Topic 6 Activity

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Gravitational wave astronomy

In total, this activity represents approximately 5 units of study time.

The following sections guide you through the activity for this topic. This activity will directly assist you to complete the associated TMA question, so it is vital that you attempt it. It will also help you to develop the following:

- *Learning outcomes*: KU1, CS1, KS1 and KS3
- *Employability skills*: self-awareness of transferable skills.

A full list of learning outcomes and the skills that we expect you will develop while studying S284 are available from What is S284, and how to study it.

This activity comprises two aspects. You will first research a particular topic, then you will prepare a presentation that reports on what you discovered. The time for the research task is allocated to the activity itself, whereas the time for the presentation task is allocated to the TMA.

This activity will allow you to demonstrate self-awareness of the various transferable skills that you have developed during this module. These include

- digital literacy, and the capacity to search for appropriate sources of information and assess their reliability
- the ability to communicate scientific findings to different audiences
- the skill of self-management and resilience in order to complete a task on schedule

Transferable skills such as these are valued by employers, so if you are aiming to advance or change your employment, you can use this example to demonstrate your aptitude in these areas. Indeed, after completing the activity, you might want to update your CV and/or personal development plan accordingly (see FutureYou for more details).

For context, in the following video some former OU students describe how self-awareness of transferable skills has proved useful in the context of their personal and professional development.

Video 1 Employability skills: self-awareness and transferable skills.

Activity task: Carry out research

Visit the LIGO consortium website and look at the events listed under the `Detections` tab. Other than the two merger events specifically described in the module materials (GW150914 and GW170817), select *one* of the confirmed gravitational wave events reported by LIGO and investigate it using resources available. For example, look at the press releases, the images associated with the event, and any scientific papers resulting from the detection. Some of the links provided on the website may take you to other, related websites – this is fine.

Make notes on what you discover about the properties of your chosen event, the observations that were made of it, and the implications of the results. Keep copies of (or links to) any images, diagrams, animations, etc., that you find useful, including a reference for where you found them. Remember that full references – including the date that you accessed the materials – will be required in your final presentation.

TMA task: Create your presentation

A key activity for many scientists is to present their research to others at conferences and meetings, in the form of a talk or seminar. We can't give you that experience in this module, but we can allow you to demonstrate some of the skills required for it. Consequently, Question 2 of TMA 06 asks you to submit your research findings about a gravitational wave event as a short slide show and accompanying script, written in your own words.

You should use Microsoft PowerPoint (or similar presentation software) to create a presentation of no more than *five slides* that summarises the information you have discovered about your chosen event. Each slide should be accompanied by a written script (between *100 and 200 words per slide*). The slides should be suitable for displaying in full-screen mode and the script should be suitable for reading out loud as if you were presenting a talk to an audience. The intended audience for the presentation is another S284 student, so you should assume that the audience already knows the background to gravitational wave astronomy.

Things you might wish to include in your presentation are:

- When was the signal detected and by which detectors?
- What does the signal look like?
- How well localised on the sky was the origin of the signal?
- Was any counterpart to the event detected in any part of the electromagnetic spectrum? If so, what was the nature of these other observations?
- What are the inferred masses of the progenitor objects and the resulting merged object? How do these compare with other reported detections?
- Is there anything noteworthy about this particular event?

Be sure to include references and (if necessary) copyright information for any images or diagrams that you include in your presentation. References should allow the source of the image or diagram to be unambiguously identified and may take the form of a journal reference (including authors, year, volume and page numbers) or a URL of the web source. These should be written onto the slides containing the images or diagrams and can be in a smaller font to save space. The script should be written entirely in your own words and should not need to include quotes or references. You should make it clear which part of the script accompanies which slide. Further guidance on preparing your presentation is provided in the next section of this activity.

You may continue to the TMA question now to get a head start on completing the assignment, or chose to return to studying Topic 6, as per the study planner. Some study time next week is allocated to completing the TMA. Of course, having just completed the activity, the details will be fresh in your mind if you do choose to complete TMA 06 Question 2 now.

Guidance on preparing the slides and script

The slides and script for a presentation should be *complementary* – that is they should each contain important information that you want to communicate to the audience without being identical copies of each other. Indeed, one potential pitfall associated with scientific presentations is the temptation for the presenter to include the same text in their script and on their slides, and then simply read out the content of the slides to the audience.

Not only does this deprive the audience of any additional information the presenter may want to share that is not included on the slides, but it also probably means that each slide is filled from top to bottom with multiple sentences of text! For audience members, the urge to try and read all of the text being presented on the slides will be very strong, but after trying to follow such high-density wording for two or three slides they may become fatigued and stop engaging with the presentation.

To prevent this from happening, it is important for the presenter to simplify their slides as much as possible, without losing the central 'thread' of what they are communicating. Presenters must therefore work through things in a predictable, coherent order (e.g. it would be illogical and confusing for the audience to present the conclusion of a study before the results have been shown). To help with this, most presentation slides often contain an *informative title* to signpost to the audience where in the presentation they are up to. (This can also cue them in to what they should expect to see and hear from the presenter.)

The slides themselves may consist of a *series of bullet points* which should be brief (up to 5- or 6-word) headings. However, using *appropriate images and graphs* is usually far better than slides that consist simply of text. The presenter then talks about these bullet points and images in the order they appear on the slides, and uses their script to help them provide more detailed information about each one.

To assist the audience further, presentation slides typically use *relatively large text sizes* (e.g. at least 18 point type, but more typically 24 point and larger), as well as *easy-to-read fonts* such as Arial or Calibri. Styles such as **bold** or *italic* can also be used to highlight a key word or emphasise an important concept. It is important to be consistent in approach, and to not use excessively garish or bright colours as this will not look so attractive to audience members after multiple slides.

The construction of the script is the other key element of the presentation. Aside from working through each slide in the sequence in which it is displayed, the script must also 'add value' to the slides. That is, it must either provide the audience with information they can't obtain from reading the slide or examining the diagrams, or it must simplify the information displayed so the audience can grasp its meaning and/or context.

The script must also take into consideration the audience that the presentation is intended for. For example, the level of methodological detail, the use of jargon or technical terms, the provision of appropriate definitions and the complexity of the analysis presented must be carefully calibrated. Otherwise, a specialist audience could find a presentation too superficial, while a more general or lay audience could find the same presentation impossible to understand due to a lack of background knowledge, thereby missing the important 'take home message' and significance of the work.

Finally, remember that the script should be written entirely in your own words, as you would read it aloud if you were presenting a talk to an audience. Do not cut-and-paste text from the internet or other sources into your script: doing so constitutes plagiarism. There should be no need to include quotes or references in your script.