

epigeum

STATISTICAL METHODS FOR RESEARCH:
SUPPLEMENT

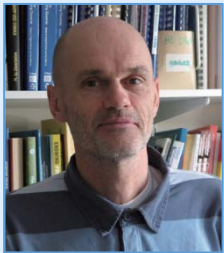
CONTENTS

INTRODUCTION TO THE <i>STATISTICAL METHODS FOR RESEARCH</i> SUPPLEMENT	3
SECTION 1: IMPLEMENTATION FOR COURSE LEADERS	7
SECTION 2: INSTALLING THE COURSES IN YOUR LMS/VLE	23
SECTION 3: SUPPLEMENTAL MATERIALS	25

**INTRODUCTION TO THE *STATISTICAL METHODS FOR RESEARCH*
SUPPLEMENT**

Introduction

A message from the Lead Advisor



Statistical Methods for Research (SMR) is designed as a foundation program in Statistics, specifically in the quantification of variability, providing students with the practical techniques they will need to conduct statistical analysis at graduate level and beyond. These key transferable skills are needed by most students and are certainly required if they intend to progress to higher-level statistics courses.

The program covers descriptive and inferential techniques and focuses on the practical application of these techniques. For example, students will learn to interpret the statistical components of a data analysis report and will then produce a model report using appropriate statistical modeling techniques. In the process, *SMR* aims to enhance students' understanding of *why* we use certain techniques – instead of simply a checking off a 'shopping list' of available statistical tests.

The content

SMR comprises the presentation of concepts, individual computer-based exercises for consolidation and other interactive learning activities. A major component of the program is analyzing data through the use of mainstream statistics packages. This will enable students to gain statistical skills commonly used today in evidence-based decision making, driven by data gathered during the research process, such as the use of estimates, confidence intervals and hypothesis tests, and the building of statistical models.

The following four areas are included in the program:

- **Describing data well: Descriptive statistics**
- **Making good generalizations: Inferential statistics**
- **Formulating and testing statistical hypotheses**
- **Fitting appropriate statistical models and interpreting their output.**

This *Supplement* is provided as an accompaniment to help you build an effective and comprehensive *SMR* training program at your institution. It opens with a sequence of key questions you need to ask when you implement the program. This is followed by additional material that your students can use to consolidate their learning process.

I wish you and your students every success with the use of this program. For further updates and information, visit the support pages on the Epigeum website at www.epigeum.com.

Sandro Leidi, Lead Advisor and author
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The *Statistical Methods for Research* program

The *Statistical Methods for Research* program is designed to provide research students with a strong foundation in Statistics, covering key areas such as confidence intervals, hypothesis testing and statistical modeling. Compatible with the most commonly used statistics packages and taking a faculty-specific approach, it provides students with practical applications, interactive statistical models and scenarios to help consolidate the skills and knowledge gained throughout the program.

The program is available in five faculty versions:

- ▶ **Biomedical Sciences**
- ▶ **Business**
- ▶ **Engineering and Technology**
- ▶ **Natural Sciences**
- ▶ **Social Sciences**

Each faculty version of the program contains seven courses:

- ▶ Introduction – Statistics in the context of research
- ▶ Thinking statistically – Describing data well
- ▶ Thinking statistically – Making good generalizations
- ▶ Which hypothesis test should I use?
- ▶ Statistical modeling
- ▶ Analysis of categorical data
- ▶ Conclusion: Putting your skills into practice

The *Statistical Methods for Research Supplement*

This *Supplement* is provided as an accompaniment to the online *Statistical Methods for Research* courses to support, extend and inform institutions' use of the online course program.

The *Supplement* is divided into three main sections:

Section 1: Implementation for course leaders

This section is for those who are in charge of running the *Statistical Methods for Research* program at their institution and are responsible for monitoring the participants¹. This section contains:

- ▶ A general introduction to the components of the *Statistical Methods for Research* program
- ▶ Guidelines on the key decisions you need to make on how to integrate the *Statistical Methods for Research* program into your existing training provision
- ▶ Advice on how to ensure that your target audience knows about the program and can access it easily, so that it attracts users and is well supported by your institution
- ▶ Suggestions on how to gather feedback and evaluate the effectiveness of the program.

Section 2: Installing the courses in your LMS/VLE

This section is for those who are in charge of the technical implementation of the courses in your institution's LMS/VLE. It contains links to online support videos to help your IT team with every aspect of installing and customizing the courses to your institution's particular needs and preferences.

Section 3: Supplemental activities

This section contains over 8 hours of additional material written by the author to accompany his courses, and is divided into two parts:

- ▶ An overview of the material available, to help you map it against the online course content
- ▶ A range of instructor-led and peer-to-peer communicative activities, including implementation instructions and resources where applicable.

This *Supplement* is available in both Word and PDF form – the former so that you can extract and edit the activities should you so wish. If you are viewing the *Supplement* in Word document form, you may find navigation easier with the 'Document Map'/'Navigation Pane' enabled (go to the 'View' toolbar and check 'Document Map' or 'Navigation Pane'). You can then move between sections using the left-hand navigation bar.

For further updates and information, you can visit the support pages on the Epigeum website at: www.epigeum.com/help-and-support.

¹ The term 'participant' is used in this *Supplement* to mean users/individuals who are taking the *Statistical Methods for Research* program.

SECTION 1: IMPLEMENTATION FOR COURSE LEADERS

The Epigeum 11-stage implementation method

Epigeum courses can be used in a wide variety of different ways – in fact, no two institutions have yet implemented the courses in exactly the same way.

Epigeum has developed an 11-stage method covering all aspects of implementation – from developing the initial vision through to resourcing and timelines (see box below for an overview). This *Supplement* covers some highlights and key areas, focusing in particular on steps 3, 4, 8 and 9.

For a more in-depth training session covering all eleven stages, or for answers to any other implementation-related questions, please contact our Senior Learning Consultant at implementation@epigeum.com.

The Epigeum 11-stage implementation method

1. Vision, goals and stakeholders
2. Your team
3. Your pedagogical approach(es)
4. Your technical implementation
5. Your organizational implementation
6. Use of pilots
7. Training and support
8. Communication plan
9. Evaluation
10. Timeline
11. Resources.

Components of the *Statistical Methods for Research* program

Component	Description	Approx. duration per course	Where can I find this material?
Self-study courses	<p>Core online component: The core of the <i>Statistical Methods for Research</i> program consists of the seven self-study courses, including an introductory course to help participants become familiar with the features and tools available throughout the program.</p> <p>Each course consists of a series of screens (web pages) containing text, videos and activities.</p>	1.5–2.5 hours	<p>Please refer to the ‘release’ email sent by Epigeum to download and log in to your <i>Statistical Methods for Research</i> courses.</p> <p>For further information on installing the courses, see Section 2 of this <i>Supplement</i>.</p>
Communicative activities	<p>Additional content: These activities are not contained in the core online component. Instead, they are optional, additional content, contained in this <i>Supplement</i> and designed to accompany and expand on material worked through in the self-study courses. There are two types of communicative activity:</p> <ul style="list-style-type: none"> ▶ Peer-to-peer activities, which encourage participants to interact with one another and share experiences through LMS-/VLE-hosted discussion boards or face-to-face discussions ▶ Instructor-led activities, which are designed to be led by an instructor, and include topics for workshop discussions and assignments. <p>The activities included in <i>SMR</i> can be implemented either as peer-to-peer activities or as instructor-led activities, depending on the preference of the course leader. We have assigned activities to both activity types but these are suggestions only.</p> <p>These activities can be incorporated by universities throughout the <i>Statistical Methods for Research</i> program, according to their requirements.</p>	1.5–2 hours	<p>Section 3 of this <i>Supplement</i> (either PDF or Word document form)</p>

An ‘[Index of supplemental activities](#)’ is provided later in this guide to show where the communicative activities map on to the screens in the self-study courses.

Key implementation decisions

From a pedagogical perspective, the courses in the *Statistical Methods for Research* program can be implemented in a number of different ways, starting with a straightforward ‘plug and play’ (where courses are simply installed and used as they are) and moving through various levels of customization and instructor input.

Our strong recommendation for institutions using the *Statistical Methods for Research* program is that they spend some time considering the key questions outlined below in order to make sure that it is implemented as effectively as possible for their particular context. Time spent planning and tailoring your implementation strategy early on will pay dividends in terms of the effectiveness of the courses.

The key questions covered are:

1. **Stand-alone or with additional materials and support?**
2. **Online or blended?**
3. **With or without communicative activities?**
4. **With or without instructors?**
5. **With or without customization?**
6. **In what order?**
7. **How to assess learning?**
8. **How to encourage further study?**

Please don't hesitate to [contact Epigeum](#) or arrange to attend one of our implementation workshops if you would like to explore any of these issues in more detail than is covered below.

Question 1: Stand-alone or with additional materials and support?

Stand-alone

The *Statistical Methods for Research* program can be used as stand-alone training, without any additional engagement. If participants are sufficiently motivated, we are confident that they will gain significant skills and knowledge through the core course content alone. Not offering any additional learning opportunities, whether online or in person, also keeps costs to a minimum.

With additional materials and support

In the online courses we have presented an excellent foundation in all of the course topics. However, the advice and over 8 hours of online and in-person materials we have provided in this *Supplement* can be used to develop a more extensive, challenging and effective training program for students.

If you decide to extend and supplement your *Statistical Methods for Research* offering in this manner, we would suggest using the core online courses as background preparation for workshops/webinars, or as the framework for fuller courses.

The remainder of the questions in this section set out the options available if you **do** choose to enrich the *Statistical Methods for Research* program by providing additional materials and support.

Question 2: Online or blended?

The additional materials and support you provide could be delivered face-to-face, online, or as a combination of the two.

Online

The primary advantages of the completely online approach are convenience and cost. Purely online courses are convenient because participants can take them at a time and place of their choosing. This is particularly advantageous if participants have difficulty in attending training sessions because of different locations and varied timetables.

Although by definition the online-only approach excludes face-to-face teaching, it can still include peer-to-peer interaction (for example, through discussion boards or webinars) and online instructor support, as outlined in questions 3 and 4 below. If this approach is taken, you will need to consider what support processes are required to ensure that the learning experience is engaging and accessible, e.g. online instructors, forums, support videos and documents.

Blended

By 'blended' we mean combining the online course content with face-to-face teaching and learning. The blended approach is more demanding in terms of time and resources, but adding a face-to-face element to your skills training provision is likely to motivate and benefit your students by giving them the opportunity to debate, challenge and extend the learning offered in the core online courses with peers and instructors. A blended approach also provides a valuable opportunity to foster a sense of collaboration and community among students using the program.

Question 3: With or without communicative activities?

The aims of the communicative activities (which are included in [Section 3](#) of this *Supplement*) are threefold:

- ▶ To facilitate dialogue between course participants
- ▶ To provide ideas for activities and workshop sessions (the 'instructor-led' activities)
- ▶ To provide opportunities for assessment.

The communicative activities represent a substantial body of additional material (8+ hours across the program) to support and extend learning and, as mentioned above, can be used to extend the online course or as a basis for face-to-face contact time.

While the courses *can* operate independently of them, we would strongly recommend that, as a minimum, institutions spend time (not much is required!) to add them in online form throughout the courses in line with their needs. Further advice on how to implement the communicative activities can be found:

- ▶ In [Section 2](#) and at www.epigeum.com/help-and-support, which includes guidelines on how to add the activities from a technical perspective
- ▶ In [Section 3](#), which includes an index of supplemental activities and where they slot into the online *Statistical Methods for Research* courses.

Question 4: With or without instructors?

The courses in the *Statistical Methods for Research* program have been designed to work either with or without instructors. Again, there are advantages to both approaches.

Without instructors

As mentioned, individual participants can work their way through the courses entirely independently, without intervention, instructors or customization. Using the courses in this manner enables participants to study at a time of their choosing and at little additional cost in terms of your time and money.

With instructors

Having instructors helps improve the effectiveness of the courses by:

- ▶ Prompting reflection and discussion of individuals' particular research contexts
- ▶ Discussing scenarios and problems and exploring/sharing ideas for appropriate courses of action
- ▶ Getting feedback on practical outputs from the program.

These kinds of processes are more likely to take place if an instructor initiates and manages them to some extent. This can be done either face-to-face or online:

- ▶ **Face-to-face meetings involving a number of participants:** As mentioned above, many of the communicative activities can be used as a basis for face-to-face discussion. The online courses also include interactive activities and scenarios, and video interviews with experienced researchers – all of which could usefully be viewed and discussed in a face-to-face session.
- ▶ **Online discussion with individual participants:** If you can establish online contact right at the start, and maintain it through regular, light nudges, the courses are much more likely to be successful.

In addition, instructors (whether online or face-to-face) can:

- ▶ Track participants' progress through the courses, assisting them as they get started, motivating them to reach the end and encouraging further study
- ▶ Respond to participants' questions on the material, both through asynchronous tools, such as discussion boards, and also by scheduling online office hours
- ▶ Enable the instructor-led communicative activities to be used
- ▶ Carry out more nuanced assessment of participants' learning, through participation in discussions and workshops/webinars (see below)
- ▶ Distribute reports on participation to stakeholders.

Question 5: With or without further customization?

As well as incorporating communicative activities, your license agreement for the *Statistical Methods for Research* program allows you to customize the courses in other ways – specifically:

- ▶ **Deleting pages** (e.g. if certain pages are less relevant to your particular context)
- ▶ **Adding your own pages** (e.g. to include your institution's information and branding at the start of the course or to add extra case studies or material in line with your particular syllabus. We do ask that you make it clear that these are your own work, and not the author's)
- ▶ **Moving pages** (e.g. if you feel that certain sections are high priority and should be moved forward in the course)
- ▶ **Adding your own institution's logos and livery.**

Customizing the program in this manner will ensure that it is as appropriate as possible for your particular context. More specific information on selected customization options is included below. If you would like to customize the material beyond the steps outlined above, then please [contact us](#). We try to be flexible.

'Your context' pods

In the first two courses of the *Statistical Methods for Research* program you will find 'Your context' pods in the right-hand margin, suggesting that participants research and locate their local guidelines, policies and relevant personnel. These pods have been specifically designed to help the student orient themselves in their specific context. They can be customized to contain links and information particular to your needs.

We would strongly recommend customizing the 'Your context' pods with links to national, institutional, departmental or subject-specific information relevant for your students. Details on how to do this are provided in [Section 2](#), and a summary of the locations and suggested content of the 'Your context' pods is provided in the table below for ease of reference.

Once you have inserted this information at relevant points throughout the course, you may also wish to provide a single, complete list of institution-specific policies and resources in summary form at the end of the course, within the 'Closing' section. You can do this by inserting a new page – see [Section 2](#) for further information on how to do this.

List of screens containing 'Your context' pods in the <i>Statistical Methods for Research</i> program	
▶ Introduction – Statistics in the context of research	
You, as a researcher	
What stage are you at currently?	
What will I be able to do with my research data by the end of this course?	
▶ Thinking statistically – Describing data well	
What is a statistical investigation?	
▶ Thinking statistically – Making good generalizations	
N/A	
▶ Which hypothesis test should I use?	
N/A	
▶ Statistical modeling	
N/A	
▶ Analysis of categorical data	
N/A	
▶ Conclusion: Putting your skills into practice	
N/A	

Course quizzes

A further element of customization we recommend you perform is to convert the course quizzes from the default HTML format to your LMS/VLE format. This enables you to make use of the more sophisticated functionality offered by your LMS/VLE.

Default format	Customized format	Benefit of customization
Quizzes will not be tracked via your LMS/VLE	Quizzes can be tracked via your LMS/VLE	You can gain valuable information regarding the participation and performance of those who have taken the courses
Questions and pass marks are fixed	Questions and pass marks can be added or changed	You can set a standard relevant to your specific institutional demands

For information on the technical aspects of customizing these courses, please see [Section 2](#) and the technical implementation section on the Epigeum website (www.epigeum.com/help-and-support).

Question 6: In what order?

The seven courses that make up the program have been designed to form a coherent whole starting from an introduction to Statistics and an exploration of a dataset using tables, charts and diagrams, through to inferential statistics, hypothesis testing, and statistical modeling techniques. However, if you have a particular cohort of participants with specific needs, you may wish to select particular courses or revise the order. The fifth and sixth courses ('Statistical modeling' and 'Analysis of categorical data' respectively) can be re-ordered easily.

The two main options are:

- ▶ Planning for an entire cohort to be studying the same materials at the same time, so that they can communicate with each other about them. The communicative activities (mentioned above and in [Section 3](#)) prompt online interaction with others, but in order for them to be useful, there need to be others who are doing much the same thing at much the same time.
- ▶ Enabling participants to learn what they need to 'just in time', i.e. when they are facing a particular challenge or have reached a particular point in the research process.

The courses can be used for 'troubleshooting' as outlined in the second option above, but they are most effective when used collectively, providing researchers with a solid and comprehensive understanding of statistical methods and techniques.

Question 7: How to assess learning?

Course quizzes

The final **multiple-choice quizzes** at the end of each course are the default assessment mode², testing both completion of the course and understanding. If you are using the *Statistical Methods for Research* program without instructors (see above), this is generally the best option. Each question in the multiple choice quizzes builds on the previous question so all questions should be attempted.

² Please note that, because some institutions will want to use courses quizzes for official assessment and credit, we are unable to provide accessible/print versions of the quizzes, as these would reveal the correct answers. We would be happy to discuss options for providing the course quizzes to participants at your institution who are unable to use the interactive functionality and to provide support on a case-by-case basis.

Activities and assignments

When instructors are present, other methods can be used to provide additional and perhaps more nuanced opportunities to assess learning, such as the communicative activities (see above and [Section 3](#)).

Question 8: How to encourage further study?

'Statistics in the real world' pods provide links to external sources for participants who would like to read and explore beyond the core course content. Instructors can also provide useful support by making available additional reading material.

Marketing and encouraging uptake

The *Statistical Methods for Research* program **can** be used as an off-the-shelf solution to skills training in statistical theory, methods and techniques: it can be downloaded and installed directly on to your LMS/VLE and is then 'ready to go'. However, the best way to get the most out of the program is to spend some time **planning a strategy** for course implementation. As well as considering the questions in the previous section, you also need a plan for:

- ▶ How to secure buy-in from key project stakeholders
- ▶ How you will ensure that the courses reach those who need them.

Planning a strategy for implementation

Your decisions at this stage will have the largest impact on the rate of participant adoption.

1. Raise awareness with departments and other stakeholders

Securing the support of stakeholders at an early stage is a key way to ensure that you get the most out of the courses and that they are implemented in the best way to benefit your institution (see diagram below). Input from stakeholders will be important in helping you decide the rest of your implementation strategy.

2. Choose whether to run a pilot or to roll all courses out immediately

This will largely be determined by the immediacy of the demand for the training at your institution. If you have the time, a pilot study is an effective way to troubleshoot and refine your use of the courses.

3. Choose your delivery mode – blended learning or purely online

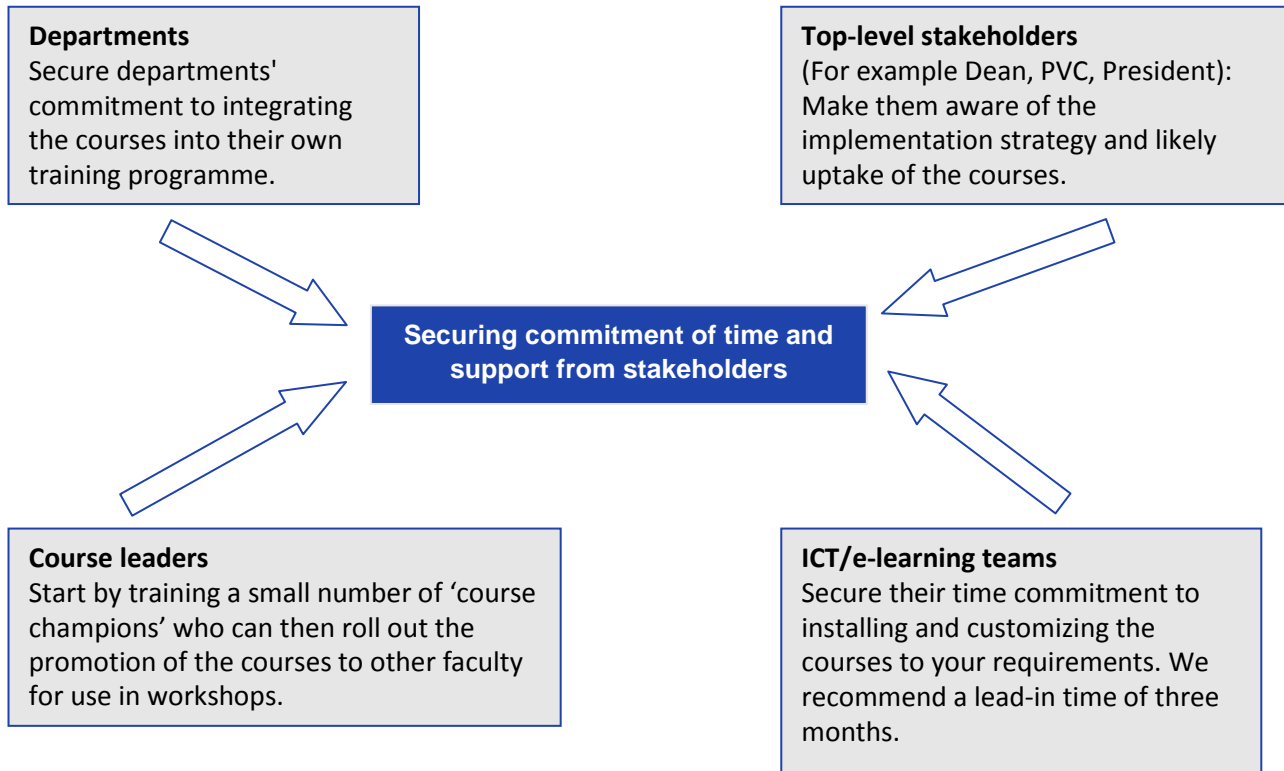
The courses are designed to function as stand-alone units; however, they can be particularly effective when used as part of a blended approach (for further information, see '[Key implementation decisions](#)'), allowing more time for detailed and higher-level discussion in face-to-face workshops.

4. Adaptation

As we have already seen, courses can be adapted to your context. Add your own university logos, livery and links to give the courses the feel of a home-grown product.

Securing commitment of time and support from stakeholders

We have seen courses sit unused for over a year because key stakeholders have failed to give prior commitment of support. The diagram below gives some advice on how to avoid this happening at your institution.



Incentivizing participation

- ✓ Participants work best when there is an **incentive**. For example, you could award a certificate, course credits or digital badges to those who have completed the courses. This sends the message that your institution takes the program seriously, and it will significantly increase uptake rates.
- ✓ Use your department stakeholders – encouragement and direction from the top will also increase the level of adoption.

Following good practice for marketing and web promotion

- ✓ Ensure that your target audience knows about the *Statistical Methods for Research* program and can access the courses easily.
- ✓ Advertise links to the courses prominently within your LMS/VLE. The general principle for web browsing is that users have an attention span of 'three clicks' to be taken to information.
- ✓ Give your online courses as much promotional prominence as your face-to-face workshops.
- ✓ Incorporate awareness of the availability of the online courses into induction training for new faculty/students.
- ✓ Promote the courses using the 'six Ws of marketing' principle:
 - ▶ **What:** What are they expected to do? What's in it for them?
 - ▶ **Why:** Why are they being asked to do this?

- ▶ **When:** When do they need to do this? When can they access the courses?
- ▶ **Who:** Who is asking them to complete this training?
- ▶ **How:** How do they use the courses?
- ▶ **Where:** Where can they access the materials?

The above exercise will help you develop a marketing message which you can promote through various communication channels, such as email, e-newsletters, induction activities and marketing materials.

Epigeum is on hand to help you with promoting the *Statistical Methods for Research* program within your institution. We run implementation workshops (both online and face-to-face) in which we share our experiences of effective marketing. We can also provide you with marketing material, such as posters and handouts. Please [contact us](#) for more information.

Launching the program

- ✓ Set a date to officially launch the online courses at your institution. Include this date in any web promotion.
- ✓ Follow up the launch with email promotion to potential users.
- ✓ Ask the course instructor(s) to send out an email to potential users recommending the *Statistical Methods for Research* program and highlighting its importance and how it relates to any upcoming workshops.

Feedback, evaluation and refinement

Once the courses in the *Statistical Methods for Research* program have been implemented, a range of tools are available to help you monitor and evaluate their effectiveness.

Monitoring course usage

- ▶ A LMS/VLE **monitoring system** can indicate whether a student has opened a course page, and how long that page has remained open.
- ▶ The **Course quiz** screens in Epigeum courses can be adapted in your LMS/VLE so that the results can be monitored and stored within assessment systems.

This data will give you information about usage **and** student engagement with the material. It will show which sections are popular and successful with participants, and which might need further adaptation and support from workshops.



Gathering feedback

A sample 'feedback form' is provided on the next page, and can also be downloaded, customized to your needs, and installed directly on to your LMS/VLE.

The questionnaire will allow you to track and gather useful data about the user experience of the *Statistical Methods for Research* program.

It is also important to keep in touch with your key stakeholders and to gather feedback from course leaders and heads of department about the effectiveness of the online courses.



Refinement

Universities sometimes cite three years as the time needed to achieve a 'steady state' for a new e-learning programme. Monitoring, evaluating and refining the usage of the course will ensure that your institution continues to get the best from the Epigeum program.

Helping Epigeum gather feedback

As well as helping you refine your use of courses internally, feedback can also greatly assist Epigeum in planning improvements to the program.

As a default setting, the *Statistical Methods for Research* program includes a link to an 'Optional program evaluation' form (similar to the one included below) in a pod within the 'Post-program quiz' screen in the 'Conclusion: Putting your skills into practice' course. Information collected via this form is gathered centrally by Epigeum and used to help shape future updates and modifications to the program. All information collected is completely anonymous.

If you would prefer to gather and analyze your own institution-specific feedback, then the 'Optional program evaluation' pod can be removed and replaced with a link to your own evaluation form. If you choose to do this, Epigeum would be most grateful if you could pass on any suggestions for improvements to the program arising from the feedback you receive from participants at your institution.

Epigeum will continue to support your institution by providing you with updates to the courses, as and when they are released.

Sample program feedback form

This questionnaire is available to download and install on your intranet, and can be used to replace the default questionnaire that appears on the 'Post-program quiz' screen in the 'Conclusion: Putting your skills into practice' course.

1. What was your overall impression of the program?

- 5 Very positive
- 4 Positive
- 3 Adequate
- 2 Negative
- 1 Very negative.

Comments:

2. How effective was the program in improving your understanding of the subject?

- 5 Very effective
- 4 Effective
- 3 Adequate
- 2 Ineffective
- 1 Very ineffective.

Comments:

3. How relevant was the program to you and your needs?

- 5 Very relevant
- 4 Relevant
- 3 Adequate
- 2 Irrelevant
- 1 Completely irrelevant.

Comments:

4. How clear, coherent and easy to follow was the program?

- 5 Always very clear and easy to follow
- 4 Usually clear and easy to follow
- 3 Adequate
- 2 Sometimes unclear or hard to follow
- 1 Frequently unclear or hard to follow.

Comments:

5. What did you think of the quality and frequency of the interaction and activities throughout the program?
(For example, was the interaction enjoyable/relevant/helpful to learning, or inadequate/overbearing/boring /irrelevant/window dressing?)

- 5 Excellent
- 4 Good
- 3 Adequate
- 2 Poor
- 1 Very poor.

Comments:

6. How much did you feel the videos added (or did not add) to the learning experience?

- 5 Very positive effect
- 4 Positive effect
- 3 No real impact either way
- 2 Negative effect
- 1 Very negative effect.

Comments:

7. What did you think about the amount of information presented on each screen?

- 5 Much too much material on each screen
- 4 A bit too much material on each screen
- 3 Just right
- 2 A bit too little material on each screen
- 1 Much too little material on each screen.

Comments:

8. Did the program take less or more time than you expected to complete? Do you think it ought to be lengthened or shortened? (Select all that apply.)

- Program was too long
- Program was too short
- Program was the right length
- Program took longer than expected
- Program took less time than expected
- Program was the length I expected.

Comments:

9. What did you think of the design, look and feel of the program?

- 5 Excellent
- 4 Good
- 3 Adequate
- 2 Poor
- 1 Very poor.

Comments:

10. The following statements relate to the learning outcomes set out at the start of the program. Select all statements that are true now that you have completed the program.

- I can use statistical analysis to quantify and interpret the variability observed in data
- I know how to describe my data with appropriate summaries, tables and graphs produced using statistical software
- I can recognize and represent the structure of a dataset
- I am able to make good generalizations, distinguishing clearly between 'description' and 'generalization'
- I can use and present standard deviation, standard errors, confidence intervals and p -values from hypothesis tests in an assured way
- I understand the modeling framework.

Comments:

11. Do you have any general comments about the program or any specific suggestions as to how we can improve it? (E.g. expanding or reducing certain sections, adding new interactive features or functions, etc.)

Positive comments:

Suggestions for improvement:

12. Check any statements that apply.

- I have taken this course/program because it was mandatory
- I have taken this course/program because I thought it was important
- I would recommend others in my position to take this course/program.

Comments:

SECTION 2: INSTALLING THE COURSES IN YOUR LMS/VLE

Installing the courses in your LMS/VLE

The link below is to our online guide, which gives you the information you will need to successfully install the Epigeum courses in your LMS/VLE. The online guide gives system-specific information and step-by-step instructions on how to:

- ▶ Install a course package
- ▶ Install a quiz unit
- ▶ Add and remove screens
- ▶ Add a discussion forum (for use with the communicative activities)

The guide also has a section outlining which parts of the course you can customize, and how to do this.

STATISTICAL METHODS FOR RESEARCH INSTALLATION GUIDE

www.epigeum.com/help-and-support

SECTION 3: SUPPLEMENTAL MATERIALS

Index of supplemental activities

As noted previously, **communicative activities** are provided within this *Supplement*, and can be customized and incorporated into the courses to support the requirements of your institution.

To help you make sense of the additional content, we have prepared a table which maps the location of the communicative activities against the individual course screens in which they appear or which are related to the communicative activity topic.

Please note that all course and activity durations are **approximate** – all participants will work at different speeds.

Key

- (90) Approximate activity length in minutes
- [CIL] Communicative instructor-led activity
- [CP2P] Communicative peer-to-peer activity

Course/Unit/Screen title	Communicative activities (located within this <i>Supplement</i>)
INTRODUCTION – STATISTICS IN THE CONTEXT OF RESEARCH	
N/A	N/A
THINKING STATISTICALLY – DESCRIBING DATA WELL	
Unit 1 Reflecting the structure in the data OR The standard deviation	Measures of average and dispersion based on value or rank [CIL] (120)
THINKING STATISTICALLY – MAKING GOOD GENERALIZATIONS	
Unit 2 Using software	The precision of an estimate: Standard errors and confidence intervals [CP2P] (90)
WHICH HYPOTHESIS TEST SHOULD I USE?	
Unit 2 A more general analysis: ANOVA OR Which test do I use?	Exploring one- and two-sample <i>t</i> -tests and ANOVAs [CIL] (120)
STATISTICAL MODELING	
Unit 1 The quadratic regression model	Simple linear regression [CP2P] (90)
ANALYSIS OF CATEGORICAL DATA	
Unit 1 Testing for association with categorical binary data: Comparing three or more groups	Analysis of categorical data using chi-squared tests [CP2P] (90)
CONCLUSION: PUTTING YOUR SKILLS INTO PRACTICE	
N/A	N/A

Communicative activities

The following pages contain the communicative activities, designed to accompany and expand on material worked through in the self-study courses. There are two types of communicative activity:

- ▶ **Peer-to-peer activities (CP2P)**, which encourage participants to interact with one another and share experiences, either through LMS-/VLE-hosted discussion boards or in face-to-face discussions
- ▶ **Instructor-led activities (CIL)**, which are designed to be led by an instructor, and include topics for workshop discussions and assignments.

NOTE: *The activities included in SMR can be implemented either as peer-to-peer activities or as instructor-led activities, depending on the preference of the course leader. We have assigned activities to both activity types but these are suggestions only.*

These activities can be incorporated by universities throughout the *Statistical Methods for Research* program according to their requirements. They can be used either online (for example, via discussion boards and webinars) or face-to-face. Instructions on how to add them to the online course are included in [Section 2](#).

Thinking statistically – Describing data well

Communicative activity 1	
Activity type:	Communicative, instructor-led
Activity title:	Measures of average and dispersion based on value or rank
Suggested location (unit/screen):	Unit 1 Reflecting the structure in the data OR The standard deviation
Implementation description:	This activity can be implemented through an online discussion board, whereby each participant should have their own thread in order to post answers, or in a classroom discussion group. Instructors should encourage and guide the discussions.
Suggested study time:	120 minutes
Learning outcome:	Completing this activity will enhance students' understanding of which descriptive statistics are suitable for efficiently summarizing large datasets. It will give students the opportunity to use modern exploratory charts and to interpret descriptive statistics practically. Finally, it will emphasize the role of data structure – for example, naturally occurring subdivisions of sample data into smaller subsets.
Guidelines for the instructor:	<ul style="list-style-type: none"> ▶ Use the 'Guardian University Tables, 2013' dataset (listed in the 'Activity resources' below) and look at the data for all 120 institutions stored in the sheet named 'Institutions'. ▶ Instruct participants to read a short article ('University guide 2013' – listed in the 'Activity resources' below), download the dataset, import it into a statistics package and then consider the bullet points in the following section (see 'Guidelines for the participant'). This must be done before the session. ▶ Once participants have prepared their answers, invite them to discuss their ideas in small groups for about 15 minutes. ▶ Finally, ask each small group to summarize and present their findings to their peers.
Guidelines for the participant:	<p>Read the article, 'University guide 2013', download the 'Guardian University Tables, 2013' dataset (both listed in the 'Activity resources' below), and then import the dataset into a statistics package. Look at the data for all 120 institutions stored in the sheet named 'Institutions', and consider the following points:</p> <ul style="list-style-type: none"> ▶ There should be only six university groups under the column 'Uni group', but the variable labeled 'Uni group' shows eight groups (there are two coding errors that you may want to rectify). You should also replace the blanks in this variable with informative text, e.g. 'none', otherwise those institutions that do not belong to any group will be excluded from all analyses.

	<ul style="list-style-type: none"> ▶ Focusing on the 'Average Teaching Score' variable, do the following: <ul style="list-style-type: none"> • For all institutions (as a single group) obtain sample size, mean, standard deviation, median and quartiles. Also obtain a boxplot: if it looks approximately symmetric, interpret the standard deviation in relation to the mean. Otherwise, interpret the quartiles in relation to the median. • For each individual 'Uni group', obtain the same descriptive statistics as listed above for each one of the groups. Note how the standard deviations by group are smaller than the overall standard deviation. Also note how the value of the standard deviation does not seem related to the sample mean. • Repeat the above task for the 'Entry Tariff' variable. You may also want to summarize the remaining variables. ▶ Your instructor will ask you to discuss your answers in small groups, and will then invite each group to share their findings with the class.
<p>Activity resources:</p>	<p>All available from the Guardian News Datablog:</p> <ul style="list-style-type: none"> ▶ University guide 2013: www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data ▶ Guardian University Tables, 2013: https://docs.google.com/spreadsheet/ccc?key=0AonYZs4MzIZbdG1PRER2ZXZTNy1veDJDU2hrNU9PdkE#gid=0

Thinking statistically – Making good generalizations

Communicative activity 1	
Activity type:	Communicative, peer-to-peer
Activity title:	The precision of an estimate: Standard errors and confidence intervals
Suggested location (unit/screen):	Unit 2 Using software
Implementation description:	This activity will work best using an online discussion board. Each participant should have their own thread in order to post their answers. Instructors may also choose to use this activity as the basis for a class discussion.
Suggested study time:	90 minutes
Learning outcome:	Completing this activity will consolidate students' grasp of how to quantify the precision of an estimate by using standard errors. It will also enhance students' understanding of the correct interpretation of confidence intervals for population parameters. Finally, it will highlight the impact of sample size on the precision of the estimated sample means.
Guidelines for the instructor:	<ul style="list-style-type: none"> ▶ Participants will read a short article (www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data), download the 'Guardian University Tables, 2013' dataset (listed in the resources below), and import it into a statistics package. They will then write answers to the questions posed. ▶ The activity is designed as a peer-to-peer exercise, but you can use the postings on the discussion board as the basis of a discussion group.
Guidelines for the participant:	<p>If you have not already, read the article, 'University guide 2013', download the 'Guardian University Tables, 2013' dataset (both listed in the 'Activity resources' below), and then import the dataset into a statistics package. Look at the data for all 120 institutions stored in the sheet named 'Institutions', and consider the following points:</p> <ul style="list-style-type: none"> ▶ There should be only six university groups under the column 'Uni group', but the variable labeled 'Uni group' shows eight groups (there are two coding errors that you may want to rectify). You should also replace the blanks in this variable with informative text, e.g. 'none', otherwise those institutions that do not belong to any group will be excluded from all analyses. ▶ Focusing on the 'Average Teaching Score' variable, do the following: <ul style="list-style-type: none"> • First, for all 120 institutions (as a single group), obtain the standard error for the sample mean and a 95%

	<p>confidence interval for its true mean. Interpret the latter interval.</p> <ul style="list-style-type: none"> • Second, obtain standard errors of the sample mean for each individual ‘Uni group’. Also obtain the corresponding 95% confidence intervals for the true ‘Uni group’ means. Note that the width of the confidence interval is inversely related to the sample size – can you explain why? • Third, estimate the difference between the means of the two largest ‘Uni groups’ (in terms of number of institutions) by presenting both a standard error of the difference between means and its corresponding 95% confidence interval. • Fourth, estimate the difference between the means of the two smallest ‘Uni groups’ (in terms of number of institutions) by presenting both a standard error of the difference between means and its corresponding 95% confidence interval. • Finally, note that the width of the confidence interval is inversely related to the sample size of both groups; explain why. Interpret the results from the estimation process in practical terms. <p>▶ Post your responses on the discussion board. How do your findings compare with those of others? Take the time to read and comment on your peers’ responses.</p>
<p>Activity resources:</p>	<p>All available from the Guardian News Datablog:</p> <ul style="list-style-type: none"> ▶ University guide 2013: www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data ▶ Guardian University Tables, 2013: https://docs.google.com/spreadsheet/ccc?key=0AonYZs4MzIZbdG1PRER2ZXZTNY1veDJDU2hrNU9PdkE#gid=0

Which hypothesis test should I use?

Communicative activity 1	
Activity type:	Communicative, instructor-led
Activity title:	Exploring one- and two-sample <i>t</i> -tests and ANOVAs
Suggested location (unit/screen):	Unit 2 A more general analysis: ANOVA OR Which test do I use?
Implementation description:	This activity can be implemented through an online discussion board, whereby each participant should have their own thread in order to post answers, or in a classroom discussion group. Instructors should encourage and guide the discussions.
Suggested study time:	120 minutes
Learning outcome:	Completing this activity will enhance students' understanding of which statistical hypothesis tests are suitable for comparing means of one or two groups (<i>t</i> -test) or three or more groups (ANOVA). It will give them the opportunity to set up the two contrasting hypotheses needed to conduct statistical tests for comparing the means of numerical data in different groups, and will increase their awareness of when to use the <i>p</i> -value criterion to reject (or not reject) the null hypothesis in favor of the alternative hypothesis. Additionally, it will emphasize the effect of sample size on both hypothesis tests and the precision of the estimated difference between group means.
Guidelines for the instructor:	<ul style="list-style-type: none"> ▶ Use the 'Guardian University Tables, 2013' dataset (listed in the 'Activity resources' below) and look at the data for all 120 institutions stored in the sheet named 'Institutions'. ▶ Instruct participants to read a short article ('University guide 2013' – listed in the 'Activity resources' below), download the dataset, import it into a statistics package and then consider the bullet points in the following section (see 'Guidelines for the participant'). This must be done before the session. ▶ Once participants have prepared their answers, invite them to discuss their ideas in small groups for about 15 minutes. ▶ Finally, ask each small group to summarize and present their findings to their peers.
Guidelines for the participant:	<p>Read the article, 'University guide 2013', download the 'Guardian University Tables, 2013' dataset (both listed in the 'Activity resources' below), and then import the dataset into a statistics package. Look at the data for all 120 institutions stored in the sheet named 'Institutions', and consider the following points:</p> <ul style="list-style-type: none"> ▶ There should be only six university groups under the column 'Uni group', but the variable labeled 'Uni group' shows eight groups (there are two coding errors that you may want to rectify). You should also replace the blanks in this variable with

	<p>informative text, e.g. 'none', otherwise those institutions that do not belong to any group will be excluded from all analyses.</p> <ul style="list-style-type: none"> • First, compare the sample mean of all 120 institutions as a single group with a target value for the 'Average Teaching Score' of 60%. • Second, compare any two 'Uni groups' to evaluate if their 'Average Teaching Score' is statistically different. • Third, ascertain whether the 'Average Teaching Score' is related to the 'Uni groups'. • Repeat the task above for the remaining eight variables, from 'NSS Teaching (%)' to 'NSS Feedback (%)'. • Interpret results from the hypothesis tests in practical terms. <p>▶ Your instructor will ask you to discuss your answers in small groups, and will then invite each group to share their findings with the class.</p>
<p>Activity resources:</p>	<p>All available from the Guardian News Datablog:</p> <ul style="list-style-type: none"> ▶ University guide 2013: www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data ▶ Guardian University Tables, 2013: https://docs.google.com/spreadsheets/cc?key=0AonYZs4MzIzbdG1PRER2ZXZTNy1veDJDU2hrNU9PdkE#gid=0

Statistical modeling

Communicative activity	
Activity type:	Communicative, peer-to-peer
Activity title:	Simple linear regression
Suggested location (unit/screen):	Unit 1 The quadratic regression model
Implementation description:	This activity will work best using a discussion board. Each participant should have their own thread in order to post their answers. Instructors may also choose to use this activity as the basis for a class discussion.
Suggested study time:	90 minutes
Learning outcome:	Completing this activity will consolidate students' grasp of simple linear regression techniques for choosing simple yet adequate models. It will increase their understanding of how to estimate model parameters by encouraging them to interpret the practical meaning of regression coefficients and their margin of error. Finally, it will highlight the role of sample size both on the kind of hypothesis test used and on the precision of the estimated regression coefficients.
Guidelines for the instructor:	<ul style="list-style-type: none"> ▶ Participants will read a short article, download the 'Guardian University Tables, 2013' dataset (both listed in the 'Activity resources' below), and import the dataset into a statistics package. They will then write answers to the questions posed. ▶ The activity is designed as a peer-to-peer exercise, but you can use the postings on the discussion board as the basis of a discussion group.
Guidelines for the participant:	<p>If you have not already, read the article, 'University guide 2013' (www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data), download the 'Guardian University Tables, 2013' dataset (also listed in the 'Activity resources' below), and import it into a statistics package. Look at the data for all 120 institutions stored in the sheet named 'Institutions', and consider the following points:</p> <ul style="list-style-type: none"> ▶ There should be only six university groups under the column 'Uni group', but the variable labeled 'Uni group' shows eight groups (there are two coding errors that you may want to rectify). You should also replace the blanks in this variable with informative text, e.g. 'none', otherwise those institutions that do not belong to any group will be excluded from all analyses. <ul style="list-style-type: none"> • Consider 'Average Teaching Score' as dependent on the 'Student: staff ratio' and conduct an appropriate statistical

	<p>analysis for all 120 institutions combined.</p> <ul style="list-style-type: none"> • Next, conduct the same statistical analysis on subgroups of institutions as defined in the categorical variable labeled 'Uni group'. There should be only six university groups under the column 'Uni group', but the variable labeled 'Uni group' shows eight groups (there are two coding errors that you may want to rectify). • Compare and contrast the result from the analysis of all 120 institutions combined with the results of the same analysis for individual subgroups. <p>▶ Post your responses to these questions on the discussion board. How do your findings compare with those of others? Take the time to read and comment on your peers' responses.</p>
<p>Activity resources:</p>	<p>All available from the Guardian News Datablog:</p> <ul style="list-style-type: none"> ▶ University guide 2013: www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data ▶ Guardian University Tables, 2013: https://docs.google.com/spreadsheet/ccc?key=0AonYZs4MzIZbdG1PRER2ZXZTNy1veDJDU2hrNU9PdkE#gid=0

Analysis of categorical data

Communicative activity	
Activity type:	Communicative, peer-to-peer
Activity title:	Analysis of categorical data using chi-squared tests
Suggested location (unit/screen):	Unit 1 Testing for association with categorical binary data: Comparing three or more groups
Implementation description:	This activity will work best using an online discussion board. Each participant should have their own thread in order to post their answers. Instructors may also choose to use this activity as the basis for a class discussion.
Suggested study time:	90 minutes
Learning outcome:	Completing this activity will help students to identify the hypothesis tests suitable for the analysis of categorical outcomes either as a single group, or when related to a categorical explanatory variable with two or more groups. It will provide an opportunity to practice setting up the two contrasting hypotheses needed to conduct statistical tests for comparing proportions of categorical data in different groups. It will also consolidate understanding of the p -value criterion to reject (or not reject) the null hypothesis in favor of the alternative hypothesis.
Guidelines for the instructor:	<ul style="list-style-type: none"> ▶ This activity will encourage students to think how the sample size affects both the hypothesis tests and estimation in the context of categorical data outcomes. It will also demonstrate how a categorical outcome variable can be related to a categorical explanatory variable. ▶ Participants will read a short article, download the ‘Guardian University Tables, 2013’ dataset (both listed in the ‘Activity resources’ below), and import the dataset into a statistics package. They will then write answers to the questions posed. ▶ The activity is designed as a peer-to-peer exercise, but you can use the postings on the discussion board as the basis of a discussion group.
Guidelines for the participant:	<p>If you have not already, read the article, ‘University guide 2013’ (www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data), download the ‘Guardian University Tables, 2013’ dataset (listed in the resources below), and import it into a statistics package. Look at the data for all 120 institutions stored in the sheet named ‘Institutions’, and consider the following points:</p> <ul style="list-style-type: none"> ▶ There should be only six university groups under the column ‘Uni group’, but the variable labeled ‘Uni group’ shows eight groups (there are two coding errors that you may want to rectify). You should also replace the blanks in this variable with

	<p>informative text, e.g. 'none', otherwise those institutions that do not belong to any group will be excluded from all analyses.</p> <ul style="list-style-type: none"> • For all 120 institutions (as a single group), compare the sample proportion that achieved an Average Teaching Score of at least 50% with a target proportion of 0.75 (that is, three out of four institutions). • Compare any two 'Uni groups' to evaluate if the respective proportion of institutions that achieved an average teaching score of at least 50% is statistically different. • Is the proportion of institutions that achieved an Average Teaching Score of at least 50% related to the 'Uni group'? • Interpret the results from the hypothesis tests in practical terms. <p>▶ Post your responses on the discussion board. How do your findings compare with those of others? Take the time to read and comment on your peers' responses.</p>
<p>Activity resources:</p>	<p>All available from the Guardian News Datablog:</p> <ul style="list-style-type: none"> ▶ University guide 2013: www.theguardian.com/news/datablog/2012/may/22/university-guide-2013-guardian-data ▶ Guardian University Tables, 2013: https://docs.google.com/spreadsheet/ccc?key=0AonYZs4MzIzbdG1PRER2ZXZTNy1veDJDUD2hrNU9PdkE#gid=0

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Epigeum is very keen to help with any questions or hear any suggestions for future improvement. Please do not hesitate to get in touch.

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