Technology in the Classroom

It would be difficult to envision a one-room school without any technology. If one defines technology as a tool to complete a task, then many of the earliest American country schools had them in various forms: hornbooks, *New England Primers*, cloth, needles, quill pens, ink, bark, flat stones, or some other surface for writing. Around 1900, a new technological era began with the introduction of *Visual Education,* a teacher's manual that explained how to use lantern-slides and stereographs for instructional purposes. Readers may be surprised to learn that Dr. Oliver Wendell Holmes, the father of the Supreme Court Justice, developed the hand-held Holmes stereoscope, which was widely used for educational purposes. In the following article, Veronica Ent explores the pedagogical foundations of stereo views in the classroom, methods for using stereographs, access and affordability of visual technologies, and the end of the early visual instruction movement in America. Although visual aids play a dominant role in today's classrooms through the widespread use of computers, the challenges of access, affordability, and effective educational applications mirror those of the early visual instruction movement.

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Twentieth Century Visual Education:
Early American Schools and the Stereograph

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Introduction

The doors closed in 1976. The company was shut down. The remaining supplies, equipment, and stereo views sat awaiting their fate as the Iowa Mast Development Company, once located in Meadville, Pennsylvania, dissolved the last subsidiary of the Keystone View Company. Harold Johnson, a 53-year employee of the company, locked the doors of the largest educational stereo view company in the United States (Johnson-Shaw Stereoscopic Museum

2002). Little did teachers of the day realize that education would never return to the third dimension of the 1900s.

Figure 1. Johnson-Shaw Stereoscopic Museum, Meadville, PA c. 2010.

The stereoscopic images, used in early education, came about as a result of the Victorian era "stereo mania" which the general public eagerly followed because of Queen Victoria's fascination with the medium. Presented at the 1851 International Exhibition in London (Goldsborough 2007, 30), stereoscopic images appeared in nearly every middle class Victorian home. The Victorians enjoyed stereo views as we do television and purchased thousands of them to share with guests during social gatherings. Ownership of elaborate, automated, and handcrafted stereoscopes and views was an indicator of wealth and status causing a sudden popularity of cabinet stereoscope viewers and ancillary equipment. Hundreds of manufacturers entered the market to meet the demand by the mid 1860s (Wing 1996, 53-74).

During the height of the stereoscopic-crazed entertainment boom, it became obvious that the apparatus could be a valuable educational tool. While Sir Charles Wheatstone is credited for the invention of stereoscopy in 1838, it was an American medical doctor, Oliver Wendell Holmes, who made the images feasible for use in education with his hand-held Holmes Stereoscope, Figure 2 (Darrah 1977, 5). Holmes, like other inventors of stereoscopic equipment,

did not secure patents; thus, hand-held models quickly became replicated, dropping prices to make them affordable for small rural schools (Bak 2012, 155).

Figure 2. Holmes-Bates Model Stereoscope 1871, Advertisement from the *Boston Almanac*, Wikimedia Commons, http://commons.wikimedia.org/.

Nevertheless, it was Holmes who enlightened the educational system as to the value of giving students a classroom stereoscopic experience. The introduction of classroom stereoscopic imagery paralleled the current momentum of formalized curriculum and grade-level specific, content-area expectations. Holmes believed that a three-dimensional experience offered greater impact than traditional imagery. In his 1859 essay written for the *Atlantic Monthly*, Holmes states:

> We see something with the second eye which we did not see with the first; in other words, two eyes see different pictures of the same thing, for the obvious reason that they look from points two or three inches apart. By means of these two different views of an object, the mind, as it were, feels round it and get in ideas of solidity… (Holmes 1859, 742).

Several sources regard Holmes as the American forefather of educational stereoscopy. He was the first to bridge the entertainment stereograph industry to education and was

recognized by stereoscopic image giants such as Underwood and Underwood and the Keystone View Company. The Keystone View Company, publishers of *Visual Education: Teachers' Guide to the Keystone 600 Set,* gave him credit throughout their pedagogy and philosophy relative to properly introducing stereo views in the classroom.

Pedagogical Foundations of Stereo Views in the Classroom

Between 1906 and 1921, the Keystone View Company led the country on pedagogical approaches that underlined the use of the stereograph and stereoscope. Following the lead of the Underwood and Underwood Company, the Keystone View Company produced several sets that aligned with curriculum in the early schools. By 1912, the Keystone View Company had purchased its predecessor, Underwood and Underwood, and had become the largest business of its kind in the world (Darrah 1977, 50). The most popular of the educational department's sets was the *600 Set* (Figure 3).

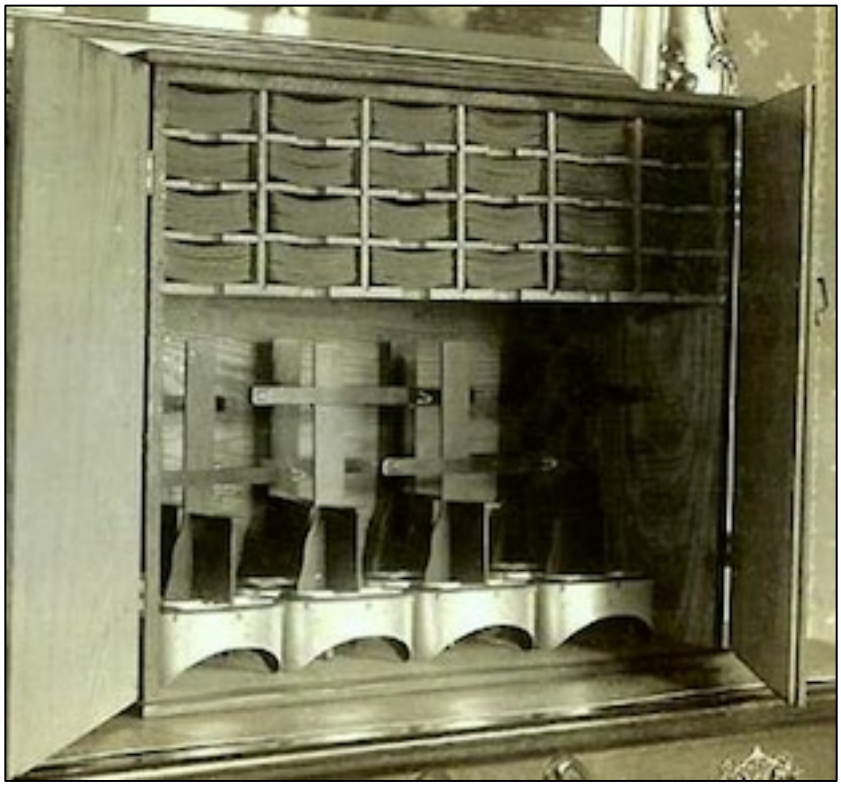

Figure 3. Keystone "*600 Set,* " c. 1906/1922. Keystone View Company.

The *600 Set* was believed to be the finest collection of views to teach geography, social studies, science, history, and reading (Apthorpe 1908, 174). The company provided resources and pedagogy to support the use of stereo views in its 1906 teacher's manual entitled *Visual Education: Teachers' Guide to the Keystone 600 Set*. The visual thinking and learning premises of the *600 Set* were based on the writings of Charles W. Elliot, William C. Bagley, Frank M. McMurry, and superintendents, principals, and teachers who used the Keystone *600 Set*. Later in 1929, the Keystone View Company began issuing the 1200-view *Tour of the World*. They also added an oak storage cabinet (Figure 3) aimed at schools and libraries (Wadsmith 1991, 175). The use of these sets offered "virtual mobility" for learning about locations without actual travel (Bak 2012, 148). Pennsylvania's Pittsburgh Public Schools were noted as one of the largest organizations purchasing fifty-two of the 600-view sets plus viewers in oak cabinets (Wadsmith 1991, 43).

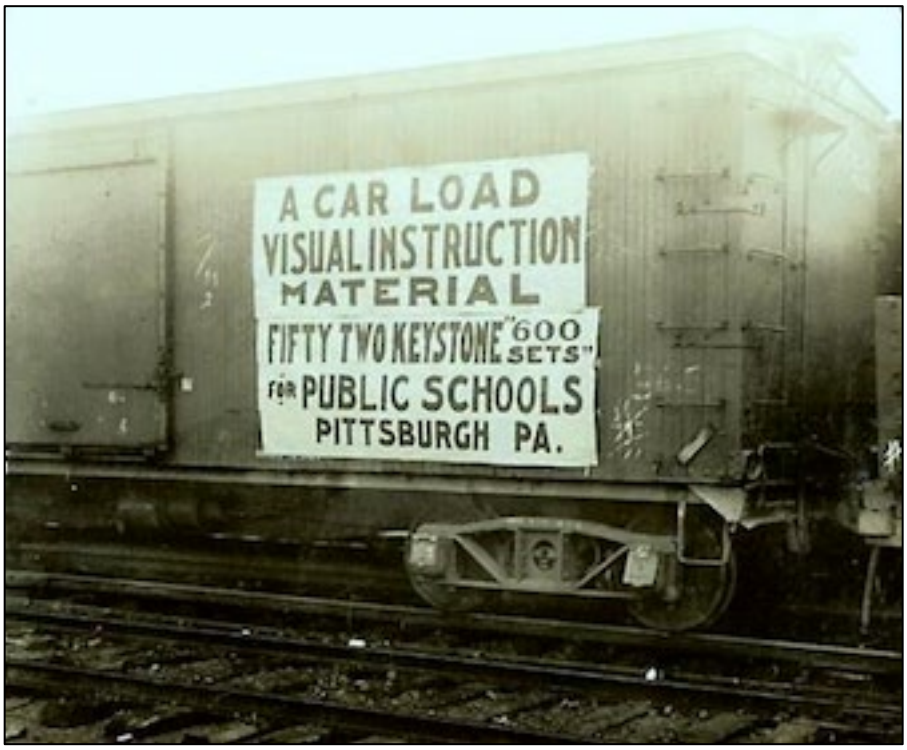

Figure 4. Shipment to Pittsburgh Public School, c. 1920. Keystone View Company.

Charles Elliot, the 1869-1902 president of Harvard University, discussed the importance of training the eye and the balance among bookwork, handwork, and eye-work in the Keystone

View Company teachers' manual (Keystone 1906/1922, vii). He asserted that using stereo views requires learners to combine visual instruction with memory and language. He encouraged teachers to have students recite mental notes of what they saw and incorporate into English compositions that impressed them in the three dimensional image. He also stressed the importance of offering familiar stereo views to help pupils review concepts and to evoke emotions that may have otherwise been forgotten. He believed pupils would thus have increased depth and reflection about various events.

In addition to Elliot's introduction in the Keystone View Company's 1906 manual for teachers, William Bagley, professor at Columbia University, provided an essay on "Concreteness in Education." Bagley, a later well-known essentialist educator disputing pragmatism and progressive education in American education, writes a seemingly "experiential" essay. He states, "experience is the best teacher. . . [and] only real teacher" (Keystone 1906/1922, ix). Throughout Bagley's essay he supports the use of stereo views as a method to reduce the distance between classrooms and concrete experiences. He reasons that it is cost prohibitive to provide actual experiences of travel, industry, and so on. Having an opportunity to witness though stereoscopic imagery deepens students' understanding and increases learning.

In keeping with Bagley's thoughts on experiential learning, he furthers the concept of simulation and pedagogy as he claims that stereo views are better, in some instances, than actual experiences. His premise is that a teacher can control the overwhelming stimuli and extraneous distractions that occur in the real setting through a "contained" image with a finite amount of visual information. A teacher acting as an artist selects the important details and carefully prescribes the how and where a pupil learns. The stereo view provides just enough controlled, third-dimension reality. Bagley supports the use of the Keystone *600 Set* to provide a superior learning experience over textbook illustrations. He believes that a teacher would have no difficulty using the *600 Set* to help a pupil "put himself into a pictured situation—actually to feel that he is there in close contact with objects or taking an active part in the processes that are portrayed" (Keystone 1906/1922, x). Ironically, several years after this publication, Bagley became known for his disbelief in the progressive activity movement (Null 2007, 1030) which seems to contradict some of the Keystone View Company's premise for using stereo views.

The last scholar that writes in the Keystone View Company manual for teachers is Frank M. McMurry, a professor of elementary education at the Teachers College of Columbia

University. He discusses the proper use of stereo views and cautions teachers about the faults of the media as well as their benefits over traditional textbooks. He agrees that stereo views must support instruction rather than serve as the only instruction. He stresses that quick use of a stereo view does not benefit a learner and underscores the importance of the learner taking sufficient time to reflect on the imagery to benefit fully from the experience. He feels pupils should not be restricted by time and be allowed to work at their own rate. Additionally, he stresses the significance of the teacher emphasizing the importance of looking for specifics rather than viewing images holistically. He states looking at stereo views without guidance leads to scattered and superficial observation (Keystone 1906/1922, xiii).

McMurry suggests that the back of the stereo view containing a description should be read prior to viewing the image and be used to guide the learner to questions and details in the image. After a thorough investigation of the image, pupils should communicate verbally or in writing about the picture. If this last step is not completed, valuable information will not be committed to memory (Keystone 1906/1922, xiii).

Methods for Using Stereographs in the Classroom

Four-step lesson sequences are suggested in the Keystone View Company manual for teachers. They are as follows: 1. Approach, 2. Preparation, 3. Expression, and 4. Review of Organization. The manual suggests that stereo views can be used in instruction by creating scenes and settings for stories, providing advanced organization for an upcoming lesson, participating in seat work and group work, visualizing historical problems, increasing vocabulary, and improving expression in written and oral modes. The manual cautions teachers on using too many stereo views and never allowing free viewing of the set. Additionally, the manual recommends that only one scene be used each day in the lower grades and not more than two a day for upper grades. According to the manual, using more than one or two scenes has proven ineffective as students are too rushed to view and reflect.

In teacher preparation of the 1900s the support for use of stereo views was based on two fundamental principles that were presented as the “laws of learning” (Dorris 1928, 139):

1. The psychological law is that only one object of thought, or one "conceptional system," can be the focus of attention at any one time;
2. Whether the educational environment, with its rich stimuli and impressions, produces any fundamental educative effects depends on the intensity of the appeal and concentration of attention, which must be deep enough and prolonged enough to call forth reflective thought and reasoning (in Dorris 1928, 139 originally cited from Norsworthy and Whitley 1923/1937, 148-149).

In a 1928 teacher preparation textbook, *Visual Instruction in the Public Schools*, stereo views are claimed to be the least understood and the most widely misused of all visual materials (Dorris 1928, 138). Dorris states that research done with children using stereoscopes has revealed that the tool is not as effective as group work or as an individual experience. This contradicts, to some degree, information provided by the Keystone View Company that suggests the tool is useful in learning centers and with other collaborative instruction.

Figure 5. Children using stereoscopes in a classroom. Keystone View Company, reproduced in Anna Verona Dorris, *Visual Instruction in the Public Schools* (New York, 1928), p. 150.

A criticized practice with stereo views is that a set of stereoscopes is distributed to the class during recitation. With a minute signal, the teacher tells students to pass the stereoscope to the next student. Several teacher educators claim that this method allows an entire class of twenty to view twenty images in twenty minutes. Dorris (1928, 139) disproves of this method, claiming that the first two laws of learning are violated as the traveling stereoscopes fatigue the students. Additionally, students cannot attend to the recitation. She believes no average student is able to retain the passing pictures and respond to the oral discussion at the same time. Dorris (1928, 140) further states that students are exposed to too many images; thus, real thinking and reflection are not possible.

Dorris (1928, 141) went on to say that stereoscopy was an entirely new experience for most children and suggested effective methods to introduce and guide pupils' attention at lower, upper, and opportunity (aka special education) levels. The suggestions were considered pedagogically sound and would increase the effectiveness of classroom use.

To properly introduce the stereoscope, the teacher was to explain using the scope with proper lighting, direction of light, carrier adjustment, obtaining the full stereoscopic experience and small-group use so that everyone could see the device. Dorris (1928, 140-152) explained that teachers should be trained to interpret visually the imagery as if they were walking right into the foreground or reaching out to touch the observed object. Doing so would help students interpret images.

All teaching methods used for stereo views with pupils were to guide learners to important information in the images. While Dorris stated that the medium could not replace books, she suggested that stereo views would better demonstrate real-life situations as opposed to artists' interpretations contained in textbooks. In order to guide students, a set of questions was to be prepared in advance for each viewed image. For example:

Viewing a stereograph of the Giant Hippopotamus at the Zoo P 78 (Figure 6)

1. How much do you think the hippopotamus weighs?
2. Does the hippopotamus have hair?

Study carefully the expression on the face.

3. Do you think the hippopotamus is concerned with the man? Why or why not?

4. In what season was the picture taken? Is there anything that the hippopotamus is doing that would give you a clue?

Figure 6. Keystone View Company, Meadville, PA, number P78, Giant Hippopotamus at the Zoo, c. 1920. Copyrighted Underwood and Underwood, Inc.

For upper grades a suggested activity would be to arrange four stereoscopes on a table, which students could use during study period. The questions and additional visual supports would be available to help students answer questions and experience the information. During the recitation period, each pupil who had studied the stereo views, read the textbook, and examined the exhibits would explain the content.

At the primary level, only one stereo view would be used in conjunction with an exhibit and/or primer. The teacher would use the stereo view to better visualize an aspect in a story such as a child falling from a boat. A stereo view of a boat on deep water would illustrate the extreme danger of such a mishap (Figure 7). The teacher would have the child review the stereo view and then close his or her eyes to focus only on the image that was seen.

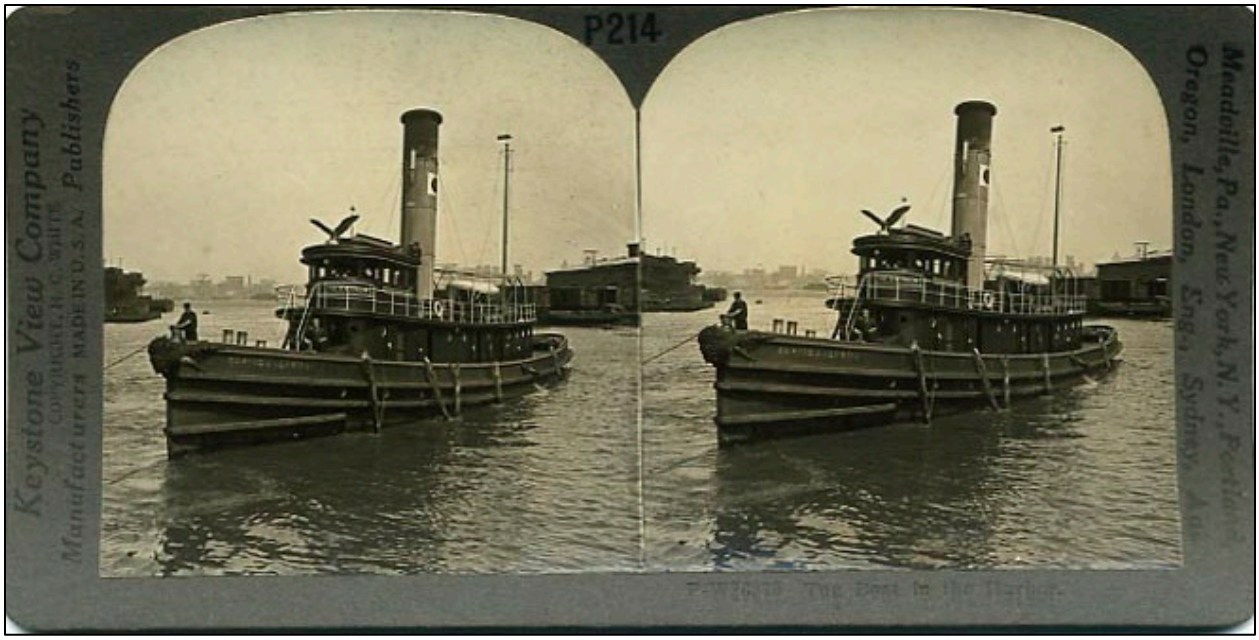

Figure 7. Keystone View Company, Meadville, PA, number P214, Tugboat, c. 1920. Copyrighted H.C. White.

Last, Dorris (1928, 147) discussed the opportunity class (similar to today's special education classes). She stated that using stereo views can stimulate "defective" children to interest them and encourage a possible result of purposeful activity. She suggested that a child looking at stereo views of African animals could be motivated to read *Wild Animals I Have Known* and later illustrate what he or she had experienced.

Other methods for stereo views were used in the early schools but not aligned with the *laws of learning* as discussed by Dorris. A variation of the classroom pass and one-minute viewing, was one- and two-row passing. Since not every classroom had a set of scopes, every other row or pairs of rows shared stereo views back and forth. The teacher would break the minute into two 20-second intervals requiring the students to focus attention, one image element at a time, before passing the scope. Questions would be answered one at a time (Keystone 1917, xiii-xviii).

Another method was called the "double desk study" in which students seated in double desks (two pupils, figure 8) would exchange roles in reading the back of the stereo view while the other viewed and vice versa. One student would improve oral reading and fluency while the viewing student would improve listening skills. When the scope was exchanged, the students would reinforce each other's understanding and reflect on questions.

Figure 8. Oak and cast iron Buffalo NY vintage school double seat desk, c. 1900, on display at Concord Schoolhouse, New Alexandria, PA, 2011.

Still another method was when a group of students recreated the stereoscopic image seen in the view as "dramatizations." This method required reflection and careful study of the stereo view to replicate the scene or event. Using more than one related stereo view, pupils would put action into the scenes. Stereograph sets often told a story in a sequence of images, thus connecting them for better retention (Keystone 1917, xiii-xviii). A variation of this strategy, called "hiking reports," required students to study the stereographs and report with the clarity of the actual visit as if they were on a hike. The student was required to visualize him or herself as a part of the scene (Keystone 1917, 264).

In the lower grades, teachers had a child recite what he or she saw in the image (Keystone 1917, xiii-xviii). The class wrote about what was being said to practice dictation and handwriting. A variation of this was to have students write in the past tense or on the chalkboard so the entire class could correct grammar, word choice, spelling, etc. A second use introduced vocabulary by having young children view an image and then recite words associated with the stereograph to increase vocabulary, coding the words into memory. Many strategies used the stereograph to create spelling lists that were generated from the images of what the pupil saw (Keystone 1917, 269-277).

Finally, as independent study for older children with access to stereoscopes, "home study" could be assigned. With this method, the student was assigned a stereo view to examine and report on the next day. This would be similar to what would happen during study hour in the classroom, but would require the student to organize his or her thoughts independently of the

classroom. A popular assignment for home study was to investigate a trade, and then write a letter to the employer about the manufacturing process, business, etc. This method helped older students prepare for the workforce (Keystone 1917, 264; 393).

Since the medium of stereo views was relatively short lived before the use of film, little was written on the above methods. In many cases, teacher preparation did not discuss stereo views because it was believed to be a quickly fading fad. The National Education Association, as a subcommittee under the Department of Science Instruction, formed the Committee on Visual Instruction in 1913-1914 (NEA 1915, 93). The purpose of the committee was to improve nationwide visual instruction since it was apparent that practicing classroom teachers were not adopting visual methods. It became evident that while stereo views were proven to be effective in the classroom, teachers were not adopting the media, largely because they did not know how to use the material (Stitt, 1916, 124). Stitt and others claimed that without the use of visual instruction tools such as the stereoscope, many teachers over explained, becoming human phonographs, and too often talking children almost to death (Stitt 1916, 124).

Stereographs and Stereoscope Access and Affordability

Country schools that desired to introduce stereo views sometimes partnered with county libraries to borrow small sets. This practice was common in California where nearly every county library had sets that were aligned to geography, history, and nature study (Dorris, 1923, 149). However as mentioned earlier, the majority of teachers in the 1900s did not appreciate the value of or did not have the training to effectively incorporate stereo views into their instruction. Common criticisms that gave schools reasons for not embracing stereoscopy came from traditionalists and artists' communities. It was universally known that fine-art photographers and their patrons were against the use of stereographs because the image required a viewing device, and trained photographers often did not take the images. This perhaps gave teachers and principals several reasons to think that it was merely a commercially driven initiative that lacked quality due to the entertainment value of the media. School boards, consisting of community members, often asserted that the dimensionality of the image was a novelty without educational significance beyond that which could be provided by traditional prints (Earle 1979, 99).

Upon school consolidation, many stereo view resources were moved to school libraries that served all classrooms. This was done to reduce the expense of buying multiple sets and transporting them to schoolhouses. While in theory this seemed to offer resources economically, Dorris recommends that teachers have their own stereo views on demand to supplement their curriculum. It was also recommended that every classroom have twelve stereoscopes so that a multi-graded classroom would have two or three per grade (Dorris 1923, 150). In 1923, the cost of a stereo view was $.24 cents for gray scale and $.60 cents for color, with the cost of a stereoscope being $1.75 (Dorris 1923, 437). In today's market, the $1.75 of 1923 has the same buying power as $23.78.

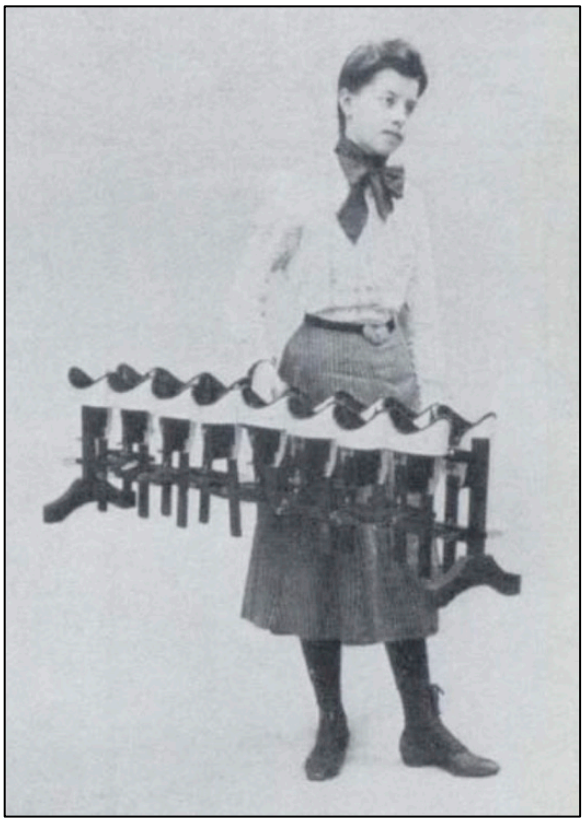

Figure 9. Brass trimmed 16 stereoscope rack for the schoolroom, c. 1908, reproduced in Paul Wing, *Stereoscopes: The First Hundred Years* (Nashua, NH, 1991), p. 156.

Figure 10. Children using stereoscopes during study period. Keystone View Company, reproduced in Anna Verona Dorris, *Visual Instruction in the Public Schools* (New York, 1928), p. 150.

End of the Stereograph and the Early Visual Instruction Movement in America

Stereo views in education made instruction visually interesting and culturally educational. They were the most universally distributed photographic instructional system (Speer 1989, 302). By the late 1930s and 1940s, the visual tool began to vanish from the schoolroom as the visual instruction era began to decline (Saettler 1990, 167). The decline was attributed to new image systems and a desire for active over passive participation. The rise of the automobile reduced the interest in stereo views, as people could drive to visit many locations (Speer 1989, 302).

The early visual instruction movement in America was thought to begin in 1906 with the introduction of the Keystone View Company Education Department's teacher's manual *Visual Education* (Saettler 1990, 123). It focused beyond use of lantern-slides and stereographs and included moving pictures, maps, charts, models, blackboards, illustrations in reading books, souvenir postcards, pictures from magazines and newspapers, school exhibits, museums, clay-modeling and sand-trays, homemade science, and art galleries or library visits in schools (Stitt 1916, 124). The early era transformed into a middle era when motion pictures and film became readily assessible and teacher training became formalized around the end of the 1940s. The entire visual instruction movement is said to have ended by the 1950s (Saetter 1990, 167). The Keystone View Company continued selling sets and scopes until 1939. While it still sold stereographs to individuals, there was no further production for education. The company ceased all production in the 1970s (Darrah 1977, 51). While the movement and the company ended, much of what was offered to teacher education still is used today.

Conclusion

From today's educational perspective, it is surprising how a visual medium such as stereoscopy is nearly non-existent as compared to 100 years ago. The technological theories to produce the third dimensional imagery, stereographs, and scopes were as novel then as they are

today. One can argue that the unique, simple, and captivating instructional media of stereo views used with pupils of the 1900s could rival the modern classrooms of interactive whiteboards, mobile technologies, and computers. No electricity, portability, simple operations, and immediate access are benefits that both twentieth and twenty-first century teachers desire when working with large groups, complex curricula, and diverse learners.

It was believed that the fascination of the stereoscopic images could educate and draw learners into greater depths of understanding. Underwood and Underwood and the Keystone View Company capitalized on the medium and offered a wide selection of images that would virtually transport learners to foreign places, learn trades, and experience culture. These experiences were unthought-of for small American country school children until Dr. Holmes invented the hand-held stereoscope. Once the simplicity and the reduced cost of the media were introduced, the teacher preparation manuals and the committees for visual instruction took on the task of transforming lecture-heavy classes to visually-rich settings encouraging pupils to reflect on and investigate concepts. This is similar to the twenty-first century theories of teaching in which learners are encouraged to deepen their understanding through several modalities.

As with most instructional technology, evolving media advancements are blamed for the demise of older media. Stereoscopy is different. In today's classrooms, the use of virtual experiences is still considered valid. New advancements in augmented realities have started to emerge as the twenty-first century stereoscope. However, the same issues of teachers with limited knowledge and desire to integrate three-dimensional imagery remain. Nevertheless, using the methods once suggested for stereo views can be reapplied to today's three-dimensional classroom augmented reality. While we may have forgotten the companies and educators who pioneered stereoscopy, their theories and ideas remain valid.

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