

EFFECTIVENESS OF K–12 ONLINE LEARNING

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Meta-Analyses of Research in K–12 Online Learning

In recent years, five meta-analyses have included data from studies of K–12 distance education. These studies attempt to answer the question about whether K-12 distance education is effective for fostering student learning in comparison to classroom learning.

1. Cavanaugh's (2001) meta-analysis looked at the range of distance technology used at the K–12 level. The results indicated that achievement between distance and classroom programs could be considered equivalent. The online programs showed higher effect sizes than the audio/videoconferencing programs.
2. The Shachar and Neumann (2003) synthesis found a significant positive effect for K-adult distance education programs, noting that, "in two thirds of the cases, students taking courses by distance education outperformed their student counterparts enrolled in traditionally instructed courses".
3. Ungerleider and Burns (2003) restricted their analysis to networked and online distance education programs at the secondary level and the postsecondary level. No significant difference was reported for student achievement, and a small positive effect size was found for satisfaction in classroom courses.
4. The meta-analysis of 232 studies of online and video-based learning in K–12 and postsecondary students by Bernard, et al. (2004) resulted in a small positive effect size for achievement in online learning, although online learners had lower retention rates.
5. The single meta-analysis that focused solely on the K–12 online learning delivery systems in use in today's virtual schools was by Cavanaugh, Gillan, Kromrey, Hess, and Blomeyer (2004). This synthesis found once more that achievement in online and classroom programs was approximately equivalent.

While distance and classroom learning appear to be equally effective, they are different and equally complex, serving different populations using different strategies and methods.

Research on Features of K-12 Online Education

Student characteristics. Rates of successful completion of distance education courses have improved over time as course design, instructional practice, support services, and student screening have been refined. Virtual schools provide a quality learning experience to a more "bimodal" range of students than do most traditional schools, attracting large proportions of students who are academically accelerated and students who have not been successful in face to face courses (Barker & Wendel, 2001). Successful online students are motivated, independent, self-directed (Weiner, 2003). Those students who learn when presented with sound logical theories to consider seem to perform better than students who rely upon 'hands on' experience to learn (Barbour & Cooze, 2004; Cooze & Barbour, 2007). They enjoy technology, have strong language skills, and are visual learners; they also have consistent parent support and are involved in non-academic activities (Roblyer & Marshall, 2003). They have positive attitudes and are willing to ask for help. Extroverted students are often more successful in socially interactive courses, while more introverted students tend to succeed in self-paced courses.

Instructional factors. Online students value frequent and timely responses to questions (Weiner, 2003). Communication with and feedback from instructors has been identified as the most valuable aspect of online courses (Smouse, 2005). Simultaneous use of a number of teaching and communication tools in online courses enables group collaboration, one-to-one coaching, oral practice, and other strategies that compensate for the lack of visual cues online (Murphy & Coffin, 2003; Nippard, 2005). Many online students value inter-student communication within courses (Zucker, 2005). There are many best practices

within the virtual school community, however, these are usually isolated to examples from individual virtual schools or individual teachers within a specific virtual school (Barbour, 2007a).

Course design factors. Effective online instructional strategies include collaborative project-based design (Barman, et al., 2002), clear expectations, concrete deadlines with some flexibility, outlines of course requirements, time sheets, study guides, a meaningful curriculum, and rich interactive collaboration among students and teachers (Weiner, 2003). A combination of flexibility, independence, and experience with online tools has been associated with improved critical thinking, research, and computer skills (Barker and Wendel, 2001). As virtual school opportunities continue to expand to a wider range of K-12 students, it will be important that courses are straightforward and consistent in their design, provide clear instructions and expectations, and make use of appropriate media (Barbour, 2005; 2007b).

Teacher preparation and professional development factors. Professional development for online teachers has been shown to have an effect on online and classroom-based teacher ability and on student perceptions (Zucker & Kozma, 2003; Lowes, 2005). Student perceptions of their learning environment may be related to the amount of professional development their teachers receive in technology (Hughes, McLeod, Brown, Maeda, & Choi, 2005). Teacher technology skill was identified as a significant factor affecting student success (Kapitzke & Pendergast, 2005). Professional development is required for at least three major roles in Virtual Schooling: VS teacher, VS facilitator, and VS designer. All preservice teachers would benefit from preparation as VS facilitators able to support students in their K-12 school who are learning from a VS teacher. (Harms, Niederhauser, Davis, Roblyer, & Gilbert, 2006) This also fits with a systems perspective of distance education

Technological approaches. Simulations, manipulatives, online tutoring and tutorials that offer student feedback can increase performance, decrease failure, and provide students with visual and cognitive support they need to master abstract concepts (Cavanaugh, Bosnick, Hess, Scott, & Gillan, 2005; Chen, Toh, & Ismail, 2005; Schiel, Dassin, de Magalhaes, & Guerrini, 2002).

Administrative practices. Student support services are considerable contributors to their increasing course completion rates (Good, 2005; Harlow & Baenen, 2003; Clark, Lewis, Oyer, & Schreiber, 2002). Mentors, on-site support staff, counseling, and technical support result in positive outcomes for students, while fine-grained views of data can inform teaching practice (Dickson, 2005).

For more information:

- Learning Point Associates, <http://www.ncrel.org/tech/>
- Michigan State University distance learning research database <http://ott.educ.msu.edu/literature/>
- *What Works in K-12 Online Learning*, ISTE, 2007
- *Handbook of Distance Education*, Erlbaum, 2007

References

- Barbour, M. K., & Cooze, M. (2004). All for one and one for all: Designing web-based courses for students based upon individual learning styles. *Staff and Educational Development International*, 8(2/3), 95-108.
- Barbour, M. K. (2007). What are they doing and how are they doing it? Rural student experiences in virtual schooling. Unpublished dissertation, University of Georgia.
- Barbour, M. K. (2007b). Teacher and developer perceptions of effective web-based design for secondary school students. *Journal of Distance Education*, 21(3), 93-114. Retrieved on June 8, 2007 from <http://www.jofde.ca/index.php/jde/article/view/30>

- Barbour, M. K. (2005). The design of web-based courses for secondary students. *Journal of Distance Learning*, 9(1), 27-36.
- Barker, K., & Wendel, T. (2001). *E-learning: Studying Canada's virtual secondary schools*. Kelowna, BC: Society for the Advancement of Excellence in Education.
- Barman, C., Stockton, J., Ellsworth, M., Gonzales, C., Huckleberry, T., & Raymond, S. (2002). Evaluation of the soar-high project: A Web-based science program for deaf students. *American Annals of the Deaf*, 147(3), 5-10.
- Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E., Wade, A., Wozney, L., Walseth, P. A., Fiset, M., & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*, 74(3), 379-439.
- Cavanaugh, C. (2001). The effectiveness of interactive distance education technologies in K-12 learning: A meta-analysis. *International Journal of Educational Telecommunications*, 7(1), 73-78.
- Cavanaugh, C., Bosnick, J., Hess, M., Scott, H., & Gillan, K. (2005). Succeeding at the gateway: Secondary algebra learning in the virtual school. Unpublished manuscript.
- Cavanaugh, C., Gillan, K., Kromrey, J., Hess, M., & Blomeyer, R. (2004). The effects of distance education on K-12 student outcomes: A meta-analysis. Naperville, IL, Learning Point Associates. Retrieved January 21, 2006, from <http://www.ncrel.org/tech/distance/k12distance.pdf>
- Chen, C., Toh, S., & Ismail, W. (2005). Are learning styles relevant to virtual reality? *Journal of Research on Technology in Education*, 38(2), 123-140.
- Clark, T., Lewis, E., Oyer, E., & Schreiber, J. (2002). Illinois Virtual High School Evaluation, 2001-2002. Retrieved January 21, 2006, from <http://www.ivhs.org/index.learn?action=other#year1evaluation>
- Cooze, M., & Barbour, M. K. (2007). Learning styles: A focus upon e-learning practices and pedagogy and their implications for successful instructional design. *Journal of Applied Educational Technology*, 4 (1). Retrieved July 2, 2007 from http://www.eduquery.com/jaet/JAET4-1_Cooze.pdf
- Dickson, W. (2005). Toward a deeper understanding of student performance in virtual high school courses: Using quantitative analyses and data visualization to inform decision making. In R. Smith, T. Clark, & B. Blomeyer, (Eds.), *A synthesis of new research in K-12 online learning* (pp. 21-23). Naperville, IL: Learning Point Associates.
- Good, D. (2005). Colorado online learning final evaluation report, 2002-2005. Retrieved January 21, 2006, from <http://www.col.k12.co.us/aboutus/evalreports/COLFinalRptYear3.pdf>
- Harlow, K., & Baenen, N. (2003). Novanet student outcomes. Eye on evaluation, E & R Report No. 02.15. Retrieved January 21, 2006, from http://www.wcpss.net/evaluation-research/reports/2002/0215_novanet.pdf
- Harms, C.M., Niederhauser, D.S., Davis, N.E., Roblyer, M.D., & Gilbert, S.B. (2006). Educating educators for virtual schooling: communicating roles and responsibilities. *Electronic Journal of Communication*, 16 (1&2) [online].
- Hughes, J., McLeod, S., Brown, R., Maeda, Y., & Choi, J. (2005). Staff development and student perception of the learning environment in virtual and traditional secondary schools. In R. Smith, T. Clark, & B. Blomeyer, (Eds.), *A synthesis of new research in K-12 online learning* (pp. 34-35). Naperville, IL: Learning Point Associates.
- Kapitzke, C., & Pendergast, D. (2005). Virtual schooling service: Productive pedagogies or pedagogical possibilities? *Teachers College Record*, 107(8), 1626-1651.
- Lowes, S. (2005). Online teaching and classroom change: The impact of virtual high school on its teachers and their schools. In R. Smith, T. Clark, & B. Blomeyer, (Eds.), *A synthesis of new research in K-12 online learning* (pp. 24-26). Naperville, IL: Learning Point Associates.
- Murphy, E., & Coffin, G. (2003). Synchronous communication in a Web-based senior high school course: Maximizing affordances and minimizing the constraints of the tool. *The American Journal of Distance Education*, 17(4), 235-246.
- Nippard, E. C. (2005). Social presence in the web-based synchronous secondary classroom. Unpublished thesis, Memorial University.

- Roblyer, M., & Marshall, J. (2003). Predicting success of virtual high school students: Preliminary results from an educational success prediction instrument. *Journal of Research on Technology in Education*, 35(2), 241–255.
- Schiel, D., Dassin, J., de Magalhaes, M., & Guerrini, I. (2002). High school physics instruction by way of the World Wide Web: A Brazilian case study. *Journal of Interactive Learning Research*, 12(4), 293–309.
- Shachar, M., & Neumann, Y. (2003). Differences between traditional and distance education academic performances: A meta-analytic approach. *International Review of Research in Open and Distance Education*, 4(2). Retrieved January 21, 2006, from <http://www.irrodl.org/index.php/irrodl/issue/view/16>
- Smouse, T. (2005). Students with either specific learning disabilities or attention deficit hyperactivity disorder: Perceptions of self as learning in online courses at Florida Virtual School and in the traditional learning environment. Unpublished dissertation, University of Central Florida.
- Ungerleider, C., & Burns, T. (2003). A systematic review of the effectiveness and efficiency of networked ICT in education: A state of the field report. Council of Ministers Canada and Industry Canada. Ottawa: Industry Canada.
- Weiner, C. (2003). Key ingredients to online learning: Adolescent students study in cyberspace. *International Journal on E-Learning*, July–September, 44–50.
- Zucker, A. (2005). A study of student interaction and collaboration in the virtual high school. In R. Smith, T. Clark, & B. Blomeyer (Eds.), *A synthesis of new research in K–12 online learning* (pp. 43-45). Naperville, IL: Learning Point Associates.
- Zucker, A., & Kozma, R. (2003). *The virtual high school: Teaching generation V*. New York: Teachers College Press.