50 'Negative' studies that demonstrate computers impair learning

Reference	Notes
Aguilar-Roca, N. M., Williams, A. E., & O'Dowd, D. K. (2012). The impact of laptop-free zones on student performance and attitudes in large lectures. *Computers & Education*, *59*(4), 1300-1308.	University students who take notes using a laptop during lecture scored significantly lower than students who took notes by hand.
Alpert, W. T., Couch, K. A., & Harmon, O. R. (2016). A randomized assessment of online learning. *American Economic Review*, *106*(5), 378-82.	Students who took an online course scored 5 to 10 points lower on final exam than students who took same course in a face-to-face format.
Angrist, J., & Lavy, V. (2002). New evidence on classroom computers and pupil learning. *The Economic Journal*, *112*(482), 735-765.	After 8-years of using computer-aided instruction within Israeli schools, there was no discernible educational benefit.
Beland, L. P., & Murphy, R. (2016). Ill communication: technology, distraction & student performance. *Labour Economics*, *41*, 61-76.	Academic performance significantly increased following the ban of cell phones in schools.
Belo, R., Ferreira, P., & Telang, R. (2013). Broadband in school: Impact on student performance. *Management Science*, *60*(2), 265-282.	Increased internet use in schools (via increased broadband speeds) leads to significantly lower exam scores.
Bernard, R. M., et al. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of educational research*, *74*(3), 379-439.	A meta-analysis reveals students in a synchronous online class perform worse than students in the synchronous face-to-face version of that class.
Bettinger, E. P., Fox, L., Loeb, S., & Taylor, E. S. (2017). Virtual classrooms: How online college courses affect student success. *American Economic Review*, *107*(9), 2855-75.	Students in online courses perform significantly worse and show higher drop-out rates than students in the same face-to-face courses.
Campuzano, L., Dynarski, M., Agodini, R., & Rall, K. (2009). Effectiveness of Reading and Mathematics Software Products: Findings From Two Student Cohorts. NCEE 2009-4041. *National Center for Education Evaluation and Regional Assistance*.	After a year of using computer learning software, there was no discernible benefit on student learning and, in some cases, impaired learning compared to traditional methods.
Carter, S. P., Greenberg, K., & Walker, M. S. (2017). The impact of computer usage on academic performance: Evidence from a randomized trial at the United States Military Academy. *Economics of Education Review*, *56*, 118-132.	Students who use a laptop during class time (for notes and/or research) perform significantly worse than students who do not use computers.
Chingos, M. M., Griffiths, R. J., & Mulhern, C. (2017). Can low-cost online summer math programs improve student preparation for college-level math? Evidence from randomized experiments at three universities. *Journal of Research on Educational Effectiveness*, *10*(4), 794-816.	Students who used a computerized program for math tutoring during summer hours did not demonstrate improved math scores the following year – regardless of number of hours used.
Cristia, J., Ibarrarán, P., Cueto, S., Santiago, A., & Severín, E. (2012). Technology and child development: Evidence from the one laptop per child program.	15 months of a 'one-laptop-per-child' intervention across 319 Peruvian schools demonstrated no discernible impact on learning or academic achievement.
Daraban, B. (2015). Possible Negative Consequences of Student Laptop Use in the College Classroom: An Empirical Evaluation. *International Information Institute (Tokyo). Information*, *18*(8), 3439.	Students who use a laptop during class time (for notes and/or research) demonstrate significantly lower participation and learning than students who do not.
Dynarski, M., Agodini, R., Heaviside, S., Novak, T., Carey, N., Campuzano, L., ... & Emery, D. (2007).	After one-year of computerized math and English training, students did not show any discernible learning benefits compared to traditional teaching.

Effectiveness of reading and mathematics software products: Findings from the first student cohort.	
Ellis, Y., Daniels, B., & Jauregui, A. (2010). The effect of multitasking on the grade performance of business students. *Research in Higher Education Journal*, *8*(1), 1-10.	Students who use a cell phone during class time demonstrate significantly worse performance on the final exam and significantly worse final grades.
Falck, O., Mang, C., & Woessmann, L. (2018). Virtually no effect? Different uses of classroom computers and their effect on student achievement. *Oxford Bulletin of Economics and Statistics*, *80*(1), 1-38.	Quantitative review finds computers lead to worse 'skills practice' (and, consequently, learning) than traditional practice methods.
Figlio, D., Rush, M., & Yin, L. (2013). Is it live or is it internet? Experimental estimates of the effects of online instruction on student learning. *Journal of Labor Economics*, *31*(4), 763-784.	Students in an online course show significantly worse learning than students in an identical face-to-face course.
Fox, A. B., Rosen, J., & Crawford, M. (2009). Distractions, distractions: Does instant messaging affect college students' performance on a concurrent reading comprehension task?. *CyberPsychology & Behavior*, *12*(1), 51-53.	Instant Messaging time is negatively correlated with time-on-task and overall GPA.
Fried, C. B. (2008). In-class laptop use and its effects on student learning. *Computers & Education*, *50*(3), 906-914.	Amount of laptop use in class in negatively correlated with student understanding and course performance.
Glass, A. L., & Kang, M. (2019). Dividing attention in the classroom reduces exam performance. *Educational Psychology*, *39*(3), 395-408.	Students who use a laptop during class time (for notes and/or research) demonstrate significantly worse long-term retention and exam performance than students who do not.
Goolsbee, A., & Guryan, J. (2006). The impact of Internet subsidies in public schools. *The Review of Economics and Statistics*, *88*(2), 336-347.	Over a 4-year period, there was a 68% increase in classrooms with internet connection across the US, but zero discernible impact on learning and academic achievement
Goolsbee, A., & Guryan, J. (2006). World wide wonder? Measuring the (non-) impact of Internet subsidies to public schools. *Education Next*, *6*(1), 60-66.	Over an 8 year period, over 12 billion dollars were spent on CPU and internet subsidies across US schools, but there has been zero discernible impact on learning and academic achievement
Grace-Martin, M., & Gay, G. (2001). Web browsing, mobile computing and academic performance. *Journal of Educational Technology & Society*, *4*(3), 95-107.	There is a negative correlation between amount of computer usage during class and final grades.
Hembrooke, H., & Gay, G. (2003). The laptop and the lecture: The effects of multitasking in learning environments. *Journal of computing in higher education*, *15*(1), 46-64.	Students who use a laptop during class time (for notes and/or research) demonstrate significantly worse memory and comprehension than students who do not.
Heppen, J. B., Sorensen, N., Allensworth, E., Walters, K., Rickles, J., Taylor, S. S., & Michelman, V. (2017). The struggle to pass algebra: Online vs. face-to-face credit recovery for at-risk urban students. *Journal of Research on Educational Effectiveness*, *10*(2), 272-296.	Students in an online math recovery program struggled more and demonstrated significantly worse learning than students in an identical face-to-face recovery program.
Jacobsen, W. C., & Forste, R. (2011). The wired generation: Academic and social outcomes of electronic media use among university students. *Cyberpsychology, Behavior, and Social Networking*, *14*(5), 275-280.	There is a negative correlation between the amount of computer use (both inside and outside of class) and final grades.

Junco, R. (2012). In-class multitasking and academic performance. *Computers in Human Behavior*, *28*(6), 2236-2243.	Students who access social media during class perform significantly worse than students who do not.
Karjo, C. H. (2018). Comparing the effect of ICT and longhand note-taking instructions towards learners' comprehension test results. *Indonesian JELT*, *13*(1), 17-30.	Students who take notes using a CPU or tablet perform significantly worse than those who use pen & paper.
Kraushaar, J. M., & Novak, D. C. (2010). Examining the affects of student multitasking with laptops during the lecture. *Journal of Information Systems Education*, *21*(2), 241.	There is a significant correlation between in-class computer multitasking and academic performance. Unfortunately, students with a laptop multitask about 42% of class time.
Kuznekoff, J. H., & Titsworth, S. (2013). The impact of mobile phone usage on student learning. *Communication Education*, *62*(3), 233-252.	Students who accessed a mobile phone during learning scored a full letter grade lower than students who did not.
Lau, W. W. (2017). Effects of social media usage and social media multitasking on the academic performance of university students. *Computers in human behavior*, *68*, 286-291.	Social media use for learning is not correlated with performance. Social media use for non-academic purposes negatively correlated with performance.
Linden, L. L. (2008). *Complement or substitute?: The effect of technology on student achievement in India*. Working Paper, Columbia University: InfoDev.	Students in a computerized maths program showed highly significantly worse learning and performance than students in a similar face-to-face class.
Luo, L., Kiewra, K. A., Flanigan, A. E., & Peteranetz, M. S. (2018). Laptop versus longhand note taking: Effects on lecture notes and achievement. *Instructional Science*, *46*(6), 947-971.	Students who took notes by computer showed impaired comprehension of concepts than students who took notes by hand.
Maxwell, N. G. (2007). From Facebook to Folsom Prison Blues: How banning laptops in the classroom made me a better law school teacher. *Rich. JL & Tech.*, *14*, 1.	Banning laptops led to better engagement, student reports, and outcomes.
Mueller, P. A., & Oppenheimer, D. M. (2014). The pen is mightier than the keyboard: Advantages of longhand over laptop note taking. *Psychological science*, *25*(6), 1159-1168.	Students who took notes on a laptop performed significantly worse on conceptual questions than students who took notes by hand.
Muir-Herzig, R. G. (2004). Technology and its impact in the classroom. *Computers & Education*, *42*(2), 111-131.	Teacher, student, and overall technology use has no significant impact on grades, performance, and attendance of at-risk students.
Pane, J. F., McCaffrey, D. F., Slaughter, M. E., Steele, J. L., & Ikemoto, G. S. (2010). An experiment to evaluate the efficacy of cognitive tutor geometry. *Journal of Research on Educational Effectiveness*, *3*(3), 254-281.	Over 3-years, students who took a computerized Geometry curriculum performed nearly 20% worse than students in a traditional geometry class.
Patterson, R. W., & Patterson, R. M. (2016). The Impact of Laptop Use in the College Classroom.	Laptop use during class time decreases scores by 0.14-0.37 grade points
Patterson, R. W., & Patterson, R. M. (2017). Computers and productivity: Evidence from laptop use in the college classroom. *Economics of Education Review*, *57*, 66-79.	Students induced to use computers during class (by teachers or policy) perform significantly worse than students who are induced to *NOT* use computers.
Ravizza, S. M., Hambrick, D. Z., & Fenn, K. M. (2014). Non-academic internet use in the classroom is negatively related to classroom learning regardless of intellectual ability. *Computers & Education*, *78*, 109-114.	Non-academic internet use during class is negatively correlated with exam performance.
Ravizza, S. M., Uitvlugt, M. G., & Fenn, K. M. (2017). Logged in and zoned out: How laptop internet use relates to classroom learning. *Psychological science*, *28*(2), 171-180.	Academic (learning relevant) internet use during class demonstrates no discernible impact on learning or performance.

Rouse, C. E., & Krueger, A. B. (2004). Putting computerized instruction to the test: a randomized evaluation of a "scientifically based" reading program. *Economics of Education Review*, *23*(4), 323-338.	Students who undertook a computerized language and reading skills program show no improvement of actual language acquisition or reading skills.
Sana, F., Weston, T., & Cepeda, N. J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers & Education*, *62*, 24-31.	Laptop use during class negatively correlated with performance. Furthermore, students *within range* of a laptop (not using one themselves) suffered as well.
Stolarchuk, E., & Fisher, D. (2001). First years of laptops in science classrooms result in more learning about computers than science. *Issues in Educational Research*, *11*(1), 25-39.	Students in a 'computer mediated' science classroom learn less about science than students in a more traditional science classroom.
Truman, G. E. (2005, January). An empirical assessment of student computer use behaviors in the classroom. In *Proceedings of the 38th Annual Hawaii International Conference on System Sciences* (pp. 6a-6a). IEEE.	Most students multitask when having access to a computer, and this is negatively correlated with academic performance.
Van Der Schuur, W. A., Baumgartner, S. E., Sumter, S. R., & Valkenburg, P. M. (2015). The consequences of media multitasking for youth: A review. *Computers in Human Behavior*, *53*, 204-215.	Media-use during in-class and at-home learning is negatively correlated with academic performance.
Witecki, G., & Nonnecke, B. (2015). Engagement in digital lecture halls: A study of student course engagement and mobile device use during lecture. *Journal of Information Technology Education: Research*, *14*(1), 73-90.	Smartphone and laptop use negatively correlated with student engagement during class time.
Woessmann, L., & Fuchs, T. (2004). Computers and student learning: Bivariate and multivariate evidence on the availability and use of computers at home and at school.	Increased access to computers at home is negatively correlated with academic achievement. Increased access to computers in school has no impact on academic achievement.
Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multi-tasking with technology on real-time classroom learning. *Computers & Education*, *58*(1), 365-374.	Students who use any form of digital technology during class time demonstrate significantly worse performance than students who do not use any digital technology.
Wurst, C., Smarkola, C., & Gaffney, M. A. (2008). Ubiquitous laptop usage in higher education: Effects on student achievement, student satisfaction, and constructivist measures in honors and traditional classrooms. *Computers & Education*, *51*(4), 1766-1783.	Honours students forced to use computers during class show no GPA improvement and less satisfaction than honours students who do not use computers during class.
Yamamoto, K. (2007). Banning Laptops in the Classroom: Is it Worth the Hassles?. *Journal of Legal Education*, *57*(4), 477-520.	Banning laptops during class led to significantly improved student performance.

50 'positive' studies commonly used to argue for the inclusion of computers in education

(Blue = Studies that show computers are merely equivalent to traditional methods

Green = Studies that do not compare computers to other methods)

Reference	Notes
Aberson, C. L., Berger, D. E., Healy, M. R., & Romero, V. L. (2002). An interactive tutorial for teaching statistical power. Journal of Statistics Education, 10(3).	Students who used on online statistics tutorial performed better than students who did not (no comparison to other teaching/learning methodologies).
Alpert, W. T., Couch, K. A., & Harmon, O. R. (2016). A randomized assessment of online learning. *American Economic Review*, *106*(5), 378-82.	Students in a blended (part computer / part face-to-face) class performed similar to students in a pure face-to-face class.
Banerjee, A. V., Cole, S., Duflo, E., & Linden, L. (2007). Remedying education: Evidence from two randomized experiments in India. *The Quarterly Journal of Economics*, *122*(3), 1235-1264.	A 2-year computerized math remediation program improved math scores similar to a face-to-face program.
Barrow, L., Markman, L., & Rouse, C. E. (2009). Technology's edge: The educational benefits of computer-aided instruction. *American Economic Journal: Economic Policy*, *1*(1), 52-74.	Students who received computer aided algebra instruction performed significantly better on a final exam than students in a face-to-face class.
Bebell, D., & Kay, R. (2010). One to one computing: A summary of the quantitative results from the Berkshire wireless learning initiative. *Journal of Technology, Learning, and Assessment*, *9*(2), n2.	Over 3-years on one-to-one computer use in schools led to significant student learning (no comparison to other teaching/learning methodologies).
Belland, B. R., Walker, A. E., Kim, N. J., & Lefler, M. (2017). Synthesizing results from empirical research on computer-based scaffolding in STEM education: A meta-analysis. *Review of Educational Research*, *87*(2), 309-344.	Meta-analysis demonstrates computer-based scaffolding during student-led STEM significantly improves cognitive and academic outcomes (no comparison to other teaching/learning methodologies).
Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2014). Interactive learning online at public universities: Evidence from a six-campus randomized trial. *Journal of Policy Analysis and Management*, *33*(1), 94-111.	Students in a blended (part computer / part face-to-face) class performed similar to students in a pure face-to-face class.
Bowman, L. L., Levine, L. E., Waite, B. M., & Gendron, M. (2010). Can students really multitask? An experimental study of instant messaging while reading. *Computers & Education*, *54*(4), 927-931.	Students who used Instant Messenger while reading took longer to complete the reading, but performed similar on a comprehension test as those who did not.
Carstens, B. A., Watson, T. L., & Williams, R. L. (2015). Unstructured laptop use in a highly structured entry-level college course. *Scholarship of Teaching and Learning in Psychology*, *1*(2), 137.	Students who use a laptop during class do not perform differently on a final exam than students who do not.
Cheung, A. C., & Slavin, R. E. (2013). The effectiveness of educational technology applications for enhancing mathematics achievement in K-12 classrooms: A meta-analysis. *Educational research review*, *9*, 88-113.	Use of computer assisted learning in K-12 significantly improves scores compared to traditional methods (effects are largest when used *in addition* to traditional learning).
Dunleavy, M., & Heinecke, W. F. (2007). The impact of 1: 1 laptop use on middle school math and science standardized test scores. *Computers in the Schools*, *24*(3-4), 7-22.	Students in a one-to-one laptop program for 2-years performed significantly better in science than students in a traditional class (but not math).
Elliott-Dorans, L. R. (2018). To ban or not to ban? The effect of permissive versus restrictive laptop policies on student outcomes and teaching evaluations. *Computers & Education*, *126*, 183-200.	Banning laptops in class had no discernible impact on learning or academic achievement compared to no-ban.

Foldnes, N. (2016). The flipped classroom and cooperative learning: Evidence from a randomised experiment. *Active Learning in Higher Education*, *17*(1), 39-49.	Students in cooperative-based blended learning (part computer / part face-to-face) had significantly higher final exam scores than students in face-to-face.
Fox, A. B., Rosen, J., & Crawford, M. (2009). Distractions, distractions: Does instant messaging affect college students' performance on a concurrent reading comprehension task?. *CyberPsychology & Behavior*, *12*(1), 51-53.	Students who use Instant Message while reading show no detriment in reading comprehension scores than students who do not.
Gallegos, C., & Nakashima, H. (2018). Mobile Devices: A Distraction, or a Useful Tool to Engage Nursing Students?. Journal of Nursing Education, 57(3), 170-173.	Students preferred laptops during class and reported improved problem solving skills, learning, and confidence (no comparison to other teaching/learning methodologies).
Grimes, D., & Warschauer, M. (2008). Learning with laptops: A multi-method case study. *Journal of Educational Computing Research*, *38*(3), 305-332.	Students in a one-to-one laptop program failed to keep pace with students in traditional classes during year one, but had achieved comparable learning scores by year 2.
Gulek, J. C., & Demirtas, H. (2005). Learning with technology: The impact of laptop use on student achievement. *The journal of technology, learning and assessment*, *3*(2).	Over 3-years, students in a one-to-one laptop classroom significantly outperformed students in traditional classes on measures of languge, writing, math, and overall GPA.
Harrington, S. A., Bosch, M. V., Schoofs, N., Beel-Bates, C., & Anderson, K. (2015). Quantitative outcomes for nursing students in a flipped classroom. *Nursing Education Perspectives*, *36*(3), 179-181.	Students in a blended (part computer / part face-to-face) class performed similar to students in a pure face-to-face class.
Heppen, J. B., Sorensen, N., Allensworth, E., Walters, K., Rickles, J., Taylor, S. S., & Michelman, V. (2017). The struggle to pass algebra: Online vs. face-to-face credit recovery for at-risk urban students. *Journal of Research on Educational Effectiveness*, *10*(2), 272-296.	After 2-years of a computer-based math remediation course, students performed similar to students who took the same face-to-face course.
Hoon, T. S., Chong, T. S., & Ngah, N. A. B. (2010). Effect of an Interactive Courseware in the Learning of Matrices. *Journal of Educational Technology & Society*, *13*(1), 121-132.	Students in a computer-assisted cooperative mastery learning maths program significantly outperformed students in computer-assisted cooperative and computer-assisted mastery programs (not compared to traditional teaching methods)
Hu, P. J. H., & Hui, W. (2012). Examining the role of learning engagement in technology-mediated learning and its effects on learning effectiveness and satisfaction. *Decision support systems*, *53*(4), 782-792.	Students who participated in an online learning program performed similarly to students in a the same face-to-face course.
Joyce, T. J., Crockett, S., Jaeger, D. A., Altindag, O., & O'Connell, S. D. (2014). *Does classroom time matter? A randomized field experiment of hybrid and traditional lecture formats in economics* (No. w20006). National Bureau of Economic Research.	Students in a blended (part computer / part face-to-face) class performed statistically similar to students in a traditional face-to-face class.
Kay, R. H., & Lauricella, S. (2011). Unstructured vs. structured use of laptops in higher education. *Journal of Information Technology Education*, *10*(1), 33-42.	Students with structured laptop use during class spent significantly more time-on-task than students with unstructured laptop use (no comparison to traditional methods).
Koedinger, K. R., Kim, J., Jia, J. Z., McLaughlin, E. A., & Bier, N. L. (2015, March). Learning is not a spectator sport: Doing is better than watching for learning from a MOOC. In *Proceedings of the second (2015)*	Students who perform activities during online learning perform significantly better than students who only watch videos during online learning (no comparison to traditional methods).

ACM conference on learning@ scale (pp. 111-120). ACM.	
Kulik, J. A., & Fletcher, J. D. (2016). Effectiveness of intelligent tutoring systems: a meta-analytic review. *Review of Educational Research*, *86*(1), 42-78.	Students who receive intelligent computerized tutoring perform significantly better on tests than students who received face-to-face tutoring.
Lowther, D. L., Ross, S. M., & Morrison, G. M. (2003). When each one has one: The influences on teaching strategies and student achievement of using laptops in the classroom. *Educational Technology Research and Development*, *51*(3), 23-44.	Students who had one-to-one laptops performed significantly better on writing assessments than students who shared laptops during class (no comparison to traditional teaching methods).
Ma, W., Adesope, O. O., Nesbit, J. C., & Liu, Q. (2014). Intelligent tutoring systems and learning outcomes: A meta-analysis. *Journal of educational psychology*, *106*(4), 901.	Students who received personalized computerized tutoring performed similarly to students who received personalized face-to-face tutoring.
Mang, C. F., & Wardley, L. J. (2012). Effective adoption of tablets in post-secondary education: Recommendations based on a trial of iPads in university classes. *Journal of Information Technology Education*, *11*(1), 301-317.	Students who used tablets to increase study time significantly outperformed students who used tablets for non-academic purposes (no comparison to traditional teaching methods).
McFarland, D., & Hamilton, D. (2005). Factors affecting student performance and satisfaction: Online versus traditional course delivery. *Journal of Computer Information Systems*, *46*(2), 25-32.	Students in an online course perform similarly to students in the same face-to-face class.
Mitchell, M. J., & Fox, B. J. (2001). The effects of computer software for developing phonological awareness in low-progress readers. *Literacy Research and Instruction*, *40*(4), 315-332.	Students who received 5-hours of computer-based phonological training performed similarly to students who received the same training face-to-face.
Morgan, P., & Ritter, S. (2002). An experimental study of the effects of Cognitive Tutor Algebra I on student knowledge and attitude. *Pittsburgh, PA: Carnegie Learning, Inc*.	Students who used a computerized cognitive tutor math curriculum performed significantly better on exams and final GPA than students in traditional classes.
Mouza, C. (2008). Learning with laptops: Implementation and outcomes in an urban, under-privileged school. *Journal of research on technology in education*, *40*(4), 447-472.	Under-privileged students who used computers during class showed gains in learning (not compared to traditional teaching methods).
O'Dwyer, L., Russell, M., Bebell, D., & Tucker-Seeley, K. R. (2005). Examining the relationship between home and school computer use and students' English/language arts test scores. *The Journal of Technology, Learning and Assessment*, *3*(3).	Review shows students who use computers to edit papers at school demonstrate higher scores than those who use computers to prepare presentations (no comparison to traditional teaching methods).
O'Dwyer, L., Russell, M., Bebell, D., & Tucker-Seeley, K. R. (2008). Examining the relationship between students' mathematics test scores and computer use at home and at school. *The Journal of Technology, Learning and Assessment*, *6*(5).	Teacher and student computer use does not appear to correlate with academic outcomes.
Pane, J. F., Griffin, B. A., McCaffrey, D. F., & Karam, R. (2014). Effectiveness of cognitive tutor algebra I at scale. *Educational Evaluation and Policy Analysis*, *36*(2), 127-144.	Students in a computer algebra training program for one year performed similar to students in traditional class tutoring.
Prescott Jr, W. A., Johnson, H. L., Wrobel, M. J., & Prescott, G. M. (2012). Impact of electronic device use in class on pharmacy students' academic performance. *American journal of pharmaceutical education*, *76*(9), 167.	Students who used computers frequently during class performed similarly as students who did not.

Ragasa, C. Y. (2008). A comparison of computer-assisted instruction and the traditional method of teaching basic statistics. *Journal of Statistics Education*, *16*(1).	Students in a computer-assisted statistics course scored significantly higher on exams than students in a traditional class.
Ritter, S., Kulikowich, J., Lei, P. W., McGuire, C. L., & Morgan, P. (2007). What evidence matters? A randomized field trial of Cognitive Tutor Algebra I. *Frontiers in Artificial Intelligence and Applications*, *162*, 13.	Students who used a cognitive-tutor algebra program scored significantly higher on exams and final grades than students in a traditional class.
Roschelle, J., Feng, M., Murphy, R. F., & Mason, C. A. (2016). Online mathematics homework increases student achievement. *AERA Open*, *2*(4), 2332858416673968.	Students who undertook homework using an online ASSIST program showed significantly higher end-of-year scores than students who did traditional homework.
Russell, M., Bebell, D., & Higgins, J. (2004). Laptop learning: A comparison of teaching and learning in upper elementary classrooms equipped with shared carts of laptops and permanent 1: 1 laptops. *Journal of Educational Computing Research*, *30*(4), 313-330.	Students in a one-to-one laptop classroom use computers more for learning than students in a shared laptop classroom (no comparison to traditional teaching methods).
Savage, R. S., Abrami, P., Hipps, G., & Deault, L. (2009). A randomized controlled trial study of the ABRACADABRA reading intervention program in grade 1. *Journal of Educational Psychology*, *101*(3), 590.	Students who undertook digital phonics training performed similarly to students who undertook traditional, small group training.
Shapley, K., Sheehan, D., Maloney, C., & Caranikas-Walker, F. (2009). Evaluation of the Texas Technology Immersion Pilot: Final Outcomes for a Four-Year Study (2004-05 to 2007-08). *Texas Center for Educational Research*.	Over a 4-year period, schools who undertook a technology immersion program performed similarly as schools that employed traditional methods.
Singh, R., Saleem, M., Pradhan, P., Heffernan, C., Heffernan, N. T., Razzaq, L., ... & Mulcahy, C. (2011, June). Feedback during web-based homework: The role of hints. In *International Conference on Artificial Intelligence in Education* (pp. 328-336). Springer, Berlin, Heidelberg.	Students who undertook computer-supported homework scored significantly higher on homework scores than students who did traditional pen/paper homework.
Sivathaasan, N., & Velnampy, T. (2013). Use of electronic information resources and academic performance of university teachers: a case study. *European Journal of Business and Management*, *5*(14), 46-52.	Students who have access to e-resources (reading, notes, etc.) score significantly higher on exams than students who do not.
Slomanson, W. R. (2014). Blended learning: A flipped classroom experiment. *Journal of Legal Education*, *64*(1), 93-102.	Students in a blended (part computer / part face-to-face) class significantly outperform students in a traditional face-to-face class.
Stack, S. (2015). Learning Outcomes in an online vs traditional course. *International Journal for the Scholarship of Teaching and Learning*, *9*(1), n1.	Students in an online course performed similarly to students in the same traditional face-to-face class.
Steenbergen-Hu, S., & Cooper, H. (2013). A meta-analysis of the effectiveness of intelligent tutoring systems on K–12 students' mathematical learning. *Journal of Educational Psychology*, *105*(4), 970.	A meta-analysis shows students who employ intelligent tutoring systems performed similarly to students who employed face-to-face tutoring.
Suhr, K. A., Hernandez, D. A., Grimes, D., & Warschauer, M. (2010). Laptops and fourth grade literacy: Assisting the jump over the fourth-grade slump. *The Journal of Technology, Learning and Assessment*, *9*(5).	Students who undertook one-to-one laptop language arts training for two years performed significantly better than students in a traditional class.

Wang, H., & Woodworth, K. (2011). A Randomized Controlled Trial of Two Online Mathematics Curricula. *Society for Research on Educational Effectiveness*.	Students who received extra support via digital tutoring demonstrated significantly higher test scores (no comparison to traditional methods).
Wijekumar, K. K., Meyer, B. J., & Lei, P. (2012). Large-scale randomized controlled trial with 4th graders using intelligent tutoring of the structure strategy to improve nonfiction reading comprehension. *Educational Technology Research and Development*, *60*(6), 987-1013.	Students who used a computer-based language arts tutoring system score significantly higher on language scales than students in a traditional class.