Education and Training in Autism and Developmental Disabilities, 2011, 46(3), 315–325

Research-Based Strategies for Teaching Content to Students with Intellectual Disabilities: Adapted Videos

Anna S. Evmenova and Michael M. Behrmann
George Mason University

Abstract: Teachers are always seeking any visual and/or auditory supports to facilitate students' comprehension and acquisition of difficult concepts associated with academic content. Such supports are even more important for students with intellectual disabilities who, regardless of their abilities and needs, are required to have access and active participation in subject-based general education curriculum. This article describes an arsenal of research-based best practices that suggest enhancing existing video clips featuring academic content with such adaptations as video "chunking," alternative narration, interactive video searching features, various types of closed captioning (e.g., highlighted text and picture symbol-based), visual and verbal cues that support content comprehension and retention by students with special needs. Corroborating research and practical recommendations for classroom implementation are provided for each of the adapted features described.

Recent legislative mandates: the No Child Left Behind Act (NCLB, 2001) and the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) emphasize an access to the general education curriculum for students with disabilities and their participation in yearly statewide assessments. No longer is it enough to just bring students with special needs along and place them in the back of the regular education classrooms. Force of these laws ensures active participation of students with disabilities in general curriculum activities alongside peers with and without disabilities as well as appropriate attainment of annual goals aligned with general standards (Browder et al., 2004; Dymond & Orelove, 2001). Schools are held accountable for academic performance of all students, including those with intellectual disabilities, which is measured by the adequate yearly progress (AYP) in reading, math and science, even if the standardized evaluation procedures are alternated and modified to address students' abilities and needs (Browder et al., 2007). With requirements for challenging curriculum and high expectations, little research has been conducted on facilitating these requirements (Agran, Cavin, Wehmeyer, & Palmer, 2006; Wehmeyer, Lance, & Bashinski, 2002).

Correspondence concerning this article should be addressed to Anna S. Evmenova, George Mason University, 4400 University Drive, MS 1F2, Fairfax, VA.

Few existing studies show promising trends in performances of students with developmental disabilities in reading and listening comprehension, as well as in acquiring factual information in various content areas (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006; Turner & Alborz, 2003; Wehmeyer, Lattin, & Agran, 2001). Students with moderate to severe intellectual disabilities demonstrated performance improvements in such complex subject areas as physical science, geography, and life science aligned with school and state standards (Agran et al., 2006). In response to NCLB (2001), further work is being conducted to ensure acquisition of academic content and skills through strategies and activities commonly employed in general education instruction (Freeman & Alkin, 2000; McDonnel, Johnson, Polychronis, & Risen, 2002; Ryndak & Alper, 2003).

Unfortunately, evidence also exists that students, especially those with more severe disabilities, continue to be educated outside the general education curriculum (Agran et al., 2006; Wehmeyer et al., 2002). It points out that educators may require assistance in designing instructional activities appropriate for students' special needs to foster their access to

the academic instruction (Browder et al., 2007). Thus, there is a continuous need for evidence-based interventions that support general curriculum instruction especially for learners with disabilities. This article presents research-based best practices to provide content-based instruction to students with developmental disabilities and to facilitate their progress in academics.

The value of video media as a rich source of information allowing students to easily create mental models, thus improving comprehension, has been identified by many researchers (Boone, Higgins, & Williams, 1997; Kroeger, Schultz, & Newsom, 2007; Xin & Rieth, 2001) for students with and without special needs. For example, secondary students with learning disabilities demonstrated significant improvements with videodisk technologies, ranging between 1 and 2.1 effect sizes in overall achievement (Maccini, Gagnon, & Hughes, 2002). Modeling and self-modeling techniques utilizing linear video for students with autism spectrum disorders (Bellini & Akullian, 2007; McCoy & Hermansen, 2007), as well as students with other developmental disabilities (Hitchcock, Dowrick, & Prater, 2003) showed to be effective in acquisition, maintenance, and generalization of various social, behavioral, and functional skills. The capacity of video features to focus students' attention on relevant stimuli, repetitiveness, controllability, learning without heavily relying on text, and intrinsic motivation provided by video-based instruction were determined to positively affect the acquisition and maintenance of various skills by students with intellectual disabilities (Hine & Wolery, 2006; Mechling, Gast, & Cronin, 2006; Reagon, Higbee, & Endicott, 2006).

The innovative strategies described in this article take video-based instruction a little further to ensure supports for individuals with various abilities, needs, and learning preferences. Thus, the appropriate academic video clips should then be enhanced with necessary features appropriate for specific students and their characteristics. For example, teachers may add: (a) Shorter video clips with alternative narration for students who have difficulty with comprehension and retention of large amounts of complex information; (b) Interactive features such as searching the video for answers for all students, especially those with attention deficits benefiting from the active engagement with the material; (c) Closed captioning for those who are able to read but have listening comprehension challenges; (d) Highlighted captions for students lacking focus on the words and key concepts; (e) Picture symbol-based captions for non-readers who are familiar with picture symbol systems; and (f) Visual and verbal cues for all students pointing out the relevant stimuli in the video. These are just some examples of adaptations that can further enhance video instruction. More detail and evaluation of any evidence sustaining effectiveness of video adaptations as well as practical recommendations for teachers to effectively implement adapted videos in every day teaching in any subject area and for any grade level are as follows.

(a) Video in the Classroom: Video "Chunking" and Alternative Narration

Undoubtedly, video format is vivid and interesting. It involves moving graphic representations and provides rich sources of information that facilitate comprehension and longer retention of even the most complex contexts (Ayres & Langone, 2008; Boone et al., 1997). Consistent with the Paivio's (1986) dual channeling theory, video-enhanced instruction utilizes both visual and auditory cues resulting in improved learning outcomes. Video applications nowadays include interactive computer-based programs with embedded video clips to represent ideas and contexts (e.g., Chambers, Cheung, Madden, Slavin, & Gifford, 2006); video simulations as tools for teaching complex scientific concepts (e.g., Jackson, 1997); programs as alternatives to using animals (e.g., Strauss & Kinzie, 1994). Various video segments available on videotapes, DVDs, and/or over the Internet are widely integrated for introducing and/or reviewing topics in all subject areas (e.g., Boster et al., 2006).

Linear and interactive clips are widely used for teaching appropriate social behaviors (e.g., Kroeger et al., 2007), daily living skills (e.g., Cihak, Alberto, Taber-Doughty, & Gama, 2006), and employment tasks (e.g., Mechling & Ortega-Hurndon, 2007) to students with intellectual disabilities. Although limited, video-based instruction has also been

integrated in teaching younger students with developmental disabilities sight word recognition (Lee & Vail, 2005), reading fluency, comprehension (Hitchcock et al., 2004), and generative spelling (Kinney, Vedora, & Stromer, 2003). Video instruction can be a great supplement for all students but is proven to augment instruction for students with disabilities who may not respond to traditional text-based modes of teaching (Wise & Groom, 1996). Beneficial features of video medium and the latest developments in streaming technology further promote acceleration of video integration in general education curriculum. Access to video over the Internet, watching without downloading, searchable by keyword and topic databases of clips, make video instruction more accessible, manageable, and realistic to use (Boster et al., 2006; Van Horn, 2001).

Thus, teachers simply need access to a video, particularly one correlated with appropriate curriculum and/or learning standards in any content area. Several existing video services such as *Unitedstreaming* by the *Discovery Channel* (www.unitedstreaming.com) and *CNN Student News* (www.cnn.com/student news) offer clips already aligned with generic and state-linked standards. In fact a service like *unitedstreaming* allows teachers searching existing video database by subject, grade level, or curriculum standards.

The existing body of research achieves the salience suggesting breaking longer clips into shorter segments. Thus, one of the easiest ways to adapt videos would include video "chunking." The presentation of content in smaller segments allow students especially those with intellectual disabilities to better focus on the video content and do not seem to overload the cognitive comprehension and retention processes. So, teachers can either search for smaller videos or segment longer videos into shorter clips with widely available and relatively intuitive programs such as *MovieMaker* (PC platform) and *iMovie* (Macintosh platform). Even within the smaller chunks, teachers could stop the video from time to time to allow for dynamic discussions of factual information and/or for modeling the inferential skills by making connections with students' past experiences. In addition, if the video narration appears to be too difficult for students to understand, teachers can simply turn off the sound during some of the video chunks and verbally narrate, thus adjusting it to students' ability levels.

(b) Interactive Features and Anchored Instruction

Active engagement adds an additional dimension of action to icons and words already existing in video format. This provides three forms (actions, icons, words) of representation of the same material essential for successful computer learning and instruction, resulting in increased video value (Lee & Vail, 2005; Presno, 1997). Video instruction was greatly transformed following the development and increased interest in "anchored instruction." This new approach to learning was conceptualized by the Cognition and Technology Group at Vanderbilt University and was founded on situated cognition as well as cognitive apprenticeship (CTGV, 1993, 1996). The new concept suggested interactive learning situated in realistic and meaningful contexts within multimedia anchors to support students' pattern recognition skills. Design principles indicate the sequence of typical instructional activities that can be observed in AI classrooms. The instruction begins with a large group watching a 10–15 minute main story that ends in a major problem. Learners are then expected to generate the subproblems comprising the overall dilemma and search the video for the necessary information to solve it. After students present and justify their solution ideas, they may watch a conclusion of the adventure to discover how the character solved the same problem. Following extensive research on the effectiveness of AI for developing higher-order skills and creative problem solving skills that easily transfer to new situations (CTGV, 1993; 1996; Xin & Rieth, 2001), further concept of Enhanced Anchored Instruction (EAI) for students with diverse abilities was developed (Bottge, 2001). Thus, regular AI was enhanced by engaging in applied, hands-on projects completed by students upon the instruction via an anchor. Simplified versions of EAI programs designed specifically for lower-achieving students with and without disabilities were examined in a series of studies (e.g., Bottge, Rueda, Serlin, Hung, & Kwon, 2007; Bottge, Heinrichs, Mehta, &

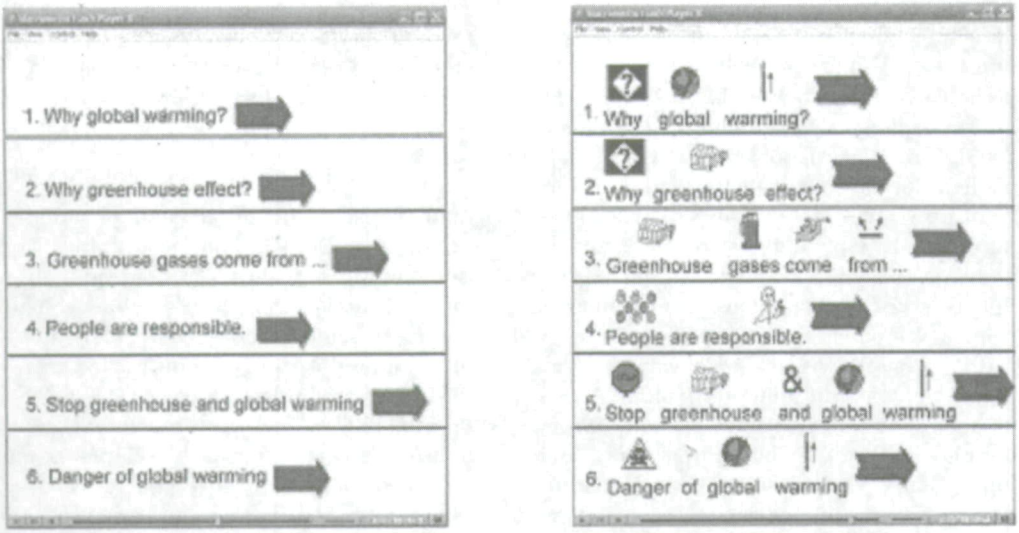

Figure 1. Examples of a different video searching screen created in Camtasia program.

Hung, 2002) revealing drastic improvements in students' performance in various subject areas.

Few studies explored applications of AI with students with intellectual disabilities. Elements of AI were incorporated into instructional strategies aiming for acquisition of social and functional skills. They provided individuals with meaningful contexts allowing interaction with the environment (Ayres & Langone, 2002; Mechling & Langone, 2000; Simpson, Langone, & Ayres, 2004). Moreover, enhanced videos, designed to incorporate interactive elements, appear to contribute even more to increases in students' achievement. In fact, a few studies even suggest that students' performance improves as the levels of interactivity and physical engagement within the video-based program increase.

Following the principles of AI, teachers can adapt existing videos to include interactive searching features. Thus, after viewing the whole clip students may get an opportunity to search the video for essential information and/or answers. In this case, at the end of the video they are offered a single video frame with phrases corresponding to key points and/or comprehension questions. All phrases appear on the screen at the same time in a numbered vertical list. The phrases may include text only or words supported by picture symbols. Each phrase is accompanied by a hyperlink in the form of a red right side arrow (see Figure 1). By clicking the red arrow hyperlink with a mouse, the students are taken to the segment of the video that corresponded to the selected phrase and contained the relevant information and/or an answer to the target question.

For more technologically sophisticated teachers, available tools for video editing are relatively easy to use. With such programs as *Camtasia* by the *Tech Smith* (www.techsmith.com) or *Adobe Premiere* (www.adobe.com), teachers can create hyperlinks embedded in the video to segments that correspond to their key points and/or comprehension questions discussed during the lesson. Moreover, programs built in any PC or Macintosh desktop or portable computer (*MovieMaker* and *iMovie*) enable teachers to easily develop timelines by placing clips or segments in sequence as well as create various menus and transitions within the storyboard simulating the interactive video searching. Furthermore, creating adapted and interactive videos for their students with various abilities and needs is possible with such programs as *Microsoft PowerPoint* or *HyperStudio* by *the Knowledge Adventures* (www.hyperstudio.com). Teachers can easily create searching opportunities for students in *PowerPoint* instead of using more complex video editing programs by linking individual slides with video segments to a slide with phrases/questions in either written text or picture symbol format.

(c) Closed Captioning

In the last decade, the synchronized on-screen transcripts of television audio soundtracks have become more common. According to the Television Decoder Circuitry Act of 1990, each television set with a screen larger than 13 inches must have a closed-captioned television decoder built-in (Captioned Media Program, 2006; Kirkland, 1999; Linebarger, 2001). Despite the fact that closed captioning was originally designed to provide access to audio and video materials for people who are deaf and/or hard of hearing, it has found alternative applications in introducing and reinforcing reading skills to young children, adults, English language learners, and students with learning disabilities (Bowe & Kaufman, 2001; Neuman & Koskinen, 1992). Captions add invaluable support for viewing and understanding video content. Indeed, print and television can complement each other creating multisensory environments for motivational learning through auditory, visual, and written cues.

Despite the argument of distractibility, several researchers successfully employed closed captioning for teaching students at-risk and/or with learning disabilities as well as for improving oral reading, word recognition, reading comprehension and retention (Kirkland, 1995; Neuman & Koskinen, 1992; Linebarger, 2001). In fact, in Kirkland's study, special education students benefited and preferred captions, while general education students reported easier understanding with uncaptioned videos. Closed captioning also appeared to have a favorable impact on auxiliary behaviors of students with learning difficulties and behavioral disorders. Aside from the fact that comprehension and word skills may significantly improve as a result of closed captioning, such intervention also positively affects students' increased time on task, motivation and other attitude measures (Shea, 2000).

The research on incorporation of closed captioning with persons with more severe disabilities is non-existent. However, based on the survey of 359 randomly selected special educators across 45 states, a majority (86%) of teachers believed in the potential value of using closed-captioning in teaching students with no hearing impairments. Sixteen percent would consider using this strategy with students with mental retardation (Bowe & Kaufman, 2001). Indeed, a captioned video format allows multiple and redundant repetitions that are consistent throughout an intervention, which can be of significance for some students with intellectual disabilities (Hine & Wolery, 2006; Reagon, Higbee, & Endicott, 2007).

Regular closed captioning is the easiest to find and use. Numerous video clips available from *Unitedstreaming* service (www.unitedstreaming.com), *CNN Student News* (www.cnn.com/studentnews), *Public Broadcasting Service* (*PBS*; www.pbs.org/teachers), and many local broadcasting stations enable teachers to easily turn on and/or off available closed captioning. Even such video sharing Internet resources as YouTube (www.youtube.com) and Google Video (http://video.google.com) begin to offer automatic captions. In addition, captions can be activated on any TV set. Thus, teachers can easily activate the textual prompts on top of any visual material taken from the broadcasting companies. In addition, when using fiction or non-fiction clips on a specific topic available on DVD, educators also have an easy access to captioning adaptations. Captions can be presented as uppercase, lowercase, or mixed white or black letters on a black, gray, or white background. However, different dimensions of captions were not found to produce any significant effects on students' performance (Kirkland, 1999).

By developing the idea of closed captioning further, highlighted captions may be a better alternative for students requiring additional supports. In his study Kirkland (1995) used highlighted captions as one of the conditions. In this case, emphasized key concepts were featured in uppercase letters (see Figure 2). Such captions are easy to create in any video editing software (e.g., *Camtasia*) or in such widely used program as *Microsoft PowerPoint*. Closed captioning with dynamic highlighting common for the majority of the text-to-speech assistive technology programs is another venue. Thus, the captions corresponding verbatim to that narration may include words highlighted in any color as they are spoken out (see Figure 2). When compared to typical options, it is anticipated that the highlighted

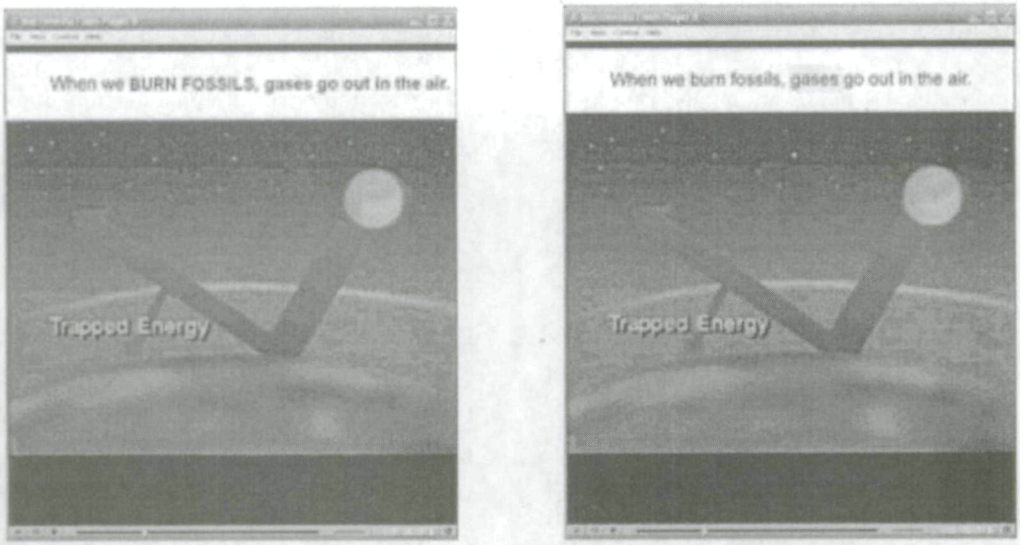

Figure 2. Examples of a video with highlighted text captioning.

text captions might have the potential to better attract students' attention and increase comprehension (Hecker, Burns, Elkind, Elkind, & Katz 2002; Pisha & Coyne, 2001). In order to support students with various abilities and needs even further, captions may include such accommodations as picture symbols.

(d) Picture-based Symbols

Symbols can be found throughout environments everywhere. They guide and support the understanding and navigation through familiar and novel surroundings. There exists a plethora of symbol systems widely used in educational settings, which serve two main purposes: to provide access to alternative and augmentative communication (AAC) and to support learning, especially in inclusive settings (Detheridge & Detheridge, 2002). Existing picture symbol systems represent a continuum from simple pictorial representations closely resembling the concept of a word to abstract images requiring manipulation of symbols to create meaningful units (Jones, Long, & Finlay, 2007). Some of the examples include Rebus and Makaton symbols, Pictogram Ideogram Communication (PIC) symbols and Blissymbols. Picture Communication Symbols (PCS) developed by *Mayer-Johnson* introduce images somewhat similar to Rebus and Makaton symbols, however are more pictorial in some instances, and thus easier to comprehend.

Besides obvious communicative value, picture symbols may also provide means for literacy instruction for students with severe learning needs. Just like road signs guide drivers, picture symbols guide and clue readers to the meaning of words. Complementary nature of picture symbols provides academic opportunities otherwise impossible by supporting unfamiliar words (Biemiller & Siegel, 1997). Thus, picture symbols can be successfully used to facilitate literacy by making content accessible (Detheridge & Detheridge, 2002) and providing the bridge as they connect concrete pictures with abstract print. Overall, using symbols along with text enables students to participate in the classroom reading activities previously unavailable (Slater, 2002).

Underachieving students with and without learning disabilities appear to improve literal and inferential comprehension when using pictorial material in conjunction with written text (Jones et al., 2007) as well as listening comprehension by students with more severe intellectual deficits (Preis, 2006). Therefore it is believed that picture-based captions can further support students' with intellectual disabilities understanding of the video, anchoring their factual and inferential comprehension

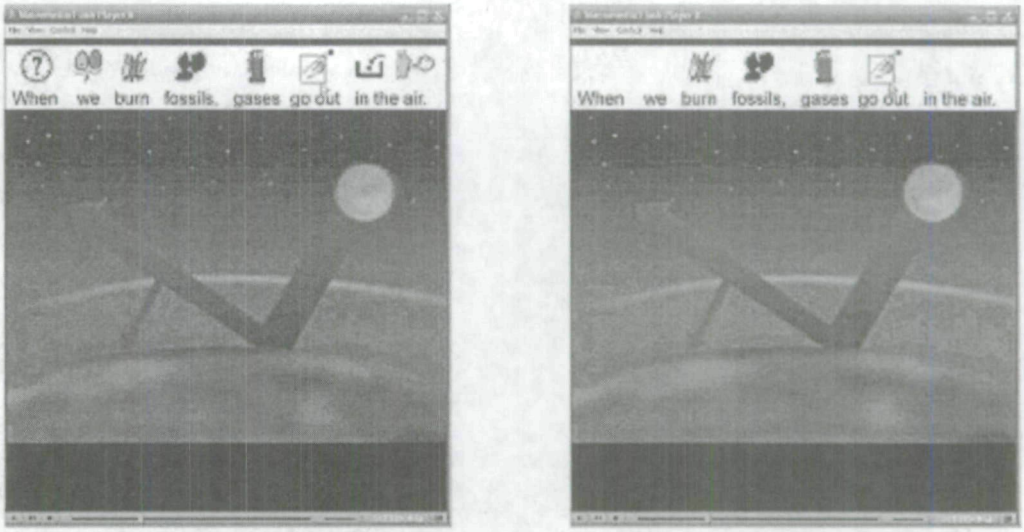

Figure 3. Example of a video with full or key word picture symbol-based captioning.

of the content in easy to understand line drawings (Walker, Munro, & Richards, 1998). Any symbol system can be used to provide sufficient assistance in clarifying the meaning and triggering the information recall of content-based informative videos. Picture symbols may further enhance such existing video adaptations as closed captioning and provide additional supports for comprehension to those students who are low- and/or non-readers. Thus, either all words or only key phrases in such captions may be accompanied with pictures symbols. Colored line drawings may be positioned immediately above or below the word that they accompany.

It's easy to create picture-based captions using any picture word processing program such as *Writing with Symbols (WWS) 2000* or *Communicate:SymWriter* programs by Mayer-Johnson (www.http://www.mayer-johnson.com); *PixWriter* or *PictureIt* by Slater Software Inc. (www.slatersoftware.com). Such picture symbol-based captions can be inserted into the videos within the video editing software (e.g., *Camtasia, Adobe Premier*; see Figure 3). In turn, with the help of such program as *Microsoft PowerPoint*, teachers can also easily enhance video chunks available on different pages with picture symbol-based captions. Furthermore, sentence strips with picture symbols used along with the video can simulate symbol-based captions.

Another way to enhance existing clips with picture symbols is to use them as a visual cue on the video screen. *MovieMaker* or *iMovie* programs allow teachers to add such picture and/or other symbol directly to the video (see Figure 4). The additional feature such as associating a picture symbol with a video chunk inserted into the slides can also be created in

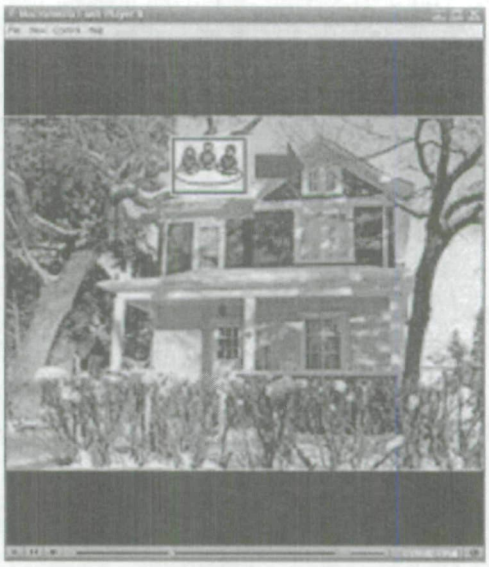

Figure 4. Example of a video with picture symbol-based visual cues.

PowerPoint to focus and anchor students' comprehension and retention.

(e) Descriptive Videos

Just like closed-captioning is used to provide access to media resources for people with hearing impairments, descriptive videos have been developed to assist those with visual impairments. Videos with such accommodations are enhanced with audio descriptions of the visual elements inserted into pauses in the original narration (Fels, Udo, Diamond, & Diamond, 2006). Descriptive videos offer obvious benefits by providing otherwise inaccessible visual information such as: descriptions of landscapes, appearances, facial expressions, sources of sound effects, positions, and internal emotions (Piety, 2004). Besides obvious benefits as the only source of visual information, some researchers also examined the value of video descriptions as a tool for increasing listening comprehension of video content. Emerging research reports that comprehension dramatically improves while the viewers found video descriptions enjoyable (Ely et al., 2006; Schmeidler & Kirchner, 2001).

Following the principles of universal design, video materials with inserted descriptions may be applicable to students with many difficulties in the classroom, including those with LD and attention difficulties (Curry, Cohen, & Lightbody, 2006). Video descriptions may help students focus on essential information. It may become an important element of video adaptations for students with disabilities, who have been known for paying attention to irrelevant parts of the video, missing the important information (Cannella-Malone et al., 2006).

Existing video clips can be easily adapted to include video descriptions. In fact, most of the teachers do such thing when stopping the video to redirect students' attention and point out important stimuli in the clip. Moreover, educators can easily record video descriptions during the pause in the narration using simple video editing software programs such as *MovieMaker* or *iMovie*. Despite the fact that viewers can have access only to limited information that could fit into the available gap in the soundtrack, such video descriptor may serve as a verbal cue to facilitate better comprehension. It is possible to reach stronger effects when descriptions are placed prior to the relevant material in a video (Ely et al., 2006). However, more research is needed before specifications of video descriptions can be established.

Overall, students with and without disabilities may benefit from video instruction utilizing such principles as video and auditory presentation of content either segmented or represented in its entirety that is enhanced with textual and visual modalities such as various captions, as well as active engagement and interaction when viewing and searching within clips. Video adaptations described in this article represent best evidence-based practices for students with intellectual disabilities and offer ways to ensure accessibility of academic content to learners with various learning abilities and preferences.

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Received: 3 June 2010
Initial Acceptance: 25 July 2010
Final Acceptance: 1 October 2010