Statistical Literacy in Psychology: Resources, Activities, and Assessment Methods

Society for the Teaching of Psychology
Statistical Literacy Taskforce 2012

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The Society for the Teaching of Psychology 2012 Taskforce on Statistical Literacy developed the following list of resources. Resources are categorized where they best fit, and some may pertain to more than one area; therefore, it is worth searching for terms or scanning other sections when looking for something specific.

The Taskforce consisted of two subcommittees, one focused on statistical literacy in the introductory psychology course at both the high school and college levels and one focused on statistical literacy across the undergraduate psychology curriculum. Because the resources developed by the two subcommittees overlapped a great deal, we created just one overall list of resources for statistical literacy.

Please note that this list provides examples of the kinds of resources that might be useful for instructors who want to implement the learning goals for Introduction to Psychology and for the psychology major. Some of these resources may cease to exist, whereas new, similar resources are likely to emerge.

Please send feedback or updates to Susan A. Nolan (susan.nolan@shu.edu).
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Statistical Literacy

[This edited book is a synthesis of research on how people think and reason about statistics, with attention given to how statistical literacy develops. Researchers in statistical education wrote each chapter.]

[The authors review activities in an Introductory Psychology course that include statistical literacy and also foster critical thinking in students. Activities include having students identify methods of analyzing results.]

[Cengage Learning features this interactive software to help students learn about the fundamental components of the role that empiricism, including statistical analysis and rationalism, has to play in the science of psychology.]

[This article reviews statistical thinking as a form of statistical development. It covers methods for helping students develop the “habits of mind” for statistical thinking along with assessment of statistical thinking.]

[delMas applies what has been learned from research on the teaching of statistics, statistical literacy, and how students learn about statistics. He provides specific recommendations on what a classroom instructor can do along with assessment techniques.]

[This article reviews specific classroom techniques involving high levels of student engagement, typically in small group settings where students are required to apply statistical concepts to form a useful argument from quantitative evidence.]
Dillion, K. M. (1999). I am 95% confident that the Earth is round: An interview about statistics with Chris Spatz. *Teaching of Psychology, 26*, 232-234. [http://dx.doi.org/10.1207/S15328023TOP260314](http://dx.doi.org/10.1207/S15328023TOP260314)  
[This is an interview with researcher and teacher of applied statistics, Chris Spatz. Spatz reflects on students learning statistics.]

[Garfield reviews both correct and incorrect forms of statistical reasoning that students often make. The author provides specific examples of how to maximize students’ statistical reasoning, building upon prior research, and she reviews methods for assessing statistical reasoning.]

[This book reviews the interrelationship between mathematics and statistics, as it guides teachers in helping students reason about statistics. This book helps integrate the research on students learning statistics with teaching practices.]

[Eighteen professors in the natural and social sciences were asked to identify the essential topics to be covered in a statistics and methods course. This article summarizes those findings.]

[Groth reviews results of carefully interviewed students between the ages of 14 and 19 regarding their thinking of statistics.]

Holmes, J. D., & Beins, B. C. (2009.) Psychology is a science: At least some students think so. *Teaching of Psychology, 36*, 5-11. [http://dx.doi.org/10.1080/00986280802529350](http://dx.doi.org/10.1080/00986280802529350)  
[This article examines results from surveys of college students regarding their thinking of science in general, and psychology as a science specifically. Over time, college students develop a more sophisticated understanding of science, yet that development does not seem to translate to a deeper understanding of psychology as a science.]

[Though this is an article about research conducted with elementary school children, both the methodology and the findings have applications to college students regarding statistical thinking.]

[Landrum reviews three statistics textbooks, providing a listing of the most common terms used in the books.]

[This article reviews threats to scientific thinking and methods for helping guide students toward more appropriate thinking.]

[This book provides insight into how people generally think about popular psychology, including examples of the misuse of statistics that contributes to common myths. Topics that students find interesting, like “Opposites Attract”, “People use only 10% of their brain,” and others are reviewed, and effective examples of the use of statistics help clarify student understanding of these myths]

[One may use the six orientations of psychology to demonstrate to students that even if their academic and/or career interests are geared toward clinical psychology, all of psychology is informed by science.]

[This article reviews a study of students that examines what increases their reasoning and critical thinking skills. Details of course structure (primarily what didn’t work) and other methods are covered.]

[This article helps teachers of statistics frame and cover statistics as an important component of the liberal arts educational tradition.]

[These authors argue that the mathematics curriculum at the secondary level should provide students with experience in interpreting data sets and understanding more complex statistical techniques. They present examples throughout the article.]


[This article reviews current perceived inadequacies in the teaching of statistical thinking, particularly to high school students. Rumsey reviews improved methods along with justification for such methods.]


[Schield reviews biases that could impede students’ learning of statistics and provides direct methods for how instructors of statistics can help students to become “believers” in how important statistics are to the science of psychology.]


[This article provides very specific examples of how to improve students’ statistical thinking.]


[Researchers used the Statistical Reasoning Assessment instrument to assess statistical reasoning. In particular they address why reasoning skills have low correlations with course performance, differences in female and male reasoning abilities, and the nationality effect.]


[The authors assessed course syllabi and faculty self-reports of research methods and statistics course learning objectives. They found discrepancies between course learning objectives and APA’s learning objectives.]
[Utts suggests that that every student who takes an elementary statistics course should know seven ideas.]

[An “absurd pseudotreatment” is used to demonstrate how appropriate research design is required for effective therapy evaluation.]

[Walker discusses tips on how to increase students’ statistical literacy by drawing from techniques that have been successful in increasing reading and writing literacy. She also stresses that students should have experiences with statistics outside of their statistics courses.]

[Wallman discusses the importance of statistical thinking and highlights methods that may be used to enhance statistical literacy.]

[The instructor gave students research problems throughout the course. She also created a course web page for students to use computer-based assignments.]

[Interviews with statistics students and practicing statisticians identified a four-dimensional framework involved in statistical problem solving. The authors characterize these processes as an investigative cycle, an interrogative cycle, types of thinking, and dispositions.]

[Zeedyk used a police detective analogy and humorous style to teach statistics. Assessment of the approach showed improvement student performance.]
Teaching Statistics – General Resources

[This resource outlines lesson plans for correlations, as well as various objectives for learning. It also includes examples of tables and figures for demonstrations.]

[Bartsch designed an activity to improve student attitudes toward statistics. Students drew numbers from bags. The instructor asked questions about the numbers to illustrate what the students already knew about statistics.]

[Writing assignments focused on context and rationale for the statistics.]

[Compared to a control class, students in the Just-in-Time Teaching class performed better on the final exam and expressed satisfaction with the approach.]

[The researchers investigated the use of humor in teaching statistics courses. They found reduced anxiety and more positive attitudes toward statistics when comparing results before and after implementing humor into the course.]

[The author suggests that teaching statistical reasoning should precede teaching statistical methods. He also proposes the importance of students’ using realistic data and doing exploratory data analysis before using classical methods.]

[Conceptual understanding of statistics was promoted by exercises designed to stimulate students to explain the interrelations between statistical concepts.]

[The article describes how to teach research methods using data sets from the National Center for Health Statistics.]


[Bryce summarizes six symposium papers that covered issues in undergraduate statistics education.]


[Carlson reports the results of using case studies in teaching statistics in an economics class.]


[Chew’s chapter reviews the research literature on creating and using examples in teaching statistics. He also discusses how to create good examples.]


[The authors stress that the teaching of statistics is not all about math, but rather on the contextual meaning of the numbers.]


[The researchers conducted an experiment in an 8th grade classroom that focused on learning and instruction of statistical data analysis.]


[The authors review the literature to discuss the challenges and solutions of teaching undergraduate statistics.]


[A study revealed little difference in the performance of two types of group structure. However, the students preferred small work groups with students of varied rather than homogenous ability.]
[The researchers designed a simulation program to help students understand sampling distributions. Additionally, graphics-based items tested the students’ understanding.]

http://dx.doi.org/10.3102/00028312037003747
[The article describes an undergraduate statistics course based on collaborative activities and real-life problem solving.]

http://dx.doi.org/10.1207/s15328023top2201_16
[The instructors designed a course for students who are considering a career in teaching. The class especially focused on using simulations of realistic social problem solving.]

[Dolinsky proposes shifting from primarily a lecture method to using active learning strategies. She proposes the use of computer applications and intensive writing assignments.]

[This edited volume is a resource for the teaching of statistics and research methods.]

http://dx.doi.org/10.1111/1467-9639.00106
[The analogies and the activities of statisticians are compared to those of chefs to teach statistics.]

[The author describes how his department incorporated the recommendations of the American Sociology Association Task Force report, *Liberal Learning and the Sociology Major*.]


Students who did poorly on an exam were able to take another equivalent exam. Sometimes they took as many as many two repeat exams. Students who took more repeat exams did better on the final exam than students who took fewer repeat exams.


The authors describe examples of humorous material that can be used for teaching statistical concepts. They also suggest strategies for being more humorous in the classroom.


The researchers tested university students on how well they were able to identify appropriate statistical procedures for different research questions. The authors suggest alternative approaches to teaching problem areas that their findings revealed.


The paper describes what cooperative learning is and why teachers should use cooperative groups.


The study compares a cooperative learning class to a lecture class. The results showed that final exam scores were higher for the cooperative class compared to the lecture class.


This resource contains 11 concept maps for topics typically covered in research methods and statistics courses. The maps can be used to help students organize material in class. Pages in the resource are internally hyperlinked to help students visualize interconnections.

[The authors argue that computational formulas should not replace definitional formulas. Because definitional formulas foster better conceptual understanding.]


[Students who read a textbook that emphasized conceptual learning of elementary probability performed better on an exam than those who read a textbook that emphasized rote learning.]


[The authors implemented four learning activities: peer-mentored learning; students reports of what was clear from a previous lecture; “consult corners,” where student groups provided solutions to problems; and applied projects.]


[The author describes four learning activities that can be used in statistics and other psychology courses.]


[The authors suggest using separate and diagrammatic strategies in teaching inferential statistics. Conceptual instruction should come before procedural and quantitative instruction.]

Additional Web content: [http://www2.webster.edu/teachstats/](http://www2.webster.edu/teachstats/)
[This volume is a good resource for how to teach a statistics class.]


[The author’s experience with using student projects to teach experimental design is described. Also, Hunter proposes the advantages of using simulated data.]

[The article is a thorough, 534 page compilation of references and resources for teaching statistics and methods. Over 50 articles each provide detailed information and data on how to optimize the teaching of statistics and research methods.]


[The researchers used a regression analysis to explore why students prefer non-traditional instructional styles to traditional styles. Variables that they found related to teaching style preference were class size, years since graduated from high school, perceived learning styles, and attitudes about visual aids.]


[The authors describe an evaluation of a course that was changed from a lecture method to cooperative learning.]


[The study showed that support information was more effective during practice than before practice. Also, simultaneous presentation of procedural information was most efficient before practice, whereas supportive information was most efficient during practice.]


[This study examines the effectiveness of using humor in the classroom and suggests that when implemented correctly, humor improves students’ overall experience and knowledge in a classroom.]


[Lane and Tang compared simulation-based teaching to textbook-based teaching. Their research resulted in students being more accurate on questions after learning from simulation-based teaching as compared to textbook-based teaching.]


[The article presents advice on increasing student involvement in lectures.]

[Students did not do significantly better on a posttest when computational examples were used than when computational examples were not used.]


[Lim conducted a study with students from an undergraduate statistics course to investigate whether students’ level of self-regulated learning skills (high or low) and type of concept mapping (expert-generated, partially learner-generated, and fully learner-generated) affected their learning. Suggestions on how to have students effectively utilize each type of concept map are included.]


[The article presents examples of humor for 14 topics. The authors claim that humor reduces anxiety, motivates, and increases conceptual understanding.]


[The authors propose five principles from cognitive theory to teach a statistics class.]


[Students provided personal information at the beginning of each class. After each class, the instructor provided statistical information to the students about their data either daily (continuous feedback) or about twice a month (partial feedback). Students in the continuous feedback condition had higher test scores at the end of the semester compared to students in the partial feedback condition.]


[The authors provide a handout of common errors made in statistics courses.]


[The article proposes using computer simulations in the teaching of statistics.]


Muttart, D. (2009). The obsolescence of computational formulae. *Teaching Statistics, 31*(1), 12-14. [The author takes the controversial position that computational formulas should no longer be taught. Instead instructors should use only definitional formulas because of their conceptual elegance.]

Myers, J. L., Hansen, R. S., Robson, R. C., & McCann, J. (1983). The role of explanation in learning elementary probability. *Journal of Educational Psychology, 75*, 374-381. [Student performance depended on the type of problem and on the level of explanations underlying the construction of the formulas.]


Pan, W., & Tang, M. (2005). Students’ perceptions on factors of statistics anxiety and instructional strategies. *Journal of Instructional Psychology, 32*, 205-214. [The study’s findings show some of the factors that contribute to statistics anxiety in graduate students. The researchers also suggest strategies to reduce students’ anxiety.]
[The researcher explores the effects of small-group cooperative instructional techniques.]

[The instructors taught students to form problem schemas in order to solve statistical problems.]

[The researchers developed an attitude scale that had moderate correlations with statistics grades.]

[The author describes various methods for reducing student anxiety in a statistics course.]

[Students created a portfolio that reflected their understanding of various topics. The portfolio integrated material from the text, lectures, and lab assignments.]

[Compared to controls, students who wrote journals had higher grades, lower anxiety, and lower physiological reactions.]

[Small-group problem solving, keeping a log of work, and investigating the misuses of statistics were all related to positive effects.]

[The researchers developed an attitude scale that had moderate correlations with statistics grades.]
[Their study provides support for the reliability and validity of the Wise Attitudes Toward Statistics scale.]

[The book highlights the advantages and concerns of data sharing for social scientists.]

[The authors argue that artificial data sets should be eliminated from the statistics curriculum. They also identify seven characteristics of good data sets.]

[The researcher evaluated the use of team projects in a statistics class. His appendix also includes examples of 20 projects for collecting data sets.]

[Snee proposes that students should experience using statistics with real-world situations because these experiences produce a more favorable attitude toward statistics.]

[Instructors could upload their own data to use to an online statistics tutorial generator. An evaluation of using the online tutorial revealed positive effects.]

[Thompson describes a Student Information Questionnaire that generates data sets. The questionnaire is designed to reduce the need for using artificial data.]

[The authors suggest that graduate students learn statistics best if they consult with real clients.]


[The researchers show a relation between attitudes toward statistics and results on statistics exams.]


[Wise reports the development of a scale to measure student attitudes toward statistics.]


[The article focuses on the advantages of interactive teaching in a statistics course.]


[After 5 weeks, students who do well on the final exam are excused from further course work but are required to tutor other students. Students have the opportunity to repeat the course several times.]


[The instructors evaluated the effectiveness of teaching students on the skills of selecting different statistical tests.]


[This study explored the correlates between math anxiety and statistics anxiety.]

**Activities and Assignments**


[The author describes how using spreadsheets is an effective tool for developing statistical skills in students.]


[The book has the same basic organization as other statistics textbooks but uses baseball for examples. It also provides a collection of exercises.]

[The instructor used Weber’s Law to introduce students to the chi square statistic. He points out their similarities and relates other psychological concepts to statistical measures.]


[The goal of this resource is to assess and analyze different types of data and explain it in a concise fashion. The book uses historical examples as well as more modern examples.]


[This resource outlines the essential learning goals for an undergraduate statistics course. This book also stresses the importance of presenting data as examples as opposed to lecturing about concepts.]


[Students learned research design and statistics in real-life situations by using information about a variety of consumer products.]


[The instructors illustrated several statistical concepts using a major sports event.]


[The authors present a demonstration that uses different flavors of candy to teach students about probability and random occurrences.]


[The instructors describe an assignment using primary source journal articles to help students understand methodological and statistical concepts.]


[The activity provides data to conduct a factorial ANOVA. An answer key and output are included.]
[This activity teaches students how to perform a repeated measures ANOVA.]

[This activity is an exercise in conducting a t test for independent means. Students identify the independent and dependent variables, enter the provided data, compute the results, and interpret the findings.]

[The demonstration uses students’ bodies and the physical space in the classroom to illustrate statistical concepts. Concepts illustrated were central tendency, variability, correlation, and regression.]

[DYASIM, a FORTRAN program, assesses the degree of similarity of dyadic data. The researchers used DYASIM to illustrate conceptual difficulties associated with measuring dyadic similarity pertaining to mate selection.]

[In this activity students learn statistical principles by participating in a game show.]

[The author uses collaborative writing and peer review in a statistics and research methods course.]

[The article describes an exercise for teaching statistics and research methods. Students write a letter to a peer in another course section, then write a response, and finally another letter clarifying their ideas.]

[The instructors used M&M® candy to teach the concept of the sampling distribution of the mean and found this method more effective than a traditional teaching method.]

[The book is a collection of ideas for student-led and instructor-led activities that can be used to teach a variety of statistical concepts.]


[The authors propose that an activity-based approach is better than a lecture approach. They present several examples of what they believe are effective activities.]


[The authors explain how to create univariate and bivariate raw data sets. The provided data may be used to obtain graphs, test assumptions, and create new problems with specified outcomes.]


[An activity uses collaborative polling simulation to teach students about sampling distributions.]


[The article describes how a data generation system called GENSTAT may be used to create sample data for demonstrations, homework, lab assignments, and testing.]


[This volume contains about 500 small data sets. The data sets are real rather than fictitious, and each is accompanied by a brief description and details of its source.]


[The author argues that student-generated data increases student interest and nurtures critical thinking.]

[Each activity and demonstration includes a summary of the activity, how long it would take to complete, and expected outcomes. Activities can be used individually or in group environments.]

[The authors describe an activity in which students work together to fill out a question grid regarding the purpose, assumptions, etc. of various statistical tests. The question grid and sample responses are provided.]

[The authors provide a collection of 32 activities that demonstrate how writing can be incorporated throughout a statistics course. Instructions for each activity are included.]

[The authors describe three activities in which students apply their knowledge of descriptive/inferential statistics to data they collect during class.]

[This article reviews activities that can help introduce students to their first statistics course on the first day of class.]


[The article reviews an interactive spreadsheet that can be used to help illustrate type I and type II decision errors in hypothesis testing.]

Almost all students are familiar with the Müller-Lyer Illusion, the basis of this activity that helps students to better understand the concept of variance. This article provides clear directions on how to make this activity work in the classroom.


The authors created a reading packet on reasoning with statistics for students to use on a daily basis throughout the semester. Their performance was found to be superior to two different control groups. The authors provide details of the research method and the assignment.


The authors discuss how technology can be used as a tool for teaching statistics.


This activity provides a hypothetical real-world situation in which a therapist would need to make a decision using statistical information. Students are given arguments for three different products and are asked to analyze the statistical strengths/weaknesses of each argument to determine which product would be the best choice.


Lutsky describes the process and benefits of an activity in which students complete the entire research process (including formulation of a research question, write-up of results, etc.) using data sets collected by other researchers.


The author discusses various experiments that can be used in science classes to help students understand statistical concepts. One such experiment involved the use of a spectrophotometer to demonstrate independent samples.


The author describes various activities to demonstrate to students the importance of establishing clear operational definitions before data collection to better ensure agreement in measurement and reduce error.

[This article reviews the use of computer-simulated pedagogical practices for enhancing student understanding of statistical concepts. It discusses methods of implementation and benefits to students.]


Washington, DC: Mathematical Association of America.

[This resource is a collection of articles covering various topics related to teaching statistics including ideas for classroom activities, incorporating technology, and choosing the right textbook.]


[This article reviews an activity that requires students to analyze a data set comprised of information from obituaries.]


[This article provides three activities that can be used with students to help them understand critical concepts in graphing, including how to obtain information from graphs.]


[This activity allows students to work with actual data and discover the importance of graphs, especially when conducting Pearson correlation analyses.]


[The authors describe the use of the Gambler’s Fallacy in a classroom. This fallacy helps increase student understanding and helps emphasize the importance of statistical interpretation. The authors also include various activities and databases for use in the classroom.]


[Rossi outlines an exercise that in which students calculate statistical formulas and determine if there are any discrepancies between their calculations and what the original study authors reported in their journal articles.]

[The authors provide 10 principles regarding how to increase students’ ability to make and understand statistical inferences. Examples and relevant class exercises are provided to illustrate each of the principles.]


[The use of humorous examples has been found to decrease students’ anxiety toward learning statistics. This article reviews two activities that use humor while increasing students’ conceptual understanding of statistics.]


[This book provides a series of activities that help maximize students’ intellectual engagement through hand-on activities encompassing critical concepts in introductory statistics.]


[This article reviews the benefits of striking demonstrations and reviews over 30 different striking demonstrations noted to help increase student understanding of concepts like statistical distributions, estimations, or testing. This article is great for people already using some striking demonstration and looking for more, and for individuals unfamiliar with this form of pedagogy.]


[This article provides evidence for the benefits of including mnemonics throughout a statistics course. A table within the article includes all of the mnemonics as well as an explanation of how each mnemonic relates to a statistical concept.]

The author describes an activity in which students examine their assumptions regarding the accuracy of the Zodiac. The personality descriptions needed for this activity are included.


This article reviews methods for obtaining student-generated data sets, and demonstrates that such sets increase students’ interest and understanding of statistics.


[Stern’s chapter reviews a method of gathering and analyzing data that helps increase students’ interest and understanding in statistics.]


The authors provide examples of how to use semi-randomly generated data for individual students to test statistics. With the data, students can better learn to perform hypothesis testing, confidence intervals, and regression, and increase their understanding of sampling distributions.


This resource provides instructors with a program (SYSTAT) to generate data sets with enough information for students to perform various analyses. Because many examples in research articles do not include all necessary information for complete statistical analysis (e.g., raw data), this program generates data sets that do provide this information.


[This extensive handbook provides professors with several demonstrations and activities geared at increasing students’ intellectual engagement and comprehension.]


[The authors discuss how they have adapted their own experiences as consultants to provide real-world examples for students to apply their knowledge of research.]

[A list of major league baseball players’ salary is published in *USA Today*, annually. Using that readily available data set, this article takes a teacher of statistics through activities to help students better understand the application of statistics.]


[The author presents two activities, suitable to large class sizes, that involve students in learning the Central Limit Theorem: group peer teaching and in-class simulation of random sampling from the discrete Uniform Distribution.]


[The author describes how he used imagery in his demonstrations of various types of distributions.]

**Technology in the Teaching of Statistics**


[Anderson discusses how computer activities (specifically with SPSS) can be incorporated into statistics courses based on his own teaching experiences.]


[This article reviews how various departments use computer-assisted instruction in statistics courses.]


[This study revealed that actively integrating static representations before processing dynamic visualizations resulted in better performance. Moreover, students’ experimentation became more systematic and goal-oriented during simulation-based discovery learning in a statistics class.]
[The author discusses how Datasim (a data simulator) can be used to illustrate a variety of statistical concepts.]

[The authors review the use of Excel as a supplement to learning statistics. Students performed better in the Excel condition compared to the control condition in several areas. The article includes details for implementation.]

[G*Power is free software to calculate statistical power; it is available at http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/]

[This study compares students’ comfort level and sense of learning when using SPSS and Minitab during a statistics class.]

[This e-book provides teachers of statistics with different methods of bringing technology into the classroom to improve student learning.]

[Five research readings, accompanied by data, allow students to simulate the psychological research process. Information is provided so students can analyze the data in SPSS or in Excel.]

[This article provides a scheme for classifying data tables and graphs and then uses this scheme to organize and assess the tables and graphs found in three commonly used software packages: Microsoft Excel, Minitab and SPSS. The classification and assessment is of one–, two– and three–dimensional displays.]

[This resource book reviews how to use SPSS for analyzing data.]

[This paper addresses the pedagogical advantages of teaching statistics not as a stand-alone subject, but rather as a topic integrated into teaching hands-on, problem-based computer-assisted data analysis.]

[This article describes how the mail merge facility within Microsoft Word can be used in conjunction with Microsoft Excel to generate personalized assignments for students at all levels.]

[The author discusses how SPSS can be used to make course activities (e.g., papers, presentations) in advanced sociology courses more effective without becoming the sole focus.]

[This resource provides information on how to use SPSS for analyzing data.]

[This resource contains several resources and information about statistical theories and statistical tests. There are examples for each item, as well as background information.]

[This article reviews errors found in statistical calculations within Excel. The authors recommend that other software be used until Microsoft fixes the errors.]

[This workbook is designed to provide step-by-step instructions for introductory statistics students on how to use Microsoft Excel for statistics calculations. The authors stress that Microsoft Excel should be used over other statistical programs such as SPSS because Microsoft Excel is more widely available and easier to use.]

The writer of AnoGen (a free computer program) explains how both teachers and students can use this program to create ANOVA data sets that include between and within-subjects variables.


This resource outlines the importance of research examples in the teaching of statistics. Examples using SPSS are also included with activities.


This resource includes examples for teaching statistics with SPSS and how to implement SPSS into a lesson plan. Limitations of the program are also included.


This resource discusses the program “Link,” which is used to assess undergraduates’ knowledge of correlations. Studies involving “Link” are included as well as evidence that it is a useful resource to implement into classrooms.


This article discusses whether spreadsheets are a useful technique to aid in teaching statistics or if it reduces learning.


Oswald reviews the methods, and technology used to teach undergraduate statistics. She argues that a computer and a projector should be used to statistics, as it has been shown to improve learning.


Proctor argues for the use of Microsoft Excel, as opposed to SPSS, for teaching undergraduates statistics. Students who learned statistics using Microsoft Excel showed increased knowledge compared to students that learned using SPSS.]

[This article discusses three statistical laboratories on descriptive statistics, statistical inference, and regression for introductory statistics courses using Minitab, SPSS, and Excel.]

Quilici, J. L., & Mayer, R. E. (2002). Teaching students to recognize structural similarities between statistics word problems. *Applied Cognitive Psychology*, 16, 325-342. [http://dx.doi.org/10.1002/acp.796](http://dx.doi.org/10.1002/acp.796)

[The authors emphasize the importance of applying statistical concept from examples that students already know and understand, to help teach more complex statistical problems. By implementing this, researchers were able to identify how to increase students' recognition of structural similarities in word problems. Though this article does not provide in-class activities, it could serve as the basis for an in-class activity.]


[This study found that using visual aids to teach statistics, especially spreadsheets, improves learning. Also, Rogers discusses different types of visual aids.]


[This study failed to find a benefit of the use of technology in student comfort or understanding of statistics.]


[This book is a reference source for people using Excel for statistical analysis.]

Singamsetti, R. (2007). Teaching business statistics with real data to undergraduates and the use of technology in the classroom. *Journal of College Teaching & Learning*, 4(7), 59-68. [This article reviews the use of real data and technology to help students make real-life decisions by using statistics.]


[This article reviews an activity that helps students to better understand sampling distribution, Confidence Interval, and hypothesis testing through the use of SPSS and Excel.]

[This study failed to provide evidence of the benefits of computer assisted testing in statistics for improving student performance, understanding, or attitudes.]


[This authors discuss a program (QuickBASIC) that can help students understand complex factorial design ANOVAs. Specifically, this program simplifies and helps students understand the differences in interactions as opposed to main effects.]


[This resource links to 12 assignments ranging from measures of central tendency to Chi Square that students can complete using Excel.]


[This review provides examples of how to integrate SPSS into the teaching of statistics. Direct methods and activities for successful integration are discussed.]


[This article evaluates the limited benefits of using computer assisted statistical analysis.]


[This article discusses Excel “Toolpack,” a free addition to Microsoft Excel, that works as an alternative to more expensive software packages.]

**Assessment of Learning in Statistics**


[This detailed report includes information on emphasizing statistical literacy and developing statistical thinking, using real data, stressing conceptual understanding rather than mere knowledge of procedures, fostering active learning in the classroom, using technology for developing conceptual understanding for analyzing data, and assessing student learning for the purpose of improving it.]


delMas, R., Ooms, A., Garfield, J., & Chance, B. (2006, July). Assessing students' statistical reasoning. In *Proceedings of the seventh international conference on teaching statistics* (Vol. 2006). Minneapolis, MN: University of Minnesota. [An NSF-funded project that developed assessment resources for statistics instructors. The link provides access to PowerPoint Slides: https://apps3.cehd.umn.edu/artist/][This link will get you to a list of resources on assessing statistics that was produced by an NSF-funded project geared at developing assessment resources for statistics instructors.]


Desrochers, M., & Margolin, S. (2010). Factorial research design. Retrieved from http://www.acs.brockport.edu/~mdesroch/Factorial3/ [This link will lead students to an activity to help them better understand factorial research design. It includes an assessment that, once students complete it, will result in a certificate they can turn in to their professor.]

[This edited book reviews various methods to assess students’ understanding of statistics including classroom assessment, curricular goals, conceptual understanding, and probability.]


[This paper summarizes current trends in educational assessment and relates these to the assessment of student outcomes in a statistics course. Garfield presents a framework for categorizing and developing appropriate assessment instruments and procedures.]


[This article discusses the Statistical Reasoning Assessment, a 20-item instrument created to provide 16 scores in eight different areas of statistical reasoning. Garfield provides an overview of demographics related to statistical reasoning and the measure.]


[This study found that using visual aids, especially spreadsheets, to teach statistics improves learning. Also, different types of visual aids are discussed.]


[This article provides various assessments and resources for teaching statistics in a college setting. These assessments also include examples of when to use each one.]


[This resource provides three assessment measures including a rubric for evaluating a psychology research report, evaluating students’ understanding of interrater reliability, and assessing students’ comprehension in reading a journal article.]


[This article reviews the critical components of statistics that go beyond the underlying mathematics and deal more directly with the applied components of the discipline.]


Onwuegbuzie, A. J. (2000). Attitudes toward statistics assessments. *Assessment and Evaluation in Higher Education, 25*, 321-339. http://dx.doi.org/10.1080/713611437 [The authors emphasize the importance of using different teaching techniques that students not only prefer, but also benefit from most. Previous research has shown that students’ attitudes towards the material is important. This includes both positive attitudes (ease of understand, overall enjoyment) and negative attitudes (anxiety provoking tasks/examples).]


**Statistics Websites with More General Resources**

Assessment Resource Tools for Improving Statistical Thinking: https://apps3.cehd.umn.edu/artist/ [This website includes sample items and articles regarding how to assess statistical thinking.]

[This website includes resources for teaching statistics, especially teaching online. The site includes activities and research articles about statistics literacy.

Consortium for the Advancement of Undergraduate Statistics Education: www.causeweb.org
[This website includes several resources for the teacher of statistics, including articles on the teaching of statistics, https://www.causeweb.org/profdev/readings/]

Correlation or causation Web site: http://jfmueller.faculty.noctrl.edu/100/correlation_or_causation.htm
[This web site provides links to articles in the general press that misattribute cause to a variable. Activities to help students understand this concept are also included.]

[These tutorials, created by Nancy Bliwise, provide key instruction to areas where students often struggle in statistics classes.]

International Association for Statistical Education: http://www.stat.auckland.ac.nz/~iase/publications.php
[This organization provides resources on the teaching of statistics, with special attention given to statistical literacy. They also sponsor a series of conferences directed toward improving statistical education.]

[This website provides links to full length articles published on statistics education.]

Not Awful and Boring Examples for Teaching Statistics blog: http://notawfulandboring.blogspot.com/
[This site provides examples of graphs that display poor correlations.]

[This organization provides, among other things, resources, activities and articles directly related to the teaching of statistics.]

Society for the Teaching of Psychology (STP) online resources http://www.apadiv2.org/otrp/resources/index.php
[Though many of these resources are listed individually in our references, as STP is in a perpetual state of adding additional online resources, this is a web site worth visiting.]


STP: Project Syllabus – peer-reviewed syllabi:
http://www.teachpsych.org/page-1567662
[Instructors submit their syllabus for various classes, including statistics. Peers review the syllabi and post those deemed of high quality. This is a great resource to see what your peers are doing in the teaching of applied statistics.]

STP: ToPIX (Teaching of Psychology Idea Exchange) – Statistics video clips:
http://topix.teachpsych.org/w/page/19981042/Statistics%20Video
http://topix.teachpsych.org/w/browse/#view=ViewFolder&param=Statistics
[Video clips that have been reviewed for accuracy and value are listed here.]

Statistical Literacy: http://www.statlit.org/
[This web site provides information and articles on improving statistical literacy.]

[This series of articles on the teaching of applied statistics focuses on the scientific applications of pedagogy to improving student learning in statistics.]
Statistical Instructors Lost in Cyberspace: A New Online Statistics Teaching Discussion Group: [https://groups.google.com/forum/?fromgroups#!forum/onlinestats](https://groups.google.com/forum/?fromgroups#!forum/onlinestats)
[For more information about this group, please contact Dr. Michelle Everson at gaddy001@umn.edu]

TeachPsychScience: Resources for Teaching Research and Statistics in Psychology: [www.teachpsychscience.org](http://www.teachpsychscience.org)
[This web site provides peer reviewed activities and assignments that help students master statistics and research methods.]

**Statistics, Research Methods, and Ethics**


Obedience: Milgram
- Great Minds of the 20th Century Dr. Stanley Milgram [DVD] [http://mediasales.psu.edu/](http://mediasales.psu.edu/) (Films about the original experiments)


Tuskegee Apology:

Stanford Prison Experiment: Zimbardo

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