STATISTICAL SOFTWARE FOR TEACHING: RELEVANT, APPROPRIATE AND AFFORDABLE

Stewart Andrews
VSN International Ltd, Hemel Hempstead, United Kingdom
Stewart.Andrews@vsni.co.uk

Students need to have a good grounding in statistics given how important it is in many disciplines—scientific or otherwise. But it isn't just the statistics that is important, it's statistical software. Computer hardware and software developments together with the accessibility of data have accelerated the need for students to understand how their learning is used in the real world. It isn't just a formula, it's used by many through the world in their everyday life. In order to equip our young people with life skills we should be teaching them, not just the basics of statistics, but teaching them with tools they will encounter later in life. By using a software system that is and always has been designed by everyday users of statistical analysis, we can show students the relevance of their learning. GenStat for Teaching is a menu driven, world class statistics system used by statisticians, scientists and researchers across the world

VSN INTERNATIONAL: A BACKGROUND

VSN International Ltd (VSNi) is the prime supplier of data analysis software for the biological and life sciences markets worldwide. Formed in 2000, VSNi is a spin off from Rothamsted Research (RRES) and the Numerical Algorithms Group (NAG). Using our shareholder organisations' 30 years of experience in developing high-quality analytical software and solutions, VSNi is one of the leading providers of high end statistical tools.

Due to its backing from RRES, the largest land-based research institute in the UK and arguably the original home of statistics in biology, VSNi has stuck close to its roots. As a result we are uniquely placed to provide statistical software to a wider market, seeking opportunities within the UK and overseas public bioscience sectors.

We aim to support all bioscientists and researchers in their work, even those with no budget through GenStat Discovery Edition, which is offered free to not-for-profit research organisations, charities and educational institutes based in over 100 developing world countries.

GenStat for Teaching is an extension to this project, offered free to all students and educators (up to and including Master's level) throughout the world.

GenStat, developed from the late 1960s, was by most accounts the first statistical software tool to be developed, and stems from the ongoing research activity at what is regarded as the birthplace of modern statistics: RRES. Rothamsted Research was founded in 1843 and has continued to be a centre of excellence for science, supporting sustainable land management and its environmental impact. Its scientific research ranges from studies of genetics, biochemistry, cell biology and soil processes to investigation into the ecosystem. More recently, and of increasing relevance, research has begun to focus on the impacts of climate change and the possible ways to mitigate them.

Our other parent company, NAG, is a recognised quality leader in its own field of analytical software. Founded in 1970, NAG specialises in the provision of software for the solution of mathematical, statistical and data mining problems. The services offered are used by companies and institutions in a diverse range of industries spanning the globe; industries such as financial analysis, science, engineering, education and academia.

STATISTICS IN EDUCATION

Statistics is used across disciplines throughout all levels, and yet it isn't always given the support and credit it deserves. For many, statistics is simply a branch of mathematics, and of little relevance to their chosen subjects or interests; this is true of many disciplines, even those of a more science or applied nature. We have noticed that one of the underlying problems in undergraduate courses is that quite a high number of students don't appreciate that they have to take data analysis or investigative studies as part of their chosen course. Obviously this isn't true for every student but for those students it is true for, part of the reason for this lack of understanding is the students

In C. Reading (Ed.), *Data and context in statistics education: Towards an evidence-based society. Proceedings of the Eighth International Conference on Teaching Statistics (ICOTS8, July, 2010), Ljubljana, Slovenia*. Voorburg, The Netherlands: International Statistical Institute. www.stat.auckland.ac.nz/~iase/publications.php

themselves. From the students' perspective, they've enrolled on a course either because they just happen to be good at it, or in some cases, wish to pursue a personal interest in, but what they haven't done is read the small print. On the other hand, some students could rightly argue that quite often 'data analysis' doesn't feature as part of their course descriptions even when it is a compulsory module. But whatever the reason, for many it will have come as an unwelcome surprise to find that, far from leaving maths and stats behind them, data analysis is a compulsory part of their chosen course.

Given its applicability and usefulness across so many disciplines it is vital that statistics receives support and concentration at all levels of education. The better the grounding in statistics, the more likely a student is to be able to appropriately analyse data in later life for courses and work.

OVERCOMING THE ISSUES

The tragedy is that students and teachers do not always have the resources available to effectively teach statistics and statistical analysis. This problem stems from two issues:

- Lack of funding
- Physical lack of appropriate software to choose from.

At VSN International we are trying to address these issues: since 2008 we have provided GenStat for Teaching free to all students and educators throughout the world. It developed from our belief that financial limitations should not be a barrier to gaining access to expert tools and follows in the footsteps of GenStat Discovery, a free version of our software that is available to all education and non-profit organisations in the world's poorest 100 countries. Indeed many students find their plight not wholly dissimilar to those in developing countries with limited budgets.

However, just because something is free is not a reason to use it. Any teaching tool, be it software or otherwise should be used because it is suitable.

WHY USE PROFESSIONAL SOFTWARE

GenStat for Teaching is thoroughly tested, fully integrated with no additional modules, supported with a wealth of guides and documentation all within an intuitive menus driven system, and available to all students and educators world-wide, and hence highly suitable to use in teaching. It covers a wide range of statistical techniques, from basic statistics to more complex analyses methods.

Another reason GenStat should be considered for use by the education market is because it has been professionally developed by a respected organisation with its roots in research: our background is very much based within the research, and the software has grown from a background of statisticians applying their knowledge to understanding and solving some of the research issues faced by researchers; and not by statisticians trying to create a statistical software programme. It is this level of applied knowledge that sets GenStat apart from other statistical systems; we have always tried to look at the problem in hand, rather than programme statistical routines for the sake of it or because it is possible.

Additionally GenStat actively encourages critical thinking in users. Take for example its well-planned menus that offer a consistent 'analyse - check assumptions - save details' approach. This ensures users think logically and interactively about data analysis rather than race to get the right answer.

Students need to think logically and fearlessly about data analysis, with GenStat, you know that the underlying statistics is well-formed, accurate and reliable so there is no longer any need for long-hand manual calculations. But this isn't just about understanding how to use a software system, this is about understanding and using statistics appropriately. There is a danger that many people learn how to get by with software, rather than using the software as a tool in their arsenal. The software is working them rather than the software working for them; students should be able to easily see which analysis is the most appropriate rather than finding a technique that "sort of" fits. Using the correct statistical analysis means that the results are more useful and reliable, and hence

any conclusions or recommendations drawn from them are likely to be more meaningful and appropriate.

Appropriate statistical analysis is more likely to result in appropriate conclusions, so, students still need a good grounding in the principles of statistics. Some of the key principles students need to be grilled in are: recognising and understanding valid data; choosing appropriate analysis techniques; and critically analysing output.

Given that so much real life data analysis is done via software systems on computers it does make sense to teach students using appropriate software. By appropriate I clearly mean software that is statistically sound, and importantly software that is used in a wider context in working environments. This means that students not only learn statistics but they learn to use statistical software tools that they will come across in later life, be it at university, research institutes or commercial organizations. Being a part of the GenStat family GenStat for Teaching provides the range of sound, reliable statistical analysis techniques you would expect; but importantly it is a software tool that students will see and use in their later working life.

At VSN, we are aiming to assist teachers with equipping young people with the skills and information they will need in life. This means not only working on helping students understand and work with statistics and statistical analysis with confidence, but to show it to them in an environment that are likely to come across in an applied sense.

THE OTHER SIDE

But this isn't just about the students' experience. Lecturers also deserve to have tools that make teaching easier and relevant. While there is quite a number of software tools available to the lecturer, some that are free, others that require a hefty subscription fee, very few are 'fit for purpose' or are designed in a way that actually encourages students to take a greater interest in what they are studying and helps them understand what they are doing and why. GenStat is one of these. Teaching students with the very software that is used in the real world will of course make the experience far more compelling.

CONCLUSION

Despite the apparent plug for a "free software", VSN's opinion is that as provider of professional statistical analysis software we must also provide suitable software for use in education. It's becoming increasingly obvious that statistics is an important component of many disciplines, in education and research, and we have a duty to assist educators across the world with enabling our children to be equipped and trained with world-class tools.