Video-based instruction

and its role in today’s classroom:

A study of *Square One TV*

and *The Adventures of Jasper Woodbury*

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Abstract

Video-based curricula have been around since the early 1920s. While the technology for and content of video-based curricula has evolved, the effectiveness of these programs in motivating students and bringing life outside the classroom into the classroom has remained consistent. This paper looks at how two video-based curricula developed for the mathematics classroom benefited student achievement. The Cognition and Technology Group at Vanderbilt (CTGV) developed *The Adventures of Jasper Woodbury* specifically for classroom use. This program helped students become excited about math, learn how to generate their own problems, and see the usefulness of mathematics. The Children’s Television Workshop (CTW) developed *Square One TV* as a public broadcast television show that eventually made its way into classrooms. Research also found this program to be effective in engaging students in mathematical task, showing the usefulness of math outside of the classroom, and connecting math to other disciplines. Even with the positive results that these programs showed, they are no longer widely used in classrooms today. Lack of access to the program or technology needed to use it and lack of time due to fast-paced standards based courses all attribute to the dismissal of these programs from US classrooms. This paper looks closely at how these two video-based programs enhanced the learning environment, engaged learners, supported effective teaching methods, and how they can be assessed.

*Keywords:* video-based curriculum, educational television, mathematics,

Square One TV, Jasper Woodbury

**Video-Based Instruction And Its Role In Today’s Classroom: A Study of *Square One TV* and *The Adventures of Jasper Woodbury***

America loves being the leader in innovation. Our educational system proves that we are willing to experiment with different resources and teaching strategies to make this happen. While most fall by the wayside in a matter of a few years, only to be replaced by a newer trend in education, video-technology took its place in the classroom in the 1920s and is still being tested and tried in classrooms around the United States today. Why have we embraced this resource in the classroom with such enthusiasm?

As with many educational reform movements, motion pictures’ potential for bringing the classroom to life was discovered by non-teaching educators. Experts in education and motion pictures saw the silent film as an efficient way to educate students about the world outside of the four walls of a school. Thomas Edison stated in 1922, “I believe that motion picture is destined to revolutionize our educational system and that in a few years it will supplant largely, if not entirely, the use of textbooks” (as cited in Cuban, 1987, p. 9). While we have not seen films achieve this amount of influence in our classrooms, they have taken a permanent seat in instructional activities. Researchers discovered early on that films seemed to be highly motivational and exciting additions to the classroom, but few schools had the resources to use them. As early as 1914, silent films that could be used for educational purposes were cataloged and stacked in libraries across the country. By the early 1930s, twenty-five states had educational departments who solely focused on visual media. As is still true today for most visual media products, the films in the 1920s and 1930s motivated students and helped students match or exceed the educational achievement levels of their peers (Cuban, 1986).

Over the years, technology advanced and video programming became more accessible. Cuban (1987) talks about several studies done in the 1950s and 1960s where entire subjects were taught through videotaped lessons at under-staffed schools. Around that same time, other schools began using video technology to enhance learning or aid their teaching. Studies consistently showed that elementary schools implemented video technology in their classrooms (in any capacity) more than secondary schools. Even with the excitement of this technology, the use of video technology in classrooms varied widely because of lack of access to and ownership of the equipment needed to use the programs, lack of teacher training on how to use the technology, and time constraints on teachers (Cuban, 1987).

Educational television began a new wave of opportunities for the use of video technology in the classroom. Some schools used closed-circuit television to broadcast shows to their schools. Students saw educational television in their own living rooms thanks to public broadcasting stations. With the development of *Sesame Street* by CTW in the 1960s, a new type of video-based education was born. The developers of *Sesame Street* thought collaborating throughout the production process with educational researchers, producers, and content experts was the key to developing an entertaining and educational program that could be beneficial for home viewers and teachers alike. While the original purpose of the program was to improve school readiness for all students, teachers were excited to take advantage of the program for educational purposes within the classroom. With the path laid, educational programs for math, social studies, reading, social development, and a vast array of other topics started popping up. Educational television continues to be one of the most useful video based resources teachers have (Fisch, 2004).

In this paper, I will explore two different video-based programs and their uses in the classroom. Both were popular around the same time in the late 1980s and 1990s. They demonstrate two different types of programming for classrooms, those created for use specifically in the classroom (e.g. *The Adventures of Jasper Woodbury)* and those adapted for the classroom (e.g. *Square One TV*). Both programs focus on mathematics in the late elementary school years to the early middle grades. I will explore the educational benefits of each program as determined by numerous research studies as well as the problems teachers and schools had with implanting both programs. Neither program is widely used today even though students, teachers, and researchers praised them heavily. This paper aims to expose some of the reasons for their dismissal from classrooms and suggest ways to encourage the use of similar programs in the future.

**The Adventures of Jasper Woodbury**

Created by a group of educators and researchers known as the Cognition and Technology Group at Vanderbilt (CTGV), the *Jasper* series encouraged a new type of thinking in 5th -8th grade math students. Because of the structure of the curriculum, students have to generate their own subproblems in order to solve each challenge. Another goal of the series is to set the class up on common ground for their problem solving. Each video presents enough information to make the students and teacher feel as though they understand the context in which the problem is set. All of these factors lead to “anchored” instruction, which is the ultimate goal of *Jasper*. CTGV (1992a) define “anchored” instruction as an instruction design “whereby instruction is situated in engaging, problem-rich environments that allow sustained exploration by students and teachers” (p.65). This differs from typical classroom problem solving situations that usually change context for each word problem. The format of the program, the types of problems presented, and the follow-up problems included with the video combine to help teachers and students realize the goals set forth above.

*Jasper* was created in the 1990s using a then-new technology called laser disks. While they also produced the curriculum on VHS tapes, the program was ideally designed to be used in the laser-disk format. Many of the benefits of this record-size disk are similar to our current DVD technology. The program designers were particularly interested in the ability to freeze frames and the ability skip to certain parts of the disk quickly. This was cutting-edge technology in the 1990s and was therefore not widely used, particularly in schools, and was very expensive. With the creation of DVDs, laser disk technology was short lived. One component of the laser disks that differs from DVDs is the option for a barcode scanner. The laser disk could connect directly to a computer and a bar code scanner. In the resource materials that come with each Jasper adventure are pages of bar codes which link to specific frames of the laser disk. This aids in the speed and efficiency of finding needed information while problem solving. Access to technology was a major hindrance in getting *Jasper* into the hands of teachers.

Each of the 12 videos in the series is paired with another video on a similar topic. For example, the first two videos in the series, “Journey to Cedar Creek” and “Rescue at Boone’s Meadow” are about complex trip planning in relation to distance, rate and time. Other topics include statistics for business planning, architectural geometry, and way-finding geometry. Another interesting feature of Jasper is that it is not intended to be used as the core curriculum for a class, it is simply supplemental material to help enhance students thinking about problem-solving and a few core concepts, such as rate and time. During the research trials of Jasper, teachers typically only used 3-4 of the videos in their classroom throughout the year (CGTV, 1992b). It takes teachers about one week to finish a single *Jasper* adventure, which also makes it nearly impossible to use all 12 videos in one course.

Each video runs between 12 and 18 minutes. The video also includes additional extension problems and a wrap up section where the characters present their solution. While each adventure is distinct, the format is similar. The first video in the series, “Journey to Cedar Creek,” is described below to give a picture of what the adventures are like.

The video opens with Jasper Woodbury checking his mail at his house. He sees an ad in the newspaper for a boat he is interested in buying. Sal is selling this boat at Cedar Creek. For a reference that students will later go back to, Jasper pulls out a map of the creek system to see how far it will be from his house to Cedar Creek by water. Jasper narrates his activities while you watch him get in his boat, buy gas at Larry’s, and head out to Cedar Creek.

On his journey, Jasper breaks his propeller and must stop at Willie’s repair shop. He arrives a while later at Cedar Creek and Sal shows him the boat. Along the journey we learn important information like when sunset is, what the capabilities of both boats are, that Sal’s boat has broken lights, the amount of money Jasper has, and the speed of Sal’s boat. Students encounter several problems without even knowing it. For example, Jasper and Sal test the speed of the boat by timing it between two markers. Jasper buys the boat and then must decide when he needs to leave to get home before sunset. Jasper gives some hints as to what things needs to be considered in his narration of his thoughts but never offers any solutions.

At this point, students would break off into groups and try to figure out what time Jasper needs to leave, if he has enough money to get home, when he needs to get gas, and other sub-problems, some of which Jasper mentions and others are created by students. At the end of the video, Jasper gives a very detailed description of how he solved this problem. He shows where the information is in the video that he used, the calculations he did, and the thought process he went through. The analogous problems included on the video include questions like “Could Jasper make it home if the price of gas was $1.20?” Several other gas prices are listed as well. Problems get increasingly more difficult and may involve three or more variables per problem. For example, the last analogous problem asks students to solve a trip-planning problem that is separate from the *Jasper* adventure but would use the same skill set (The Learning Technology Center, Vanderbilt University, 1996).

Creators chose this format for the stories so that students of different backgrounds and ability levels could be engaged in the story and problem situation (CTGV, 1993b). It is also easier for students to remember what happened, what information they know, and what they are trying to find out when they have seen a visual representation in a video-based format (CTGV, 1992a). These stories also point out the everyday relevance of the math since they are solving a real problem and naturally connect mathematics to other content areas.

One of the most distinctive features of *Jasper* is that students must generate several problems themselves in order to solve the problem presented by Jasper. Program developers desired that students would actively create knowledge instead of receive the knowledge from the perceived experts in the room, namely the teacher. To achieve this, they looked to constructivist theorists. These theorists “want to help students learn to construct and coordinate effective problem representations through the use of symbolic and physical models, through reasoning and argumentation, and through deliberate application of problem-solving strategies” (Cognition and Technology Group at Vanderbilt, 1992b, p. 292). Because of this unique feature, students can be creative in how they choose to solve problems. Each group presents their work to their classmates, and this results in rich discussions since each group could potentially come up with a different solution or at least a different path to the solution. Both the generation of problems and the presentation of student work support the NCTM goal for discourse “in which students- listen to, respond to, and question the teacher and one another … initiate problems and questions … [and] rely on mathematical evidence and argument to determine validity” (NCTM, 1991, p.45). *Jasper* helps teachers achieve these goals through the set up of their adventures.

Each adventure has a set of extra materials to help teachers enhance the effectiveness of the program. There are also suggested methods for presenting the material and assessing students. These are discussed later in the paper in detail.

**Square-One TV**

CTW produced *Square One TV* between July 1984 and December 1992. The programs aired on public television stations starting in 1987. Aimed at 8-12 year old children, *Square One TV* had three main goals: 1) to encourage positive attitudes towards math, 2) to demonstrate various problem-solving techniques, and 3) to present math content in interesting and meaningful ways (Fisch & McCann, 1993). Over the five seasons on the air, CTW recorded 230 episodes of *Square One TV*. Each episode was constructed in a magazine format. This means that the program consisted of segments ranging in length from 10 seconds to 10 minutes. “A segment may be a parody of any of the programs and devices typical of the commercial channels: situational comedy, detective drama, music video, game show, news programming, commercial interruptions, self-promotion, and so on” (Schnieder, McNeal, & Esty, 1993, p.4). Some segments were more popular with children than others (Fisch & McCann, 1993).

One of the most popular segments was *Mathnet*, a Dragnet parody. In this segment, three mathematicians solve crimes by using their knowledge of mathematics and problem solving. Each mystery was originally aired as the last segment over five consecutive episodes. Since *Square One TV* aired Monday through Friday, children would begin the mystery on Monday and it would be resolved on Friday. Research shows that students engaged in informal problem solving and rich mathematical discourse during this segment of the show (Fisch & McCann, 1993; Schauble & Peel, 1987).

Another popular regular segment on the show was *Mathman*, a Pacman parody. While *Mathman* travels around the arcade game like board, students have to quickly identify which items *Mathman* can and cannot eat. For example, *Mathman* may only be able to eat pentagons or decimals less than 0.5. Students were actively engaged in mental math exercises while watching and participating in this segment (Fisch & Mann, 1993).

During the production of *Square One TV* for public airing, producers realized the classroom benefits that *Square One TV* could provide. These include student motivation, student interest in mathematics, cross-curriculum lessons, student engagement in problem-solving, and students viewing math as useful in the real world (Chen, Ellis, & Hoelscher, 1988; Fisch & Hall, 1991; Fisch & McCann, 1993; Schauble & Peel, 1987; Schnieder & Esty, 1990). NCTM (National Council of Teachers of Mathematics) supports these goals as well making *Square One TV* an effective option for enhancing curriculum (NCTM 1989, 1991, 1995, 2000). In order to ease the use of *Square One TV* in classrooms, several steps were taken by the CTW. One helpful step for example was that CTW coded all 230 episodes to identify what segments were in each episode and the topics covered during those segments. Since most episodes contained several different topics, this organization was essential for teachers to be able to locate appropriate segments quickly and easily (Schnieder et al., 1993).

CTW also created specific lesson plans and worksheets to go along with several episodes. They created a teacher’s guide for *Mathnet* and game show segments and one for connecting *Square One TV* to social studies and language arts lessons. Each teacher’s guide contains the coded list of episodes so finding the segment is easier. While *Square One TV* was airing, producers encouraged teachers to simply record the episodes at home on their VCR and then use them in the classroom. Each guide stresses that this is legal as long as the tapes are erased after 3 years. This was a benefit for teachers because it was free, but it also required some work on their behalf to obtain the segments for classroom use (CTW 1988, 1989; Schnieder & Esty, 1990). The other challenge of recording shows as suggested by CTW is that after the show goes off the air, teachers will have 3 years to use their tapes and then they must erase them. That means that few tapes, if any, are still available for teachers, automatically eliminating the use of *Square One TV* in classrooms.

A few years later, researchers organized the episodes into 30 videocassettes based on topic to see if teachers used them more often in this format. They also edited *Mathnet* segments together so that they were one program, rather than five separate programs. They gave them to teachers ranging from 2nd to 6th grade to use for a school year along with the curriculum goals they related to. They found that teachers used the programs based on the curriculum goals that were recently covered, were currently being taught, or they had just finished (Chen, Ellis, & Hoelscher, 1988).

*Square One TV* finally produced tapes of the program just for teachers similar to the format described above called *Square One Math Talk.* For *Math Talk, Square One TV* episodes were edited in length to fit the constraints of a classroom and reorganized by curricular topics (Fisch, 2004).

**Implications For Teaching**

In this section, I will explore the benefits and problems of video-based programming, namely the *Jasper* series and *Square-One TV*, by looking at their impact on learners and learning, the learning environment, curriculum and teaching strategies, and assessment.

***Learning environment.***

School learning environments typically differ from the environments in which you actually use things you learn in school. Lappan (1993) stated that the classroom environment is key to how a student learns and how they view themselves as learners. Many times school classrooms are environments distinct from the environment a student lives their daily life in. Resnick (1987) points out four main contrasts between school environments and out-of-school (or informal) learning environments. The first main difference is that schools focus on individual achievement and work whereas in everyday situations you are more likely to work in groups or pairs. She states that in everyday situations, “a person’s ability to function successfully depends on what others do and how several individuals’ mental and physical performances mesh” (p. 1). The second difference she points out is the abundant use of tools in informal settings as opposed to solving problems in school based on pure mental computation and memory. We also tend to focus on symbol manipulation, particularly in math, during school hours yet switch to more situational reasoning as soon as the bell rings. Finally, Resnick points out that out-of-school contexts lend well to situation-specific skills where as schools focus on generalized concepts and skills. With so many differences between what we learn and how we use it, video-based curriculums aim to create a classroom environment that brings informal situations into schools.

CTGV set out to bring the world into the classroom by creating the *Jasper* series. Anchored instruction was a key design consideration for this series. These anchored environments allow novice students to explore a real-world context as an apprentice. CTGV also refers to “anchored environments as *macrocontexts* because they involve complex situations that require students to formulate and solve a set of interconnected subproblems” (1993b, p. 116). This means students work in one particular context for a sustained amount of time allowing them to focus on using various mathematical techniques to solve one problem instead of the typical method of solving smaller word problems about varied topics. During the *Jasper* videos, students become familiar with the context by listening to the thought process of Jasper. By making them apprentices in this specific context, students are able to transfer skills learned in the classroom to a single real-world situation.

This situation has both benefits and faults. While the benefit of letting students explore rich math within a single context is that it allows them to solve several subproblems to get to their final answer and therefore create their own learning, Bransford (2000) found that there is less flexible transfer of knowledge when it is taught within a single context. Researchers of the *Jasper* series found this to be somewhat true as well. In a field based study done in the 1990-1991 school year, students who had participated in 3-4 *Jasper* adventures were tested alongside non-*Jasper* viewing peers. They found that the *Jasper* student outperformed their peers on tasks that related to the contexts shown in *Jasper* and on problems requiring organization and development of subproblems. But, they found no significant difference in scores when the problems were based on non-*Jasper* contexts (CGTV, 1992b). This suggests that while *Jasper* students developed more sophisticated thinking strategies than their peers, they were not able to transfer their knowledge to new contexts any more readily than other students.

*Square One TV* addresses the problem of exposing students to various contexts because of the format of their program. The magazine format of the TV show allows teachers to pick and choose what segments they want to show their class. Some of these segments such as *MathNet* bring mathematics to real-world situations while other segments like *MathMan* are not situated within a context.

Regardless of which video-based curriculum is used, these shows create an out-of-school learning environment, which students find motivating and interesting. The ability to bring entertaining and practical situations to students allows students to see mathematics as a useful tool rather than a boring set of steps to memorize. Studies done on both series expressed the change in attitude that students had while working on problems and watching the programs (CTGV, 1992b; Fisch & Hall, 1991; Schauble & Peel, 1987). This will be discussed in detail in the next section but it should be noted that the excitement of students is a clear change in a typical classroom environment! Teachers who have used these programs have not viewed them as teacher replacement videos but instead have seen them as a tool to get students excited about their schoolwork and challenge them to think in new ways. Students are engaged and talking with their classmates as well as the teacher.

The downfall of using video-based technology in the classroom is limited access to and money for resources at school and production costs for the developer. It is estimated that production for high-quality films costs about $1000 per minute (Sherwood, Kinzer, Hasselbring, & Bransford, 1986). With this enormous financial restraint, materials produced for classroom use alone would be too costly for many districts and schools to afford under tight budget restraints. This makes adapting movies and TV series that are already available more appealing for use in the classroom. The other financial restraint on using video-based curricula is purchasing the equipment need for viewing. While this is less of a concern today than when these programs came out in the 1990s, it still plays a role in what programs teachers can and can’t use in their classroom. For example, *Jasper* was created to be used on a laser disk player. Since most schools never had these players, the hard work that went into making *Jasper* effective and easy to use was not able to be widely used. Access to technology and monetary resources plays a large role developing a classroom environment that can support video-based curricula.

***Learners and learning principles.***

Each student is different and therefore learns through a variety of methods. Video-based curricula present an opportunity for students to learn through a new medium. By engaging with the technology that is so prevalent in their daily lives, lessons become naturally engaging when presented through well-chosen TV and video clips. In numerous studies done on *Jasper* and *Square One TV*, researchers found that students were excited about watching and interacting with the programs, voluntarily engaged with the mathematics embedded in the shows, and came to see mathematics as more useful (CGTV, 1992a, 1992b; Fisch & Hall, 1991; Fisch & McCann, 1993; Sherwood et. al., 1986).

Fisch and McCann (1993) found that during several segments of *Square One TV* students would participate and interact with the program even when unaided viewing occurred. This interaction with the program included commenting on answers, saying the answers to problems aloud, and demonstrating tricks learned from the program to others. Researchers attributed the success of the program in getting children engaged to four things: wait time, appeal, clearly defined problems, and allowing educated guesses. All four of these are also characteristics of a good lesson plan, which shows the benefit of using programs designed by educators within the classroom.

CGTV (1992b) found in a survey that students who participated in *Jasper* videos had a significant change in their self-confidence in mathematics, their math utility, their interest in math, and their feelings about challenging problems. Compared to their pre-*Jasper­* answers, students’ attitudes improved in all four categories while their non-*Jasper* peers had lower scores on the post survey in three of the four categories. Students who completed 3 to 4 *Jasper* videos made comments like, “It’s not just that it’s fun, you’ll learn so much” and in reference to situations they encountered “This would make a good Jasper problem” (CGTV, 1992b, p. 308). Allowing students to see the usefulness of the subject matter we teach is one of the most difficult and important challenges a teacher faces. It is also encouraging that students showed persistence on difficult problems.

A benefit that is particular to video-based lessons is the ability to engage students in rich mathematics even if they have trouble reading. Many students in our schools today fall behind in every subject because of low reading ability or unfamiliarity with English. I encountered this problem frequently when teaching in Charlotte. I had many students who were new to the US and math was difficult for them because they had a hard time reading English. By watching and listening to problems, students can demonstrate their understanding more readily even with a lower reading level. CGTV (1993a) purposefully designed the *Jasper* series to help students visualize what is going on in the problem. This improves all students’ access to meaningful mathematics.

***Curriculum and teaching strategies.***

Now that students have equal access to the mathematics through video, are motivated by the real-world situations, and are becoming experts in one particular macro-context, what do they do next? Teachers must now pick up where the videos left off and engage students in rich mathematical discussions and projects. Both programs went to great lengths to prepare teachers to use their curriculum materials effectively and efficiently while also providing rich cross-curricular connections. CGTV looked at how teachers taught with *Jasper* so that the teacher manuals could include teaching strategies as a type of teacher training. Teachers however did not always use the programs even when available because of time constraints and the current focus on standardized testing.

A great concern for using any type of progressive curriculum is the ability of teachers to use it to its highest potential. Many companies bring in specialists to train teachers on how to use new strategies and tools for the classroom. CGTV and CTW realized that training teachers to use their programs in person was unreasonable if it was to be used on a large scale. They instead made teacher’s guides for *Square One TV* and included teaching methods with the *Jasper* videos. Since so much research was done for both programs, it would be a shame for all of the techniques discovered to be lost. The manuals and supplemental materials enabled teachers to pick up both tools and use them more effectively.

CTGV (1992a) studied how teachers taught *Jasper* and came up with three general teaching methods. For each model they considered how tasks were sequences within the curriculum (e.g. did students already know how to do all the calculations needed for the adventure), how teachers handled student errors and struggles, and what role the teacher played in the classroom. One model demonstrated what Fenstermacher & Soltis (2004) would call the executive approach. These teachers are the providers of information, control what students learn and the order they learn it in, and give the answers to students when they ask questions. This type of teaching is harmful to the goals of *Jasper* because it reduced students’ ability to generate their own problems and solutions. It also diminishes the curiosity of the students and their ability to view themselves as the expert. A second model of teaching CTGV found was less authoritative but still structured and guided. Teachers would give students step-by-step worksheets to walk them through each subproblem. While students still got to explore each subproblem, students were denied the opportunity to find and generate their own problems. Since every student completed the same problems in the same way, there is not much to discuss, making this method more effective for individual work rather than group work. The third method which CTGV calls the “guided generation” model allows students to use *Jasper* to its full potential. For this teaching approach, the teacher becomes a learner along with the students, groups of students work together to generate and solve problems, the teacher asks open-ended questions, and the teacher scaffolds discussion when necessary. Teachers using this method offer students the opportunity to learn in their own unique way and at their ability level (CTGV, 1992a). This study demonstrates that it is critical that teachers use specific teaching strategies to maximize the effectiveness of video-based programs.

NCTM (2000) states in their teaching principles:

“Worthwhile tasks alone are not sufficient for effective teaching. Teachers must also decide what aspects of a task to highlight, how to organize and orchestrate the work of the students, what questions to ask to challenge those with varied levels of expertise, and how to support students without taking over the process of thinking for them and thus eliminating the challenge” (p. 18)

This principle aligns perfectly with what *Jasper* found in their study. Teachers are a key element in making any instructional activity worthwhile. Instructional programs like *Jasper* do not automatically create great teachers, but instead give resources to good teachers to help them achieve their goals of challenging students and expanding their reasoning skills. This also leads to the point that video-based curriculums should not be used just because they are available or entertaining. “They must offer the potential for students to engage in sound and significant mathematics as part of accomplishing the task” (Lappan, 1993, p.525).

Because *Square One TV* was not originally designed for use in the classroom, teacher resources are structured a little differently. The producers and researchers at CTW created specific curriculum guides with extra worksheets, suggested lesson plans, and other ideas for specific types of segments. The game show teacher’s guide explains the activities step-by-step, explains game rules where applicable, and supplies worksheets to go along with the activities and games (CTW, 1989). A more detailed lesson plan is given for 13 *Mathnet* cases in CTW’s *Mathnet t*eacher’s guide (1988). Since *Mathnet* cases can be viewed in 5 sections (as they originally aired), or viewed all at once, teachers are more flexible in how they could teach these segments. Each lesson plan includes a story summary, worksheets, and suggested activities to engage students with the episode. This gives teachers ideas about what types of questions to ask or where meaningful mathematics can be drawn out. Within this teacher’s guide are the curriculum goals to help teachers align the programs with their content standards as well as a program guide that indexes the program number and length of each segment needed.

Maybe the most interesting and helpful teacher’s guide for *Square One TV* is Schneider & Esty’s (1990) Curriculum Connections Teacher’s Guide. The production staff at CTW took a *Mathnet* episode, a game show, and a commercial and grouped them together by topic to produce meaningful lesson plans for an English class and a Social Studies class and link them directly with mathematics content goals. For example, the social studies lesson plan begins with the *Mathnet* episode called “The Case of the Deceptive Data.” Students would watch the clips and then have class discussion periodically about opinions, writing to local politicians, Gallop polls, etc. The guide supplies teachers with resources such as worksheets on Presidential approval ratings and interpreting graphs. The lesson also contains a game show episode, “Piece of the Pie,” and supplemental activities that include taking a survey and creating a pie graph. Finally, the lesson concludes with a two commercials that are public service announcements. This allows the teacher to talk about how they are used to inform the public and students have the opportunity to create their own public service commercials. These cross-curricular activities support NCTM’s goal for students to be able to see where math can be used in various situations and environments (NCTM, 2000).

One of the biggest struggles I had as a teacher was deciding how to fit enrichment activities into our already fast-paced courses. While teachers enjoyed both programs as much as their students did and could see the benefits from using them, they still chose not to use them in some cases because they did not have time (Chen et al, 1988). Both programs list specific standards and topics that are covered by each episode and activity in an effort to help teachers locate the appropriate resources quickly. When time is an issue for teachers, they could still use a 10 minute *Square One TV* clip to introduce a topic or review a previous idea. *Jasper* however requires a significant time commitment. Each adventure is designed to take several whole class periods. Most of the teachers in the *Jasper* studies took about one week for each *Jasper* adventure. Many of these teachers completed 3-4 adventures per course (CTGV, 1992b). That means that four weeks out of your course would be devoted to a math program that hits lots of standards but does not explicitly teach any standards. In our standards-based testing-focused educational world, these programs are easier to ignore because of time constraints. What we need to remember as educators is that students can learn important content standards through non-standard activities. After students have completed a *Jasper* activity that allows them to explore distance, time, and rate problems, the teacher would theoretically need to spend less time explicitly teaching about this concept since students developed a deep understanding of it during *Jasper*. Using programs like this challenge teachers to not only rethink their teaching strategies, but to get creative with how standards fit together and what “teaching to the test” could look like.

***Assessment.***

Assessment is at the center of education today. Standardized tests, formative and summative assessments, quizzes and tests, and projects all seek to quantify each student’s ability to perform on specific tasks. Teachers rarely teach anything that is not going to be formally assessed at some point. *Jasper* originally had assessments included with the program, but after horrible reviews from students and teachers, these assessments were cut from the curriculum. *Square One TV* was not created to be a formal teaching tool, so assessments were never created specifically for this curriculum. So how do teachers know what students are learning during their viewing and interaction with video-based curricula?

Our view of what assessments looks like is probably very narrow if we grew up in traditional classrooms, but assessment can take many different forms and non-formal assessments can be very informative for teachers. One of the most effective forms of assessment for *Jasper* type activities (e.g. student-led group work) is walking around the room and monitoring students. This form of informal assessment gives immediate feedback to teachers about what students understand and what they are struggling with. To enhance this method, teachers should consider making a list of strategies they see students using and ask some leading questions to groups as they walk around. Another thing to consider with this type of informal assessment is making sure that all students are observed, not just struggling students (Cole, 1999). Having ready-made lists with student names on it will ensure that the teacher notices and engages with each student (Clarke, 1992). These notes will also be helpful for the teacher when leading the class discussion because she will have a list of ideas she wants presented and can call on the appropriate students to make class discussions more efficient and meaningful.

A more formal type of assessment for *Jasper* activities would be to grade the work students completed in order to solve the challenge. Teachers could require students to document their thought process in a journal. This not only makes student thinking more visible, it helps students learn to communicate their ideas to their classmates more clearly. There is also opportunity with project-based activities like those found in *Jasper* for students to self-assess. If the teacher has spent time creating norms (Yackel & Cobb, 1996) in her classroom that promote students valuing their own learning and growth over their numerical grade, self-assessment could be an encouraging and motivational way for students to monitor their progress.

*Jasper* researchers initially created formal assessments but received overwhelming negative feedback from both students and teachers. In fact, one teacher in the study quoted “My kids, as much as like Jasper, as much as they begged for Jasper, they finally told me: ‘If I have to take another test on Jasper I don’t want to see another Jasper’” (CTGV, 1992a, p.308). Researchers decided that formative feedback would be more effective than testing students on *Jasper*. Teachers would be better able to pick appropriate analogous problems and extend their teaching based on formative assessments done while students were working on *Jasper*.

*Square One TV* is used more for introducing concepts, reviewing previous concepts, and demonstrating new problem-solving techniques. This makes it increasingly more important to assess the effectiveness of the program itself along with the progress of student thinking. Assessing instructional materials is one of NCTM’s (1995) four main assessment categories. We typically forget that assessment is not limited to student performance. Questioning of students is a key element to seeing what students are getting out of any instructional activity. Open-ended questions can lead teachers to see the advances in student thinking and give students the opportunity to talk through new concepts and information. Teachers should be able to see how instructional programs like *Square One TV* affect their students by looking at what strategies students use to solve problems and if those strategies match up with those presented in the program.

The downside of informal assessment is that is fails to prepare our students for standardized testing. This means that formal assessments need to be mixed in with informal assessments so that students are familiar with the process of taking more formal assessments. Testing students on the skills and techniques learned through video-based programming would be a beneficial tool to help inform teachers of program effectiveness and student progress. If students are able to transfer their learning back into generalized school situations, the learning taking place from the program is highly effective and educationally beneficial.

**Future Suggestions/ Implications for Teaching**

Even with the successes of some video-based curricula, the widespread use of videos in the classroom has not reached its full potential yet. One reason for this may be that while access to the technology has become less of a hindrance to using video- based technologies, I think the idea that videos replace teaching or give teachers a break from teaching has created a stigma around the use of videos in classrooms. For example, in the high school setting that I taught in, there was only one video resource available specifically for math teachers. Some teachers used these videos as supplemental instruction in the same way that teachers used *Square One TV* clips. Most teachers however would pull out a video and use it so that they could sit down a grade some papers during class while the class was being entertained. This abuse of resources has led to a bias against videos, particularly in high school math classrooms. Few teachers used movie clips to introduce interesting problems, and when they did, the whole movie was shown, not just a clip. In order to fight back against this problem, teachers should be presented with effective video-curricula, such as *Jasper*, as well as given some professional development on how to effectively use videos in the classroom. As discussed earlier, how the curricula is presented by the teacher and the activities in which the class engages is the key to making video-curricula effective.

Another reason that has contributed to the short-lived success of programs such as *Jasper* and *Square One TV* is the changing of styles and culture as time progresses. While the mathematics has not changed, students dress differently, act differently, and use different language now than they did in the early 1990s. Videos made without lower quality equipment and “funny hairstyles” may not be as engaging for students since they will seem outdated. This creates a challenge for program developers to either re-film programs to keep them updated and exciting, or to constantly create new programs that will better fit into the culture of students today. This makes using movies and other current media as the basis for video-based curricula seem more feasible in the rapidly changing times we live in. This will require constant upkeep on the teacher’s part to find good media clips and to create activities for those clips.

The resources are available now for teachers. Just “Google” videos for high school mathematics and hundreds of websites appear that link movies and TV shows to interesting math problems. The barrier that needs to be crossed now is how to get teachers excited about using these resources and teaching them how to use them effectively through asking interesting leading questions and facilitating rather than dictating the class discussions. While adapting resources for the classroom is more time consuming and requires a little more tweaking than a series created as a classroom curricula, the motivational and academic benefits have the potential to be comparable to those found with *Jasper*.

Knowing what I know now about the effective benefits of video-based curricula for math students, I am excited to explore the possibilities of using movie clips and TV episodes to motivate and excite my students about learning. Allowing students to generate problems in groups and discover their own uses for mathematics in the real-world will set my students up to be 21st century learners and thinkers. By effectively integrating video-based lessons into my math curriculum, I can hopefully spread the use of videos through my department. Teachers really do want to help their students learn to the best of their abilities, we just need to know about what resources are out there and how to best use them. I can help accomplish that goal within my realm of influence as it concerns video-based curricula and I am excited to see the results!

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