EDITORIAL

3D in the Classroom: See Well, Learn Well

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Editor

The 3Ds of Viewing 3D[a]

- **D**iscomfort [Since 3D viewing is based on the eyes converging in front of or beyond the screen, viewing 3D images can potentially create eyestrain and headaches.]
- **D**izziness [3D technology can exaggerate visual motion hypersensitivity (VMH), which can cause motion sickness, and vergence-accommodation conflict, causing individuals to feel dizzy or nauseous during or after viewing 3D content.]
- Lack of **D**epth [A viewer lacking binocular vision, simply won't see 3D. While this doesn't pose any problem viewing the screen, it serves as a "vision screening" that something is abnormal with the viewer's binocular vision.]

[a]*Adapted from the American Optometric Association's "The 3Ds of Viewing 3D"*

Keywords: 3D, 3dathome, 3deyehealth, 3d vision syndrome, classroom, convergence insufficiency, vision related learning problems

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It all started around 300 BC when Euclid first observed that each eye sees an image from a slightly different perspective. Italian Maestro, Leonardo da Vinci in the 1500's then realized that having two eyes gave us a sense of depth and an ability to perceive distance. Later in the 1800's Sir David Brewster (of the Brewster Stereoscope fame), Sir Charles Wheatstone (of the Wheatstone Stereoscope fame) and American jurist, author and inventor, Oliver Wendell Holmes (who brought 3D to the masses with his inexpensive Stereopticon) made it possible for many to experience simulated 3D images.

As our fascination with the 3D images created by advances in technology continued, the first feature length 3D movie (The Power of Love) was shown in 1922 while the first 3D television was invented by John Logie Baird in 1928. It wasn't until the 1950's that the inaugural Golden Age of 3D burst upon the big screen with *Bawana Devil,* a full length feature film directed by Arch Oboler and starring Robert Stack, Barbara Britton and Nigel Bruce. About 2 years later, the film *Dial M for Murder* by Alfred Hitchcock was seen by thousands. Many critics and moviegoers alike thought this movie to be the best 3D film ever made even with Hitchcock's significant resistance to using 3D techniques in this movie.

3D movies during this time often used anaglyph techniques as more of a gimmick than story telling enhancement. Vincent Price, an actor famous for his "scary" movies were always fun, but *The House of Wax* in 3D was even more so. Other movies of a similar vein included the original *13 Ghosts* and *The Mask.* These were usually fun to watch, sometimes scary, but seldom considered as a "serious" film genre.

Everything changed, when in 2009, David Cameron's *Avatar* literally exploded on the big 3D movie screen. This movie almost single-handedly brought to the world the next Golden Age of 3D viewing. The technology had improved to the level so that it did not interfere with the telling of the story, but rather enhanced the overall moviegoing experience.

Hundreds of 3D movies have now been produced, many with great stories to tell. (Unfortunately, all too often these stories were told badly and created with 3D technology that made the viewing experience less than desirable.)

This new Golden Age of 3D, however, has provided an innovative, fascinating, inexpensive, expansive and fun way to highlight a major public health problem that has been ignored for decades. The American Optometric Association's (AOA) publication, *3D in the Classroom: See Well, Learn Well* and their multiple seminars and webinars, Internet webpages, AOA television programs, other public relations efforts and doctor 3D Practice Kits are telling the story that the College of Optometrists in Vision Development could not have told quite so successfully for decades to come.

We have known since the time of Skeffington and Alexander, when in 1928 they formed the Optometric Extension Program Foundation (OEPF), that vision is learned. It has also been known to those of us in OEPF and the College of Optometrists in Vision Development (COVD) that *3D has been in the classroom all along, we just called it binocular vision!*

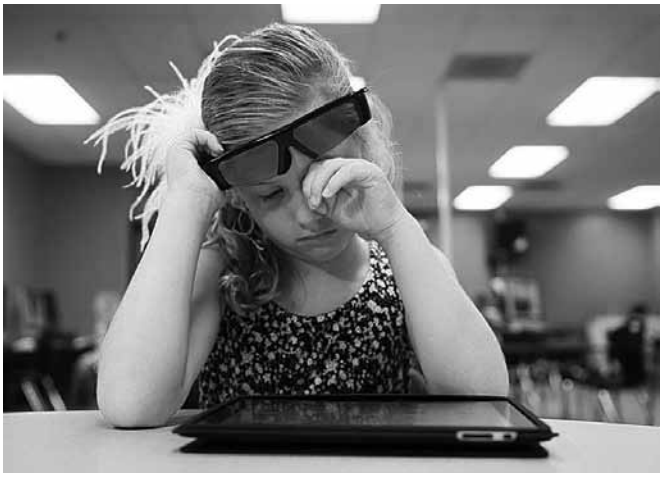
> *"… If students are currently at a disadvantage if they have a binocular vision dysfunction, what will happen when simulated 3D movies and interactive educational tools become commonplace…?"*

A disruption of 3D (AKA binocular vision function) is associated with a host of symptoms and signs that impede whatever the individual wants to do. The American Optometric Association notes that if you experience ***The 3Ds of Viewing 3D: Discomfort, Dizziness and lack of Depth*** you should (and this is where I put in the 4th D) see your **Doctor of Optometry** if you experience any of the above. (An appropriate fifth "D" that should be added might be to See a ***Fellow of COVD!)***

Over the decades vision problems have been shown to be associated with academic difficulties that include reading disabilities and dyscalculia.[1,2,3,4] The research also shows that if these vision problems are addressed, academic performance improves.[5] Although some of those in education, psychology and medicine refuse to accepted the presence of a vision based learning problem, the research usually demonstrates that vision does play a vital role in the educational process and if these various functional vision disorders are treated not only does academic performance improve[6,7,8,9] but as an added bonus symptoms are eliminated.[10,11,12,13] Even children with severe genetic anomalies can show improved reading ability by enhancing accommodative functioning with the application of bifocals.[14]

Many elementary schools, high schools, colleges and graduate programs are now incorporating 3D into their curriculum. These schools are also taking a close look at procedures and outcomes. If you are not familiar with the use of simulated 3D as a part of the educational process, you should consult the various 3D classroom research[15] and industry case studies now available[16] as well as, visit the Future Talk 3-D blog of Len Scrogan.[17] Mr. Scrogan is a digital learning architect, past Director of Instructional Technology for the Boulder Valley School District, Adjunct Professor for the University of Colorado-Denver and Lesley University and educational technology speaker and consultant. He also was an AOA team member with me on the 3D in the Classroom project. When I have a question about education, teaching and how students learn within a classroom involved in the 3D simulated experience, I always seek out his advice.

Schools at all levels of education are using "spatial thinking" and 3D to improve the educational experience and outcomes.[18] Early research[19,20] suggests that children learn better when the educational programs



Child with eyestrain while using 3D in the classroom. Photo courtesy of the American Optometric Association.

incorporate various 3D technologies. If students are currently at a disadvantage if they have a binocular vision dysfunction, what will happen when simulated 3D movies and interactive educational tools become commonplace within the educational environment? Will the end result be more students who fail?

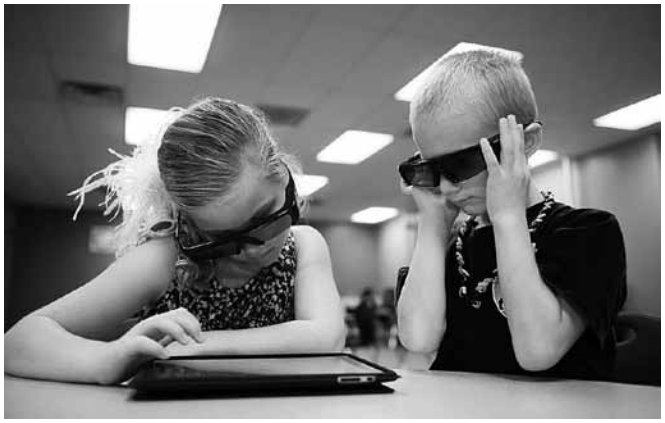
The utilization of 3D within the academic environment generates many questions including:

1. Will some educators, psychologists, pediatricians and ophthalmologists continue to say vision has nothing to do with learning?
2. Will those with dysfunctional simulated 3D abilities grow up to be adults with problems associated with learning and any work environments that uses simulated 3D?
3. Will there be enough optometrists to diagnose and treat those with classroom related, simulated 3D anomalies?

I certainly do not have all the answers that must be sought by the questions posed above, but here's what may occur:

"… 3D has been in the classroom all along, we just called it binocular vision!"

Those who believe that vision has nothing to do with learning will continue to do so until their research funding dies off from lack of support.



Children enjoying 3D learning in the classroom. Photo courtesy of the American Optometric Association.

Research supports the concept that those adults who had problems as children, have problems as adults. This tends to be true no matter the area of concern[21,22] including vision dysfunction.[23]

Will we have enough doctors trained to diagnose and treat the functional vision disorders often at the core of learning related vision problems and those that will cause major issues for educating within the simulated 3D environment? That question is somewhat more difficult to answer.

Here's what I suspect will happen if current trends continue.

1. The Optometric profession will continue to expand its scope. This will finally include a mandate for all specialty areas to have a residency and board certification associated with the speciality.
2. Even before residencies in general are mandated, our pediatric/binocular vision/vision therapy/rehabilitation residency programs will increasingly include not only academic based institutions, but also high level pediatric, binocular vision and optometric vision therapy private practice based situations.
3. A small but significant number of previous "It's all about the pathology" doctors will realize that all though pathology is important: vision function, improving outcomes and being able to give our patients a better quality of life will become paramount within their approach to patient care. These individuals will be the functional vision evangelists for the 21st century and beyond.
4. Optometry students will, over time, tend to gravitate towards the side of the profession that is more people oriented and less towards the model of "patient as the disease" approach to care.
5. Various professions, such as those involved in occupational therapy, physical therapy, athletic kinesiology and others concerned with neurorehabilitation; will give

their patients the care they must have if we do not do so. Optometrists and these professions should work together without any detrimental turf battles interfering with appropriate care.

Although this editorial started out about the creation and the evolving use of simulated 3D, it ended up where we as a profession really began. This initial starting point, and now a new imperative for the profession as a whole, is the importance of single, clear, comfortable, binocular, and pathology free vision.

Use all the resources now being made available to you by our American Optometric Association (AOA) to tell your patients and others about the importance of 3D vision. Let all you know that binocular vision dysfunction is a major public health concern that must be addressed, diagnosed and treated. Support the AOA so they can support you.

Use the resources of the Optometric Extension Program and the College of Optometrists in Vision Development to help tell this story as well. Go to your schools and colleges of optometry, and tell them how important 3D is for the welfare, individual and economic success of our patients at all age levels. Personally and fiscally support your school and college of optometry, so that they can do the research that provides a solid base for the diagnostic and therapeutic approaches we use.

It is an incredible time to be practicing functional optometry. The appropriate supportive science is there. The acceptance of what we do by our patients is growing, in fact, many of our patients deliberately seek us out because we are the only ones that can provide the care they need.

As always, organized medicine continues to say NO (if it hurts to watch a 3D movie do not watch a 3D movie); while optometry is the profession of YES (if it hurts, we can fix it and YES, then you can watch your 3D movie).

Use all the resources available so that you can be that doctor who says, YES!

Resources

Note: In the online version the following underlined lines of text are functional hyperlinks to internet addresses.

You Can Help Your Patients See 3D![24]

3D Vision Eye Health Symposium Highlights[25]

Experts Explain 3D[26]

Kids @ Play 3D Moms Consumer Electronics Show 3D[27]

3-D TV and Movies Look to Attract Viewers But Not Everyone Can 'See' What All the Hype is About[28]

What is 3D Vision Syndrome?[29]

The AOA 3D Practice Kit[30]

Exploring a New Dimension[31]

3Ds of Stereoscopic 3D Viewing[32]

Optometrists describe effects of 3D viewing on eye health[33]

The Visual System and Virtual 3D[34]

3D: The User Experience Story[35]

3D TV & Movies May Reveal Hidden Vision Problems[36]

AOA Spokesperson discusses 3 D Vision Syndrome[37]

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See Toni Bristol's practice management article in this issue of *Optometry & Vision Development, Bristol T. 3D Technology: Increasing the Need for Optometric Vision Therapy. Optom Vis Dev 2011;42(4):237-238,* for additional information on all the tools now available for the optometrist so that you can communicate to all how to diagnose and treat and/or refer the disorders of binocular vision often found with those who have difficulty viewing 3D content.

Acknowledgements

New JRB Member

OVD is pleased to announce that Patrick Quaid, BSc(Hons)Optom, PhD, FCOVD is now a member of our Journal Review Board. Dr. Quaid is in private practice in Guelph, Ontario Canada, an Adjunct Clinical Lecturer at the University of Waterloo, School of Optometry, a Research Associate Mount Allison University, Dept. of Mathematics and Computing, New Brunswick and a Member of College of Optometrists of Ontario Quality Assurance Committee. In 2011 he completed his Fellowship in COVD. He has published several articles including Diagnosing Extraocular Muscle Dysfunction in Clinic: Comparing Computerized Hess analysis and a Novel 3-step Method in *Optometry & Vision Development.* His many other publications have appeared in *Ophthalmic and Physiological Optics, Vision Research,* and *Optometry & Vision Science.* Please welcome Dr. Quaid as a new Fellow of COVD and member of the JRB.

Thank You Dr. Wright

Dr. Mark Wright has resigned from his position as editor of the Practice Management section of OVD. Mark has done an excellent job in this position and has always written the most timely articles on how we can keep our practices thriving. Thank you Mark for all you have done for OVD!

Correction

In the article, Lawton, T. Improving magnocellular function in the dorsal stream remediates reading deficits. Optom Vis Dev. 2011;42(3):142-154, the correspondence information should be emailed to: tlawton@cs.ucsd.edu or sent to Dr. Teri Lawton, P.O. Box 2206, Del Mar,CA 92014. (www.pathtoreading.com and www.pathtoinsight.com).

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