questions, and the short length of the video. None of the decisions regarding the looks and sounds of this CAP were made without explicit reference to leading instructional design theory and evidence-based practices (EBPs) for vocabulary instruction.

Triarchic Model of Cognitive Load (DeLeeuw & Mayer, 2008)	Research-Based Instructional Design Principles (Mayer, 2009)	Brief description of Mayer's instructional design principles (Mayer, 2008; 2009)
Limit Extraneous Processing	Coherence Principle	Instructional materials are enhanced when irrelevant or extraneous information is excluded
	Signaling Principle	Learning is enhanced when explicit cues are provided that signal the beginning of major headings or elements of the material being covered
	Redundancy Principle	Inclusion of extensive text (transcription) on screen along with spoken words and pictures hinders learning. Carefully selected words or short phrases, however, augment retention (Mayer & Johnson, 2008)
	Spatial Contiguity Principle	On-screen text and pictures should be presented in close proximity to one another to limit eye shifting during instructional presentations
	Temporal Contiguity Principle	Pictures and text shown on screen should correspond to the audio presentation
Manage Essential Processing	Modality Principle	People learn better from spoken words and pictures than they do from pictures and text alone
	Segmenting Principle	People learn better when multimedia presentations are divided into short bursts as opposed to longer modules
Foster Generative Processing	Multimedia Principle	People learn better from pictures and spoken words than from words alone
	Personalization Principle	Narration presented in a conversational style result in better engagement and learning than more formal audio presentations.
	Voice Principle	People learn better when narration is clearly spoken with respect to rate and accent.
	Image Principle	People learn better when images are non-abstract, and clearly represent the content being presented

Figure 1. Mayer's Design Principles as Aligned with the Triarchic Model of Cognitive Load.

Shaping the Looks and Sounds of CAPs

The CTML is grounded in cognitive load theory (Chandler & Sweller, 1991), which states that all humans are subject to cognitive overload when capacity in working memory is overwhelmed by environmental stimuli. This theory also builds upon Paivio's (1986) dual processing principle (people learn using visual and auditory inputs), and Baddeley's (1986)

model of working memory (people remember about three seconds worth of auditory and visuospatial information, respectively, without taking explicit cognitive action to remember it). Multimedia instruction is a known perpetrator of overwhelming viewers with fast-paced, visually rich, instructionally redundant features that make no explicit effort to structure content so that viewers have time for processing (Clark, 2009; 1983; Mayer, 2009). The CTML and accompanying instructional design principles help instructors do a better job of creating instruction that is a match for how people learn (Mayer, 2009).

Figure 2 contains a rubric used by Kennedy, Aronin, Newton, O'Neal, and Thomas (2014) to score CAPs' adherence to Mayer's instructional design principles. This rubric is simple, but it can help an instructor carefully study each of Mayer's principles and consider how it influences the looks and sounds of instruction throughout a CAP. Before attempting to create a CAP, we recommend careful study of Mayer's principles and use of the rubric to evaluate multimedia currently being used to teach students.

Mayer's Instructional Design Principles as Rubric for Evaluating Multimedia Instructional Materials

Name:

Research-Based Instructional Design Principles (Mayer, 2009, 2008)	Rubric for Evaluating Multimedia Instructional Materials
Coherence Principle *ES = .97, 14 Studies*	*1 ----------2----------3* Includes Excess Some Irrelevant Content Standard Met Irrelevant
Signaling Principle *ES = .52, 6 Studies*	*1 ----------2----------3* Lacks Explicit Cues Some Cues Provided Standard Met
Redundancy Principle *ES = .72, 5 Studies*	*1 ----------2----------3* Extensive Text Occasional Redundant Text Standard Met
Spatial Contiguity Principle *ES = 1.12, 5 Studies*	*1 ----------2----------3* Words and Pictures Some Content Not Standard Met Not Near Each Other Closely Aligned
Temporal Contiguity Principle *ES = 1.31, 8 Studies*	*1 ----------2----------3* Audio & Text Some Misalignment Standard Met Misalignment
Modality Principle *ES = 1.02, 17 Studies*	Does Not Use Audio/Visuals Uses Audio/Visuals
Segmenting Principle *ES = .98, 3 Studies*	*1 ----------2----------3* Excessive Length Contains Explicit Breaks Standard Met & No Explicit Breaks But is Excessively Long
Pretraining Principle *ES = .85, 5 Studies*	*1 ----------2----------3* No Advance Organizer Limited Use of Standard Met Or Hierarchy of Content Pretraining Strategies
Multimedia Principle *ES = 1.39, 11 Studies*	Not Multimedia Standard Met
Personalization Principle *ES = 1.11, 11 Studies**	Not Personalized Standard Met
Voice Principle *	*1 ----------2----------3* Formal Narration Some Formal Standard Met Some Conversational
Image Principle *	*1 ----------2----------3* Images Are Vague &/or Most Images Clear Standard Met Blurry

Figure 2. Mayer's Instructional Design Principles as Rubric for Evaluating Multimedia Instructional Materials. *Note – Personalization Principle's 11 Studies Includes the Voice and Image Principles. They are separated here for the purpose of guiding instructional design.*

Empirical Evidence for CAPs

There are two emerging research bases for CAPs' use in education. The first is using CAPs to provide vocabulary instruction to SWD. Kennedy, Deshler, and Lloyd (2015) randomly assigned 278 urban high school students, including 30 with learning disabilities, to four experimental conditions: 1) Students assigned to watch CAPs containing a combination of EBPs for teaching vocabulary, including explicit and strategic instruction; 2) Students who learned using multimedia-based instruction that did not adhere to Mayer's evidence-based instructional design principles. The students in Group 1 assigned to watch CAPs containing a combination of evidence-based practices for teaching vocabulary, including explicit and strategic instruction significantly outperformed their classmates in Group 2. In a follow-up study, Kennedy, Thomas, Meyer, Alves, and Lloyd (2014) measured vocabulary learning of high school students with and without disabilities across two units in a social-studies course. Students took turns either using CAPs or not during each unit. Results show significant differences in performance on weekly curriculum-based measures when students had access to the CAPs. Research continuing in this area is examining the effects of CAPs on student vocabulary performance in science courses. Although preliminary, these two empirical studies demonstrate that CAPs can help students improve vocabulary performance.

The second empirical base for CAPs is with teachers and teacher education students. A total of 12 empirical articles support the use of CAPs to improve teacher candidate knowledge of various topics compared to classmates who learn by either reading or hearing a lecture containing the same content. A review highlighting several

of these studies is available from Kennedy, Kellems, Thomas, and Newton (2015). A free resource for teachers wishing to see sample CAPs or use them in teaching or learning is available at www.SPEDIntro.com.

Embedding Evidence-Based Practices within CAPs

While Mayer's model provides the roadmap for considering and designing the looks and sounds of instruction, it offers no guidance in terms of the substance of the content to be delivered. Therefore, CAPs must draw from a menu of EBPs for vocabulary instruction depending on the term or concept being taught. A menu containing EBPs that make particular sense for inclusion within the CAP model for vocabulary instruction is presented in Figure 3. It is important to note that more is not necessarily better when it comes to including EBPs within CAPs. Instead, logical choices supported by the term/concept, the meaning, and how much information students need to know should drive decision-making. To illustrate, it might make sense when teaching the term *biodegradable* to explicitly teach students about the prefix bio-, the root word degrade, the suffix -able, to give an example and non-example of the term, and to define the term using a student-friendly definition attached to an anchor image. In addition, it would make sense to create CAPs for other terms being taught in this unit such as biodiversity, recycling, and conservation.

Review and Select Relevant Evidence-Based Practices (EBPs) *Choose from this menu of vocabulary instruction EBPs that make sense for the term being taught, given its content-specific meaning and students' learning needs. (Note: This list is not exhaustive.)*	
✔	**Evidence-based practices**
	Semantic feature analysis and mapping (Ebbers & Denton, 2008)
	Explicit instruction, using examples/non-examples, student-friendly definitions, explicit language (Archer & Hughes, 2011)
	Keyword mnemonic strategy (Mastropieri, Berkeley, & Graetz, 2010)
	Word ID strategy (Lenz & Hughes, 1990)
	Morphemic awareness & analysis (Reed, 2008)
	Using instructional technology including visuals (Xin & Rieth, 2001)
	Graphic organizers (Dexter, Park, & Hughes, 2011)
	Content enhancements (Deshler & Shumaker, 2006)
	Anchored instruction (Cognition and Technology Group at Vanderbilt, 1990)

Figure 3. Sample evidence-based practices for teaching vocabulary terms/concepts

Figure 4 provides a worksheet teachers and other educators can use to plan the content of CAPs before bringing them to life with Mayer's instructional design principles. Some recommendations to help guide teachers planning to create CAPs include the following:

- Take a bank of vocabulary terms for a unit and practice matching them to EBPs that would be appropriate given student needs and the features of the term.
- Write a script for the CAP in advance and share with a colleague.
- Justify selection of EBPs during a planning meeting with teammates, including other special educators or general-education teachers.

To operationalize these recommendations, Figure 5 is a functional score sheet an

instructor can use to evaluate a CAP's use of EBPs within the video. Kennedy et al. (2014) used this score sheet in a recent study in which teacher candidates were taught how to make CAPs; the products were evaluated using this, and the rubric of Mayer's principles noted in Figure 2.

Term/Concept:
Fancy Definition:
Student-Friendly Definition:

- **What does the student's IEP say about his or her strengths for learning?**
- **What background knowledge is needed to learn this term/concept?**
- **What are related terms and how are they related? Different?**

Term	**Similarity One:**	**Similarity Two:**	**Difference One:**	**Difference Two:**

- **Does the word have any morphological parts that have specific meaning? What do they mean?**
- **What is an example of this term/concept students would probably understand?**
- **Is there a non-example that might confuse them?**
- **In your experience, what is a good way for students to remember this term/concept?**
- **Is this term a candidate for the keyword mnemonic strategy?**
- **Provide a passage from the textbook or other source that uses this term in context.**
- **What is a question about this term/concept you might write for a quiz or test?**
- **What is a sample question from the state assessment that might be asked about this term/concept?**

Figure 4. ***Vocabulary planning worksheet for embedded evidence-based practices within CAPs***

CAP Evidence-Based Practice Worksheet

Name: Term/Concept:

Preteaching/Word choice		Y	N	Notes
Word choice is appropriate for content				
Word choice is appropriate for grade/skill level				
Provides rationale for word selection				
Background knowledge is provided for word				
Puts word in context				
Explains how word connects to class content				
Word is pronounced correctly				
Word is sounded out and pronounced by syllable				
Definition				
Provides formal definition				
Provides student friendly definition				
Definition given at beginning				
Definition given at end				
Definition repeated				
Multiple definitions provided				
Compared to definition of known words				
Teaching Behaviors				
Uses explicit language				
Uses examples				
Uses non-examples				
Provides opportunities to practice				
Breaks instruction into manageable chunks				
Connections to known words				
Evidence-based Practices: Select which practice is used and fill out the chart for that practice				
1. Semantic Feature Analysis				
	Characteristics identified			
	Characteristics defined			
	Other terms given			
	Comparisons made			
	Concluding statement			
2. Keyword Mnemonic				
	Keyword given			
	Keyword appropriate			
	Interaction given			

	Retrieval steps given			
	Retrieval practiced			
	Definition practiced			Number of times?
3. Word ID/morphemic analysis				
	Correct root word identified			
	Correct root word defined			
	Correct prefix identified			
	Correct prefix defined			
	Correct suffix identified			
	Correct suffix defined			
	Root, prefix, suffix stated together with definition			
	Retrieval/definition practiced			Number of times:
4. Graphic organizer/content enhancement				
	Appropriate GO/CE device chosen			
	GO/CE presented			
	Each component of GO/CE taught			
	Each component of GO/CE reviewed			
	Retrieval practice			How many times?
5. Anchored instruction				
	Appropriate anchor chosen			
	Critical components of anchor identified			
	Critical components of anchor explained			
	Critical components of term identified			
	Critical components of term explained			
	Term and anchor explicitly compared			
	Retrieval practice			How many times?
6. Other				
	What practice?			Name the practice:
	Is the practice used correctly?			

Figure 5. ***CAP Evidence-Based Practice Worksheet***

CAP Production Steps

See Table 1 for a set of recommended production steps for CAPs and a two-part CAP on how to create a CAP.

Set of recommended production steps for CAPs	**http://tecplus.org/article/1**
Two-part CAP on how to create a CAP	**Part 1: https://vimeo.com/24179998** **Part 2: https://vimeo.com/24182724**

Table 1. CAP Production Steps

It is important to note that the path to creating CAPs is best left to the discretion and preferences of the person creating the instructional tool. Therefore, the production steps available through the aforementioned website and CAPs should be used as a reference; user creativity and use of other products (e.g., Camtasia, etc.) are welcome. That said, it is critical to ensure that CAPs adhere to Mayer's evidence-based instructional design principles and to embed vocabulary instruction that matches the topography of the term and the learner's needs.

Adding embedded questions. An additional step in the CAP development process is optional, but potentially useful in supporting student learning. Embedding comprehension and other questions throughout the CAP will give a teacher additional data to aid in decision-making. Qmedia allows users to embed questions throughout CAPs and provides data on questions for individual users and groups of users. To add questions, the completed CAP video must be on a video-sharing site such as Vimeo or YouTube. Once the video has been uploaded, go to www.qmediaplayer.com. The remaining steps for embedding questions using Qmedia are presented in Figure 6. CAPs under current research using assessment questions typically have two stop

points: one pretest question at the beginning of the video and a series of questions at the end of the video. Future research could examine at what point the number of questions in a video begins to decrease comprehension due to a lack of coherent viewing of the CAP.

Conclusion

We began this chapter by noting challenges general and special education teachers face with respect to implementing evidence-based instruction for SWD in various instructional settings. It is very easy to offer technology as a path to supporting students' needs, but the empirical evidence does not support applications of technology as a student cure-all. With this in mind, teachers and other education stakeholders should prioritize instructional design theory and evidence-based instructional practices when designing or selecting technology to be used with SWD. This will require educators to become technoskeptics, and to learn about evidence-based design principles such as those from Mayer (2009) in order to properly evaluate various instructional products brought to market.

CAPs are an intentionally flexible instructional tool. Students can watch CAPs during class, at home, before tests or quizzes, on the bus, and at other times when they have an opportunity to spend a couple minutes receiving high-quality vocabulary instruction. There is no right or wrong way to watch CAPs, so long as the learner is engaged during the brief vignettes.

Directions for adding embedded questions to CAPs through Qmedia

Step 1: On the Qmediaplayer home page, click “Qedit.”	
Step 2: On the right side of the page, click “File,” then “New.” When a confirmation window pops up, click “yes.”	
Step 3: Click “Settings” and follow steps below for initial setup. (Other features are available through QMedia. The focus here is on what is most applicable to CAP videos.)	
Title	Enter the CAP title (typically the term being taught)
Require user login?	If you want to collect data on individual students, click “true.” If you do not want individual student data stored, leave as “false.”
Media source (Id or URL)	If using a YouTube or vimeo video, enter the entire identifying information of the video. (Eg. For YouTube: https://www.youtube.com/watch?v=qqbFgasTsDs For Vimeo: https://vimeo.com/111015222 The video should now appear in the player pane when you click the preview button.
Stop time	Enter duration of CAP video in seconds.
Initial width % (0-100)	Enter “100”—this feature will make the video fill the browser window.
Step 4: Click “Preview” to save progress.	
Step 5: To add assessment questions, click “Content,” then “Edit assessments” and follow the steps below.	
Note: In Qmedia terminology, an “assessment” is one stop point in a video that can include one or multiple questions. A “step” is an individual question within an assessment.	
Step 5.1: Pause the video in the location you want to add an assessment.	
Step 5.2: Click “Add assessment.”	
Step 5.3: An untitled assessment will appear. Click “untitled” and rename the assessment. Assessment names are case sensitive and will be used when making data reports.	
Step 5.4: Click “Add Step.” An untitled step will appear.	
Step type	“Radio” is a standard multiple-choice question. These questions are most appropriate for CAP videos. Radio questions can also be used as true and false questions by entering “true” and “false” as the answer options.
Step Id	Enter the name of this specific question. Eg. “SOL Question,” “True or False,” etc.
Text	Enter the directions for the question. Ex. “Choose the best

	answer."
Prompt	Enter the assessment question. Ex. "What is an independent variable?"
If right answer	Enter any message you want the student to see if he or she gets the answer correct. Qmedia has a built-in response if students get the answer correct. What is entered here is in addition to the Qmedia statement.
If wrong answer	Enter any message you want the student to see if he or she gets the answer incorrect. Qmedia has a built-in response if students get the answer incorrect. What is entered here is in addition to the Qmedia statement.
Number of tries	Enter the number of times the student will be allowed to attempt the question.
Allow skipping	Select "true" if students will be able to skip this question. Select "false" if a response is required.
Font size	Select desired font size.
Options	Click "Add new option" and enter each response option for the question.
Designate a correct answer	Put an asterisk (*) in front of the correct answer (e.g., *1776). The asterisk will not appear in the assessment, but it signals to Qmedia which answer is correct.
Step 6: Save Qmedia video by following the steps below.	
Step 6.1: Click "File," then "Save as."	
Step 6.2: In the popup window enter your email address and a password you will use to make future edits and create data reports. The password and email address can be the same for every video you create in Qmedia. Note: Check the "Private?" box if you do not want anyone else to see the video.	
To edit an already existing Qmedia video, follow the steps below.	
Step 7: Go to www.qmediaplayer.com	
Step 7.1: Click "Qedit."	
Step 7.2: Click "File," then "Open."	
Step 7.3: Enter the email and password information used to save the video.	
Step 7.4: Use steps 3-6 to edit. Remember to save the video after editing.	
To view video on Qmedia without editing follow the steps below.	
Note: Every Qmedia video is assigned a number when it is saved (eg. 103).	
Step 8: In an Internet browser, enter www.qmediaplayer.com/show.htm?XXX where the XXX represents the number assigned to the video. (Eg. www.qmediaplayer.com/show.htm?103	
Note: This link can then be added to a teacher's website or sent to students to allow them to easily view the completed video.	
Note: The original video uploaded to Vimeo or YouTube will still exist in its original location without embedded questions. To watch videos with embedded questions, viewers must go through Qmedia.	

Figure 6. ***Directions for adding embedded questions to CAPs through Qmedia***

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