

EMPIRICAL EDUCATION INC. CAPABILITIES

Empirical Education Inc. is an education research firm located in Palo Alto, CA. Our mission is to help school districts make cost effective decisions about adopting new instructional and professional development products and programs. We partner with and provide research services to school districts, research organizations, publishers, and state and federal agencies—including Regional Education Laboratories and the US Department of Education—to determine the effectiveness of programs. We are committed to providing independent, objective evidence while remaining sensitive to the unique context of the research site.

Our focus is on instructional and professional development programs in K-12 schools, in content areas ranging from reading intervention for students with severe disabilities to algebra and geometry achievement with the use of graphing calculators. Our studies have involved educators in more than a thousand classrooms across the United States. We are currently conducting our largest randomized experiment in 80 schools in Alabama as part of our subcontract with the Southeast Regional Education Laboratory.

We tailor our services to meet the needs of any client. Our research activities range widely; for example, we have conducted experiments of national scope, provided data collection services for other research organizations, and presented workshops for school districts on data analysis and use. Through our software engineering and other process improvements, we are able to provide highly efficient research operations. Our research design and statistical analysis capabilities allow us to rigorously address questions in the complex context of school systems. At the same time, our understanding of the work of teachers and school administrators and of the implementation of instructional and professional development programs enables us to give our clients insight into the story behind the quantitative results.

Our Services

We specialize in rigorous program evaluations that meet the research standards of the US Department of Education, including both experimental and quasi-experimental designs. Our work integrates quantitative analyses with relevant information on implementation, changes in school and classroom processes, and qualitative data collected from teachers and classrooms. Thus our studies can go well beyond the overall student achievement outcomes to examine finer grained program results at the school and classroom levels, and for subgroups based on student and teacher characteristics. Using mediation analyses, we are able to understand the contribution to our findings that process measures of educational practices can make. Our data mining and value-added analyses help our clients with descriptive evaluations and needs assessments. The many services we can provide our clients are specified below.

Experimental Design and Evaluation Methodology: Planning for Precision with Practicality

We have proven design capabilities for a wide range of experimental and evaluation studies. We have planned and executed—or played a significant role in—17 randomized experiments encompassing 138 school districts and in five non-randomized or “quasi”-experiments in five school districts. Research designs include group randomized trials and longitudinal experiments tracking both teachers and students over periods as long as five years. In several cases, our designs accommodate control groups that receive the treatment intervention prior to the end of the study period. In quasi-experimental designs, we use a variety of matching-based approaches, including propensity score analyses and

differences-in-differences estimation, as well as simpler methods involving multilevel regression. Where appropriate, we also perform interrupted time series analyses. We also use data-mining techniques, including value-added analyses, to examine data patterns and build hypotheses when comparison groups are not available. Beyond the designs based on quantitative comparisons, we conduct formative research on programs in the early stages of development. In some cases, our reviews may use meta-analytic methods. The research proposals we prepare contain details on the design so that expectations are clear from the start. At the beginning of each project, we review the existing literature pertinent to the program being studied to identify the mechanisms or indicators that may be observable, the size of the impact we can expect, and other factors that can serve as mediators and moderators. Understanding implementation challenges in prior studies is essential to undertaking a new study. Our repertoire of experience and skill allows us to help you select and carry out the study that fits your customer's needs and that can be carried out successfully in their setting.

Research Operations: Carrying Out Your Study

Several stages comprise the life cycle of a research study: design, development of instruments, recruitment of research sites, training and implementation, management of operations, data collection, and data analysis. Empirical Education can conduct research studies from inception to reporting. We also provide services to school district research departments and to other research organizations that draw on components of our overall capabilities, such as research design or data collection and warehousing. Specific components of our operational capabilities are described below.

Recruiting Research Participants

For our publisher partners not already working with a school system, we can apply our expertise in identifying, contacting, and bringing on board a sufficient number of districts, schools, or teachers to address the research design. We begin with discussions at the school district level where the authority to permit access typically resides. We may draw upon our many district contacts, established through prior work and professional meetings, or we can recruit new sites as needed. We use standard district agreements that are brief yet comprehensive, spelling out the study's data requirements and identifying a point of contact. Our agreements also contain teacher consent forms and specify timelines and procedures that may be needed for identifying and training participants and for collecting data. We comply with the requirements of Family Educational Rights and Privacy Act (FERPA), the expectations for which are built into our district agreements.

Complying with Institutional Review Board (IRB) and Office of Management and Budget (OMB)

Empirical Education retains an external IRB to provide objective oversight of all our protocols. We have worked closely with the organization to develop standard operating procedures, including templates for district agreements, teacher consent forms, and other research activities, to assure that our staff remains fully aware of all requirements for human subject protections. By building these procedures into our operations, we also improve our ability to work effectively with a wide variety of school systems. We always give precedence to any additional requirements when we work in school systems having their own review procedures. We have also developed the package required by the OMB for any research conducted under federal contracts. This includes providing the particulars of design, protocols, participant burden, and other details, and following them through the whole process to final acceptance.

Developing and Deploying Surveys

Empirical Education uses a proprietary, secure, web-based survey tool, *SurveyCenter*[™], to collect qualitative and quantitative information from the teachers involved in a study, including information on background and assignment, professional development and on-site support, participation in professional learning communities, and curriculum and instruction. We typically send out periodic survey questionnaires over the duration of a study. We have an exceptionally high response rate (over 90% at the teacher level), as we follow up non-responses with email, fax, and phone calls—including contact with principals and other administrators—in order to find effective channels of communication. To date, we have written hundreds of surveys for approximately 10,000 recipients,

each respondent answering as many as eight monthly surveys per year. We have developed a manual of style for surveys, and we maintain a data bank of questions that have been tested and refined for use in various applications.

Conducting Observations and Interviews

Our team is proficient with data collection from the field. We have experience using a variety of interview and observation protocols during our site visits, focus groups, and individual participant interviews. We frequently observe training sessions to document the presentation of an implementation model and to better understand the issues around implementation that may arise. Interviews and focus groups verify continuing participation and possible contamination and serve to follow up on additional topics that may have become evident in survey responses. We have recruited and trained local observers (retired teachers, for example) and can manage observations or testing anywhere in the country. Our observations and interviews serve twin goals of quantification of practices and rich qualitative description.

Collecting and Entering Data

We have extensive experience with the various stages of data collection, including initial requests for class rosters and demographic data from school districts. Drawing on our expertise and engineering resources in data warehousing, common data elements, and formats, our team takes full advantage of district student record systems to gather data and track implementation efficiently. All data integrated into the Empirical Education data warehouse are cleaned and verified, and can be examined statistically. For surveys, our *SurveyCenter*[™] tool's interface to our database allows automated email invitations to be sent to study participants and performs automated aggregation of data from the responses we receive. Resulting figures are fed back into our data warehouse where they are automatically transferred to our analysis team.

Analysis, Reporting, and Consultation: Generating Clear, Useful Findings

We are particularly aware of the need to put findings in context and to provide guidance in the interpretation of research results. Through hundreds of interactions with district personnel, we have developed expertise in bridging the world of rigorous methodology and the practical context of schools. Thus our analyses include measures at the student, teacher, and school levels and our reports provide an interpretation in terms of implementation and purposes of the program under study.

Statistical Analysis

In most cases, we address questions of program or product effectiveness by comparing students' performance on standardized tests, where the classes, teachers, grade level teams, or schools have been assigned to either treatment or control conditions. When assignment is random, we conduct experimental impact analyses. When assignment is non-random we use quasi-experimental analyses. The mean impact is estimated using multi-level models (or hierarchical linear models, HLM) that account for the clustering of lower-level units, such as students, in upper-level units, such as classes or schools. In a similar fashion, impacts on teacher instructional practices are estimated. Aside from the basic analysis of the mean impact, our studies typically identify the teacher- and student-level covariates that are expected to make a difference in the effectiveness of the program being tested. We conduct moderator analyses to test the interactions between these covariates and the experimental condition. We also conduct mediation analyses by determining, for example, the extent to which an impact on student achievement is explained by an impact on teacher practice or by another process measure. In addition to examining impacts and interactions where we anticipate effects, we use other demographics, teacher characteristics, and supplementary observational data in exploratory analyses to better understand unexpected results and to generate additional hypotheses about which factors potentially moderate or mediate the treatment impact. Multi-level models are a general tool applicable across almost any analysis of differences measured in the context of hierarchical organizations such as school systems.

Reporting Results

Our planning process includes an agreement stipulating the types and timing of all our deliverables: written interim and final reports, presentations, and other depictions of our findings. We employ rigorous error checking processes at every stage of reporting. Our style guide mirrors APA format; our reports, while written in accessible language, contain the necessary criteria for submission to peer-reviewed journals as well as to the US Department of Education's What Works Clearinghouse. Because several Empirical Education staff members have been trained in WWC review procedures, we are proactive in our conduct and reporting of research. In addition to the full reports and research summaries intended for a non-technical audience, feedback to the client—whether a school system or a publisher—includes analysis of the product features that worked well or that failed, implementation issues that influenced the outcome, and acceptance by teachers. We also can conduct reviews based on the principles of the WWC and meta-analyses of existing research literature.

Consultation, Workshops, and Grant Writing Assistance

We can work with districts to prepare the rigorous evaluation component required of many federal and state grants. We bring a deep knowledge of school districts' conduct and use of research for decision making. Our workshops for educators focus on understanding the value of rigorous research as well as the application of these methodologies to support the work in their agencies.

Our Tools and Infrastructure

As detailed below, our company has invested in a technical infrastructure for our services so that research programs can be executed efficiently and accurately.

Security and Reliability Techniques and Procedures

At Empirical Education we are vigilant concerning the security of our electronic and physical data. Our security policy includes both technical and social procedures to ensure restricted access to sensitive student and school records. We maintain a firewall and use encryption on data requiring confidentiality. We are protected from interruption of operations by a rigorous backup schedule including off-site storage of backup tapes and critical records. Data transfers with customers are fully secure. Customers can upload data via the Internet with our *Empirical SecureServer*[™] website, which is password-protected and fully encrypted, using VeriSign Security and SonicWall. Similarly, our *MeasureResults*[®] and *SurveyCenter*[™] tools use a top-quality VeriSign security certificate; all teacher interactions are confidential over the Internet. Our off-site server has 24/7 technical support and a direct connection to the Palo Alto fiber ring, one of the fastest and most reliable Internet connections in the US. The server is guarded by a top-of-the-line firewall and several anti-viral and anti-spyware programs.

Data Warehousing

Our data warehousing techniques and software are optimized for school data and can easily handle large and complex datasets. Our procedures are designed to address the many cases in which data provided by districts have not been fully verified or standardized. In addition to being able to interface with our SAS analytical engine and established analytical tools and with our survey generation tools, including our Survey Mirror tool, our database schemas and structures can support a wide range of scenarios. These include multi-level structure for districts/schools/students that allows flexible hierarchies, default structures for handling standard demographics while allowing extensions (extended ethnicity, for example), ability to track changes such as attrition and its causes, and multi-year support for projects spanning several years, including tracking changes in teachers, students, and rosters. Our data tools also include the proprietary FastMatch program, a simple adaptation of artificial intelligence techniques, that matches student names in cases where established IDs are not available. In addition, we have developed programs that process Scantron and similar input and provide data in the format useful in our databases.

Surveys

As noted, our tools provide sophisticated capabilities for authoring, presentation, and collection of web-based surveys. Our proprietary *SurveyCenter*™ provides a portal for survey participants, tracks their participation, and supplies other communication facilities. Surveys used in our research often consist of a series of individual questionnaires that provide time samples of teacher practices, resources, attitudes, and observations. The system can handle weekly logs concerning specific students. The facility uses a commercially available tool for web delivery of surveys which are maintained on a remote web server. Our off-site server has 7X24 technical support and a direct connection to the Palo Alto fiber ring, one of the fastest and most reliable Internet connections in the world. The survey server is guarded by a top-of-the-line firewall and several anti-viral and anti-spyware programs. Our tools provide sophisticated capabilities for authoring, presentation, and collection of web-based surveys. Our proprietary tool includes the interface to our database, which allows automated invitations to be sent via email to active and listed participants. The custom software performs automated aggregation of data from the surveys. New figures resulting from aggregation are fed back into our main databases where they are automatically transferred to analysis.

Analytical Tools

Empirical Education uses the industry-leading statistics engine SAS for most of our analyses. We have enhanced the capabilities of SAS with several standardizing tools and procedures. Specifically, we have developed workflow tools that provide for an efficient analytical operation. These include early identification of data requirements, transmission of data sets from data warehousing, and automated listing of tasks and responsibilities. We have developed SAS macro sets to combine commonly used analyses, such as moderator analyses using demographic variables that can be carried out quickly and efficiently. SAS output is processed by Word and Excel macros that accurately generate complex tables and figures in standard, easy-to-use formats. We are also currently working with R, a rapidly growing open-source platform for statistical data analysis. R is more suitable for development of custom analytical projects, easily programmable graphics and tables, and more advanced data post-processing including report generation.

Reporting Tools

Each of our reports is customized to the individual needs of our client. When appropriate, we utilize template guides to ease and streamline uniform reporting practices. For this, we have developed a number of tools, including Microsoft Office macros, that support the efficient reuse of templated text, table, and graph-building scripts used to create the final presentations of data.

Office and Location

Empirical Education maintains 5,300 square feet of office space in Palo Alto, California, known as the birthplace of Silicon Valley and the home of Stanford University. The University of California campuses at Berkeley and Santa Cruz are both less than an hour away.

Library Resources

Our staff members have access to the nearby Stanford library containing books, journals, and reference works numbering more than 8 million volumes. Stanford's Cubberley Education Library contains over 150,000 volumes and subscriptions to approximately 670 education journals. The collection includes curriculum guides, educational tests, and historical textbooks. We also have access to the full range of electronic library resources. Empirical Education serves as the Reference Desk for a federally funded regional laboratory, and as such, we access literature databases through the National Library of Education.

THE EMPIRICAL EDUCATION TEAM

With an extraordinarily talented staff currently of 28 members, our company has the capacity to conduct high quality research efficiently. Beyond our expertise in research methods, we bring experience in teaching, school administration, product development, marketing, and publishing.

Our Executive Team's expertise encompasses educational research and evaluation, classroom practice, staff development, product development, and commercial publishing.

Denis Newman (*President*) founded Empirical Education in 2003 after a 25-year career in education. To help school districts succeed in their mission, he draws on his awareness of children's learning in the classroom, extensive experience in developing instructional technologies, lifelong commitment to scientific research, and entrepreneurial drive. Newman's PhD is in Developmental Psychology from the City University of New York. He has conducted research and development at Rockefeller University, UC San Diego, Bank Street College of Education, and BBN Corporation. He has published more than 35 books and articles and has served as program chair for the American Educational Research Association's Curriculum and Learning Division. He was a pioneer in the application of Internet technologies for student learning, professional development, and school administration, bringing to market the first integrated web server designed for schools. His business career has included senior positions at educational software companies Tegrity and Soliloquy Learning.

Andrew Jaciw (*Chief Scientist*) complements his deep understanding of statistical methods and experimental design with five years' practical experience as a third-grade teacher and ESL instructor. Jaciw holds a PhD in Education as well as an MS in Epidemiology from Stanford University. The research for his PhD focused on hierarchical modeling of longitudinal data of adolescent outcomes and using econometric methods to measure selection bias in studies of educational interventions. Before joining Empirical Education, Jaciw completed a BS in statistics and MA in math education at the University of Toronto and worked as a statistical analyst at the Ontario Institute for Studies in Education and Ontario's Education Quality and Accountability Office. As Empirical Education's Chief Scientist, Jaciw is involved in design and analysis for all our company's research.

Valeriy Lazarev (*Research Scientist*) holds an MS in Applied Math from Moscow Institute for Physics and Technology and a PhD in Economics from the University of Houston. Lazarev has held numerous research and teaching positions at Stanford University, Yale University, the University of Houston, and Moscow University, and has participated in a number of collaborative social science research projects. He is a recipient of the prestigious John M. Montias prize in Comparative Economic Studies and has most recently held the Campbell National Fellowship at the Hoover Institution. He brings to the company his extensive experience in both econometric data analysis and analytical software development and continues to work on both directions, providing scientific coordination of observational studies and contributing to the development of the company's data analysis system MeasureResults.

Boya Ma (*Manager of Design and Analysis*) holds a Masters in Statistics from California State University. Ma has over 6 years of experience as a statistician using sophisticated experimental methodologies and programming environments such as SAS, R, HLM and Matlab to conduct effectiveness evaluations of educational products. At Empirical Education, Ma oversees the design and analysis team and works with data warehouse engineers and research managers to assist in the writing of reports and interpretations of study results and support in the ongoing quantitative theoretical and empirical research to develop, implement, and automate cutting edge method in analyzing multilevel data. Currently, much of her work focuses on analyzing results from multi-site group randomized control trials as well as quasi-experiential multilevel data sets with continuous and categorical outcome variables.

Gloria I. Miller (*Director of Evaluation Design*) is both an experienced classroom educator and an expert learning-products developer in the electronics industry. While academic director of Sonoma State's PreCollege Programs, she helped the 3-1-3 program—now called University Transition Academy and winner of California State School Board's 1998 Golden Bell Award—to become a model

high school-university collaboration. Miller co-authored *Digital Design: Foundations of Web Design*, which aligns key national technology standards—including both the ISTE National Educational Technology Standards for Students and the National Workforce Center for Emerging Technologies—with the needs of K-12 education. In her tenure as Director of Evaluation Research and Director of Research Operations, Miller has designed and implemented observational, interview, and survey measures for studies on topics ranging from elementary and secondary mathematics to college preparation and support policy initiatives. She is completing a PhD at the Stanford University School of Education's Learning Sciences and Technology Development program, with a concentration on Curriculum and Teacher Education.

Kylene Chinsio Shen (*Product Manager*) brings more than ten years of experience in the education industry to her role as Product Manager for Empirical Education. Since receiving her MSEd from Northwestern University, she has worked as a curriculum developer on an NSF-funded environmental science initiative for high school students and has taught first and second grades and served as a math specialist in inner-city Boston. As an instructional designer and product manager at Kaplan K12's student technology division, Shen managed the development, implementation, and support of seven online education products. At Empirical Education, she oversees the production and marketing team in the development of company products, identification of new prospects and partnerships, and evaluation and improvement of company processes.

Robert L. Smith (*Vice President of Engineering*) holds a PhD in mathematical logic from Stanford University. As senior vice president of Computer Curriculum Corporation, he led the company's product development through its principal years of growth, creating the underlying algorithms for instructional optimization as well as the tools for efficient content formulation and for maintenance and design of the management system. At Stanford, Smith was the manager for a large National Science Foundation project involving computers and artificial intelligence in education. He taught computer science at Rutgers University and spearheaded that university's deployment of new computer systems for education and research.

Laurel Sterling (*Director of Research Operations*) applies her extensive experience in urban education, public school administration, research, and public policy to support schools in conducting evidence-based research. She has a Master's degree in Public Policy from the University of California, Berkeley. As a Program Manager/Evaluator in Oakland Unified School District's Department of Research and Evaluation, Sterling conducted summative and formative evaluations, best practices studies, needs assessments, and policy analyses.

Kathryn Thomas (*Research Scientist*) served over 17 years as a school teacher and administrator. While earning a PhD in Education Administration from the University of North Texas, she taught science, mathematics, and social studies courses for teacher candidates. With the Texas Center for Educational Research and with Academic Information Management, Thomas conducted research in school reform, vouchers and charter schools, academic accountability, teacher preparation, and special education issues. As research associate with LTG Associates, she evaluated California grant-funded programs supporting efforts among law enforcement, mental health agencies, and community service providers to assist juvenile offenders and their families.

Professional staff. Currently, 19 additional staff members constitute the professional workforce to conduct our research and report results. These include research managers and survey analysts who have a wide range of practical school experience and expertise in disciplines such as psychology, sociology, education policy, instruction, and professional development. Our statistical analysis team is trained in advanced techniques required for the complex research designs called for in rigorous studies in schools. Our engineering team has extensive experience in database development and school data systems. Additional staff members provide support in product and contract management, accounting, HR, and general business administration.

RESEARCH PARTNERS, SITES, AND CONTENT AREAS

We have worked in more than a thousand classrooms across the United States. Our partners have included districts, state agencies, and publishers. Our exclusive focus is on instructional and professional development programs in K-12 schools.

Selected School Districts and State Agencies

Alabama Department of Education	Maui Community College, HI
Alum Rock Union School District, CA	McKinney Independent School District, TX
Amarillo Independent School District, TX	Mesa Public Schools, AZ
Anaheim Union High School District, CA	Miami-Dade County Public Schools, FL
Berryessa Union School District, CA	Mt. Vernon City School District, NY
Boston Public Schools, MA	Nacogdoches Independent School District, TX
Bowie Independent School District, TX	Nazareth Area School District, PA
Brevard Public Schools, FL	Niagara Falls City School District, NY
Charlotte-Mecklenburg Schools, NC	Ogden City Schools, UT
Corpus Christi Independent School District, TX	San Diego City Schools, CA
Delaware Department of Education	School District of Philadelphia, PA
Diocese of St. Petersburg, FL	Pickens County Board of Education, AL
Duncanville Independent School District, TX	Poway Unified School District, CA
East Side Union High School District, CA	Putnam County Schools, WV
Federal Way Public Schools, WA	Reynoldsburg City Schools, OH
Forsyth County School District, GA	Richardson Independent School District, TX
Fresno Unified School District, CA	Riverview Gardens School District, CA
Griffin-Spalding County School System, GA	San Diego Unified School District, CA
Hawai'i Department of Education	Springfield School District, IL
Illinois Valley Central School District, IL	Triad Community Schools, IL
Jefferson County School District, KY	Visalia Unified School District, CA
Kalamazoo City Schools, MI	Wauconda Community Unit School District, IL
Kanawa County Schools, WV	Wood County Schools, WV
Maui School District, HI	Yorkville Community Unit School District, IL

Selected Publishers

Our company has partnered with these publishers to recruit school district sites and conduct randomized experiments or comparison group studies.

Frey Scientific	Pearson Education
Harcourt Achieve	Peoples Publishing Group
McGraw-Hill	Scholastic
PCI Education	Texas Instruments

Federally Funded Grants and Contracts

We are working on grants and contracts with the following organizations:

U.S. Department of Education

Institute of Education Sciences (Education Policy, Finance, and Systems)

National Center for Education Research

Regional Education Laboratories (USED Institute of Education Sciences)

REL Southeast (University of NC, Greensboro)

REL West (WestEd)

REL Northeast and Islands (Education Development Center)

REL Midwest (Learning Point Associates)

REL Northwest (Education Northwest)

Selected Interventions and Content Areas

Our basic research design and methods of data collection and statistical analysis apply to any instructional program expected to have an impact on measured student achievement. We have conducted research on the following content areas and interventions:

Elementary School

Early reading (Scott Foresman's *Links to Reading First*)

ELA test preparation (PPG's *Measuring Up*)

English language learning (Harcourt Achieve's *On Our Way to English*)

Math (confidential)

Reading (confidential)

Reading – Special education (PCI's *Level One Reading Program*)

Science (Scott Foresman's Science)

Middle School

History (Teachers' Curriculum Institute's *History Alive!*)

Pre-algebra (Carnegie Learning's *Bridge to Algebra*)

Reading remediation (intervention in progress)

Reading – Special education (PCI's *Level One Reading Program*)

Science (Frey Scientific's *Premier Science*)

High School

Algebra (Carnegie Learning's *Cognitive Tutor*)

Algebra (Texas Instruments' *TI-Navigator system*)

Foreign languages (Language Learning Solutions' *Classpak*)

Geometry (Texas Instruments' *TI-Navigator system*)

Reading remediation (Scholastic's *READ 180*)

Science (confidential)

Teacher Professional Development

Backward design model (confidential)

Using electronic whiteboards with instruction (Forsyth County, GA)

Empirical Education Inc.
www.empiricaleducation.com
425 Sherman Avenue, Suite 210
Palo Alto, CA 94306
(650) 328-1734