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## ASA ADOPTS NEW GUIDELINES FOR UNDERGRADUATE PROGRAMS IN STATISTICAL SCIENCE

The American Statistical Association (ASA) has endorsed new guidelines for the undergraduate statistics curriculum that will help ensure bachelor's graduates have the necessary capacities to use data to make evidence-based decisions.

The [ASA Guidelines for Undergraduate Programs in Statistical Science](#) recently were adopted by the association's board of directors to replace guidelines adopted in 2000. The updated guidelines were developed by a work group of ASA members chaired by Nicholas Horton, professor of statistics at Amherst College. This group recommended adapting the undergraduate curriculum to account for the increased importance of data analysis, teamwork, communications and other relevant skills and

experiences in today's practice of statistics and a dramatic increase in student interest in earning an undergraduate statistics degree.

"These new guidelines recognize the increasing importance of the practice of statistics to solving the complex problems faced by business, industry and government entities," said Horton. "The oft-quoted McKinsey & Company report foretells a shortage of up to 190,000 workers with deep analytical skills and 1.5 million managers and analysts to manage data projects. A large number of these workers will be holders of bachelor's degrees in statistics. These new curriculum guidelines will help ensure they have the skill set to tackle the more rigorous data analysis challenges that our society faces. These data-analytics skills are needed by society and employers in our increasingly information-rich world."

The ASA report also notes U.S. enrollments in statistics classes have increased dramatically in recent years. The Integrated Post-Secondary Education Data System Completions Survey, conducted by the U.S. Department of Education's National Center for Education Statistics, shows the number of bachelor's graduates in statistics has increased more than four-fold since the ASA guidelines were first issued: from 380 in 2000 to 1,656 in 2013.

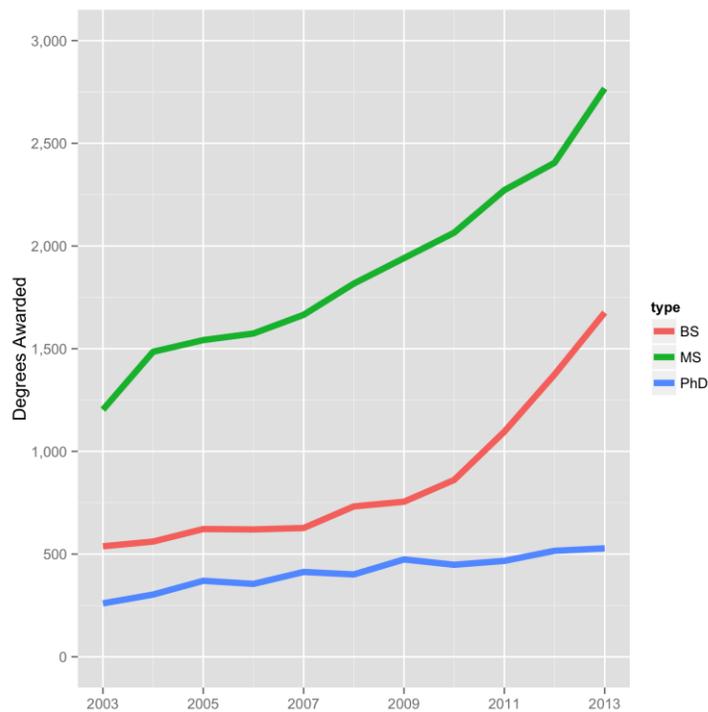


Figure 1: Statistics degrees at all levels in the United States. These data include the following categories: biostatistics; statistics; mathematical statistics and probability; statistics, other; and mathematics and statistics, other. Source: The Integrated Post-Secondary Education Data System Completions Survey, National Center for Education Statistics, [ncesdata.nsf.gov/webcaspar](http://ncesdata.nsf.gov/webcaspar).

The key curriculum updates recommended in the ASA Guidelines for Undergraduate Programs in Statistical Science are the following:

**Statistical Methods and Theory** – Undergraduate statistics students need a deep understanding of fundamental concepts, as well as exposure to a variety of topics and methods such as statistical theory, exploratory data analysis, design of studies and statistical models.

**Data-Related Topics and Computation** – Undergraduate statistics majors need facility with computation to be able to handle increasingly complex data and sophisticated approaches to analyze it. They need the ability to manage and restructure data. Such skills underpin strategies for assessing and ensuring data quality as part of data preparation and are a necessary precursor to many analyses. Among the skills cited are the following:

- Use of one or more professional statistical software environments and multiple data tools
- Data manipulation using software in a well-documented and reproducible way
- Key programming concepts
- Computationally intensive statistical methods

**Mathematical Foundation** – Undergraduate statistics majors should have a firm understanding of why and when statistical methods work. They should be able to communicate in the language of mathematics and explain the interplay between mathematical derivations and statistical applications based on their knowledge of calculus, linear algebra, probability and connections between concepts in these mathematical foundation courses and their applications in statistics.

**Statistical Practice** – Undergraduate curricula must provide ample opportunities to practice the work of being a statistician. Strong communication skills are particularly necessary for statisticians and complement technical knowledge to ensure results are made available in an accessible and accurate manner. These skills include effective technical writing, presentation skills and visualizations; teamwork and collaboration; and the ability to interact and communicate with a variety of clients and collaborators.

**Pedagogical Considerations** – The approach to teaching this curriculum should model the correct application of statistics such as:

- Emphasize authentic real-world data and substantive applications related to the statistical analysis cycle
- Develop flexible problem-solving skills
- Present problems with a substantive context that is both meaningful to students and true to the motivating research question
- Include experience with statistical computing and data-related skills early and often
- Encourage synthesis of theory, methods, computation and applications
- Provide opportunities to work in teams
- Integrate training in professional conduct and ethics
- Offer frequent opportunities to refine communication skills, tied directly to instruction in technical statistical skills
- Incorporate regular assessment to provide authentic feedback

“These guidelines will ensure undergraduate statistics programs provide their students appropriate training for a career in statistics,” says ASA President-elect David Morganstein. “The ASA leadership and the members of the undergraduate guidelines work group strongly encourage the leaders and faculty of each undergraduate statistics program to read and apply these updated guidelines so their students are fully prepared to thrive in our increasingly data-centric world.”

“There is a pressing need to ensure we have quantitative scientists, including statisticians, with the ability to bridge the technology and information transfer gap in order to accelerate our understanding of disease biology, etiology and prognosis and innovations in disease prevention and treatment,” said Xihong Lin, professor of biostatistics at Harvard University’s T.H. Chan School of Public Health and member of the Committee on Applied and Theoretical Statistics at the National Research Council. “These guidelines are very timely, insightful and thoughtful. They can help to prepare this next generation of analysts to effectively translate these data into knowledge and contribute to making new discoveries in health sciences.”

The report also includes recommendations for curriculum topics for minors or concentrations in statistics and discussions about the relationships of the undergraduate statistics curriculum with the growing number of high-school and community-college courses in statistics and master’s programs in statistics.

Horton also noted a variety of white papers are in development that will help steer undergraduate statistics departments through the process of implementing the new curriculum guidelines. Topics broached in these papers will include “data science and the undergraduate curriculum,” “learning outcomes for undergraduate programs in statistical science” and “roadmap for smaller schools.”

[Click here to access the complete undergraduate statistics guidelines online.](#)

## **PARTY LIKE IT’S 2015!**

There will be an event in the official statistics community that will be celebrated worldwide next year. The second World Statistics Day will take place October 20, 2015. The event, which will be coordinated by the [United Nations Statistics Division](#) (UNSD), will operate under the theme, “Statistics for better decision-making—statistics for better development.”

UNSD is calling on countries, regional and supranational organizations, thematic-oriented institutions, and government and nongovernmental organizations to join this global celebration of official statistics.

Each participating country and organization can design its celebration and create materials that fit best within its national identity and relate its ideas to the main theme for World Statistics Day and the materials that will be created and disseminated to countries by the UNSD. Among these promotional materials will be posters, pamphlets and handouts. The division also will provide assistance—where possible—with publicity, the organization of seminars and workshops and participation in special events.

The objective of the event is to bring the importance of official statistics to the attention of policy decisionmakers at the highest levels of national governments and to the public.

The World of Statistics will be joining in the worldwide celebration of official statistics next year. Planning and coordination of activities will commence soon. Check this newsletter and [the website](#) for future announcements.

The first World Statistics Day was celebrated October 20, 2010. In 2012, the UN Statistical Commission decided to observe the celebration every five years on that same calendar date.

## THE WORLD OF STATISTICS 2014 ACTIVITIES CALENDAR FOR NOVEMBER & DECEMBER

Following are The World of Statistics participating organization-sponsored events and activities around the world that are scheduled for the remainder of November and for next month. To see the complete 2014 Activities Calendar [click here](#) and to view the recently added 2015 Activities Calendar [click here](#).

### NOVEMBER 2014:

- **November 20, 2014** — **VIRTUAL WORKSHOP: [Exploring Best Practices in Design of Experiments](#)**, SAS Institute
- **November 21, 2014** — [Missing Data Workshop](#), New Jersey Chapter of the American Statistical Association and Bayer Statistics, Whippany, New Jersey, USA
- **November 21, 2014** — [From Research Question to Exploratory Data Analysis Workshop](#), UK Data Service, Manchester, United Kingdom
- **November 27, 2014** — **VIRTUAL WORKSHOP: [Exploring Data Visualisation—Case Studies in Exploratory Data Analysis](#)**, SAS Institute
- **November 28-30, 2014** — [X Statistics Colloquium: Applications in Statistics](#), National University of Colombia at Medellin, Medellin, Colombia

### DECEMBER 2014:

- **December 1-5, 2014** — [BioInfoSummer 2014](#), Australian Mathematical Sciences Institute, Melbourne, Australia
- **December 8, 2014** — [Crime Surveys User Conference 2014](#), UK Data Service, London, United Kingdom
- **December 8-12, 2014** — [70th Deming Conference on Applied Statistics](#), Metropolitan Section of the American Society for Quality and Biopharmaceutical Section of the American Statistical Association, Atlantic City, New Jersey, USA
- **December 10, 2014** — [Data Driven Research: Access, Analyse, Evidence](#); UK Data Service, London, United Kingdom
- **December 11-12, 2014** — [Applied Statistics and Public Policy Analysis Conference 2014](#); Australian Mathematical Sciences Institute (AMSI) and Charles Sturt University (CSU); Wagga Wagga, Australia
- **December 15-17, 2014** — [Third International Conference on the Interface Between Statistics and Engineering](#); City University of Hong Kong Department of Systems Engineering and Engineering Management and Georgia Institute of Technology School of Industrial and Systems Engineering, Hong Kong, China
- **December 18-21, 2014** — [13th Islamic Countries Conference on Statistical Sciences \(ICCS-13\)](#), Islamic Countries Society of Statistical Sciences (ISOSS), Bogor, Indonesia
- **December 27-29, 2014** — [International Conference on Applied Statistics 2014: Applied Statistics: Meeting the Challenges of the 21st Century](#); Institute of Statistical Research and Training at the University of Dhaka; Dhaka, Bangladesh

- **December 28-30, 2014** — [International Statistics Conference 2014](#); Institute of Applied Statistics, Sri Lanka jointly with the Department of Bioinformatics and Biostatistics at the University of Louisville; Colombo, Sri Lanka

[Click here to submit your organization's 2014 and 2015 events and activities to The World of Statistics Activities Calendar.](#)

## **PARTICIPATING ORGANIZATION NEWS & EVENTS**

Following is the latest news and information from statistical organizations participating in The World of Statistics:

**Cuba**—Two simultaneous events are coming up in the country next year. Those are the 11th International Workshop on Operations Research and the Colloquium on Teaching Effectiveness. Both will be held March 10-13 at the University of Havana.

The international workshop, themed “OR & Human Welfare: Health, Environment and Education,” will focus on the applications of the models and methods of operations research (OR) in problems related to the development of humans and their environment. Its goal is to promote the interchange of information and ideas around applications of OR in medicinal, biological and social research oriented to human welfare. The workshop hopes to foster papers that provide cross-fertilization between these topics. Organizers invite researchers to plan sessions not only dedicated to a certain topic but to different approaches to the same problem as well. [Click here for more information and registration.](#)

Meanwhile, the teaching effectiveness symposium will be led by James J. Cochran, professor of statistics at the University of Alabama in the United States. He is the creator of an initiative called the International Teaching Effectiveness Colloquia (TEC). Through this initiative, Cochran has organized and staged eight of these colloquia—in Uruguay, South Africa, Colombia, India, Kenya, Argentina, Cameroon and Croatia. These colloquia feature several speakers and short workshops on how to make applied mathematics education, particularly statistics and operations research, more effective. [Click here for more information and registration.](#)

**Europe**—The [European Central Bank's \(ECB\) statistics division](#) has launched a new data website called “[Our Statistics](#)”. The goal of this initiative is to facilitate the comparison of core Euro-area and national statistics. Its principal functionality is the capability to easily share the statistics via e-mail or social media or by embedding graphs into other websites. The latter capability could be useful for electronic news media and newspapers.



The site presents statistics visually, features user-friendly terms and is available in 23 languages, including all official EU languages. Statistical areas presented are:

- Bank interest rates
- Bank balance sheets
- Competitiveness indicators
- Inflation rates
- Investment funds
- Macro-economic indicators
- Securities

The set of statistics presented is publicly available in databases at the ECB, national central banks and Eurostat, and can be viewed using PCs, tablets and mobile devices. It constitutes a core set of official statistics that gradually will be extended based on demand.

The website was developed in cooperation with the Organisation for Economic Co-operation and Development. Because of the similar mission objective of enhancing the communication of statistics, this shared model and presentation of statistics can be easily reused by other statistical agents.

[Try it out](#), share it with your colleagues, and send your questions or suggestions via email to Per Nymand of the ECB's statistics division at [Per.nymand@ecb.int](mailto:Per.nymand@ecb.int)

**Ethiopia**—The Ethiopian Statistical Association (ESA) invites the submission of statistical research papers for the 23rd issue of the *Journal of the Ethiopian Statistical Association* (JESA), which will be published next year. Those interested in publishing their work in JESA are encouraged to submit their manuscript to [ethstat@gmail.com](mailto:ethstat@gmail.com) as early as possible. More information about JESA and its submission guidelines is available by [clicking here](#).

**Nigeria**—A recent news article from a newspaper in Nigeria recently caught our attention. Its provocative headline jumped from the computer screen: [“For better performance, Jonathan, govts need knowledge of statistics, says don”](#).

In the article, an expert in statistics at the University of Ibadan, Dr. Olusanya Olubusoye, advocates statistics education for President Goodluck Jonathan and the governors of the country's 36 states.

“The basic ingredient[s] for any meaningful transformation include setting quantifiable targets, developing performance indicators and establishing framework for data collection, management, processing and reporting,” asserted Olubusoye.

Thanks to Dr. Olubusoye for expounding on the value of official statistics.

**United Kingdom**—The UK Data Service will host the workshop “Data-Driven Research—Access, Analyse, Evidence” December 10 in London. This free, half-day workshop will provide an introduction to the data, resources and support available from the UK Data Service.

The workshop is for researchers in the social sciences and related disciplines, research methods teachers and librarians who wish to learn more about the resources and support offered by the UK Data Service.

It will involve a mixture of presentations, group work and hands-on computing sessions using UK Data Service data and resources. By the end of the workshop attendees will be able to:

- Explore the vast range of quantitative and qualitative datasets available for reuse from the UK Data Service
- Search, access and analyse UK Data Service collections online using a variety of resource discovery and data analysis tools
- Tap into the wide variety of data support materials available, for example video tutorial guides and methodological guides
- Access further training events

The workshop will be at the London School of Economics. [Click here for more information.](#)

**United States**—John Sall, co-founder and executive vice president of SAS Institute, recently had the honor of being the first speaker for the Oregon State University College of Science’s Distinguished Lecture Series. Sall was invited to speak about his work to make Big Data useful by his longtime colleague Sastry Pantula, who is now the dean of the college.

“Big statistics” is the term Sall used in his talk to refer to statistics that deal with a lot of data and statistics that are important and significant. Being able to take Big Data and turn it into “big statistics” is important for genomics, industry and business, Sall said.

During the presentation, Sall used JMP to process large data sets and show the audience the kind of information that can be found from these analyses. He took a data set with 128 variables and displayed all the relevant information in one graph.

[Read more in this article from the OSU student newspaper.](#)

**United States**—Here are two events to add to your 2015 calendar:

- The American Statistical Association and Medical Technology Learning Institute will cosponsor a workshop titled “Short Course on Adaptive Design” April 28 in Arlington, Virginia. The course will be led by Dr. Christopher Coffey of the University of Iowa. [More information will be available on the event website in the coming weeks.](#)
- The U.S. Food and Drug Administration and Medical Technology Learning Institute will host their 8th annual Medical Devices and Diagnostics Statistical Issues Workshop April 29 and 30, also in Arlington, Virginia. [Information and registration details will be available soon on the event website.](#)

## NATIONAL STATISTICAL ORGANIZATION: NEWS & EVENTS

Following is the latest news and information from national statistical organizations participating in The World of Statistics:

**Turks and Caicos Islands**—A website full of facts and statistics related to the Turks and Caicos Islands has been launched. The Strategic Policy and Planning Department (SPPD) presented the newly designed site to media during a recent meeting at the Premier’s office in Providenciales. The public can access the comprehensive website at [www.sppdtci.com](http://www.sppdtci.com), said Chief Statistician Shirlen Forbes Jr.



Among the statistics are births and deaths, marriages and divorces, GDP, crime rates, imports and exports and election results dating back decades. In-depth details on the country’s history, people, flora and fauna, language, government and more are included.

Forbes said he wanted the site to be a place where people can find anything that they want to know about the Turks and Caicos Islands. He added that it is an evolving project and welcomes ideas on future content. Forbes said: “The website is designed with new kinds of rich multimedia content features that will be updated on a regular basis. SPPD aims to dispense a more advanced and user-friendly source of accessing economical and statistical information dissemination.”

He said the site will enable the public to be more informed about the services and works produced at SPPD in collaboration with other government departments and offices, private-sector entities, individuals as well as regional and international organisations.

The statistics team within the SPPD based in Grand Turk previously had just two members, but over the past year four more members have been added.

In addition to Forbes and Anthony Smith, who designed the new website, the SPPD team includes statistician Sabrina Williams, statistician Edward Hall, mapping technician Alex Bennett and statistical technician Varlene Aristile. “These young TC Islanders have been charged with helping us to develop a sustainable statistics department,” Forbes said. “We want to make sure that whatever statistics we produce, it is using methodology that is sound, and we are following all the international standards.”

## SHARE YOUR NEWS & EVENTS THROUGH THE WORLD OF STATISTICS

Tell your colleagues in the worldwide statistical community and the public about your organization's events through [The World of Statistics 2014 Activities Calendar](#). Now, you can submit your organization's 2015 events for next year's calendar, [which is live on the site now](#).

[Using this brief webform](#), it's easy to submit information about your 2014 or 2015 event so it is added to the activities calendar for all to see.

After your event is over, you can send us a story about it for this e-newsletter. We have developed [this easy-to-use webform](#) you can use to submit your event stories and other news about your organization's activities to promote and advance the statistical science profession. These event stories and news items will be featured in an upcoming issue of this e-newsletter.

Send us your calendar and news items now!

## JOIN THE WORLD OF STATISTICS

If your organization or an organization you know of isn't yet part of The World of Statistics, encourage them to join. Joining is easy—just ask a representative of the group go to [www.worldofstatistics.org](http://www.worldofstatistics.org) and click on the “Join” icon on the top right-hand side of the homepage to become an official participating organization in The World of Statistics. Participation is valuable and is absolutely free!

## THE WORLD OF STATISTICS NEEDS YOUR HELP

Now that the [new website for The World of Statistics](#) is up and running, we need your help. You can help move The World of Statistics website up in the list of Internet search results by linking to the new website address—[www.worldofstatistics.org](http://www.worldofstatistics.org)—from your organization's website and replacing the old Statistics2013 logo with the new logo for The World of Statistics and linking it to the new website. [You can download the new logo here](#).

[See how the United States National Center for Education Statistics is displaying The World of Statistics logo on its website \(go to bottom of the homepage\)](#). Kudos to Andrew White, NCES Senior Research Statistician Statistical Standards and Data Confidentiality, for sharing the link with us and, more importantly, for posting the logo.

Some other things your organization can do to help the cause include:

1. Update existing links to [www.statistics2013.org](http://www.statistics2013.org) on your website so that these point to [www.worldofstatistics.org](http://www.worldofstatistics.org)
2. Change all references to Statistics2013 on your website to The World of Statistics and link to the new website ([www.worldofstatistics.org](http://www.worldofstatistics.org))
3. Change your Facebook page information, links and logos so that these reference The World of Statistics. Also, share information about and publicize The World of Statistics on your organization's social media accounts, including Facebook and Twitter

4. Post a version of The World of Statistics logo in your language on your organization’s website. [We currently have nine language versions available for download.](#) To request a language-customized logo, email the following information in a PDF document to Jeff Myers at [jeffrey@amstat.org](mailto:jeffrey@amstat.org):
  - a. The interpretation in your language of: “The World of Statistics”
  - b. The interpretation in your language of: “Participating Organization”
5. If you have a linked Statistics2013 banner on your organization’s website, please remove it and replace it with a new banner for The World of Statistics and link the new banner to [www.worldofstatistics.org](http://www.worldofstatistics.org). [You can download these new banners here.](#)
6. The World of Statistics Twitter account is @astatworld. Start following us today. Be sure to retweet our tweets and also mention The World of Statistics—hashtag #TWOS—in your tweets.
7. If your website has content about Statistics2013, please delete it and replace it with [copy about The World of Statistics](#).
8. As you did with Statistics2013, include mentions of The World of Statistics in all your organization’s online communications.

Working together, we’ll move up The World of Statistics in all search engine results.

#### **FOLLOW US ON TWITTER & FACEBOOK**

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#### **NEW GUIDE TO CONTRIBUTING TO THE WORLD OF STATISTICS AVAILABLE**

[Click here to access the “Guide to Contributing to The World of Statistics and Downloading Logos and Other Resources.”](#)