sigma Σ network for excellence in mathematics and statistics support

NEWSLETTER

Issue 28: Spring 2024

INTRODUCTION

Editor's Note

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Welcome to the Spring edition of the **sigma** Network newsletter. While I have been sending out requests for articles I have been noticing the days getting longer and the changes in what is in flower, from snowdrops in February to magnificent cherry blossom today.

Thanks to everyone who responded to my requests. It has been a pleasure to read the wide variety of articles submitted and to see that the **sigma** Network is thriving. I think this newsletter illustrates the Network's strength in both breadth and depth. It is also good to see that Lucy Deacon, who introduces herself below, has found us the be a 'warm and welcoming' group.

There are plenty of ways to become more involved in the Network as you will see from the articles below. You can of course also submit an article to the next newsletter, which will come out in the autumn. So, if you are inspired by what you read here or on the jiscmail list, by attending an event or by your interactions with students, do feel free to send me submissions before I start asking for them.

As Alun mentions we have recently welcomed some new members to the Steering Group – a full list of the current membership can be found at the end of the newsletter.

Finally, the views expressed in these articles do not necessarily constitute recommendations from the **sigma** Steering Group or any associated parties.

I hope you enjoy reading this issue.

INTRODUCTION

Letter from the Chair of the sigma-Network Steering Group

Alun Owen, Chair of sigma Network and Head of Statistics Advisory Service | Coventry University

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Dear colleagues,

I hope you all have had a productive and rewarding academic year so far and you get to enjoy some well-earned downtime during the Easter break.

I'm pleased to say that the **sigma** Network has continued to offer a number of events including workshops and coffee mornings, to help support and develop our practice in maths and stats support. During the current academic year, we have so far held three coffee mornings and two workshops on "Supporting Students with Panel Data Regression" and "Funding for Maths and Stats Support". Reports on some of these events are included in this newsletter if you wish to find out more.

These events are an integral part of making our network exactly that; a network that continues to support you, me and everyone working in maths and stats support in HE in the UK and further afield. The success of these is very much down the generosity of those colleagues that continue to organize and/or host these events, and those that have been willing to share their experiences and expertise with others. The continued success of these is also very much down to the hard work of Evi Papadaki from the University of Bath, who was co-opted onto the **sigma** Steering Group last Autumn to take up the role of Events Secretary. I would like to take this opportunity to thank Evi for the amazing work she has done since then, making sure events are scheduled and advertised in a timely manner. Evi has written a piece to introduce herself to you as well as inviting you to submit ideas for future events. Also do remember that organising or contributing to **sigma** Network events are very much aligned with Descriptor 3 of the Professional Standards Framework for teaching and supporting learning in higher education 2023, which you can use as evidence for recognition as Senior Fellow of Advance HEA.

In the last newsletter I reported on some colleagues who were stepping down from the sigma Network Steering group. Following a call for nominations to fill these vacancies, I am delighted to let you know that the following colleagues were elected onto the Steering group for 2023/24; Alison Loddick from the University of Northampton, Gareth Woods from Aston University and Safa Elsheikh from Loughborough University. I would like to welcome these colleagues to the Steering Group and I'm delighted to say that Safa has also agreed to take up the role as Secretary of the Steering Group. The Steering Group continues to work hard to guide the Network in the direction you would like it to, and so I wanted to say thank you to all of those colleagues on the Steering Group for giving up their time to keep us all supported. Please do let me know if there is anything the network should be doing so that we can discuss your ideas at a future meeting of the Steering Group.

Finally, if you are relatively new to the **sigma** Network I would like to welcome you too. Please do consider writing a short piece to introduce yourself and tell us what you do. This newsletter is an ideal place to share that with everyone.

I hope you manage to enjoy some time away from work during the Spring and Summer months and I hope to see some of you at one or more of our upcoming events. But if you would like to get in touch with me about anything related to maths or stats support please drop me an email at aa5845@coventry.ac.uk.

With very best wishes

Alun Owen

Chair **sigma** Network Steering group

Let's give shape to future sigma events together

Evi Papadaki, MASH Teaching Fellow & Events Secretary for sigma| University of Bath

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Hello all!

I'm Evi. I would like to introduce myself and ask for your input in planning future **sigma** events. I work at the Mathematics Resources Centre at the University of Bath. Within the Centre, I work for the Mathematics and Statistics Teaching (MAST) team collaborating with academics and supporting the development of teaching across the University.

My introduction to the **sigma** Network coincided with the first lockdown. At the time, I worked as a tutor for the Learning Enhancement Team at the University of East Anglia alongside my doctoral studies in Mathematics Education. While I initially was not very active, even just reading the discussions in the mailing list provided me with invaluable motivation and a sense of belonging during challenging times. As I have become more active, I am grateful that I have found a community of people from across the country and beyond, whom I get to meet regularly during the CETL-MSOR conferences and the coffee mornings.

In November, I took up the role of the events secretary of the **sigma** Network. I see this role as my opportunity to give back to our community by making sure that everyone is supported to host or contribute to the events. A key goal is to increase the diversity of hosts and speakers. I would like to encourage new colleagues and smaller teams to contribute in any way that they can, knowing that they will be supported throughout.

As we look to the future, I would really appreciate your ideas on:

- Themes and topics to be discussed in future Coffee Mornings
- Professional development and/or training needs
- Follow-ups or deep-dives into discussions from previous events
- Expressions of interest in hosting a future event

Please feel free to reach out to me at pp949@bath.ac.uk with your ideas, questions, or feedback. If you prefer to make an anonymous suggestion, you can do so by following the link: https://forms.office.com/e/g73jvabfxz (no deadline).

I look forward to seeing you at a future event.

See below for a list of the **sigma** events planned for the rest of this academic year.

Date	Event Details	Host Institution
Wednesday 24th April, 2:00pm-4:30pm	Workshop: How do maths and stats support centres help students to prepare for examinations? (online)	Open University
May 2024	Coffee Morning (online)	*TBC*
June 2024	Workshop: *Topic TBA* (online)	*TBC*
Thursday July 4th, 10 am - 11:30 am	Coffee Morning: AI/ChatGPT within Maths & Stats support (online)	Brunel University London

Roundtable Discussion at ISEC 2024 – What are the key statistical methods and concepts that all [undergraduate] ecologists should learn? (July 2024, Swansea)

William Kay, Maths, Lecturer | Cardiff University

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Do you teach ecology and statistics?

If so, and you plan on attending the International Statistical Ecology Conference (ISEC) this year at Swansea (15-19 July 2024), please consider joining and contributing to the following Roundtable Discussion: "What are the key statistical methods and concepts that all [undergraduate] ecologists should learn?"

This discussion is intended to gather expert opinions and understand attempt to build a consensus towards what statistical concepts and methods should be taught to undergraduate ecologists. The intention will be to write a report from this discussion for publication as a commentary/opinion piece.

ISEC 2024 is an in-person only conference, hence if you are unable to join and contribute, please write to me! The roundtable discussion will likely be held on either the Tues (16th) or Thurs (18th) during the conference week.

The International Statistical Ecology Conference (ISEC) is the main international gathering of statistical ecologists. It is a very friendly and interdisciplinary conference at the interface between statistics and ecology, bringing together statisticians and ecologists. The conference will be held at Swansea University Bay Campus, with social events taking place at Brangwyn Hall. The registration deadline for ISEC is 30 June 2024.

Swansea University Bay Campus

Workshop on Teaching Study Design and Analysis in Life Sciences (12 June 2024, Manchester)

William Kay, Lecturer | Cardiff University

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Crispin Jordan, Senior Lecturer | University of Edinburgh

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We recently completed a survey of undergraduate teaching in study design and analysis for four Life Sciences disciplines from universities across the UK: Biology, Biomedical Science, Medicine, and Psychology.

We intend to disseminate our findings and foster communication at a Workshop on 12 June 2024, 09:30-17:00, in Manchester. This workshop has four specific aims:

- Determine why disciplines differ in how they teach study design and analysis;
- Identify opportunities for disciplines to learn from each other to improve teaching;
- Reflect on why we teach the topics that we do and whether this coverage meets objectives for student education;
- Develop and share teaching resources that address common needs across disciplines.

This workshop is being hosted one day prior to the UKCOTS conference and thus presents a convenient meeting opportunity for the audience that would have the greatest interest in the workshop's topic.

What should attendees expect to gain from the workshop?

- Cross-disciplinary perspective on the challenges faced and approaches to overcome them, and solidarity that comes from openly discussing challenges;
- Opportunity to benchmark attendees' teaching programmes versus those nationwide;
- Opportunity to gain "outside the box" (cross-discipline) perspective on why and how to teach study design and analysis;
- Knowledge of approaches and software people are using across UK to do/teach data analysis;
- Resources for teaching/influence teaching of statistics in an attendee's own institution.

Date and Time: 12 June 2024, 09:30-17:00

Venue: TBC, University of Manchester

Registration Fee: Less than £20 (most likely free)

Registration: Please register your interest via our Microsoft form, below. Formal registration will follow.

Included: Arrival tea/coffee, morning and afternoon refreshments, lunch.

Registration: Register your interest

Workshop itinerary: Teaching Study Design and Analysis in Life Sciences

REPORT

Recent sigma events

This is a list of **sigma** events held earlier in the academic year. You can read a report of the Panel Data regression event below.

Date	Event Details	Host Institution
Thursday 9th Nov 10.30am-11.30pm	AGM and Coffee Morning (online)	Coventry University
Thursday Jan 18 9:30-11:00am	Coffee Morning Promoting and evidencing the value of maths and stats support (online)	Sheffield Hallam University
Tuesday Feb 27th 10:00 am – 1:00 pm	Workshop Supporting Students with Panel Data Regression (online)	Coventry University
Friday 8th March 9:30-11 am	Coffee Morning Reading group - Research and evaluation in maths and stats support (online)	Maynooth University

REPORT

Workshop Report: Supporting Students with Panel Data Regression

Alun Owen, Chair of sigma Network and Head of Statistics Advisory Service | Coventry University

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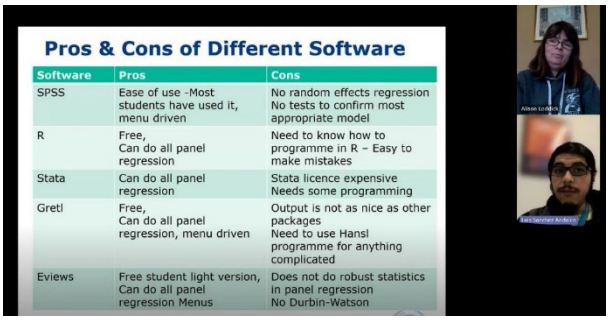
Panel Data Regression presents some additional issues to consider over Ordinary Least Squares Regression, since the data is typically collected over time on the same sampling units such as companies or banks etc. However, many students are not provided with formal learning opportunities in this subject but are then tasked with undertaking final year undergraduate and postgraduate projects which require the use of these methods. My own experience, at Coventry and Loughborough Universities, is that students studying subjects associated with Economics do receive instruction in panel Data Regression and may even make use of software such as *gretl* specifically designed for such analyses, but students studying subjects as Accounting and Finance receive no instruction beyond simple linear regression. Therein lies the problem this workshop aimed to address. How do we help students with such potentially wide-ranging previous learning in this area? And what about our own expertise; we may have heard of the methods but how can we help students use these techniques?

I was delighted therefore that two very knowledgeable colleagues that have battled with these issues, accepted the invitation to present their ideas at this workshop. One of these was Alison Loddick from the University of Northampton, who had previously presented on this topic at the most recent CETL-MSOR Conference in 2023. The other was Luis Sanchez Andalco, a colleague of mine at Coventry University, who has recently created a suite of new resources for supporting students with this topic.



Alison and Luis discussing some of the pros and cons of different software for Panel Data regression.

These resources are freely available on Coventry's **sigma** Maths and Stats Support Centre website at https://libguides.coventry.ac.uk/c.php?g=712076&p=5146769

The workshop itself was held online on 27th February 2024 and hosted by Coventry University. It was attended by 19 colleagues representing 16 different HE institutions, including one of our colleagues from Australia who burned the midnight oil to join us. The event kicked off with an introduction to Panel Data Regression by both Luis and Alison, explaining issues relating to data structure, why we need special analyses, and the models' assumptions and the need to test for these. Alison then demonstrated how to use SPSS and STATA to undertake these analyses, whilst Luis did the same using RStudio. This was followed by opportunities for self-practice in breakout rooms. The event ended with Alison providing some tips using an Excel spreadsheet she kindly shared with us, to make it easier for students to re-structure their data in a suitable format for Panel Data Regression.

The feedback from the session was very positive with comments such as

"*a great balance between listening to Luis and Alison, them demonstrating panel regression and then having time for everyone to try it out*"

and

"*until today, I was only able to recognise panel regression but was completely unable to support students with the process. The workshop helped me understand, practise and hopefully now explain the process to the students. Overall, I feel more confident, I understand the extent of the support I can offer and I've practised*"

All of the resources of the workshop, including recordings of the workshop and the Excel spreadsheet mentioned above, will be available soon via the sigma Network website, but in the meantime they can be obtained here: Supporting Students with Panel Data Regression Feb 2024

My thanks go to Alison and Luis for a super workshop.

REPORT

8th Meeting of the LemMa-Network of German Mathematic Learning and Support Centers

Mirko Schürmann, | Paderborn University

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From February 22nd to 23rd, the eighth annual meeting of the LemMa-network of German mathematic learning and support centers (MLSCs) took place in Darmstadt. The main goal was to strengthen collaboration and exchange of experiences between MLSCs, as well as to focus on network development, particularly the new homepage (www.lemma-netzwerk.de). Discussions centered around current challenges faced by MLSCs in Germany, such as advertising, recruiting suitable tutors, financial issues, room availability, and relationships with lecturers. Following tradition, an international keynote speaker was invited to broaden our national perspective. Dr. Farhana Gokhool from the University of Bedfordshire delivered a talk on "Student Engagement and Non-engagement with Mathematics and Statistics Support Services," which sparked reflection among participants and generated new ideas for future actions. This presentation was described as a "highlight of the network meeting" by attendees. Additionally, 17 individuals (mostly internal guests and members of **sigma**) were able to join Farhana's talk online and contribute to the discussion. We thank again all participants for their contributions and look forward to the next events and meetings.

Participants of the 8th LemMa Network Meeting with Dr. Farhana Gokhool

Supporting Nursing students with their Maths Anxiety

Mark Hodds, Assistant Professor in Maths Education| Coventry University

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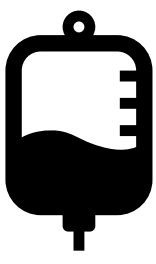
We all know that many students come to university underprepared for their courses but they are also often unaware of the maths that exists on these courses. Therefore, when faced with the mathematics on such courses, a sense of fear and panic can set in; this is known as maths anxiety. A particular group of students who often suffer from maths anxiety are nurses. In their course, nursing students need to be able to complete basic calculations, such as using fractions, percentages, addition and subtraction, but as these often relate to drug dosage calculations, the importance of getting the calculation correct is paramount for safety and their careers. Nursing students are also often career changers and therefore may not have studied formal mathematics for a long time. It is therefore important to ensure these students are supported not only with their mathematical knowledge, through the use of maths support centres, but also with their maths anxiety which is often overlooked.

At Coventry University we have worked in the first-year nursing module over the past two semesters to develop an intervention session that supports students with their maths anxiety and helps to develop their mathematical resilience. The session involves a member of the maths support team providing a 1-hour session, discussing what maths anxiety is, coping strategies, and applications of the Growth Zone Model (as seen in Johnston-Wilder et al. (2020)). We use simple and fun maths games and challenges, related to nursing maths, to apply the knowledge learnt in the first half of the session so the students can take it into formal lectures on the course and use it when getting support in the maths support centre. For these sessions we also asked the students to complete a pre-session maths anxiety and maths resilience questionnaire (using the validated scales in the literature) as well as a delayed post-session data collection point for comparison.

When analysing the data, we saw that students' maths anxiety levels were significantly decreased. Their mathematical resilience levels were also increased, but this did not reach significance. Interestingly, these students appeared to be very resilient but highly anxious at the start of the course, suggesting they were willing to work towards learning the mathematics but were worried about it at the same time. Furthermore, 97% of the students enrolled on the module passed the mathematics element at the first attempt, which was the highest ever first-time pass rate. All other elements of the module remained constant when compared to previous years and entry grades were actually slightly lower in comparison, suggesting that the session may have had an effect not only on maths anxiety but performance.

We would now like to take this further, working with other universities to apply this intervention to better understand the effects. We would also like to try it in different subjects. Therefore, if there is anyone interested, please do get in touch. A full write-up in a published journal of the work is forthcoming.

Reference: Johnston-Wilder, S., Baker, J. K., McCracken, A., & Msimanga, A. (2020). A Toolkit for Teachers and Learners, Parents, Carers and Support Staff: Improving Mathematical Safeguarding and Building Resilience to Increase Effectiveness of Teaching and Learning Mathematics. Creative Education, 11, 1418-1441. https://doi.org/10.4236/ce.2020.118104



ARTICLE

Understanding maths and stats support provision in HE: A call for survey participation

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Sue Russell, Academic Skills Manager | University of York

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The provision of mathematics and statistics support (MSS) has rapidly evolved since the pandemic, with many reporting notable changes in student engagement, type of provision available, and demographic background of engaged students. There is a continued emphasis on monitoring and evaluating the impact of MSS on student outcomes, especially for those "at-risk" students who may not access the support.
Successful interventions are regularly disseminated amongst practitioners as it is well known the importance of such information on guiding future practice. However, it is evident that the landscape in which MSS exists is constantly changing as are institutional dynamics, and therefore, interventions that are successful in one setting may not be successful in another. A survey has thus been created to gain insights into current practices and existing interventions, particularly in aiding student retention and continuation, a focal point of APPs.

The survey aims to shed light on the diverse landscape of MSS provision considering the multitude of changes necessitated by the pandemic. By capturing the characteristics, funding mechanisms and distribution of MSS, we aim to identify key factors influencing the scope and effectiveness of MSS.

Another objective is to foster collaboration among similar institutions by developing a classification model of Maths and Statistics Support provision in England and Wales, potentially extending to Ireland, Scotland, and other regions at a later date. For collaboration or survey requests, please contact Farhana.Gokhool@beds.ac.uk and s.russell@york.ac.uk via email. Participation is only open to individuals working in institutions offering MSS in England and Wales.

Access the survey at: https://forms.gle/RHmXmXxjiiuvB1U28 and share it widely with colleagues.

ARTICLE

Collaborative practice through Peer Assisted Learning (PAL) – Supporting Mathematics based modules in Engineering and Physical Science

Pinar Ozbeser, Mathematics Teaching Fellow I Aston University

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Dr Gareth Woods, Interim Head of Applied Mathematics and Data Science I Aston University

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Since the end of the COVID-19 pandemic, the University has tried to move back to more traditional methods of assessment, with examinations now taking place back on campus. Here at Aston University, we have found that there has been a significant increase in the fail rate of students in mathematics-based modules. This coupled with the decreasing number of students entering the University with A/AS level qualifications has meant that the Learning Development Centre (LDC) and its mathematics support centre has played more of a pivotal role in supporting students in the college of Engineering and Physical Sciences (EPS).

Since 2021/22 there has been a greater emphasis on the collaboration between the LDC and the college of EPS. There is a now the joint implementation of a mathematics diagnostic quiz at the start of the academic year with targeted PAL (Peer Assisted Learning) initiatives. The PAL sessions are weekly timetabled hour-long support sessions facilitated by PAL leaders who are second and final year students, recruited and trained by

the LDC. The aim of the PAL sessions is to aid the transition to subject disciplines by filling in any gaps in their knowledge as identified by the diagnostic quiz, develop community, and embed collaborative practice within programmes.

The PAL sessions have been shown to have a positive impact on students' academic performance, particularly those who were at risk of failing. For example, if we consider those students on the Computer Science Programme who failed the diagnostic quiz (a score of less than 40%) but engaged with PAL sessions, they had an average module score of 62.5%, exceeding the module average of 55.13%. There is a similar story for those students studying on one of our Engineering Programmes, where those who failed the diagnostic quiz but engaged with PAL sessions exceeded that of the average score for the module.

These positive outcomes highlight the successful impact PAL sessions have had on students' results when engagement is high, similar to Knight et al. (2022). Student feedback has also verified the positive impact of PAL on academic performance and the learning journey.

Reference: G. Knight, N. Powell & G. Woods (2022) Combining diagnostic testing and student mentorship to increase engagement and progression of first-year computer science students, European Journal of Engineering Education, 47:5, 712-724, DOI: 10.1080/03043797.2022.2063109

INTRODUCING…

Lucy Deacon, PhD & Maths support tutor| Coventry University

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Hi all!

My name is Lucy (she/her), and I'm a PhD student in Coventry University, supervised by Mark Hodds and Duncan Lawson. I started my PhD in September last year, and I am interested in collaborative learning in maths support centres, and the effect it has on student engagement and learning. I also work a few hours a week in the **sigma** support centre helping students from various course programmes with their maths skills.

I completed my MSc in Mathematics in 2019 in Maynooth University (mainly focused on abstract algebra and functional analysis) and started doing odd bits of work as a maths tutor, including some part-time work in Dublin City University (DCU). For the 2022-2023 academic year I worked full-time in the DCU Maths Learning Centre, which was a really enriching experience. Alongside my tutoring duties, I was able to dip my toes into the world of research supervised by Eabhnat Ní Fhloinn, learning about **sigma** and IMLSN, and getting to present at CETL-MSOR and MEI, which all led to me applying for the PhD here in Coventry.

Outside of academic life, I am an avid stenography enthusiast (you know, the thing that court reporters use to type their notes) and have been typing on a stenography keyboard for the last year or so. I love doing puzzles like crosswords and sudokus, and I am always up for a game of Scrabble.

It's really great being part of this network. I have loved getting the opportunity to speak to others interested in maths support at CETL-MSOR, at the recent Delta PRiME event, and in the **sigma** coffee mornings. Thanks for being such a warm and welcoming group!

What to do after Initial ANOVA

Peter Mitchell, Former part-time tutor, Mathematics & Statistics Help| University of Sheffield

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A common query at a statistical support centre is from the student who has carried out analysis of variance (ANOVA) and says: "what do I do now?" Most have used ANOVA because they know that a series of t-tests, pairwise between their treatments, is not appropriate, i.e. the problem of multiple testing and keeping to a Type I error rate (P-value) of 0.05. Many are tempted by the numerous multiple comparison tests offered by their software, perhaps prompted by a supervisor who has heard of Bonferroni, Tukey, Duncan or Scheffé. Almost none are aware of better methods of planned comparisons that exploit the structure in the treatments. These methods, bog-standard classical statistics, are not always covered well in textbooks or taught clearly, particularly in books written for users of statistics rather than for statisticians. The methods spring more from planning the experiment at the beginning than from analysis of the data. For users who are not studying statistics itself, most statistical teaching concentrates on methods for analysing data, and students grasp at what looks easiest once they have their data.

I have written a set of seven linked resources (available on request) for this situation, entitled After Initial ANOVA (Table 1). I am grateful to Andrew Chapman, University of Bath, for reviewing them. Each resource includes explanation of the method, with one or two fully worked examples, and concludes with a step-by-step procedure from initial planning of the experiment to interpreting the final results of statistical analysis.

Table 1. Overview of the linked resources.

After Initial ANOVA

1: Choices for Further Analysis

2: Planned Orthogonal Comparisons

3: Response-curve Analysis

4: Planned Non-orthogonal Comparisons

5: Unplanned Comparisons

6: Pairwise comparisons

7: Method of Coefficients, and Orthogonality

To help students such as these, I start by asking what the treatments are and why they were chosen for the experiment. By treatment I mean the individual treatment or intervention, the level in a factor. From this, the purpose of the experiment generally emerges, and discussion continues about which of the k–1 comparisons from k treatments will be of most relevance. This restriction, to only as many F-tests as there are degrees of freedom for treatments, and also planned in advance, enables us to regard the threshold of P=0.05 as reliable, with no multiple testing. The smallest possible differences between means will be detected as significant, the mean here being for an individual treatment or for a meaningful group of treatments.

A flow chart may be useful in consultations (Table 2). I emphasize that Tukey's honestly significant difference (HSD) is the *last* resort, when all else fails, but here it is sensible to eliminate this type of experiment at the start (Question 1). In my experience it is very rare; almost always there is some structure in the treatments. Factorial and dose-response structures lead easily to suitable planned orthogonal comparisons (although response-curve analysis deserves to be much better known—see After Initial ANOVA 3). At Question 4, there are two main ways to deal with the experiment examining various interventions alongside a control. If the experiment doesn't fit these standard patterns, then there is still scope for finding meaningful comparisons in discussion with the student (Question 5). All these routes to F-tests can be (and ideally should be) planned in advance because they arise from the purpose of the experiment and the choice of treatments. There is no need to see any experimental data at this point. So far, I have not encountered the final case on the

flowchart (Question 6) where no planned comparisons are possible, with the researcher waiting to see the data before selecting means to compare. Scheffé's test is available for this, rightly very conservative since winners are being picked from the data.

My hope is that this flowchart and the resources will enable much better analysis of experiments with ANOVA. By asking focused questions, leading to no more than $k-1$ specific comparisons with F-tests, the most precise information can be obtained from the experimental results, and more clearly than any multiple comparison test can do.

Table 2. Flowchart of questions about the k treatments in the experiment, to decide on further analysis after initial ANOVA.

Question		Endpoint
1. Is nothing *at all* known about the treatments, i.e. they are merely identified by arbitrary numbers or names?	**Yes** □	All pairwise comparisons: use Tukey's honestly significant difference (HSD).
	No □	
2. Are the treatments factorial, i.e. all combinations of the levels of two or more factors?	**Yes** □	Planned comparisons (orthogonal): main effects and interaction from two-way (three-way, etc.) ANOVA.
	No □	
3. Are the treatments dose rates, i.e. levels in a quantitative factor?	**Yes** □	Planned comparisons (orthogonal): response-curve analysis with polynomial components.
	No □	
4. Are the treatments a control and other interventions?	**Yes** □	(a) Planned comparisons (non-orthogonal): F-tests of control versus each other treatment. (b) Planned comparisons (orthogonal): F-tests of control versus all other treatments together; then $k-2$ meaningful comparisons among the other treatments.
	No □	
5. Are there other ways of classifying or grouping treatments in meaningful ways?	**Yes** □	Planned comparisons: F-tests for $k-1$ meaningful comparisons, orthogonal if wished, otherwise non-orthogonal.
	No □	
6. No systematic classification or grouping of treatments can be made; need to see the results before choosing comparisons.	**Yes** □	Unplanned comparisons (pairwise and any other groupings of treatments; picking winners): use Scheffé's test.

Steering Group Membership 2023/24

Steering group

Alison Loddick, University of Northampton
Alun Owen, Coventry University (Chair)
Ellen Marshall, Sheffield Hallam University
Emma Cliffe, University of Bath (Vice-chair Technical)
Gareth Woods, Aston University
Lois Rollings, Middlesex University (Newsletter Editor)
Mark Hodds, Coventry University (Vice-chair Operations)
Peter Hart, University of Sheffield (Mailing List Co-ordinator)
Rob Wilson, Cardiff University
Safa Elsheikh, Loughborough University (Secretary)
Sue Pawley, Open University
Tony Mann, University of Greenwich (Treasurer)

Co-opted:

Ed Southwood, University of Bath (Membership secretary)
Evi Papadaki, University of Bath (Events Secretary)
Samuel Walton, Birmingham City University (Early Career Representative)

Representatives:

Anne Savage (SMSN)
Duncan Lawson (IMA)
Ciarán Mac an Bhaird (IMLSN)