Last Updated: 8/30/21

Resources for Teaching K-12 Statistics (including Common Core Measurement and Statistics)

Please send suggestions for additional entries and comments to cblumberg@gmail.com.

At the request of The Joint Committee of the American Statistical Association (ASA) and National Council of Teachers of Mathematics (NCTM) this document was created to provide a listing of sources of lesson plans, learning activities, videos, data sets and more to support the teaching of statistics, measurement, and probability as covered by the college and career preparation standards of various States including the Common Core State Standards (see http://www.corestandards.org/Math/ for details). Except for resources developed by ASA or NCTM, everything listed is available at no or minimal cost.

We encourage K-12 and 2-year college users of this document to sign up for a free one-year trial ASA membership at https://ww2.amstat.org/membership/k12teachers/. ASA also has a reduced annual membership price of $54 (70% off regular price) for K-12 teachers and Community College faculty. Details are at https://www.amstat.org/ASA/JoinRenew/JoinMemberType.aspx by scrolling down the page to K-12 Teacher or Community College Educator Membership.

Those using this document are encouraged to read the 2nd edition of Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report: A Pre-K-12 Curriculum Framework at https://www.amstat.org/asa/education/Guidelines-for-Assessment-and-Instruction-in-Statistics-Education-Reports.aspx and to adapt their instruction to fit these guidelines. These guidelines were developed by the ASA and NCTM and published under the auspices of the ASA/NCTM Joint Committee on Curriculum in Statistics and Probability.

The first part of this document discusses resources which the ASA and/or National Council of Teachers of Mathematics (NCTM) were involved in developing. The second part discusses other general sources of lesson plans. The remaining parts describe other types of resources that teachers have asked to be included here. In particular, the various sections are:

This document is available at https://www.amstat.org/asa/files/pdfs/EDU-K12-StatResources.pdf

American Statistical Association (ASA) Resources

Education Homepage of the American Statistical Association
https://www.amstat.org/asa/education/home.aspx/index.cfm
This is the central portal for ASA education resources. Besides listing some of the resources given in this document, the central portal contains additional statistics education resources covering Pre-K through graduate school and continuing education.

Bridging the Gap between Common Core State Standards and Teaching Statistics
https://ww2.amstat.org/education/btg/index.cfm (for more information and free download)
ISBN: 9780983937517
Authors: Pat Hopfensperger, Tim Jacobbe, Deborah Lurie and Jerry Moreno
This document contains 20 detailed lesson plans/investigations for grades K to 8. Each investigation contains an overview, learning goals, references to Common Core Standards and NCTM Principles and Standards for School Mathematics, materials, estimated time, instructional plans (following the GAISE guidelines—see below), interpretation of results, assessments with answers, possible extensions and further references. Note: This book was co-published with NCTM.

Focus on Statistics: Investigations for the Integration of Statistics into Grades 9-12 Mathematics Classrooms
https://www.amazon.com/dp/1734223502/ref=sr_1_1?keywords=focus+on+statistics&qid=1580238832&sr=8-1
ISBN: 9781734223507
Authors: Patrick Hopfensperger, Sara Brown, and Henry Kranendonk
Consists of 19 investigations in statistics for grades 9–12. It is written to help classroom teachers implement key statistical concepts in their classrooms. Each investigation has an overview, learning goals, mathematical practice through a statistical lens, materials, instructional plans, and ideas for extensions. Note: This book is an ASA publication that is being sold via Amazon and other websites

Free Investigation from above book that deals with epidemics
https://www.statisticsteacher.org/files/2020/03/Investigation12.pdf
The worksheets for the epidemics investigation are at
https://www.statisticsteacher.org/files/2020/03/Investigation12_Worksheets.pdf

Census at School (USA)
https://ww2.amstat.org/censusatschool/
This website is the U.S. component of a bigger international effort that was originally overseen by the International Centre for Statistical Education (ICSE) in the United Kingdom. “Under the direction of their teachers, students in grades 4–12 anonymously complete an online questionnaire, thus submitting the data to a national database. The questions ask about such things as the length of their right foot, height, favorite subject in school, and how long it takes them to get to school. Thirteen questions are common to every country participating in Census at School, but each country adds its own questions specific to the interests of its students… After students have answered the survey, their teacher will have immediate access to their class results. These are used to teach statistical concepts, measurement, data analysis, and graphing, as well as to explore social concepts. Students can compare their class data with random samples from other students around the country and with random samples of

responses from the international database." (quoted from https://ww2.amstat.org/censusatschool/about.cfm).
For details of how to use this project (including its random sampler) with students, see https://ww2.amstat.org/censusatschool/participantinstructions.cfm.
For resources, including webinars, for using Census at School information as part of statistics lessons, see https://ww2.amstat.org/censusatschool/resources.cfm.

Census at School International
https://new.censusatschool.org.nz/
The USA Census at School is part of an international project hosted presently by the government of New Zealand and University of Auckland. The main webpage has links to additional excellent teaching materials. It also has a Random Sampler (https://new.censusatschool.org.nz/tools/random-sampler/), where samples can be taken of student responses to a questionnaire that is common across the nations of Australis, Canada, New Zealand, United Kingdom, and the USA or for a subset of the user's choice of these 5 nations. To get to the International data you must first check the "I agree" box. Then several choice boxes will appear. Make sure the Database box says "CAS International".

People Count
https://www.statisticsteacher.org/2020/04/03/teaching-module-people-count-and-their-data-stories/
Author: Henry Kranendonk
"This module…examines counts by sex at birth and age in the United States, Kenya, and Japan [based on the] International Data Base of the United States Census Bureau (or IDB)….The theme of this module… [is to study] a country's diversity based primarily on the distributions of ages and the implications connected to age. This module also looks back at age distributions… [over time]" (quoted from webpage at the URL above, where the module can be downloaded from). This module assumes only a knowledge of Algebra I and is consistent with Common Core Standards and those of many States.

Guidelines for Assessment and Instruction in Statistics Education (GAISE) Reports
https://www.amstat.org/asa/education/Guidelines-for-Assessment-and-Instruction-in-Statistics-Education-Reports.aspx
There are two GAISE reports—one for Grades K-12 and one for post-secondary statistics. The new (second) edition of the K-12 report can be downloaded at https://www.amstat.org/asa/files/pdfs/GAISE/GAISEIIPreK-12_Full.pdf. It can also be purchased via Amazon at https://www.amazon.com/Guidelines-Assessment-Instruction-Statistics-Education/dp/1734223510/. The first edition is at https://www.amstat.org/asa/files/pdfs/GAISE/GAISEPreK-12_Full.pdf in English and at https://www.amstat.org/asa/files/pdfs/gaise/Spanish.pdf in Spanish. The purpose of these reports is to supplement the NCTM Principles and Standards (see https://www.nctm.org/standards/), Common Core standards, and other State standards by developing detailed lesson plans at the beginning, intermediate, and more advanced levels using a four-step process of formulating questions, collecting data, analyzing data and interpretation of the results.

Making Sense of Statistical Studies
https://ww2.amstat.org/education/msss/
Authors: Roxy Peck and Daren Starnes with Henry Kranendonk and June Morita
The student "module consists of 15 hands-on investigations that provide students with valuable experience in designing and analyzing statistical studies. It is written for an upper middle-school

or high-school audience having some background in exploratory data analysis and basic probability." (quoted from website). The teacher's module includes all pages from the student module with comprehensive notes that include for each activity: overview of the major ideas that are the focus of the investigation, prerequisite knowledge and skills, learning objectives, teaching tips, references, possible extensions, and suggested answers to questions posed in the activity. Free downloadable copies of both the teacher and student modules are available by clicking on the yellow "Download…" button on the right hand side at the bottom of the page or by going to https://www.statisticsteacher.org/statistics-teacher-publications/ and scrolling down to the downloads part of "Making Sense of Statistical Studies" on the left-hand side of the page.

Journal of Statistics and Data Science Education
https://www.tandfonline.com/toc/ujse21/current
This is a free on-line journal. Although a few of the regular articles contain lesson plans, the main source of lesson plans, along with their relevant data, are the Data Sets and Stories articles (found near the end of each issue). All articles from the past (except for the years of 1999 and 2000) can be found at https://www.tandfonline.com/loi/ujse20. The 1999 & 2000 articles are at http://jse.amstat.org/jse_archive.htm. In addition, there is an extensive JSE Data Archive at http://jse.amstat.org/jse_data_archive.htm that contains many of the data sets from the Data Sets and Stories articles and other useful data sets from 2014 and earlier.

Statistics Teacher (online journal)
https://www.statisticsteacher.org/
The audience for this journal is everyone interested in the teaching of statistics at the K-12 level, including the Common Core. Maintained by ASA on behalf of the ASA-NCTM Joint Committee on Curriculum in Statistics and Probability for Grades K-12. The journal contains articles, lesson plans, announcements, and special sections on assessment and on technology. Go to http://asassoc.informz.net/ASASSOC/pages/st_signup to subscribe to receive email notification when the journal is updated.

StatisticsEducationWeb (STEW)
https://www.amstat.org/ASA/Education/STEW/home.aspx
"STEW is an online resource for peer-reviewed lesson plans for K-12 teachers…. STEW lesson plans identify both the statistical concepts being developed and the age range appropriate for its use…. Teachers can navigate the site by grade level and statistical topic." (quoted from website) Most of the lesson plans contain references to aid those that are using the Common Core standards. Starting in 2017, as new lessons are developed, they are appearing in the Statistics Teacher (see above for details) online journal.

The Statistics Teacher Network Newsletters
https://ww2.amstat.org/education/stn/index.html
Past issues are excellent sources of lesson plans. They also contain a great deal of information relevant to K-12 teachers. Starting in 2017, the newsletters have been expanded to include more detailed lesson plans) and renamed as the Statistics Teacher (see above) online journal.

K-12 Statistics Listserv
Has announcements from ASA of interest to K-12 statistics education. Members can also communicate and share resources. It is only available to ASA's K-12 Teacher members through the online ASA community. A form for a free K-12 Teacher one-year trial ASA membership is at https://ww2.amstat.org/membership/k12teachers/. In addition, ASA has a reduced membership price of $54 for renewing K-12 teachers. For details, scroll down to K-12 membership about 2/3 of the way down on https://www.amstat.org/ASA/JoinRenew/JoinMemberType.aspx.

Meeting Within a Meeting (MWM) Statistics Workshop for Mathematics and Science Teachers

https://www.amstat.org/asa/education/MWM/home.aspx

"The MWM program provides middle- and high-school mathematics and science teachers an opportunity to discuss and apply the data analysis, data science, and statistical concepts embodied in the NCTM Catalyzing Change books and American Statistical Association's (ASA) *Guidelines for Assessment and Instruction in Statistics Education (GAISE) Pre-K–12 Curriculum Framework*….from a statistical point of view and [to] study ways to assess student understanding of statistical concepts. They also will explore problems that require them to formulate statistical questions and collect, organize, analyze, and draw conclusions from data…. This workshop is held yearly (usually in connection with the Joint Statistical Meetings) in late July or early August…..Teams from the same school are especially encouraged to attend." (quoted from website)

K-12 Statistics Education Webinars

https://www.amstat.org/asa/education/K-12-Statistics-Education-Webinars.aspx

These are past webinars sponsored by ASA. Accompanying materials for each webinar are also on the site. Notices of future webinars are available to K-12 Teacher members of ASA via the K-12 listserv (see previous page) and to previous participants of the ASA MWM Statistics Workshops (see above).

K–12 Statistics Teacher Meetups

https://www.youtube.com/channel/UCESYnsheh2TclJlZW13sdBQ/videos

ASA offers free K–12 teacher meetups (via Zoom) to share resources and discuss K–12 statistics topics. Meetup topics have included the AP Statistics exam and statistics reading, assessment, applets, software resources, and lesson plans. Use the link given here to view recordings of past meetups and/or to subscribe for meetups.

To sign up to receive notices of future seminars and/or make suggestions for future seminars go to https://www.statisticsteacher.org/2020/11/12/k-12-teacher-meet-ups/

College Majors Requiring Statistics

https://www.amstat.org/asa/files/pdfs/EDU-CollegeMajorsFlyer.pdf

This one-page document is a comprehensive listing of college majors that require statistics. It can be very useful to show students that statistics is important to almost every field of study.

This is Statistics

https://thisisstatistics.org/

This is a very useful website maintained by ASA to promote the field of statistics to the public. It has a general section and sections aimed at parents, students, educators and counselors. The website also includes links to videos and other resources. The webpage for educators is at https://thisisstatistics.org/educators/.

Data-Driven Mathematics

This is a series of textbook modules funded that were specifically designed to integrate statistics and data analysis into mathematics courses throughout the secondary school curriculum. They provide realistic, real-world data situations for developing mathematical and statistical knowledge. Although written many years ago, they are very consistent with the standards of the various States, include those using the Common Core standards. The copyrights have been transferred from the original publisher to ASA. Each module has a student textbook and an accompanying Teacher's Edition. See next page for a complete listing.

Advanced Modeling and Matrices, by Burrill, Burrill, Landwehr, and Witmer https://www.amstat.org/asa/files/pdfs/ddmseries/AdvancedModelingandMatrices.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/AdvancedModelingandMatrices--TeachersEdition.pdf for the Teacher's Edition

Exploring Centers, by Kranendonk and Witmer https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringCenters.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringCenters--TeachersEdition.pdf for the Teacher's Edition

Exploring Linear Relations, by Burrill and Hopfensperger https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringLinearRelations.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringLinearRelations.pdf for the Teacher's Edition

Exploring Projects, by Errthum, Mastromatteo, O'Connor, and Scheaffer https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringProjects.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringProjects--TeachersEdition.pdf for Teacher's Edition

Exploring Regression, by Burrill, Burrill, Hopfensperger, and Landwehr https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringRegression.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringRegression--TeachersEdition.pdf for the Teacher's Edition.

Exploring Symbols, by Burrill, Clifford, and Scheaffer https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringSymbols.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringSymbols--TeachersEdition.pdf for the Teacher's Edition

Exploring Systems of Inequalities, by Burrill and Hopfensperger https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringSystemsofIneqalities.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ExploringSystemsofIneqalities--TeachersEdition.pdf for the Teacher's Edition.

Mathematics in a World of Data, by Burrill, Clifford, Errthum, Kranendonk, Mastromatteo, and O'Connor https://www.amstat.org/asa/files/pdfs/ddmseries/MathematicsinaWorldofData.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/MathematicsinaWorldofData--TeachersEdition.pdf for the Teacher's Edition

Modeling with Logarithms, by Burrill, Clifford, and Landwehr https://www.amstat.org/asa/files/pdfs/ddmseries/ModelingwithLogarithms.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ModelingwithLogarithms--TeachersEdition.pdf for the Teacher's Edition

Probability Models, by Hopfensperger, Kranendonk, and Scheaffer https://www.amstat.org/asa/files/pdfs/ddmseries/ProbabilityModels.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ModelingwithLogarithms--TeachersEdition.pdf for the Teacher's Edition

Probability Through Data, by Hopfensperger, Kranendonk, and Scheaffer https://www.amstat.org/asa/files/pdfs/ddmseries/ProbatilityThroughData.pdf for Student Edition and https://www.amstat.org/asa/files/pdfs/ddmseries/ProbabilityThroughData--TeachersEdition.pdf for the Teacher's Edition

CHANCE
https://www.tandfonline.com/action/journalInformation?show=aimsScope&journalCode=ucha20
and
Significance https://www.significancemagazine.com/
These two magazines have articles that emphasize entertaining or unusual interesting uses of statistics. Some can even be used as the basis for classroom lesson plans. Note: ASA K-12 and 2-year college teacher members have online access to all *CHANCE* issues and receive Significance in the mail. For information on a one-year free trial membership to ASA for K-12 teachers or 2-year college faculty, see page 1 of this document.

CHANCE Special Issues on Nurturing Statistical Thinking Before College
Available on the web at https://www.tandfonline.com/toc/ucha20/28/3?nav=tocList (Part 1) and https://www.tandfonline.com/toc/ucha20/28/4?nav=tocList (Part 2). In addition, videos of webinars based on the articles on Nurturing Statistical Thinking are at https://www.youtube.com/channel/UCmUHsGdPwsEsWZcF1Lt2Yqg
While all articles are available to subscribers of *CHANCE* (see the entry just above), articles relevant to K-12 education and that are free access are:
The Relationships Between Statistics and Other Subjects in the K-12 Curriculum by Zalman Usiskin and Kathy Hall at https://www.tandfonline.com/doi/full/10.1080/09332480.2015.1099361 (webinar discussing this article at https://magazine.amstat.org/videos/education_webinars/Usiskin-StatisticsandotherSubjects.wmv)
Data Surfing by Kay Endriss and Michael McWilliams at https://www.tandfonline.com/doi/full/10.1080/09332480.2015.1099367 (webinar related to the article is at https://magazine.amstat.org/videos/education_webinars/DataSurfing.wmv)
Collaboration in the Mathematical Sciences Community on Mathematical Modeling Across the Curriculum by Peter R. Turner, Rachel Levy, and Kathleen Fowler at https://www.tandfonline.com/doi/full/10.1080/09332480.2015.1120122.
Preparing Students for a Data-centric World by Nicole Lazar and Christine Franklin at https://www.tandfonline.com/doi/full/10.1080/09332480.2015.1120128.
Taking a Chance in the Classroom: Modeling Statistical Thinking by Daniel Kaplan at https://www.tandfonline.com/doi/full/10.1080/09332480.2015.1120129.

Curriculum Guidelines for Undergraduate Programs in Statistical Science
https://www.amstat.org/asa/education/Curriculum-Guidelines-for-Undergraduate-Programs-in-Statistical-Science.aspx (home page)
https://www.amstat.org/education/pdfs/guidelines2014-11-15.pdf (downloadable copy of complete guidelines)
These guidelines are suggestions for the content and instruction for undergraduate majors in statistical science. High school teachers will benefit from looking at these guidelines so that they know what their students who get interested in Statistics will study at the undergraduate level. In addition, the following white papers associated with the guidelines are also worth looking at:
Ethics for Undergraduates by Steve Cohen at https://www.amstat.org/asa/files/pdfs/EDU-EthicsUndergraduates.pdf
What Teachers Should Know about the Bootstrap: Resampling in the Undergraduate Statistics Curriculum by Tim Hesterberg at https://www.amstat.org/asa/files/pdfs/EDU-ResamplingUndergradCurriculum.pdf (this article is also available at https://arxiv.org/format/1411.5279v1). A closely related article by T. Hesterberg is at https://amstat.tandfonline.com/doi/full/10.1080/00031305.2015.1089789.

The American Statistician Special Issue on Statistics and the Undergraduate Curriculum (Volume 69, Issue 4, 2015)

https://amstat.tandfonline.com/toc/utas20/69/4 and then scroll down past the new articles. This special issue of The American Statistician is an outgrowth of the curriculum guidelines for undergraduate programs (see just above for details) and is devoted to how to prepare students to engage with data in their work and focuses on statistics and the undergraduate curriculum. While this journal is not normally free access, the introduction and one article in this issue are open access and relevant to the K-12 curriculum:

(Introduction) *Teaching the Next Generation of Statistics Students to "Think With Data": Special Issue on Statistics and the Undergraduate Curriculum* by Nicholas J. Horton & Johanna S. Hardin at https://amstat.tandfonline.com/doi/full/10.1080/00031305.2015.1094283. This introduction has over 100 useful references.

What Teachers Should Know About the Bootstrap: Resampling in the Undergraduate Statistics Curriculum by Tim C. Hesterberg at https://amstat.tandfonline.com/doi/full/10.1080/00031305.2015.1089789

There are also several non-free access articles in this issue that are relevant to Common Core.

Home pages of ASA Sections and Interest Groups with a focus on the Teaching of Statistics

Statistics and Data Science Education

https://community.amstat.org/statisticaleducationsection/home

Teaching of Statistics in the Health Sciences

https://community.amstat.org/TSHS/home

Both have links to blogs, lists of presentations and other things. Many of the things linked to are appropriate for Common Core Statistics.

History of Statistics Interest Group

https://community.amstat.org/historyofstats/home

The members of this group are very interested in helping teachers integrate the history of statistics into their classrooms. The activities they have developed thus far are at https://community.amstat.org/historyofstats/ourlibrary/new-item2.

Online Teaching Resources and Discussion community of the ASA

https://community.amstat.org/communities/community-home?CommunityKey=9c8a2ecb-45a6-469d-894e-5254e00d619f

This community was created in response to the Covid-19 crisis to have a discussion forum for those teaching remotely. Participants must be members of ASA. See page 1 of this document for information on free and reduced-price memberships for K-12 and 2-year college faculty.

National Council of Teachers of Mathematics (NCTM) Resources

Principles and Standards for School Mathematics
https://www.nctm.org/Standards-and-Positions/Principles-and-Standards/
The Standards of the various States and the Common Core Standards for statistics and probability have their basis in the National Council of Teachers of Mathematics (NCTM) Principles and Standard for School Mathematics. This document gives detailed explanations and examples for each of the standards separated by grade level.

Common Core Standards homepage
https://www.nctm.org/standards/mathcommoncore/
As the name implies, this is a comprehensive webpage for NCTM and non-NCTM resources related to the Common Core. It is broken down into Elementary, Middle School, High School and Leadership portions, which can be reached by links near the bottom of this homepage. Since the NCTM Common Core Standards homepage is a general website, to help the users of this document, NCTM resources that are highly relevant to statistics and probability are listed in the rest of this section.

Illuminations
https://illuminations.nctm.org/
"Lessons and interactives searchable by NCTM's Principles and Standards and by the Common Core State Standards. [It has over] 700 lesson plans [and over]100 activities; these are virtual manipulatives, applets, and games" (quoted from https://illuminations.nctm.org/Content.aspx?id=58). The easiest way to access the statistics and probability content is to go to the search box on the right-hand side of the homepage and click on the "NCTM Standards" option and then choose the desired grade levels and the "Data Analysis & Probability" options in the search box.

Thinking and Reasoning with Data and Chance, 68th Yearbook (2006)
ISBN: 9780873535885
Editors: Portia C. Elliott and Gail F. Burrill
Covers Grades 3 through 12. It "focuses on students' and teachers' learning in statistics centered on a set of activities. Topics include the relation between mathematics and statistics, the development and enrichment of mathematical concepts through the use of statistics, and a discussion of the research related to teaching and learning statistics." (quoted from old website)
It is now out-of-print. However, many copies are available through the usual resale websites.

Learning and Teaching Measurement, 65th Yearbook (2003)
ISBN: 9780873535397
Editor: Douglas H. Clements
Covers Grades Pre-K through 12. It "presents current thinking about the learning and teaching of measurement, including students' understanding, the mathematics of measurement, estimation and approximation, connections, and pedagogy. The companion booklet, which not only illustrates some of the issues from the yearbook but also contains activities that go beyond the content, contains teaching notes and ready-to-use handouts." (quoted from old website)
It is now out-of-print. However, many copies are available through the usual resale websites.

Focus in High School Mathematics: Reasoning and Sense Making in Statistics and Probability
https://www.nctm.org/store/Products/Focus-in-High-School-Mathematics--Reasoning-and-Sense-Making-in-Statistics-and-Probability/
ISBN: 9780873536424
(As an e-book) https://www.nctm.org/Store/Products/Focus-in-High-School-Mathematics--Statistics-and-Probability-(Download)/
ISBN: 9780873537650
Authors: J Michael Shaughnessy, Beth Chance and Henry Kranendonk
"Six investigations illustrate how to help high school students develop their skills in working with data. The investigations emphasize the roles of reasoning and sense making in defining a statistical question and collecting, analyzing, and interpreting data to answer it. The authors examine the key elements of statistical reasoning identified in *Focus in High School Mathematics: Reasoning and Sense Making* and elaborate on the associated reasoning habits." (quoted from website)

Statistical Questions from the Classroom
https://www.nctm.org/Store/Products/Statistical-Questions-from-the-Classroom-(POD)/
ISBN: 9780873536332
Authors: J Michael Shaughnessy and Beth Chance
"This little book presents eleven short discussions of some of the most frequently asked questions about statistics, questions that are consistently raised by statistics students and by classroom teachers alike. Some questions such as "What is the difference between a sample and a sampling distribution?" or "What is a margin of error?" or "What is a p-value?" involve major concepts in statistics. Other questions such as "Why are deviations squared?" or "Why do we divide by n - 1 instead of n?" deal with some of the more technical aspects of the mathematics in statistical theory. The authors offer teachers of statistics some quick insight and support in understanding these issues and explaining these ideas to their own students. Examples and visual representations of the ideas are included." (quoted from website)

Regularly Published Journals
Almost every issue of these journals has articles on statistics. In order of grade levels covered:
"Teaching Children Mathematics"
https://www.nctm.org/publications/teaching-children-mathematics/
"Mathematics Teaching in the Middle School"
https://www.nctm.org/publications/mathematics-teaching-in-the-middle-school/
"Mathematics Teacher"
https://www.nctm.org/publications/mathematics-teacher/
"Mathematics Teacher Educator"
https://www.nctm.org/Publications/mathematics-teacher-educator/

Making Sense of Data
https://www.nctm.org/store/Products/Curriculum-and-Evaluation-Standards-for-School-Mathematics--Addenda-Series-Grades-K-6--Making-Sense-of-Data/
ISBN-10 for out-of-print original version: 0873533186
ISBN-13 for print on demand version: 9780873533188
Authors: Mary M. Lindquist and Jan Luquire
This booklet (and the two listed below) is part of NCTM's Addenda series. It contains 7 chapters, one for each grade of K through 6, with descriptions of classroom investigations that include activities, master copies of student pages and student questions.

Dealing with Data and Chance
https://www.nctm.org/store/Products/Curriculum-and-Evaluation-Standards-for-School-Mathematics--Addenda-Series-Grades-5-8--Dealing-with-Data-and-Chance/
ISBN-10 for out-of-print original version: 0873533216
ISBN-13 for print on demand version: 9780873533218
Authors: Judith S. Zawojewski with Gary Brooks, Lynn Dinkelkamp, Eunice D. Goldberg, Howard Goldberg, Arthur Hyde, Tess Jackson, Marsha Landau, Hope Martin, Jeri Nowakowski, Sandy Paull, Albert P. Shulte, Philip Wagreich and Barbara Wilmot
This booklet (and the ones listed directly and below) is part of NCTM's Addenda series. It is aimed at the Grades 5-8 level and contains classroom activities that illustrate data gathering, communication, problem solving, reasoning and connections.

Data Analysis and Statistics
https://www.nctm.org/store/Products/Curriculum-and-Evaluation-Standards-for-School-Mathematics--Addenda-Series-Grades-9-12--Data-Analysis-and-Statistics/
ISBN-10 for out-of-print original version: 0873533291
ISBN-13 for print on demand version: 9780873533294
Authors: Gail Burrill, John C. Burrill, Pamela Coffield, Gretchen Davis, Jan de Lange, Diann Resnick and Murray Siegel
This booklet (and the two listed above) is part of NCTM's Addenda series. It is aimed at the Grades 9-12 level. It describes ways of integrating statistics into the curriculum via numerous examples. It has special "Try This" parts that have exercises, problems and explorations for use with students.

Navigations
"The Navigations series translates the five strands of NCTM's *Principles and Standards for School Mathematics* into action and illustrates the growth and connectedness of content areas from prekindergarten through grade 12…. Each book includes a supplemental CD-ROM that features interactive electronic activities to use with students, printable PDF files of all activity pages, articles from NCTM's journals and interactive applets." (quoted from old NCTM website).
The ones most relevant to statistics and probability are:
Navigating through Data Analysis and Probability in Prekindergarten–Grade 2 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Data-Analysis-and-Probability-in-Prekindergarten%E2%80%93Grade-2-(with-CD-ROM)/
Navigating through Measurement in Prekindergarten–Grade 2 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Measurement-in-PreKindergarten%E2%80%93Grade-2-(with-CD-ROM)/
Navigating through Data Analysis and Probability in Grades 3-5 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Data-Analysis-and-Probability-in-Grades-3%E2%80%935-(with-CD-ROM)/
Navigating through Measurement in Grades 3-5 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Measurement-in-Grades-3%E2%80%935-(with-CD-ROM)/
Navigating through Discrete Mathematics in Prekindergarten–Grade 5 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Discrete-Mathematics-in-Prekindergarten---Grade-5-(with-CD-ROM)/
Navigating through Data Analysis in Grades 6-8 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Data-Analysis-in-Grades-6%E2%80%938-(with-CD-ROM)/

Navigating through Probability in Grades 6-8 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Probability-in-Grades-6%E2%80%938-(with-CD-ROM)/
Navigating through Discrete Mathematics in Grades 6-12 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Discrete-Mathematics-in-Grades-6-12-(with-CD-ROM)/
Navigating through Data Analysis in Grades 9-12 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Data-Analysis-in-Grades-9%E2%80%9312-(with-CD-ROM)/
Navigating through Probability in Grades 9-12 (with CD-ROM)
https://www.nctm.org/store/Products/Navigating-through-Probability-in-Grades-9%E2%80%9312-(with-CD-ROM)/

Developing Essential Understanding of Statistics for Teaching Mathematics in Grades 6-8
https://www.nctm.org/store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-6-8/
ISBN: 9780873536721
(As an electronic download) https://www.nctm.org/Store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-6-8-(Download)/
ISBN: 9780873538534
Authors: Gary Kadar, Tim Jacobbe, Patricia Wilson and Rose Mary Zbiek
This book is part of the NCTM Essential Understanding Series. “This book focuses on essential knowledge for mathematics teachers about statistics. It is organized around four big ideas, supported by multiple smaller, interconnected ideas *essential understandings*… [Going] beyond a simple introduction to statistics, the book will broaden and deepen … understanding of one of the most challenging topics for students and teachers. It will help … engage…students, anticipate their perplexities, avoid pitfalls, and dispel misconceptions… [Users] also learn to develop appropriate tasks, techniques, and tools for assessing students’ understanding of the topic.” (quoted from website)

Developing Essential Understanding of Statistics for Teaching Mathematics in Grades 9-12
https://www.nctm.org/store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-9-12/
ISBN: 9780873536769
(As an electronic download) https://www.nctm.org/Store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-9-12-(Download)/
ISBN: 9780873538527
Authors: Roxy Peck, Rob Gould, Stephen Miller and Rose Mary Zbiek
This book is part of the NCTM Essential Understanding Series). “… [It] examines five big ideas and twenty-four related essential understandings for teaching statistics in grades 9–12. The authors distinguish mathematical and statistical models, explore distributions as descriptions of variability in data, focus on the fundamentals of testing hypotheses to draw conclusions from data, highlight the importance of the data collection method, and recognize the need to examine bias, precision, and sampling method in evaluating statistical estimators … [The] authors discuss the growth of students’ ideas about statistics and examine challenges to teaching, learning, and assessment. They intersperse their discussion with questions for teachers’ reflection.” (quoted from website). See next entry for a companion to this book.

Putting Essential Understanding into Practice: Statistics, 9-12
https://www.nctm.org/Store/Products/Putting-Essential-Understanding-into-Practice--Statistics,-9-12/
ISBN: 9780873537377
(As an electronic download) https://www.nctm.org/Store/Products/Putting-Essential-Understanding-into-Practice-Statistics,-9%E2%80%9312-(Download)/
ISBN: 9780873539159
Authors: Terry Crites and Roy St. Laurent
This is a companion to the book Developing Essential Understanding… of the previous entry. "The authors demonstrate how to use this multifaceted knowledge to address the big ideas and essential understandings that students must develop for success with statistics—not only in their current work, but also in higher-level mathematics and a myriad of real-world contexts. Explore rich, research-based strategies and tasks that show how students are reasoning about and making sense of statistics. Use … these … to build on their understanding while identifying and correcting misunderstandings…" (quoted from website)

Developing Data Graph Comprehension (3rd Edition)
https://www.nctm.org/store/Products/Developing-Data-Graph-Comprehension,-third-edition/
ISBN: 9780873536516
(As an electronic download) https://www.nctm.org/Store/Products/Developing-Data-Graph-Comprehension-in-Grades-K-8,-third-edition-(Download)/
ISBN: 9780873537971
Author: Frances Curcio
[Has] 30 Classroom-ready activities that emphasize exploration, investigation, reasoning, and communication…This book offers teachers and teacher educators practical ideas for incorporating graph reading and quantitative literacy into instructional programs. Activities include objectives, vocabulary, materials, questions for discussion, and ideas for summarizing that are meant to guide students in data collection, representation, and interpretation." (quoted from website)

Statistics: Modeling with Data Casebook
https://www.nctm.org/Store/Products/Statistics--Modeling-with-Data-Casebook/
ISBN: 9780873539371
(As an electronic download) https://www.nctm.org/Store/Products/Statistics--Modeling-with-Data-Casebook-(Download)/
ISBN: 9780873539586
Authors: Susan Jo Russell, Deborah Schifter, and Virginia Bastable
"The *Modeling with Data Casebook* was developed as the key resource for participants' Developing Mathematical Ideas seminar experience. The twenty-eight cases, written by teachers describing real situations and actual student thinking in their classrooms, provide the basis of each session's exploration of using data to model real-world contexts by collecting, representing, describing, and interpreting data." (quoted from website). Consists of both a casebook and a facilitator manual, which can be purchased separately or together. See the webpage given here for details.

Resources Developed by ASA Committees and Published Elsewhere

Exploring Data (Second Edition)
ISBN-10: 0866516131 ISBN-13: 9780866516136 (Student Edition)
ISBN-10: 0866513221 (Teacher's Edition)
Authors: James M. Landwehr and Ann E. Watkins
This book is the first book of four in the Quantitative Literacy Series (along with the next three books described below). It contains 45 investigations, sorted by statistical topic, which are set up as worksheets for students. This book covers basic descriptive statistics and plots. It assumes no prior knowledge of statistics or of algebra. In addition, there is a Teacher's Edition with detailed lesson plans. The student and teacher books are now out-of-print. However, many copies are available through the usual resale websites. Can be used in Grades 5 to 12.

Exploring Probability
ISBN-10: 0866513337 ISBN-13: 978-0866513333
ISBN-10: 0866513345 (Teacher's Edition)
Authors: Claire M. Newman, Thomas E. Obremski and Richard L. Scheaffer
This is one of the 4 books in the Quantitative Literacy Series (along with the book described above and the two books described below). The book was written specifically for high school students with minimal mathematics background. It is a series of 44 investigations set up as worksheets for students. Although written before the NCTM Principles and Standards for School Mathematics existed, it covers probability in the manner advocated by the Common Core and other State standards. It even covers conditional probability. In addition, there is a Teacher's Edition with detailed lesson plans. The student and teacher books are now out-of-print. Many copies are available through the usual resale websites. Can be used in Grades 6 to 12.

Exploring Surveys and Information from Samples
ISBN-10: 0866513396 ISBN-13: 978-0866513395
ISBN-10: 086651340X (Teacher's Edition)
Authors: James M. Landwehr, Jim Swift and Ann E. Watkins
This is one of the 4 books in the Quantitative Literacy Series (along with the 2 books described above and the book described below). This book was written specifically for high school students with minimal mathematics background. It is a series of 32 investigations set up as worksheets for students. Although written before the NCTM Principles and Standards for School Mathematics existed, it covers much of the material on analyzing the results from surveys in the manner advocated by the Common Core and other State standards. In addition, there is a Teacher's Edition with detailed lesson plans. The student and teacher books are now out-of-print. However, many copies are available through the usual resale websites. Can be used in Grades 6 to 12.

The Art and Techniques of Simulation
ISBN-10: 0866513361 ISBN-13: 9780866513364
ISBN-10: 086651337X (Teacher's Edition)
Authors: Mrudulla Gnanadesikan, Richard L. Scheaffer, & Jim Swift
This is one of the 4 books in the Quantitative Literacy Series (along with the 3 books described above). This book contains 30 investigations of real-world topics that use simulation to solve them. The simulations are set up as worksheets for students. In addition, there is a Teacher's Edition with detailed lesson plans. The student and teacher books are now out-of-print. However, many copies are available through the usual resale websites. Can be used in Grades 7 to 12.

AMATYC (American Mathematical Association of Two-Year Colleges) Webinar Series
https://amatyc.org/page/Webinars
In cooperation with the ASA/AMATYC Joint Committee a continuing seminar series related to introductory statistics topics has been developed. The above link goes to the listing of all AMATYC seminars since 2011. To get to the statistics seminars, scroll down to the "Past Webinars" box and click on the "statistics" link.

ASA-CRC Series on Statistical Reasoning in Science and Society
https://www.routledge.com/ASA-CRC-Series-on-Statistical-Reasoning-in-Science-and-Society/book-series/CRCASASERSTAREA
The purpose of this series of books is:

- to highlight "the…role of statistical and probabilistic reasoning in many areas.
- [have] Concepts presented assuming minimal background in Mathematics and Statistics.
- [be accessible to] A broad audience including …the general public and courses in high schools and colleges.
- [cover] Topics include Statistics in wide-ranging aspects of professional and everyday life" (quoted from website)

Present books in the series are listed below. All come in hardback, paperback & e-book formats.
Visualizing Baseball by Jim Albert
ISBN 9781498782753
https://www.routledge.com/Visualizing-Baseball/Albert/p/book/9781498782753
Errors, Blunders, and Lies: How to Tell the Difference by David S. Salsburg
ISBN 9781498795784
https://www.routledge.com/Errors-Blunders-and-Lies-How-to-Tell-the-Difference/Salsburg/p/book/9781498795784
Data Visualization: Charts, Maps, and Interactive Graphics by Robert Grant
ISBN 9781138707603
https://www.routledge.com/Data-Visualization-Charts-Maps-and-Interactive-Graphics/Grant/p/book/9781138707603
Improving Your NCAA® Bracket by Tom Adams ISBN 9781138597747
https://www.routledge.com/Improving-Your-NCAA-Bracket-with-Statistics/Adams/p/book/9781138597747
Statistics and Health Care Fraud: How to Save Billions by Tahir Ekin
ISBN 9781138197428
https://www.routledge.com/Statistics-and-Health-Care-Fraud-How-to-Save-Billions/Ekin/p/book/9781138197428
Measuring Crime: Behind the Statistics by Sharon L. Lohr
ISBN 9781138489073
https://www.routledge.com/Measuring-Crime-Behind-the-Statistics/Lohr/p/book/9781138489073
Measuring Society by Chaitra H. Nagaraja
ISBN 9781138035980
https://www.routledge.com/Measuring-Society/Nagaraja/p/book/9781138035980
Monitoring the Health of Populations by Tracking Disease Outbreaks: Saving Humanity from the Next Plague by Steven E Rigdon and Ronald D. Fricker, Jr.
ISBN 9781138742345
https://www.routledge.com/Monitoring-the-Health-of-Populations-by-Tracking-Disease-Outbreaks-Saving/Rigdon-Jr/p/book/9781138742345
Debunking Seven Terrorism Myths Using Statistics by Andre Python
ISBN 9780367472245
https://www.routledge.com/Debunking-Seven-Terrorism-Myths-Using-Statistics/Python/p/book/9780367472245

Achieving Product Reliability: A Key to Business Success by Necip Doganaksoy, William Q. Meeker and Gerald J. Hahn
ISBN 9781138054004
https://www.routledge.com/Achieving-Product-Reliability-A-Key-to-Business-Success/Doganaksoy-Meeker-Hahn/p/book/9781138054004
Protecting Your Privacy in a Data-Driven World by Claire McKay Bowen
ISBN 9780367640743
https://www.routledge.com/Protecting-Your-Privacy-in-a-Data-Driven-World/Bowen/p/book/9780367640743

Elementary Quantitative Literacy (EQL) Series
Authors: Carolyn Bereska, L. Carey Bolster, Cyrilla H. Bolster, and Richard Scheaffer

- ***Exploring Statistics in the Elementary Grades*, Book One**

ISBN-10: 1572323442 ISBN-13: 9781572323445

- ***Exploring Statistics in the Elementary Grades*, Book Two**

ISBN-10: 1572323450 ISBN-13: 9781572323452
These were written by a team of elementary school teachers and statisticians to introduce the key ideas and lessons in data analysis and probability in the K–6 mathematics curriculum. The books are now out-of-print. However, many copies are available through the usual resale websites.

Statistics: A Guide to the Unknown, 4th Edition
ISBN-10: 0534372821 ISBN-13: 9780534372828
Authors: Roxy Peck, George Casella, George W. Cobb, Roger Hoerl, Deborah Nolan, Robert Starbuck and Hal Stern
"Published in partnership with the American Statistical Association, this collection of intriguing essays describes important applications of statistics and probability in a wide variety of fields. Instead of teaching methods, the essays illustrate past accomplishments and current uses of statistics and probability. Examples of surveys, questionnaires, experiments, and observational studies are included to help the student better understand the importance of and the influence of statistics." (quoted from old Cengage website). Each essay, in combination with its accompanying questions for students, can be used as the basis for lesson plans in grade 9 to 12. It is now out of print. However, many copies are available through the usual resale websites. The 3rd edition of this book (see below) is also worth looking at.

Statistics: A Guide to the Unknown, 3rd Edition
ISBN-10: 0534094929 and ISBN-13: 9780534094928
Edited by Judith M. Tanur, Frederick Mosteller and William H. Kruskal. This book is similar in format to the 4th edition (see above). But it has a totally different set of essays which, although somewhat dated, are also worth looking at. It is now out of print. However, many copies are available through the usual resale websites

Other Sources of Lesson Plans

EngageNY
https://www.engageny.org/common-core-curriculum
This website comes highly recommended by many teachers. "The…materials on EngageNY are designed to be adopted or adapted. Educators will find both PDF and Word versions available for their use. Some lessons provide detailed instructions or recommendations but it is important to note that ***the lessons are not scripts*** and rather they should be viewed as vignettes so that the reader can imagine how the class could look. Lessons … allow for teacher preference and flexibility so that what is happening in the classroom can both meet students' needs and be in service to the shifts and the standards…. [T]he Tristate/EQuIP rubric [https://www.engageny.org/resource/tri-state-quality-review-rubric-and-rating-process helps teachers] …evaluate the quality, rigor, and alignment of … adapted lessons… [T]he Math modules include a significant number of problem sets so that students have ample opportunity to practice and apply their knowledge." (quoted from website)
They also have questions translated into Spanish, Chinese, Haitian Creole, Korean & Russian at https://www.engageny.org/resource/released-2019-3-8-mathematics-state-test-questions-translated-editions and translated into Arabic, Bengali, Chinese, English, Haitian Creole, Korean, Russian and Spanish at https://www.engageny.org/resource/released-2021-3-8-mathematics-state-test-questions-translated-editions. For older questions, go to https://www.engageny.org/ccss-library.
The most relevant modules for statistics and probability are:
Grade 6—Module 6 at https://www.engageny.org/resource/grade-6-mathematics-module-6
Grade 7—Module 5 at https://www.engageny.org/resource/grade-7-mathematics-module-5
Grade 8—Module 6 at https://www.engageny.org/resource/grade-8-mathematics-module-6
Algebra I—Module 2 at https://www.engageny.org/resource/algebra-i-module-2 and Module 5 at https://www.engageny.org/resource/algebra-i-module-5
Algebra II—Module 4 at https://www.engageny.org/resource/algebra-ii-module-4
Precalculus and Advanced Topics--Module 5 at https://www.engageny.org/resource/precalculus-and-advanced-topics-module-5
These modules also have translations into Arabic, Bengali, Chinese and Spanish. However, some modules only have translations into some of these languages.

Illustrative Mathematics
https://www.illustrativemathematics.org/content-standards
With a few clicks the user can get a list of activities (called "tasks") to match any particular Common Core standard from Grades K to 12. Each activity is accompanied by a list of which standards it covers, the task itself, commentary, and solutions. Although tied to the Common Core in terms of organization, teachers in states with other standards have found these activities useful.

Mathematics Vision Project
https://www.mathematicsvisionproject.org/
"The Mathematics Vision Project (MVP) curriculum has been developed to realize the vision and goals of the New Core Standards of Mathematics. The Comprehensive Mathematics Instruction (CMI) framework is an integral part of the materials." (quoted from website). For each course there are downloadable student lessons (most are worksheet-based) and teacher notes at both the regular and honors level. The "honors" editions for each module are located by scrolling down each page.
The most appropriate modules for statistics are:

Algebra—Module 9: Modeling Data at https://www.mathematicsvisionproject.org/algebra.html
Geometry—Module 8: Probability at https://www.mathematicsvisionproject.org/geometry.html
Algebra II—Module 9: Statistics at https://www.mathematicsvisionproject.org/algebra-ii.html
Secondary I—Module 9: Modeling Data at https://www.mathematicsvisionproject.org/secondary-mathematics-i.html (available in both English and Spanish)
Secondary II—Module 9: Probability at https://www.mathematicsvisionproject.org/secondary-mathematics-ii.html (available in both English and Spanish)
Secondary III—Module 9: Statistics at https://www.mathematicsvisionproject.org/secondary-mathematics-iii.html (available in both English and Spanish).

Mathematics Georgia Standards of Excellence (GSE)
The State of Georgia has developed comprehensive frameworks and lesson plans for implementing their State standards. These are easily adaptable to other States. Below, for each grade band the most relevant ones for each grade are given.
Grade K—Unit 4 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/K-Math-Unit-4.pdf
Grade 1—Unit 4 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/1st-Math-Unit-4.pdf
Grade 2—Unit 3 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/2nd-Math-Unit-3.pdf
Grade 3—Unit 6 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/3rd-Math-Unit-6.pdf
Grade 4—Unit 7 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/4th_Math-Unit-7.pdf
Grade 5—Unit 6 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/5-Math-Unit-6.pdf
Grade 6—Unit 6 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/6th-Math-Unit-6.pdf
Grade 7—Unit 5 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/7th-Math-Unit-5.pdf AND Unit 6 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/7th-Math-Unit-6.pdf
Grade 8—Unit 6 at https://www.georgiastandards.org/Georgia-Standards/Frameworks/8th-Math-Unit-6.pdf

CAUSEweb.org (Consortium for the Advancement of Undergraduate Statistics Education)
https://www.causeweb.org/cause/
Although this website is concerned with undergraduate statistics, many of its resources, including its webinars and “fun” page, are appropriate for secondary schools. The webinars can be found at https://www.causeweb.org/cause/webinars. The fun page is at https://www.causeweb.org/cause/resources/fun.

Concord Consortium STEM Resources
https://learn.concord.org/
Has a wide variety of resources, including many that involve various uses of statistics and statistical modeling. Resources include appropriate grade levels (including some with different versions for the various grade levels) and how they match with various standards (including both Common Core and Next Generation Science Standards). While many are under the category of Mathematics, the other categories also contain many activities that use statistics and measurement. There is also a data science portion at https://concord.org/our-work/research-projects/#data-science-education

Online Statistics Education: An Interactive Multimedia Course of Study
https://onlinestatbook.com/2/
As the name implies this is a multimedia course of study that covers the first two courses of undergraduate statistics for those majoring in non-technical areas. It can be used as a source of ideas for teaching topics in statistics that are part of the secondary school curriculum or as a source for teachers to improve their own knowledge of statistics.

Statistics New Zealand Lesson Plans
https://new.censusatschool.org.nz/resources/
Even though this extensive collection of lesson plans and other resources for Grades 4 to 12 were developed for New Zealand's schools, they fit well into the Common Core and other State Standards and are easily adaptable to U.S. students.

Gapminder
https://www.gapminder.org/resources/
"Gapminder is a non-profit venture – a modern "museum" on the Internet – promoting sustainable global development and achievement of the United Nations Millennium Development Goals." (quoted from an older version of Gapminder's mission statement). Although most of the content is concerned with global development, there is a huge variety of resources here for Grades 9 to 12. The resources are sorted into data, videos, downloads, for teachers, labs and more. The data and videos parts are described further in the "Sources of Data" and "Videos" sections later on in this document.

About Statistics: Power from Data!
https://www150.statcan.gc.ca/n1/edu/power-pouvoir/toc-tdm/5214718-eng.htm
Developed by Statistics Canada (the official agency for statistics in Canada), this is a modified version of the Australian book, Statistics: A Powerful Edge! (see below). It was developed for secondary school students. It was created using comments from teachers about topics they would like to see covered and includes exercises and lesson plans. The version in French is at https://www150.statcan.gc.ca/n1/edu/power-pouvoir/toc-tdm/5214718-fra.htm

Statistics: A Powerful Edge! (2nd edition)
http://www.ausstats.abs.gov.au/ausstats/free.nsf/0/86DAB2444C5B43E4CA256ADB00163218/$File/Statistics%20-%20a%20powerful%20edge.pdf
This "is a resource book from the Australian Bureau of Statistics (ABS) about getting the most from statistics. It is published for secondary students of Mathematics and…teachers…Along with extensive text, the book contains exercises to help students consolidate their understanding of presented material." (quoted from website). Even though it is more than 20 years old, it has a wide variety of resources applicable to the Common Core and other State Standards.

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas
https://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts
Editors: Helen Quinn, Heidi Schweingruber and Thomas Keller
This framework was used as the basis for the Next Generation Science Standards (see next entry). It "draws on current scientific research—including research on the ways students learn science effectively" (quoted from website). There is a free downloadable copy on the website.

Next Generation Science Standards
https://www.nextgenscience.org/get-to-know
Although written for science, there is much that can be used in teaching statistics and probability (especially in the elementary grades).

Teaching Statistics
https://onlinelibrary.wiley.com/journal/14679639
This journal is specifically aimed at teachers from Pre-K through Grade 12, with an emphasis on articles that can easily be adapted for use in classrooms. While receiving the complete copy of each issue has a cost, many of the articles can be accessed for free on its website.

Technology Innovations in Statistics Education
https://escholarship.org/uc/uclastat_cts_tise
No-cost journal that has articles that describe "how to better teach statistics with technology or how to better teach technology…. [at] any level of education, including graduate and post-graduate education, professional development, college, and K-12." (quoted from Aims and Scope webpage of the website).

Lesson Plans and Other Resources in Spanish and Other Languages

Guidelines for Assessment and Instruction in Statistics Education (GAISE) Reports
Only the 1st edition of GAISE K-12 report has been translated into Spanish. The direct link to the Spanish translation of K-12 version is https://www.amstat.org/asa/files/pdfs/gaise/Spanish.pdf.
There are two GAISE reports—one for Grades K-12 and one for post-secondary statistics. The K-12 version emphasizes the important ideas (such as variability) that the NCTM Principles and Standards (see https://www.nctm.org/Standards-and-Positions/Principles-and-Standards/), Common Core Standards, and other State Standards are addressing by developing detailed lesson plans at the beginning, intermediate, and more advanced levels using a four-step process of formulating questions, collecting data, analyzing data & interpretation of the results.

Talleres de Alfabetización Estadística (Workshops in Statistical Literacy)
https://alfabetizacionestadistica.wordpress.com/nuestros-talleres/
The objectives of this project were to develop and disseminate a set of strategies applicable to teaching of middle school statistics. Although it was developed for use in Argentina, it is heavily influenced by the Common Core standards and can easily be adapted to U.S. classrooms. It is only available in Spanish.

Mathematics Vision Project
https://www.mathematicsvisionproject.org/
"The Mathematics Vision Project (MVP) curriculum has been developed to realize the vision and goals of the New Core Standards of Mathematics. The Comprehensive Mathematics Instruction (CMI) framework is an integral part of the materials." (quoted from website). The materials are written as a 3-year sequence called Secondary Mathematics I, Secondary Mathematics II and Secondary Mathematics III. For each year there are downloadable student lessons (most are worksheet-based) and teacher notes at both the regular and honors level. However, only the regular level modules are available in Spanish. The most appropriate modules for statistics are:
Secondary I—Module 9: Modeling Data at https://www.mathematicsvisionproject.org/secondary-mathematics-i.html
Secondary II—Module 9: Probability at https://www.mathematicsvisionproject.org/secondary-mathematics-ii.html
Secondary III—Module 9: Statistics at https://www.mathematicsvisionproject.org/secondary-mathematics-iii.html

Project MOSAIC Little Books for Learning R Programming Language
https://github.com/ProjectMOSAIC/LittleBooks/blob/master/README.md (English versions)
https://github.com/fjaraavilaa/MOSAIC-LittleBooks-Spanish (Spanish versions)
Authors: Randall Pruim, Nicholas Horton, and Daniel Kaplan
The books that are relevant to teaching Common Core statistics are:
*"**Start Teaching Statistics Using R***
…presents overview of our approach…with R and an introduction to our primary R toolkit.
A Student's Guide to R
This book is organized by analysis method and demonstrates how to perform all of the statistical analyses typically covered in an Intro Stats course. It can serve a good reference for both students and faculty." (quoted from website).
In addition to these books, the authors have stored many useful materials in English at https://cran.r-project.org/web/packages/mosaic/index.html. In particular, there is a four-page

handout called **"Minimal R for Intro Stats"** on the website or directly at https://cran.r-project.org/web/packages/mosaic/vignettes/MinimalRgg.pdf.

Visual Understanding Applets
https://www.vusoft.eu/apps/
Authors: Carel van de Giessen and Piet van Blokland
These applets were developed for use in Common Core classrooms and many of them include simulation capabilities. They come highly recommended by several Common Core statistics teachers and can be used in any course using statistics in Grades 7 to 12. Also available in Spanish, German, Turkish, Dutch, Polish, Swedish, French, Russian, Italian, Portuguese, Chinese and Japanese. To select the language you want, click on the menu near the top of the webpage.

About Statistics: Power from Data! (Les statistiques: le pouvoir des données!)
https://www150.statcan.gc.ca/n1/edu/power-pouvoir/toc-tdm/5214718-eng.htm (English version)
https://www150.statcan.gc.ca/n1/edu/power-pouvoir/toc-tdm/5214718-fra.htm (French version)
Developed by Statistics Canada (the official agency for statistics in Canada), this is a modified version of the Australian book, Statistics: A Powerful Edge! (see below). It was developed for secondary school students. It was created using comments from teachers about topics they would like to see covered and includes exercises and lesson plans.

StatLine
https://opendata.cbs.nl/statline/#/CBS/en/
StatLine is the central data site of Statistics Netherlands for public use. It is extremely user friendly and allows the user to make queries, histograms, tables, and other graphics as well as to see summary statistics. The link above is for the version in English. The Dutch language version is at https://opendata.cbs.nl/statline/#/CBS/nl/.

EngageNY Sample Questions for the Mathematics Tests
https://www.engageny.org/resource/released-2021-3-8-mathematics-state-test-questions-translated-editions (for 2021 questions)
https://www.engageny.org/resource/released-2019-3-8-mathematics-state-test-questions-translated-editions (for 2019 questions)
For older questions, go to https://www.engageny.org/ccss-library.
These sample questions are in Arabic, Bengali, Spanish, Chinese, English, Haitian Creole, Korean and Russian. They are matched to the New York State standards (which are close to the Common Core standards) they cover. In addition, there are explanations for the correct answers and even for the wrong answers—which explain for the teacher what the students' misunderstandings may be. Note: Not all questions are translated into all languages.

EngageNY Lesson Plans
The most relevant modules for statistics and probability are:
Grade 6—Module 6 at https://www.engageny.org/resource/grade-6-mathematics-module-6
Grade 7—Module 5 at https://www.engageny.org/resource/grade-7-mathematics-module-5
Grade 8—Module 6 at https://www.engageny.org/resource/grade-8-mathematics-module-6
Algebra I—Module 2 at https://www.engageny.org/resource/algebra-i-module-2 and Module 5 at https://www.engageny.org/resource/algebra-i-module-5
Algebra II—Module 4 at https://www.engageny.org/resource/algebra-ii-module-4
Precalculus and Advanced Topics--Module 5 at
https://www.engageny.org/resource/precalculus-and-advanced-topics-module-5

These modules also have translations into Arabic, Bengali, Chinese and Spanish. However, some modules only have translations into some of these languages.

PISA (Programme for International Student Assessment) Questions
https://www.oecd.org/pisa/test/ (for questions from 2012, 2015 and 2018)
https://www.oecd.org/pisa/pisaproducts/pisa-test-questions.htm (for questions from 2000, 2003, 2006 and 2012)
PISA is the international effort (under the auspices of OECD) in mathematics to compare mathematics knowledge (and knowledge in other areas) across the world. This webpage contains items from past PISA assessments. The items were designed to be administered to 15-year-old students. Many of those shown on the website directly or indirectly assess statistical literacy. Some of the questions are available in French.

Data Science Frameworks/Guidelines and Teaching Resources

Frameworks and Guidelines

International Data Science in Schools Project (IDSSP)
http://www.idssp.org/pages/datascience.html
This is a curriculum framework that describes the content and philosophy for a secondary school pre-calculus course in data science that is fun to learn and that teachers with a variety of backgrounds can comfortably teach. The framework describes content topics sufficient to fill a sequence of two courses (total of 240 instructional hours).

The Two-Year College Data Science Summit Final Report
https://www.amstat.org/asa/files/pdfs/2018TYCDS-Final-Report.pdf This report discusses the current state (as of 2018) of data science/analytics programs at two-year colleges, recommendations, recommended program outcomes, and challenges. There are also 4 pages eof additional resources and references at the end of the report. Much in this report is relevant to secondary schools.

Curriculum Guidelines for Undergraduate Programs in Data Science
http://www.amstat.org/asa/files/pdfs/EDU-DataScienceGuidelines.pdf
These guidelines were developed by a group of undergraduate faculty, mostly from statistics, mathematics and computer science departments. They have been endorsed by ASA (American Statistical Association). They are also available as an article in the Annual Review of Statistics and Its Application at https://www.annualreviews.org/doi/pdf/10.1146/annurev-statistics-060116-053930. Much in these guidelines is relevant to secondary schools.

Teaching Resources

National Workshops on Data Science Education
https://data.berkeley.edu/academics/resources/data-science-education-resources/2021-national-workshop-data-science-education
The above link goes to the 2021 version of the Berkeley National Workshop for 2021. You can then also access the slides, videos and other materials from the 2021 workshop as well as the workshops from 2018 to 2020 from the 2021 workshop page.

Concord Consortium STEM Resources
https://learn.concord.org/
Has a wide variety of resources, including many that involve various uses of statistics and statistical modeling. Resources include appropriate grade levels (including some with different versions for the various grade levels) and how they match with various standards (including both Common Core and Next Generation Science Standards). While many are under the category of Mathematics, the other categories also contain many activities that use statistics and measurement. There is also a data science portion at https://concord.org/our-work/research-projects/#data-science-education

Common Online Data Analysis Platform (CODAP)
https://codap.concord.org/
A free, online data analysis platform developed by the Concord Consortium that offers many useful and fun features, such as linked graphs and features for working with nested/hierarchical data. Their dynamic data science page is at https://learn.concord.org/dynamic-data-science.

Mobilize Introduction to Data Science
https://www.introdatascience.org/
This curriculum is currently being taught in high schools. It teaches students to reason with, and think critically about, data in all forms. The various Standards for secondary school statistics and probability (including the Common Core Standards) relevant to data science are taught along with the data demands of good citizenship.

Data Science in a Box
https://datasciencebox.org/
Introductory data science course, including datasets, lectures, homework assignments, labs, exams & projects. The course focuses on data exploration, visualization & analysis to investigate patterns, model outcomes, and make predictions. Problems & case studies are based on real-world questions and data. Students program in R.

Data 8: The Foundations of Data Science
http://data8.org
This college course is completely free-access, and even includes a textbook. But much of it can be used at the secondary school level. The course teaches critical concepts and skills in computer programming and statistical inference using real-world data using both Python and Jupyter notebooks (https://jupyter.org/).

RStudio Primers
https://rstudio.cloud/learn/primers
A set of interactive tutorials that serve as an introduction to data science. Although based on R (and teach important introductory portions of R), the tutorials do not assume a knowledge of R.

Tidyverse
https://www.tidyverse.org/ and https://www.tidyverse.org/packages/
Tidyverse is a collection of R packages designed for data science. All packages share an underlying philosophy and common APIs.

A Whirlwind Tour of Python
Author: Jake VandePlas
https://jakevdp.github.io/WhirlwindTourOfPython/.
An “introduction to essential features of the Python language, aimed at [those] … who are already familiar with programming in another language. The material is particularly designed for those who wish to use Python for data science and/or scientific programming.”

Applets and Similar Websites with Interactive Activities

If you have trouble running some of these applets that are in Java, explanations of what to do are at http://www.rossmanchance.com/applets/JavaHelp.html (for PCs) and https://www.youtube.com/watch?v=u6_n-qR1B_M&feature=youtu.be&hd=1 (for Macs).

Visual Understanding Applets
https://www.vusoft.eu/apps/
Authors: Carel van de Giessen and Piet van Blokland
These applets were developed for use in Common Core classrooms and many of them include simulation capabilities. They come highly recommended by several Common Core statistics teachers and can be used in any course using statistics in Grades 7 to 12. Also available in Spanish, German, Turkish, Dutch, Polish, Swedish, French, Russian, Italian, Portuguese, Chinese and Japanese. To select the language, click on the menu near the top of the webpage.

Rossman/Chance Applet Collection
http://www.rossmanchance.com/applets/index2021.html
This is a comprehensive set of applets for many of the topics covered in secondary school statistics. They can be used in Grades 6 to 12.

Statkey
http://lock5stat.com/statkey/
Contains many applets and very nice data visualization tools in the "Descriptive Statistics and Graphs" section. Comes highly recommended by secondary Common Core teachers for use in any classroom. One very nice feature for classroom use is that the software can be downloaded into Chrome and used without Internet access in its regular format or in its presentation mode. There is a "Help" key at the bottom left.

Stat-Attic
http://sapphire.indstate.edu/~stat-attic/index.php?topic_id=GR
"This site contains links to and descriptions of over 600 applets that can be used for demonstrations or analysis of topics commonly covered in introductory statistics courses." (quoted from the website). Many of these applets contain lesson plans or lesson plans can easily be developed from them. Some only run in Java. Many are applicable for Grades 6 to 12.

Book of Apps for Statistics Teaching (BOAST)
https://sites.psu.edu/shinyapps/
Developed by statistics students and faculty at Penn State University. Although this an extensive collection of apps for a college-level course, many of these apps are applicable to high school statistics.

Little Apps (part of StatPREP project of ASA and other professional societies)
http://www.statprep.org/LittleAppSite/ (direct link to the apps)
https://statprep-activities.netlify.com/ (direct link to classroom activities using the apps)
These apps have been developed as part of the StatPREP project. They are easy to use and are accompanied by teacher guides on how to use them in introductory statistics courses.

Statlets
http://www.math.usu.edu/~schneit/CTIS/
Some of these applets are at a level beyond Common Core. However, those applets still may be very useful to teachers trying to improve their own knowledge of statistics and probability.

Rice Virtual Lab in Statistics Simulations/Demonstrations
http://www.onlinestatbook.com/2/index.html (in the right-hand column)
This website has 35 simulations/demonstrations. Most require the use of Java. Each comes with instructions, an explanation of the statistical concepts, and student exercises. They can be used in Grade 9 to 12. Note: A short description of each of these simulations is at http://onlinestatbook.com/stat_sim/index.html

Data Games
http://ccssgames.com/
"Playing computer games creates a lot of data, which usually disappear when the game is over. But in Data Games…[students] learn to analyze data that are saved, learning math and data skills…Short videos show… how to play each game and use data from… [the] game play to develop winning strategies." (quoted from website). They can be used in Grades 5 to 12.

Stat2 Games
https://www.stat2games.sites.grinnell.edu/
This website has 12 games (along with instructions) for students and a detailed instructor manual for each game. Although these games are designed for a second course in statistics at the undergraduate level, much of what is on the website can be used in secondary school statistics courses.

Videos

BetterLesson
https://betterlesson.com/common_core
This website has thousands of video-based lessons along with written commentary for teachers and worksheets for students. The lessons are broken down by grade level and by particular common core standards. Many of the lessons cover more than one standard. There are also lessons listed under Next Gen Science (which stands for Next Generation science standards) which are appropriate for teaching statistics and probability.

Against All Odds: Inside Statistics
https://www.learner.org/series/against-all-odds-inside-statistics/
This is a complete free-of-cost introductory statistics course based on videos. This is a totally new version developed by Annenberg Learner (the producers of the original version in the 1980's). It is at the level that most high school students should be able to understand. It contains videos, on-line tools, teacher guides and student guides.

Gapminder (Videos)
https://www.gapminder.org/videos/
There are 77 videos here on a variety of topics related to sustainable world growth over time and for a variety of indicators. Each video comes with links to the data being used in it. They can be used in Grades 9 to 12.

Khan Academy (Grades K to Undergraduate)
https://www.khanacademy.org/math
The appropriated materials are broken down by grade level on this webpage. The ones relevant to Common Core Statistics are under Measurement and Data, Data and Statistics, Data and Modeling, or Statistics and Probability depending on the grade level.
Note: While using this website you will constantly get a screen asking for donations. You can just scroll down it to get to the content you want without paying money or signing on.

Khan Academy (Grades 6 to 12) direct links to introductory statistics courses
https://www.khanacademy.org/math/statistics-probability and
https://www.khanacademy.org/math/probability (Despite the name of this second URL, this is an introductory high school statistics course, with less probability than the first URL)
These are the links to its materials (mostly videos) for statistics and probability. While the two webpages have substantial overlap, there is enough different on each to make it worthwhile looking at both of them. They can be used in Grades 6 to 12. The topics covered include scatterplots, dotplots, boxplots, stem and leaf displays, correlation, fitting lines (including regression), data distributions, two-way tables, study design, probability, binomial probability and normal distributions.
Note: While using these websites you will constantly get a screen asking for donations. You can just scroll down it to get to the content you want without paying money or signing on.

Sources of Data (Including Case Studies)

Journal of Statistics and Data Science Education
https://www.tandfonline.com/toc/ujse21/current
This is a free on-line journal. The main source of data (along with lesson plans) is the Data Sets and Stories articles (found near the end of each issue). All articles from the past (except for the years of 1999 and 2000) can be found at https://www.tandfonline.com/loi/ujse20. The 1999 & 2000 articles are at http://jse.amstat.org/jse_archive.htm. In addition, there is an extensive JSE Data Archive at http://jse.amstat.org/jse_data_archive.htm that contains many of the data sets from the Data Sets and Stories articles and other useful data sets from 2014 and earlier.

A Little Stats
http://alittlestats.blogspot.com/p/data-sources.html
This list of data sets was created by a high school teacher and is designed specifically for those involved in teaching Common Core statistics. However, it is appropriate for all courses at the secondary school level that include statistics. The website has multiple datasets in areas of high interest to secondary and post-secondary students. These include Arts & Entertainment, Education, Health, Sports, Social Science, Weather and more. The website also has tabs on the top to access other resources useful to secondary and post-secondary faculty.

Data.Gov
https://www.data.gov/
This website has over 311,000 data sets from over 100 organizations at the City, County, State and Federal government levels. There are also data websites created by various Federal agencies. A few that have easily accessible datasets are listed next in this document.

U.S. Census Bureau
https://data.census.gov/cedsci/ and https://www.census.gov/data.html
These websites contain links to a huge variety of data sets, tools, articles, data visualizations, mobile apps, software, maps and more in the context of surveys and of the national Census. To go directly to the tools use https://www.census.gov/data/data-tools.html for details

College Scorecard Data from U.S. Department of Education
https://collegescorecard.ed.gov/data/
"Here, you can get the data behind the College Scorecard, as well as other data on federal financial aid and earnings information. These data provide insights into the performance of schools eligible to receive federal financial aid, and offer a look at the outcomes of students at those schools." (quoted from the website). There is also documentation available at https://collegescorecard.ed.gov/data/documentation/.

FRED (of the Federal Reserve Bank system)
https://fred.stlouisfed.org/
"This site offers a wealth of economic data and information to promote economic education and enhance economic research. The widely used database FRED is updated regularly and allows 24/7 access to regional and national financial and economic data." (quoted from earlier version of https://research.stlouisfed.org/about.html). Also includes some international data. Many of the over 815,000 datasets from 107 sources are downloadable directly into Excel and come with detailed explanatory notes and an easy-to-use graphing tool.

Data.gov.uk
https://data.gov.uk/
Has datasets from a variety of UK government sources that are available in a variety of downloadable formats.

UK Data Service
https://www.ukdataservice.ac.uk/
"The UK Data Service is a comprehensive resource funded by the ESRC to support researchers, teachers and policymakers who depend on high-quality social and economic data. Here you will find a single point of access to a wide range of secondary data including large-scale government surveys, international macrodata, business microdata, qualitative studies and census data from 1971 to 2011. All are backed with extensive support, training and guidance to meet the needs of data users, owners and creators." (quoted from an earlier version of https://www.ukdataservice.ac.uk/about-us). The website includes user guides, teacher resources at https://www.ukdataservice.ac.uk/use-data/teaching, and student resources at https://www.ukdataservice.ac.uk/use-data/student-resources.

The World Factbook (of the CIA)
https://www.cia.gov/the-world-factbook/
This website comes highly recommended by several teachers as a source of interesting datasets. It is "produced for US policymakers and coordinated throughout the US Intelligence Community, marshals facts on every country, dependency, and geographic entity in the world. We share this information with the people of all nations in the belief that knowledge of the truth underpins the functioning of free societies. The Factbook provides information on the history, people, government, economy, geography, communications, transportation, military, and transnational issues for [266] world entities." (quoted from earlier version of website)

IPUMS (Integrated Public Use Microdata Series)
https://www.ipums.org/
This group of 9 separate websites is sponsored by the Minnesota Population Center. It has a wide variety of population and sample data from the US and over 100 countries including special website connections for health, environment, and more. Use https://usa.ipums.org/usa/ to go directly to the US data. Use https://international.ipums.org/international/ to go directly to the international data. There is also a teachers' resource page with many links to IPUMS materials at https://ipums.org/support/teaching-resources.

Pew Research Center Website
https://www.pewresearch.org/
Pew Research Center is a nonpartisan fact tank that informs the public about the issues, attitudes and trends shaping America and the world. It conducts public opinion polling and other social science research. To link directly to datasets and other research tools use https://www.pewresearch.org/tools-and-resources/.

Sports Reference
https://www.sports-reference.com/
Has an amazing amount of data and summary statistics for the following sports: Baseball, Basketball, Football, Ice Hockey and Soccer. For each sport there are links to professional, college and amateur teams (including the Olympics) both in North America and elsewhere. Warning: The Stathead portion of the website has a charge. The rest of the website is free-of-charge.

baseballsavant
https://baseballsavant.mlb.com/
This site has lots of information about baseball statistics, but most is located under the menus across the top of the homepage other than the “Statistics” one.

Gapminder (Data Portion)
https://www.gapminder.org/data/ (homepage)
This website has numerous indicators that are available directly from this webpage and has links for 3 Github repositories: Systema Globalis (indicators inherited from Gapminder World, many are still updated); Fast Track (indicators they compile manually); and World Development Indicators (direct copy from World Bank). Each can be downloaded as a CSV and/or Excel data file.

FiveThirtyEight
https://fivethirtyeight.com/
The head of FiveThirtyEight is Nate Silver, who is famous for his election predictions.
This website of the FiveThirtyEight group covers news, sports and features from a statistical viewpoint using correct methods and write-ups that are extremely easy to follow. There are over 100 datasets with explanations of all the variables and sample analyses and graphics for each dataset at https://data.fivethirtyeight.com/. For more information on FiveThirtyEight see the next section of this document about Statistics and the Media.

ICPSR (Inter-University Consortium for Political and Social Research)
https://www.icpsr.umich.edu/web/pages/ICPSR/index.html
This website has a wide variety of data sets from over 16,200 studies. Also, there are materials for teaching using their data at https://www.icpsr.umich.edu/web/pages/instructors/

StatLine
https://opendata.cbs.nl/statline/#/CBS/en/
StatLine is the central data site of Statistics Netherlands for public use. It is extremely user friendly and allows the user to make queries, histograms, tables, and other graphics as well as to see summary statistics. The link above is for the version in English. The Dutch language version is at https://opendata.cbs.nl/statline/#/CBS/nl/.

Rice Virtual Lab in Statistics Case Studies
http://onlinestatbook.com/case_studies_rvls/index.html
Although there are only 9 case studies here, they are worth exploring. They come with detailed explanations of how the data were collected, the raw data, some analyses, and how to do the analyses in various statistical packages. Some even give questions for students to answer.

Statistics and the Media (Including Graphical Displays)

What's Going On in This Graph?
https://www.nytimes.com/column/whats-going-on-in-this-graph (for the most recent activity)
https://www.amstat.org//ASA/Whats-Going-on-in-this-Graph.aspx (for list of resources for teachers)
https://www.nytimes.com/2020/06/10/learning/over-60-new-york-times-graphs-for-students-to-analyze.html (for over 60 past graphs and activities)
This is a joint effort of the ASA and the New York Times Learning Network, with the objective of having students think critically about graphs. Every Thursday during the school year, a new activity is released that is related to an interesting graph published recently in the New York Times. Individuals and classes can then make comments interpreting this graphic. Also, by clicking on the "What's Going on in this Graph? link for each graph, it is possible to see comments made by others. Six days later, on Wednesdays, there is a moderated discussion on the website of the graph. Finally, two days later on Fridays, a link to the original graph and the article that accompanied it will be posted along with related statistical nuggets that might help students more fully make sense of the graph. An archive of past "What's Going On in This Graph?" activities is found by scrolling down on the most recent activity webpage.

The Learning Network (of the New York Times)
https://www.nytimes.com/section/learning
This is the New York Times website for teachers, parents and students in grades 5-12. It covers all areas of learning with an emphasis for many of the webpages/activities on data and statistics. The What's Going On in This Graph? activity described above is one example. The teacher resource page is at https://www.nytimes.com/2019/09/02/learning/current-events-teaching-resources.html.

FiveThirtyEight
https://fivethirtyeight.com/
The head of FiveThirtyEight is Nate Silver, who is famous for his election predictions.
This website of the FiveThirtyEight group covers news, sports and features from a statistical viewpoint using correct methods and write-ups that are extremely easy to follow. In addition, they have newsletters (https://fivethirtyeight.com/newsletter/) and over 100 datasets with explanations of all the variables and sample analyses and graphics for each dataset (https://data.fivethirtyeight.com/).

TheUpshot
https://www.nytimes.com/section/upshot
Upshot is a feature of the New York Times focusing on politics, policy, and economics, with an emphasis on data and graphics. You can also sign up for its newsletter at https://www.nytimes.com/newsletters/upshot.

Science and News: A Marriage of Convenience
https://ww2.amstat.org/meetings/jsm/2016/webcasts/index.cfm (and then scroll down to ASA President's Invited Address)
This is a video of a talk given by Joe Palca of NPR (National Public Radio) at the 2016 Joint Statistical Meetings. Its abstract is "Science doesn't fit comfortably into the news format. News is about things that are happening today, things that are or will change people's lives, things that involve life or death. Science is incremental, occurs over long sweeps of time, and in many cases can be safely ignored. True "breakthroughs" are few and far between, and yet in the procrustean bed of the news media, everything sounds like a breakthrough. I'll describe

examples of this awkward marriage, and propose an alternative model for presenting science in the news media." (Copied from https://ww2.amstat.org/meetings/jsm/2016/onlineprogram/AbstractDetails.cfm?abstractid=321845)

Work of Alan Schwarz of the New York Times
https://en.wikipedia.org/wiki/Alan_Schwarz
This website gives links to his work using statistics to do unbiased reporting on the topics of concussions in football and the prevalence rates for ADHD, as well as his work on the use of statistics in baseball. He was the winner of the 2013 ASA Excellence in Statistical Reporting Award.

The New York Times 2013: The Year in Interactive Storytelling
http://www.nytimes.com/newsgraphics/2013/12/30/year-in-interactive-storytelling/index.html
This website has portions on multimedia stories, data visualization, exploratory graphics, breaking news, and visual and interactive features.

The New York Times 2012: The Year in Graphics
https://archive.nytimes.com/www.nytimes.com/interactive/2012/12/30/multimedia/2012-the-year-in-graphics.html?_r=0
"Graphics and interactives from a year that included an election, the Olympics and a devastating hurricane. A selection of the graphics presented here include information about how they were created." (quoted from website)

Stats + Stories: The Statistics Behind the Stories and the Stories Behind the Statistics
https://statsandstories.net/episodes
This is a series of oral "podcasts". Each episode features a guest and a story with that involves statistics. The link here goes to the list of all episodes.

Simulation Tools

Statkey
http://lock5stat.com/statkey/
This website contains many simulation tools under its "Bootstrap Confidence Intervals" and "Randomization Hypothesis Tests" section. There are also very nice data visualization tools in the "Descriptive Statistics and Graphs" section. The website comes highly recommended by secondary school teachers for use in any classroom. One very nice feature for classroom use is that the software can be downloaded into Chrome and used without Internet access in its regular format or in its presentation mode. There is a "Help" key at the bottom left.

Visual Understanding Applets
https://www.vusoft.eu/apps/
Authors: Carel van de Giessen and Piet van Blokland
These applets were developed for use in Common Core classrooms and many of them include simulation capabilities. They come highly recommended by several Common Core statistics teachers and can be used in used in any course using statistics in Grades 7 to 12. Also available in Spanish, German, Turkish, Dutch, Polish, Swedish, French, Russian, Italian, Portuguese, Chinese & Japanese. To select a language, click on menu near top of webpage.

Stat-Attic
http://sapphire.indstate.edu/~stat-attic/index.php?topic_id=GR
"This site contains links to and descriptions of over 600 applets that can be used for demonstrations or analysis of topics commonly covered in introductory statistics courses." (quoted from the website). Many of these applets contain simulations.

The Art and Techniques of Simulation
ISBN-10: 0866513361 ISBN-13: 9780866513364
ISBN-10: 086651337X (Teacher's Edition)
Authors: Mrudulla Gnanadesikan, Richard L. Scheaffer, & Jim Swift
This book contains 30 investigations of real-world topics that use simulation to solve them. The simulations are set up as worksheets for students. In addition, there is a Teacher's Edition with detailed lesson plans. The student and teacher books are now out-of-print. However, many copies are available through the usual resale websites.

Teaching the Common Core: Making Inferences and Justifying Conclusions (Webinar)
https://magazine.amstat.org/videos/education_webinars/TeachingCommonCore-KariLockMorgan.wmv
This is a webinar that was presented by Kari Lock Morgan of Penn State University as part of the ASA webinar series for K-12 teachers (see https://www.amstat.org/asa/education/K-12-Statistics-Education-Webinars.aspx) It explains how to integrate simulation tools into the teaching of Common Core statistics. It uses Statkey (see above), but is also very useful for simulations using other tools.

Teaching Simulation-Based Inference
https://magazine.amstat.org/videos/education_webinars/KariLockMorganWebinar4-16.wmv
Covers how to integrate bootstrap confidence intervals and randomization tests into the teaching of Common Core statistics and other introductory statistics courses using free online tools. Talk is from a Washington Statistical Society (WSS) Statistics Education Seminar by Kari Lock Morgan. Overlaps with the above webinar, but has some different coverage.

Random Number Generators and Random Samplers

Excel
To generate random numbers between two integers (say, c and d), enter the formula =randbetween(c,d) in a cell. Dragging it to other cells produces more random integers. This is sampling with replacement. Warning: Each time you click on a cell it regenerates the random number in that cell.

Rossman/Chance Random Number Generator
http://www.rossmanchance.com/applets/2021/randomnumbers/GenRandom01.htm
This is an easy-to-use applet. It even allows the choice between sampling with replacement and sampling without replacement.

Statkey
http://lock5stat.com/statkey/
On this main webpage, there are random samplers in the “Sampling Distributions” line for creating sampling distributions for means and proportions. These can be done for data sets supplied by the authors or the users can enter their own data set using the “Edit Data” tab. There is a “Help” key at the bottom left.

Technology (Including, but not limited to, Statistical Calculators and Statistical Software Packages)

Statistics Online Computational Resource (SOCR)
http://www.socr.ucla.edu/SOCR.html
"Statistics Online Computational Resource (SOCR)… provides portable online aids for probability and statistics education, technology based instruction and statistical computing…The core SOCR educational and computational components include: Distributions (interactive graphs and calculators), Experiments (virtual computer-generated analogs of popular games and processes), Analyses (collection of common web-accessible tools for statistical data analysis), Games (interfaces and simulations to real-life processes), Modeler (tools for distribution, polynomial and spectral model-fitting and simulation), Graphs, Plots and Charts (comprehensive web-based tools for exploratory data analysis), Additional Tools (other statistical tools and resources), SOCR Wiki(collaborative Wiki resource), Educational Materials and Hands-on Activities (varieties of SOCR educational materials), SOCR Statistical Consulting and Statistical Computing Libraries." (quoted from website)

iNZight
https://www.stat.auckland.ac.nz/~wild/iNZight/index.php
This software is heavily used in secondary schools in New Zealand. There are downloadable versions for Windows and Macintosh on the website. It does all of the statistical procedures that are part of the Common Core. See the next entry for an online version of the software.

inzight lite
https://lite.docker.stat.auckland.ac.nz/
"inzight is a simple data analysis system which was initially designed for high school students to help explore data fast and easy without having to learn complex statistical software. By popular demand, it has been extended to support 3D graphics, multivariate analysis, and time series analysis. inzight lite is an online version of the full software, which goes a long way to make it more accessible to a wide range of users." (quoted from website)

SPLAT (Statistical Package for Learning and Teaching)
This package was developed by a high school teacher for use in both Advanced Placement and more basic statistics classes at the secondary level. The instructions for how to download and use SPLAT are in a document called SPLATURLs, which can be found by scrolling down to near the end in the Google Drive at https://drive.google.com/drive/folders/1xEU_oena9LnErAEnaEELcv5pe4nRQnFm.

Project MOSAIC Little Books for Learning R Programming Language
https://github.com/ProjectMOSAIC/LittleBooks/blob/master/README.md (English versions)
https://github.com/jarochoeltrocho/MOSAIC-LittleBooks-Spanish (Spanish versions)
Authors: Randall Pruim, Nicholas Horton, and Daniel Kaplan
The books most relevant to teaching secondary school statistics (including Common Core) are:
*"**Start Teaching With R*** [view] [download]
This book presents instructors with an overview of our approach to teaching statistics with R and an introduction to our primary R toolkit.
A Student's Guide to R [view] [download]
This book is organized by analysis method and demonstrates how to perform all of the statistical analyses typically covered in an Intro Stats course. It can serve a good reference for both students and faculty." (quoted from website).

In addition to these books, the authors have stored many useful materials at https://cran.r-project.org/web/packages/mosaic/vignettes/mosaic-resources.html.

Some Additional Resources for Beginners for using R
This list is suggestions from others. It is not comprehensive. It only includes free resources.
The R Guide by Jason Owen at http://lib.stat.cmu.edu/R/CRAN/doc/contrib/Owen-TheRGuide.pdf
The R Commander: A Basic-Statistics GUI for R by John Fox and Milan Bouchet-Valat at https://socialsciences.mcmaster.ca/jfox/Misc/Rcmdr/
RStudio Primers
https://rstudio.cloud/learn/primers
A set of interactive tutorials that serve as an introduction to data science. Although based on R (and teach important introductory portions of R), the tutorials do not assume a knowledge of R.

Effective Graphs with Microsoft-R-Open by Naomi Robbins and Joyce Robbins
www.joyce-robbins.com/wp-content/uploads/2016/04/effectivegraphsmro1.pdf
In addition, a Github site, https://www.github.com/nbrgraphs/mro, is available for downloading an electronic version of this document, individual code scripts for graphs, and code scripts for ggplot2 versions of many of the graphs.

JupyterHub
https://jupyter.org/hub
"JupyterHub … gives users access to computational environments and resources without burdening the users with installation and maintenance tasks. Users - including students … - can get their work done in their own workspaces on shared resources which can be managed efficiently by system administrators.
JupyterHub runs in the cloud or on your own hardware, and makes it possible to serve a pre-configured data science environment to any user in the world. It is customizable and scalable, and is suitable for small and large teams, academic courses, and large-scale infrastructure." (quoted from website)
Note: Jupyter stands for Julia, Python, and R.

Free or Minimal Cost Copies for Teachers of Statistical Software
Several publishers have agreed to make a copy of their statistical software free or at minimal cost to K-12 teachers. The list below (in alphabetical order) is given as a convenience to users of this document. No endorsement of these software packages is implied by this listing.
Fathom https://fathom.concord.org/download/
JMP https://estore.onthehub.com/WebStore/OfferingDetails.aspx?o=2ebffc52-f75f-eb11-8133-000d3af41938
NZGrapher https://grapher.nz/
Python https://www.python.org/downloads/
RStudio https://www.rstudio.com/pricing/academic-pricing/. The free academic version also includes a limited shiny apps access
SAS https://www.sas.com/en_us/learn/academic-programs/software.html. They also now have free teaching and learning (for both teachers and students) materials at https://www.sas.com/en_us/learn/academic-programs/educators.html and https://www.sas.com/en_us/learn/academic-programs/resources/free-sas-e-learning.html.
StatCrunch Go to https://www.statcrunch.com/register/instructor and then click on either instructors or students.
Tinkerplots https://www.tinkerplots.com/get

Resources for Teacher Preparation (Both Pre-Service and In-Service)

Note: Almost all of the resources given elsewhere in this document may be very useful to those involved in teacher preparation and are not repeated here.

Preparing Pre-K–12 Teachers of Statistics: A Joint Position Statement of the American Statistical Association (ASA) and the National Council of Teachers of Mathematics (NCTM)
https://www.nctm.org/Standards-and-Positions/Position-Statements/Preparing-Pre-K-12-Teachers-of-Statistics/ (homepage)
https://www.nctm.org/uploadedFiles/Standards_and_Positions/Position_Statements/1Statistics%20joint%20ASA%20NCTM%20statement%20021113.pdf (pdf file of the position statement)

The Mathematical Education of Teachers II (commonly called MET II)
http://www.cbmsweb.org/archive/MET2/met2.pdf
This book was produced by the Conference Board of the Mathematical Sciences. The book is Volume 17 in the CBMS series "Issues in Mathematics Education". "This report is a resource for those who teach mathematics—and statistics—to PreK–12 mathematics teachers, both future teachers and those who already teach in our nation's schools. The report makes recommendations for the mathematics that teachers should know and how they should come to know that mathematics." (quoted from page xi of the book's preface). It also includes numerous recommendations regarding the preparation of teachers to teach statistics.

The Statistics Education of Teachers
https://www.amstat.org/asa/files/pdfs/EDU-SET.pdf
This document was developed by ASA as a companion to the MET II report. It puts forth recommendations on how elementary, middle, and high school teachers should be prepared in statistics. In particular, it "aims to:

- Clarify and expand MET II's recommendations for the statistical preparation of teachers at all grade levels: elementary, middle, and high school.
- Address the professional development of teachers of statistics.
- Highlight differences between statistics and mathematics that have important implications for teaching and learning.
- Illustrate the statistical problem-solving process across levels of development.
- Make pedagogical recommendations of particular relevance to statistics, including the use of technology and the role of assessment." (quoted from the preface to the report)

Teaching Statistical Thinking
https://www.youtube.com/user/profdstangl/playlists (location of videos)
Authors/Speakers: Dalene Stangl, Kate Allman, and Mine Çetinkaya-Rundel
Through funding from Duke University and the American Statistical Association, the authors have created a set of 52 videos to help teachers understand and teach basic descriptive statistical concepts. The videos are organized into five units. Within each unit there are videos covering core concepts, pedagogy, software use (via JMP, but can be adapted to other software), and applet demonstrations. Unit 1 covers data and explains the structure of the videos. Unit 2 covers one variable descriptive statistics, transforming a variable, and the normal curve. Unit 3 covers description of relationships between two categorical variables (contingency tables) and between one categorical and one numeric (side-by-side boxplots). Unit 4 covers descriptions of relationships between two numeric variables using correlation and regression. Unit 5 pulls all the concepts together in review videos. (adapted from email from the 1st author). There are also some additional videos available on this website.

Developing Essential Understanding of Statistics for Teaching Mathematics in Grades 6-8
https://www.nctm.org/store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-6-8/
ISBN: 9780873536721
As an e-book) https://www.nctm.org/Store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-6-8-(Download)/
ISBN: 9780873538534
Authors: Gary Kadar, Tim Jacobbe, Patricia Wilson and Rose Mary Zbiek
This book is part of the NCTM Essential Understanding Series. "This book focuses on essential knowledge for mathematics teachers about statistics. It is organized around four big ideas, supported by multiple smaller, interconnected ideas *essential understandings…* [Going] beyond a simple introduction to statistics, the book will broaden and deepen … understanding of one of the most challenging topics for students and teachers. It will help … engage…students, anticipate their perplexities, avoid pitfalls, and dispel misconceptions… [Users] also learn to develop appropriate tasks, techniques, and tools for assessing students' understanding of the topic." (quoted from website)

Developing Essential Understanding of Statistics for Teaching Mathematics in Grades 9-12
https://www.nctm.org/store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-9-12/
ISBN: 9780873536769
As an e-book: https://www.nctm.org/Store/Products/Developing-Essential-Understanding-of-Statistics-for-Teaching-Mathematics-in-Grades-9-12-(Download)/
ISBN: 9780873538527
Authors: Roxy Peck, Rob Gould, Stephen Miller and Rose Mary Zbiek
This book is part of the NCTM Essential Understanding Series). "… [It] examines five big ideas and twenty-four related essential understandings for teaching statistics in grades 9–12. The authors distinguish mathematical and statistical models, explore distributions as descriptions of variability in data, focus on the fundamentals of testing hypotheses to draw conclusions from data, highlight the importance of the data collection method, and recognize the need to examine bias, precision, and sampling method in evaluating statistical estimators … [The] authors discuss the growth of students' ideas about statistics and examine challenges to teaching, learning, and assessment. They intersperse their discussion with questions for teachers' reflection." (quoted from website).

Putting Essential Understanding into Practice: Statistics, 9-12
https://www.nctm.org/Store/Products/Putting-Essential-Understanding-into-Practice--Statistics,-9-12/
ISBN: 9780873537377
As an e-book: https://www.nctm.org/Store/Products/Putting-Essential-Understanding-into-Practice-Statistics,-9%E2%80%9312-(Download)/
ISBN: 9780873539159)
Authors: Terry Crites and Roy St. Laurent
This is a companion to the book Developing Essential Understanding… of the previous entry. "The authors demonstrate how to use this multifaceted knowledge to address the big ideas and essential understandings that students must develop for success with statistics—not only in their current work, but also in higher-level mathematics and a myriad of real-world contexts. Explore rich, research-based strategies and tasks that show how students are reasoning about

and making sense of statistics. Use … these … to build on their understanding while identifying and correcting misunderstandings…" (quoted from website)

Enhancing Statistics Teacher Education with E-Modules [ESTEEM]
https://hirise.fi.ncsu.edu/projects/esteem/
"The ESTEEM materials are designed to be used with preservice middle and secondary mathematics teachers in online environments, though instructors may adapt these for use in face-to-face or hybrid courses, or with other teacher audiences. The diagram shows our modular approach. There are 3 modules available. Module 1 (Foundations in Statistics Teaching) should always be used first (1.1 and 1.2). After Module 1, you can implement the Teaching Statistical Association (B.1 and B.2) and/or the Teaching Inferential Reasoning (A.1 and A.2) Modules in any order." (from the materials page of ESTEEM). Note: To access the materials you will need to go through a registration process.

Primarily Statistics: Developing an Introductory Statistics Course for Pre-service Elementary Teachers
http://jse.amstat.org/v21n3/green.pdf
(Journal of Statistics and Data Science Education, Volume 21, Issue 3, 2013)
Authors: Jennifer L. Green and Erin E. Blankenship
and
The Development and Evolution of an Introductory Statistics Course for in In-Service Middle-Level Mathematics Teachers
http://jse.amstat.org/v22n3/schmid.pdf
(Journal of Statistics and Data Science Education, Volume 22, Issue 3, 2014)
Authors: Kendra K. Schmid, Erin E. Blankenship, April T. Kerby, Jennifer L. Green, and Wendy M. Smith
These two articles deal, as their names imply, with teaching statistics to teachers. Besides describing the course, each has an extensive section of references.
Webinar and materials related to the second article are at
https://www.causeweb.org/cause/webinar/jse/2015-02

Wild About Statistics
https://www.stat.auckland.ac.nz/~wild/wildaboutstatistics/ (homepage)
https://www.youtube.com/channel/UCEIKp33-h_Yw0o8XATHllCg (YouTube channel)
This is a series of videos that were originally developed for a MOOC (Massive Open Online Course) and then released publicly.
Week 1 Videos: Getting Started: Introduction, data analysis and data organization
Week 2 Videos: Boot Camp: Basic statistical concepts
Week 3 Videos: Relationships: Discusses relationships between categorical and numeric variables and changes across subgroups
Week 4 Videos: More Relationships: Diving deeper into relationships
Week 5 Videos: Why what we see is never quite the way it really is: Biases, confounding and random errors
Week 6 Videos: Estimation with Confidence: Confidence intervals and bootstrapping
Week 7 Videos: Randomised Experiments and Statistical Tests (including "significance" and randomisation tests)
Week 8 Videos: Time Series: Basic ideas, seasonal decomposition and forecasting

What is a Survey?
https://www.unh.edu/institutional-research/sites/default/files/pamphlet.pdf
"This…booklet is written primarily for non-specialists and is free of charge. Its overall goal is to improve survey literacy among individuals who participate in…surveys or use…survey results." (quoted from website).

ABCs of EDA (Full name is: Applications, Basics, and Computing of Exploratory Data Analysis)
https://ecommons.cornell.edu/bitstream/handle/1813/78/A-B-C_of_EDA_040127.pdf;jsessionid=EE350E49918B787B2A92497E5B3DCD6D?sequence=2
Authors: Paul F. Velleman and David C. Hoaglin
This is a pdf file (publicly available through the library of the first author's university) of a book that is now out-of-print. It was the only textbook on exploratory data analysis (EDA) that was developed for use by undergraduates. It goes one step beyond the exploratory data analysis (EDA) topics taught as part of the Common Core and includes very useful variations on topics such as stem-and-leaf displays and boxplots. It also has some more EDA topics that are worth knowing such as resistant lines, median polish, and rootograms.

What Teachers Should Know about the Bootstrap: Resampling in the Undergraduate Statistics Curriculum
https://arxiv.org/format/1411.5279v1 or
https://www.amstat.org/asa/files/pdfs/EDU-ResamplingUndergradCurriculum.pdf
Author: Tim Hesterberg
This is an 83-page easy-to-follow article on the methods used for resampling and simulation. It is at the level that all secondary teachers should be able to follow. The author has "three goals in this article: (1) To show the enormous potential of bootstrapping and permutation tests to help students understand statistical concepts including sampling distributions, standard errors, bias, confidence intervals, null distributions, and P-values. (2) To dig deeper, understand why these methods work and when they don't, things to watch out for, and how to deal with these issues when teaching. (3) To change statistical practice---by comparing these methods to common t tests and intervals, we see how inaccurate the latter are; we confirm this with asymptotics. n ≥ 30 isn't enough---think n ≥ 5000. Resampling provides diagnostics, and more accurate alternatives. Sadly, the common bootstrap percentile interval badly under-covers in small samples; there are better alternatives. The tone is informal, with a few stories and jokes." (quoted from the article abstract)

Mathematics Teacher Educator
https://www.nctm.org/Publications/mathematics-teacher-educator/
This is a journal of the National Council of Teachers of Mathematics (NCTM) and the Association of Mathematics Teacher Educators. Its mission is to "contribute to building a professional knowledge base for mathematics teacher educators that stems from, develops, and strengthens practitioner knowledge" (quoted from website-March 2014 issue).

Proceedings of the IASE Round Table on the Joint ICMI/IASE Study: Teaching Statistics in School Mathematics: Challenges for Teaching and Teacher Education
https://iase-web.org/Conference_Proceedings.php?p=2008_Joint_ICMI-IASE_Study
This round table was held "to start the process of organising a Joint Study to *analyze the teaching of statistics at school level and make recommendations about how to improve the training of mathematics teachers to better succeed in educating statistically literate students."* (quoted from page 3 of the Discussion Document).

Assessment Resources

LOCUS (Levels of Conceptual Understanding in Statistics
https://locus.statisticseducation.org
"LOCUS is … focused on developing assessments of statistical literacy. The intent of these assessments is to provide teachers, educational leaders, assessment specialists, and researchers with a valid and reliable assessment of statistics consistent with the Common Core State Standards (CCSS)." (quoted from website). Limited to Grades 6-12.

PARCC (Partnership for Assessment of Readiness for College and Careers)
https://www.lumoslearning.com/llwp/resources/parcc-practice-tests-sample-questions.html
Free PARCC practice tests and sample questions for Math and Language Arts assessments. Updated for 2019-2020 PARCC assessment practice. Includes standards-aligned tech-enhanced questions that mirror PARCC testing items for Grades 3 to 12.

EngageNY Sample Questions for the Mathematics Tests for Grades 3 to 8
https://www.engageny.org/resource/released-2021-3-8-mathematics-state-test-questions-translated-editions (for 2021 questions)
https://www.engageny.org/resource/released-2019-3-8-mathematics-state-test-questions-translated-editions (for 2019 questions)
For older questions, go to https://www.engageny.org/ccss-library.
These sample questions are in Arabic, Bengali, Spanish, Chinese, English, Haitian Creole, Korean and Russian. They are matched to the New York State standards (which are close to the Common Core standards) they cover. In addition, there are explanations for the correct answers and even for the wrong answers—which explain for the teacher what the students' misunderstandings may be. Note: Not all questions are translated into all languages.

Khan Academy Assessment Items
https://www.khanacademy.org/commoncore/map
This portion of the Khan Academy website contains a wide variety of both mathematics and statistics assessment items. For example, there are approximately 700 measurement and data items for Grade 3. For the higher grades, the number of statistics and probability items is 594 for Grade 6, 213 for Grade 7, and 249 for Grade 8. There are more than 800 items at the high school level. Hints are available for the students, if needed. These items are applicable to assessing the Common Core standards as well as other State Standards. Also, links to relevant videos are given with the items.

PISA (Programme for International Student Assessment) Questions
https://www.oecd.org/pisa/test/ (for questions from 2012, 2015 and 2018)
https://www.oecd.org/pisa/pisaproducts/pisa-test-questions.htm (for questions from 2000, 2003, 2006 and 2012)
PISA is the international effort (under the auspices of OECD) in mathematics to compare mathematics knowledge (and knowledge in other areas) across the world. This webpage contains items from past PISA assessments. The items were designed to be administered to 15-year-old students. Many of those shown on the websites directly or indirectly assess statistical literacy. Some of the questions are available in French.