Study Guide

This item contains selected online content. It is for use alongside, not as a replacement for the module website, which is the primary study format and contains activities and resources that cannot be replicated in the printed versions.

Study Guide

Contents

1 Welcome to the MSc Project Study Guide 3
2 Aims and learning outcomes 4
3 Resources for your project 6
3.1 Module materials 7
3.2 Using other students as a resource 7
4 TMA 01: Proposal development 8
4.1 Developing your proposal 8
4.2 Crafting objectives 9
4.3 Example project proposals 10
4.4 Keeping a project log 10
5 From TMA 01 to TMA 02 11
6 TMA 02: plans and audit 12
7 TMA 03 and TMA 04: Research development and progress 13
7.1 Citing and referencing 13
7.2 Writing for a Lay Audience 14
7.3 Writing an abstract 14
8 End-of-module assessment (EMA) 16
8.1 Who is your reader? 16
8.2 Writing style and visual presentation 16

8.3 Structure of your report 17
8.4 Word count 20
8.5 Presentation of your report 21
9 Contact with your TS 22
10 Avoiding common mistakes 23
11 Support 24
12 Assessment policy and structure 25
12.1 Vivas and re-submissions 25
12.2 Plagiarism and ethical practice 25
12.3 Confidential information and other relevant issues 26
Appendices 26

1 Welcome to the MSc Project Study Guide

Welcome to the Study Guide for the Project for MSc Space Science & Technology. This guide steers you through designing and planning your individual project, collecting and analysing your data and writing your final report. It will also direct you to a number of additional resources.

Your tutor supervisor (TS), will help you to design, direct and complete your project.

We strongly suggest that you make good use of your TS's experience and knowledge. Please don't ever be reluctant to contact them during your studies. Supervising projects requires more continuous contact than being a tutor on a taught module and your TS is well aware of this and expects a regular dialogue with you. So do make sure that you keep in regular contact with your TS and take on board their feedback to maximise your chance of producing an exciting, scientifically-sound and well-presented project report. If you have any long-term difficulties making contact with your TS please contact the Student Support Team (details on your StudentHome page).

Our experience of the MSc Project module over the years has highlighted the fact that project work takes a lot of time. After a month or two you will realise just how time-consuming doing research and literature surveys can be. Careful time management from the outset is vital. There is a tendency to feel that 10 months is a long time and that you will be able to make-up time later on, but this is not as easy when you are completing a project as when you are doing a taught module.

> Get going as soon as you can and make sure that, if you have a bad week or two, you catch up as soon as possible.

If you have queries, do get in touch via the Module-wide forum. Please also introduce yourself on this forum at an early stage and share your project topic with your colleagues – this is a good way of identifying others with similar research interests. The Module Team and TSs will be posting regular Top Tips and advice on the forum to help you keep on track with your project, so please try to log in at least once a week. In addition, don't forget to keep a regular eye (at least once a week) on the News page on the module website. This is where we put relevant information about recent developments or any new website addresses or bibliographical details and feedback.

Your module team this year comprises:

Module Team Chair: Andrew Norton

Module Team Members: Monica Grady, Andy Diament

Curriculum Manager: Wendy East

Curriculum Assistant: Debbie Hing

We hope that you enjoy the MSc Project module. We are sure that you will feel a huge sense of satisfaction once you have completed your final project report. We're looking forward to "meeting" you through the forums and the online tutorials.

2 Aims and learning outcomes

The MSc Project module aims to enable you to use and further develop your knowledge and skills to design, conduct and report on research work in an area of your choice, related to the learning outcomes in the MSc taught modules. This module provides you with opportunities to develop and demonstrate the following learning outcomes.

Knowledge and understanding (Kn)

You will already have a detailed knowledge and understanding of your selected areas of scientific study. You will develop this further during your project work to demonstrate:

Kn1 a systematic understanding, knowledge and critical awareness of a current aspect of science, much of which is at, or informed by, the forefront of your field of study

Kn2 a comprehensive understanding of techniques applicable to your advanced scholarship in your chosen areas of study.

Cognitive skills (C)

After studying this module you should be able to demonstrate:

C1 conceptual understanding that enables you to critically evaluate current research and advanced scholarship in your field of study

C2 conceptual understanding that enables you to evaluate methodologies and develop critiques and propose alternative hypotheses, where appropriate

C3 the ability to deal with complex issues both systematically and creatively and make sound judgements in the absence of complete data

C4 decision-making in complex and unpredictable situations

C5 originality of thought in the application of knowledge.

Key skills (Ky)

After studying this module you should be able to:

Ky1 communicate information and conclusions to specialist and non-specialist audiences

Ky2 continue to develop relevant new skills to a high level

Ky3 demonstrate self-direction and originality in tackling and solving problems

Ky4 act autonomously in planning and implementing tasks at a professional level

Ky5 use ICT to locate information and to communicate with the University.

Practical and professional skills (P)

After studying this module you should be able to:

P1 continue to advance your knowledge and understanding in your chosen area

P2 demonstrate initiative and exercise personal responsibility

P3 exercise independent learning ability required for continuing professional development.

3 Resources for your project

Computing

It is essential that you have regular access to a computer and a reliable internet connection in order to access the Open University Library, the module website and forums. The module team and TS team rely on being able to contact students via email, the forums and the module website. Any specific information relating to different versions of the MSc Project module (e.g. qualification-specific requirements), will be made available on the module website under Resources, and/or posted in the News and on the module-wide forums where and when necessary.

Cost

You may decide that you need to visit academic libraries, work in laboratories and/or work in the field in order to collect data for your specific project. Most of the literature you will need to access should be accessible in full text format through the OU library, but in rare cases you might find you need an inter-library loan or may be required to pay to view a particular journal or issue. Please be aware of, and plan for, any cost implications for any of these activities and ensure that your overall estimates are realistic for you.

Time

One of the most significant resources you will require for a successful project is your own time. You need to define time for planning, collecting information or working with data, analysis and putting together the final report. It is easy to underestimate how much time is required to write a 15 000 word dissertation, so make sure that you plan well in advance and seek guidance from your TS (see Sections 5 and 6). This will help ensure that you don't fall into the trap of having to rush through the writing-up of your project close to the submission deadline.

Other resources

Example project proposals can be found in the 'Planning your report' section on the Resources page, other useful information can be found on the Resources page. Information provided should help you identify the types of resources you might require for your project. Using the examples to guide you, make a preliminary list of the resources you are likely to need.

If you require access to equipment or sites, now is the time to investigate availability/ accessibility. Please note that it is your responsibility to carry out any risk assessment, negotiate your requirements and obtain any necessary permissions.

> You should also consider any health and safety implications of any lab work or fieldwork that you might carry out. It is YOUR responsibility to make sure that you work in a safe environment.

Depending on the type of work you are planning to undertake, you may also need ethical approval *before* you start your project. Ethical approval will likely be required for any project involving questionnaires or work involving human participants or materials. It can take several weeks to months to obtain appropriate approvals, discuss your plans with

your TS before you start making any firm plans to ensure that your plans are realistic and achievable within the time available to you. You can find further guidance on this in the 'Responsibilities, rights and ethics' section on the Resources page of the module website. (Note: We expect the majority of research projects for SXH810 to be hypothesis-led critical literature (i.e. narrative or systematic) reviews which do not require separate ethical approval, see Section 4.1).

You should also be aware of potential issues with copyright and/or intellectual property, and initiate access to any major resources early on in your study of this module.

3.1 Module materials

As this is a project-based module, there are no learning materials that are compulsory for all students. However, you are supplied with a number of links to web resources and articles on the module website. In some cases, these describe good practice, while others should help you to develop the skills needed for completion of your project. Other useful information will be posted on the News page of the module website, so it is advisable to check there at least weekly, to see if any additional materials or notices have been posted.

As with other MSc modules, you will have access to literature databases through the Open University Library. If you haven't already worked through the 'Information Literacy website for MSc students' or you need to refresh your skills around how to find literature for your project then follow the Library resource link in the 'Research methods' section on the Resources page.

Many of you will have your own statistics packages, or can use Microsoft Excel for the simple statistics you need. However, if you do need a statistics software package you can download SPSS via a link from the 'Data analysis' section on the Resources page of the module website.

3.2 Using other students as a resource

Distance learning is sometimes a lonely experience – project work even more so – and you might find it valuable to have personal contacts with other students. Such contact can be both academically stimulating and a helpful resource. We encourage you to use the Module-wide forum to locate colleagues with overlapping interests with whom you can test your personal understanding of module issues or regulations, or even let off steam occasionally! You will also find discipline-specific forums on the module website so that you can have more targeted discussions with other students studying similar topics.

4 TMA 01: Proposal development

Please read the *Assessment Guide* to familiarise yourself with what you need to submit as part of TMA 01.

4.1 Developing your proposal

You should decide on an area derived from one of the *postgraduate level* taught modules you have already studied.

As you are planning for the **MSc in Space Science and Technology (F77)**, your project must relate to the compulsory module S818 Space Science.

You now need to develop your ideas into a project proposal, which you will submit as TMA 01. The template you should use for your project proposal can be found on the Assessment page of the module website. There is more detailed information about the Assessment strategy and policy for the module in Section 12 of this guide.

If you are planning to base your project on a previous MSc end-of-module assessment or mini-review, you ***must*** first discuss this with your tutor. You will need to demonstrate how the research you are doing for this module differs in scope and direction from your previous work and meets the required learning outcomes. We recommend that you design your objectives such that your project does not overlap significantly with any projects you have done in the past. If you decide to delve deeper into a topic you have researched before **then you must submit your previous project to your tutor at TMA 02 stage**, and treat your previous work as you would any other resource by referencing any similar text or ideas appropriately in your final report. Sometimes students worry that in reusing material they have already submitted for assessment they are self-plagiarising. To find out what you can and can't do, read the following paper by Tracey Bretag & Saadia Mahmud on self-plagiarism.

Please note: the MSc project module should be taken as the final module within your masters qualification. You must have either passed the underpinning science core compulsory modules or be waiting for the results before starting the module. You can still register on the project module if you are awaiting results from your previous module(s), but please be aware that if you subsequently fail your previous module(s) you will be referred to the Study Support Team for advice on options to enable you to complete your qualification.

The learning outcomes of the MSc taught modules on which your individual project should be based are available in Appendix 1. Using these learning outcomes as a basis for your project proposal, you will need to develop specific project objectives linked to your chosen MSc area and come up with a proposed project title.

Your project can be purely literature based. Alternatively, you may include some investigative work, which could be laboratory or field based, based on archived scientific data, or involve the use of questionnaires, analyses of texts or focus group interviews (see Section 3 for ethics requirements). However, any investigative project still needs to be firmly grounded in the relevant literature, and you should provide a robust rationale for your choice of methodology. Any facilities or equipment you may need, any health and safety implications and any ethical approval for your project are your responsibility (see Section 3).

The expected workload for the project module is 600 hours. For a literature-based project we would expect that this time would be divided approximately into 20% planning and identifying resources, 40% reading, and 40% analysis and writing the report. For an investigative project the 40% reading would be replaced by 10% reading plus 30% doing the investigation.

Once you have submitted your proposal as part of TMA 01 you will receive written feedback from your TS, so please ensure that you download your marked TMA and associated feedback (PT3 form). At this point it will be sensible to discuss your proposal with your TS over email or by telephone. For instance, your TS might discuss modifying part of the proposal and then help you to formulate the amendments. There are usually three main areas of amendment at this stage:

- refining your title and outcomes
- working out whether the resources necessary are available
- reducing the scope of the work.

If your feedback for TMA 01 suggests that you should change your project title then you can, with the guidance of your TS, choose a new project title and work on that for TMA 02.

Your project proposal for TMA 01 is very unlikely to be fully developed, but we would like to see that you have a clear idea for your investigation and not just a general area of interest. Also, we would like to see that you have thought about the scope of the proposal and the time available, which should have resulted in narrowing your interests to something fairly specific. Many students have identified a general area of interest at this stage, yet find it difficult to narrow this down. One way of doing this effectively is to spend 2-3 days finding and reading a review on the chosen area.

In Appendix 2 there are some sample project ideas (some of which were written by past students) arising from the taught MSc modules. These may help give you an idea of the scope and range of suitable projects.

4.2 Crafting objectives

Objectives need to be formulated in a way that means you know when you have achieved it. For the purposes of this MSc Project module, they need to be *research* objectives, and not personal goals. Tight objectives will allow you to know when to stop researching and start writing – because it should become obvious when you have achieved your objective.

Good objectives use words such as determine, analyse, compare/contrast, evaluate, measure, assess, quantify. For example:

1. Using data from the Daily Mail, the BBC news website and the Economist, assess whether regular bias exists in the reporting of UFO sightings.
2. Using data from the scientific literature, compare and contrast the effectiveness of hot stone massage, cognitive behavioural therapy and military-style boot camps in the treatment of big toe disease.
3. To analyse whether the global warming targets of the 2015 Paris Agreement can be met by letting off more fireworks along the Equator than at the Poles.

You don't need to state where the data are going to come from in every objective if it's always the same, i.e. in a literature-based project, but it might be useful, at least at the project development stage, to be explicit about how you might collect the necessary data.

4.3 Example project proposals

In the 'Planning your project' section on the Resources page, there are examples of project proposals for TMA 01. Studying these should help you to assess whether your own proposal is along the right lines. Also in the example project proposals we have included examples of TS feedback that show how modifications to proposals can improve the submissions, so that they become acceptable project proposals.

These example project proposals are not examples of what a perfect project proposal should look like. Most have at least some areas that need to be improved before the project is approved and we hope that these examples help you to avoid such pitfalls yourselves. Note that we have removed key references from the example project proposals so as not to give unfair advantage to students who select topics in these subject areas.

4.4 Keeping a project log

You will need to keep a project log (required to be submitted as part of TMA 02, TMA 03, TMA 04 and the EMA). Your log should be a succinct record of your journey through the module. The log differs from your plan in that it provides details of things you have done, whereas the plan is a schedule of what you are or should be doing and when.

Record detailed ideas, books to refer to, useful articles you have read, work planned and results obtained. A dated record of everything you do in connection with your project work (including drafts of TMAs) will help you to access information and probably save time in the long run. Remember, you are asked to use your log to keep your TS fully briefed about what you are doing, so put it together carefully and regularly submit it with your TMAs and your final project report. Make brief notes in your log on how you will use any feedback from your TS to inform the next stage of your work.

Your log can have a database layout or be more like a diary. Excerpts from a previous MSc project log can be found in the 'Planning your project' section on the Resources page. Your log may be quite extensive over the year, as you will include comments on your various activities. For instance, you should identify successes and explain how you overcame problems and any subsequent revision of your plans. This will help you to recognise any need to modify your project work plan.

Finally, a log should give a continuous indication about how you intend to move on to tackling the next phase of your work.

You might like to log the number of hours you have worked on this module each week: we expect you to put in about 600 hours overall.

5 From TMA 01 to TMA 02

Having completed TMA 01 your next task is to re-read carefully the feedback you received for it, then make contact and discuss with your TS how to re-work the proposal into a form that will be approved by the module team. This is a really crucial period of your study and you need to be confident that your TS supports your proposal – otherwise the chance of success in the module may be low.

Is my project feasible and appropriate?

Use the following checklist to assess the feasibility of your project:

- Does your project fit with the knowledge-based learning outcomes from your previous postgraduate science module(s)?
- Are you now happy with your outline plan and the major issues you have decided to investigate? Are the expected outcomes clear?
- Have you identified just how and when you are going to find the time necessary to conduct your project work?
- Have you built in regular contact with your TS?
- Have you built in time for holidays?
- Have you built in space, time and resources to deal with unexpected occurrences, such as short-term illness or the need to repeat activities?
- Have you found the resources you will require and identified any costs involved? Have you budgeted for these?
- If you need the cooperation of other people or institutions, do you know how to obtain it?
- Will your project require ethical approval?
- How will you search for and access the literature you require and how will you record this for future easy retrieval?
- If you find that your original objectives need modification, have you discussed this with your TS?
- Very importantly, have you set milestones (dates and outcomes) for the major phases of your project work that will help you reach your final goal?

Having talked to your TS, you should read textbooks or reviews in order to expand your background knowledge of the recent and seminal (i.e. historically critical) literature in the area you have chosen. This may involve a database search using OU Library resources or the internet to identify the most relevant titles. You should then read the most relevant books or papers you identify.

Once you have read the material you have identified it would be sensible to have another discussion with your TS on the themes and methodologies that are beginning to emerge. After this you are ready to move forward to producing a detailed plan for your work as part of TMA 02. The rest of TMA 02 involves a skills audit and project work plan, as described in the next section of this guide, and the submission of your project log (see Section 4.4).

6 TMA 02: plans and audit

Please read the *Assessment Guide* to familiarise yourself with what you need to submit as part of TMA 02.

Before putting your final project work plan together it is essential to do a skills audit. This will help you to identify the skills and knowledge that you already have, as well as those that you need to obtain for successful completion of your project. You need to submit your skills audit as part of TMA 02.

There are examples of skills audits in the 'Planning your report' section on the Resources page; they should help you identify the kinds of skills you might include and suggest ways in which you might organise your personal analysis. You will almost certainly have additional or alternative needs.

You should also prepare a detailed plan of work, ideally in the form of a Gantt chart with supporting notes. An example Gantt chart (and Gantt chart advice) can be found in the 'Planning your report' section on the Resources page and you can customise this for your own use if you wish to. Gantt charts are useful because they relate all activities to a single visual calendar. They are used to analyse the tasks ahead in the form of smaller pieces of work to be done within a defined time. The chart should ideally include all your expected ‘milestones’ and ‘deliverables’, each with timescales. For each ‘deliverable’, ensure that you identify and record the resources you will require and how and when you will obtain them.

By looking vertically down such a chart you can identify periods of peak activity. These charts are really useful in identifying times when your workload might become too heavy – which of course would mean it would be best to amend your plan. Ensure you include the time necessary to prepare your assignments. Remember to build in time for ‘slippage’ as a result of, for instance, holidays and emergencies, such as work pressures, family or personal issues. You need to submit your project work plan as part of TMA 02.

As a result of this exercise you will have identified all the tasks you have to carry out (and their outcomes) for your project work and for preparing your report.

Templates for both skills audits and Gantt charts, which may be modified to your requirements, can be found on the Assessment page of the module website.

7 TMA 03 and TMA 04: Research development and progress

Please read the *Assessment Guide* to familiarise yourself with what you need to submit as part of TMA 03 and TMA 04.

Throughout the year, you should maintain a log of your activities and results (to be submitted with TMA 02, TMA 03, TMA 04 *and* your final end-of-module assessment). You should also be in *regular contact with your TS* about your progress.

In March you are expected to submit TMA 03. This will consist of your log to date, a progress report and a revised project work plan (Gantt chart), as well as an overview of your project written in 'laymans' language, a brief survey of the most important literature that underpins the questions you are asking, and your methods of examining these questions. TMA 03 provides you with the opportunity to consolidate the overall design of the project and its likely outcomes. It is also a chance for you and your TS to review your initial progress and the project work plan you have devised. An example of a student submission for TMA 03 is available in the 'Presenting your research' section on the Resources page of the module website.

In June you should submit TMA 04, which builds on TMA 03 and in which you will describe the progress you have made with your project and present any amendments to your plan. A large proportion of TMA 04 is a literature review. This review might form part of the introduction to your project, so time spent on this now will reduce the time you will need to spend on it later. You should also give a short overview or summary of the methods you are using to collect your data (whether investigative, experimental or literature-based, you will always have a method of collecting and analysing your data) and a report of any results so far. In TMA 04 we will also ask you to write a project abstract – feedback on this will be useful for your EMA. Examples of previous TMA 04 submissions are *not* provided as by this point there is little communality between different projects.

Note: remember to back up all your files whenever you work on them. You could suffer real trauma if part of your data and/or records are lost and need to be reconstituted.

7.1 Citing and referencing

In TMA 03 and TMA 04 you will develop and refine a literature review that will provide your reader with a solid introduction to your chosen subject area. By this point you will have read quite a few papers and will need to start thinking about how you are going to cite them in your report, and also how you are going to organise your bibliography. There are no fixed rules for the format, as to some extent this will be subject specific: some subject areas use number formats, e.g. [1] or [1], while others use Harvard, or author-date format, e.g. (Bloggs et al., 2013). You should use the format that is most commonly used in the literature that you are reading for your project. Make sure you are *consistent*: both in the citation style you use and also in the way that you reference the literature in the bibliography.

We highly recommend that well prior to TMA 03, you become familiar with a bibliographic software package, which will automatically keep track of your citations and provide you with a correctly and consistently formatted bibliography at the click of a mouse. You can

directly export references straight from most journals into the common bibliographic packages. Details of the most commonly used (and free) packages can be found on the Library website.

7.2 Writing for a Lay Audience

In TMA 03 you are asked to write a summary of your research project for a 'lay' or 'non-specialist' audience. Being able to communicate your ideas to a wide variety of people is a useful skill to learn, and really makes you think about what you are doing and why. You need to submit a lay summary as part of your EMA so having a first go now will allow your TS to provide feedback in this critical skill.

The level we would like you to aim for is, for example, a high school history teacher: educated to degree level but may not have studied science past the age of 16.

Some tips:

- Pitching the first sentence at the right level is really critical. Can you pull the audience in? What is the 'wow' factor?
- A focus on "so what" is also critical: what is the relevance, benefit or use/applicability of your research?
- Avoid technical, scientific or jargon terms. Use simple, every-day terms. Ask yourself: does the reader really need to know that term?
- Avoid introducing acronyms unless they are absolutely critical.
- Keep sentences short (aim for 25 words or fewer).
- Keep to the point.
- Be specific.
- Provide context.

7.3 Writing an abstract

In TMA 04 you are asked to write an abstract to your project. You will need to write an abstract to your EMA so this TMA gives you an opportunity to practise this critical skill.

An abstract is a brief summary of the results and implications of the research. It allows the reader to gain an overview of the content of the report and maybe even to decide whether or not to read further!

A good abstract is not just a summary of the content. Instead, it provides a brief overview of the research problem, previous attempts at solving the problem, the results of the study and the wider implications of the findings. You will find a guide to writing a good abstract in the 'Presenting your research' section on the Resources page called "Turbocharge your writing".

The abstract is often the *last* item you actually compose, though *drafting* your abstract early on in the process of composition may give you a clearer idea of what you are aiming to say. It is an important skill to be able to summarise the key points of your work.

Writing an abstract

In your research and reading of articles, you should have realised the importance of good abstracts in enabling you to decide whether you want to read an article further. While abstracts are usually found with an article, they are perhaps more importantly listed in databases/collections and thus help you decide whether to obtain the full paper.

Essentially an abstract is a brief summary of a larger document that highlights the major activities and outcomes of the work and provides a brief pointer towards the implication of the results. It is important to distinguish an abstract from the introduction, which provides the background to the work and sets it in context, and the conclusion, which provides the results without putting them in context.

An abstract tells the readers what information the report contains and briefly outlines the methodology, results and conclusions. It is always very short, usually under 300 words. The use of key words in an abstract is vital because of electronic information retrieval systems that search for such key words in order to identify relevant resources.

A good abstract:

- is concise
- adds no new information, but simply summarises the report
- uses an introduction/body/conclusion structure mirroring the report
- should be understandable to a wider audience than the report itself.

8 End-of-module assessment (EMA)

You must submit your final project for assessment by the cut-off date given on the study planner. Your report must be accompanied by your log of activities, and is marked both by your own TS, who has followed your development throughout the year, and by an independent second marker, who has not seen your previous TMAs. This submission comprises your end-of-module assessment (EMA). Further details of how to prepare and submit your EMA are given in the *Assessment Guide* on the Assessment page of the module website.

Please note: *You will not be granted extensions on the EMA date*.

There is a **maximum limit of 15 000 words** for the EMA.

If you think that you will not be able to write that amount, be reassured. We most commonly find that there are considerably more students who complain that such a paltry allowance cannot begin to do justice to the range and scope of their work than those who complain that they do not have enough to write about.

It is possible to submit media files as part of an appendix of your report so long as these are edited down to ensure that the content is entirely relevant to the report, do not exceed 30 minutes of watching or listening time and are fully referenced in the report. The report must put this evidence in context and explain why, and how, any alternative medium was prepared.

Remember that this report combines with TMA 03 and TMA 04 to form the basis on which your TS and members of the Module Result Panel can assess the work that you have done towards the completion of this module. **Therefore it is important to follow all the guidelines for format and presentation set out here.**

You will need considerable time *once you have completed the project work itself* to write this final report. We estimate it should take about five or six weeks, but previous students have suggested that even eight weeks often feels too short.

8.1 Who is your reader?

In many ways this is the first question we should ask when we produce any document, whether it be a paper for a prestigious journal, a TMA for a TS, or a letter to a friend. What you write and how you present it relies heavily on what you can expect your audience to know.

Your EMA target audience are the two TSs who are marking your project, and you need to demonstrate your understanding of the report material to both people. While you may expect these readers to have knowledge of the area in which you have been researching, they will not necessarily be experts in it, so you need to gauge what you would expect them to understand and thus what you can assume and what you need to explain.

Another target audience to keep in mind would be an MSc student who has the same background knowledge for your discipline. The target audience for your lay summary is explained in Section 7.2.

You might also like to refer to the 'Presenting your findings' page of the Postgraduate Study Skills website, the link to which is in the 'Presenting your research' section on the Resources page.

8.2 Writing style and visual presentation

Good writing style is difficult to define, but the writing should be crisp, not too wordy, and not repetitive. A skilled writer selects the best possible points to demonstrate something

and, once this is achieved, can refer forward and back to these when necessary. However, do not be so concise that the meaning of your writing is obscured. Try to express an idea using several short sentences rather than one that is long and cumbersome.

One of the keys to good writing is good organisation of material. It is rather like telling a story: you need to start with the familiar, describing what you are researching in the context of more familiar ideas, and then slowly focus the reader onto the details as you develop an argument. There needs to be a smooth, logical flow through the material as you build up information and your arguments.

Your report must not be simply a list of the papers you have read and their various conclusions. Instead, you need to group related ideas together. Thus, a particular paper may be referred to at various points in the report as you develop the logic of your topic. One of the reasons for splitting the report into chapters and sections is to provide a framework for the development of ideas. Just by looking at the titles of the chapters and subsections, the reader should understand the logic of your approach. This provides the reader with some signposting so they know where they are in the document and how it fits with the development of your ideas.

The presentation of your report should make it attractive and easy to follow. Visual impact is significant, but should not detract from the scientific message you are communicating.

8.3 Structure of your report

The structure of the sections of your report should be as shown below (sections that are optional are in italics):

- Title page
- Abstract
- Lay summary
- Objectives
- *Preface*
- Contents
- *List of abbreviations (in alphabetical order)*
- *List of tables*
- *List of figures*
- Chapters: should be separated into Introduction, Methods, Data/results chapter(s), Discussion and Conclusion. It is acceptable to combine the results and discussion for each objective into separate chapters but make sure you clearly separate 'data' from 'discussion'.
- References
- *Glossary*
- *Acknowledgements* (if any; but it is often nice to acknowledge any help you may have had with your project over the year.)
- *Appendices*, including a copy of any previous relevant work such as EMAs for previous OU modules.

If your report does not include any tables, a list of tables is not required. However, if you do include more than three or four tables then a list becomes obligatory.

Each section of your report as outlined above, and each chapter, should start on a new page.

8.3.1 Title page

The title page must give the project title followed by the words:

A Report submitted as the examined component of the Project Module SXS810 within The Open University's Master of Science Degree in Space Science and Technology.

The title page must also contain your name in full, your Open University personal identifier, the date of submission and a word count.

8.3.2 Abstract

You must include an abstract in your report. This should be **no more than 300 words long**. See Section 7.3 for further guidance.

8.3.3 Lay summary

The lay summary should be **no more than 300 words long** and should explain the rationale underpinning your project as well as your results at a level that is accessible to people without detailed scientific training. See Section 7.2 for further guidance.

8.3.4 Objectives and preface

State your final objectives as agreed with your TS.

A preface includes observations you wish to make that are not part of the report proper, such as introductory and explanatory remarks. For example, you might wish to make a brief note on why you chose the topic and whether the work derives from a previous MSc end-of-module assessment or mini-review or with other projects you have completed at work or for an organisation. Please explain here how the work in this dissertation shows significant differences from your previous work. (Remember, you should include any relevant previous report with your appendices).

You do not need to include a preface in your report, but you must include your objectives.

8.3.5 List of abbreviations

You can present abbreviations in a list at the start of your project. However, it is often more readable to give each abbreviation in brackets immediately after the first use of a term. When you complete your report, check carefully that you have been consistent in using abbreviations and that all the ones you use are listed. The 'find' function of your word processing package is useful in this regard.

8.3.6 Contents

The contents page consists of the title ('Table of Contents' or 'Contents'), and a list of numbered chapter and subsection headings (including their titles), shown with their associated page numbers. Page numbers should be aligned consistently. There are a number of styles possible for tables of contents. Most word-processing packages have the capability of creating Tables of Contents automatically if you use fixed "Styles" for different levels of headings in your report. There are numerous guides showing how to do this if you search online for your particular word processing package.

8.3.7 Numbered lists of tables and figures

You should number all tables and figures using a consistent style, and in the lists of tables and figures you should include the titles of each as well as the numbers.

Figures include pictures, diagrams and graphs, etc., which are essential illustrations in your report. Number tables and figures separately, but consistently – for example, choose between sequential numbering throughout the dissertation (Table 1, Table 2 … Table *n*) or numbering within chapters ([Chapter 1] Table 1.1, Table 1.2, Table 1.3, [Chapter 2] Table 2.1, Table 2.2 … [Chapter *N*] Table *N.n*). The latter method is preferable when there are many tables or figures. Do not mix the two methods by using one for figures and another for tables.

8.3.8 Organising your chapters

It is critical that you present a well-organised project report. To some extent the precise structure will vary depending on the nature of the project.

- Begin with an introduction that describes the topic area and surveys what has been done in the past (the bulk of your introduction will probably be based on your literature review that you developed in TMA 03 and TMA 04). The introduction should put the objectives of your work into context.
- The next chapter should describe your research methods, and *why* you chose those methods. Indicate any ethical approval obtained and any other information relating to how you went about researching your project and conducting your analysis.
- Subsequently, describe your results in one or more chapters. Put background details and raw data in appendices. Many successful literature-based projects use the objectives to form the 'theme' of each of the results chapters, but this isn't a requirement. You should present a coherent evaluative piece of writing that links and synthesises the information and data that you have collected. Setting clear, defined and achievable objectives early on in the project is therefore key for crafting clear, defined and critical chapters.
- Your next chapter(s) should analyse your results, developing your argument in a discussion based on your now expert knowledge of the literature.
- The final, usually concise, chapter should succinctly summarise any conclusions you have reached, again with references to past literature. (Convention suggests that any literature referred to at this stage has been mentioned in more detail earlier in your report). Your conclusions should link directly back to the objectives that were stated at the start of the report. It should also discuss areas of further research: this section should demonstrate clear understanding of the strengths, weaknesses and limitations of current practice.

Each chapter should begin on a new page, it is helpful to divide each chapter into titled sections and subsections, just as in this *Study guide*, for example:

1.2 The application of Avogadro’s hypothesis to Darwinian Inheritance.

1.2.1 The duck-billed platypus and the bottom quark.

This is a simple way of separating arguments while maintaining ‘flow’ between ideas.

8.3.9 References and glossary

In this section you must include all the books, papers, articles and websites that you have referred to in your report. Information about referencing is available via the OU Library.

The number of citations and references in your project will probably rapidly become unmanageable without the use of citation software. You will find a link to the OU Library bibliographic management website in the 'Referencing and good academic practice' section on the Resources page. We strongly recommend that you use a bibliography package to automate linking your citations to your reference list.

If your report includes a large number of technical terms, the inclusion of a glossary may make those terms clearer for the reader.

8.3.10 Appendices and acknowledgements

Appendices should contain material that is explanatory or supplementary to the report but that is *not* necessary for the examiner to study in detail. For example, it is quite common to find raw data, detailed statistical analysis, software code and the actual text of questionnaires or interview responses included as separate appendices; these items are thus available for checking or reference without interrupting the flow of the report for the reader. Their inclusion is important so that other researchers could replicate your work in the future.

If you have based your work for this project on a previously completed piece of your own work you should include a copy of this here, and make reference to it when appropriate in your report. All appendices should be referenced in your main text.

Appendices *do not* count towards your final word count for your EMA (see next section).

An acknowledgements section provides you with an opportunity to acknowledge help and collaboration you have received during your project work.

Acknowledgements *do* count towards your final EMA word count (see next section).

8.4 Word count

Your project must be **no more than 15 000 words**, you must include a word count on your title page.

The following *do not* count towards the word count:

- equations
- words within diagrams (labels, key, axes, etc.)
- figure captions, list of figures
- tables that contain numbers/data/few words in cells
- table captions, list of tables
- generic text in the header/footer (e.g. name, PI, course code)
- reference list (remember, you only reference papers you mention in the text, not everything you've read)
- appendices
- glossary
- list of abbreviations
- table of contents.

The following *do* count towards the word count:

- title, headings, subheadings
- abstract
- lay summary
- objectives
- preface
- tables that are largely text-based, for example, tabulated descriptions/explanations
- all citations
- footnotes to text
- acknowledgements.

If you find you are in danger of exceeding the word count limit, consider whether you are being too verbose and can cut out or condense some of what you have written. For example, some detail may have been important to you in starting to undertake the project work, but it is not necessary to describe it in depth at this stage. Take care not to repeat information in more than one format.

Carefully consider your audience. Do they need to know all the information you are giving them? Does every piece of information build up to make the story? If not, consider cutting.

If your project is significantly over or under the 15 000 word limit then you are unlikely to have demonstrated all the learning outcomes.

8.5 Presentation of your report

There are no specific rules to follow about the presentation of your report in terms of colour, font etc. However, you should remember that it should look professional and should be easy on the eye to read.

A few suggestions:

- Font: use a classic font like Times New Roman, or a clean, modern sans-serif font like Calibri or Arial.
- Font size: use either 11 or 12 point font.
- Line spacing: 1.5 is easiest to read, and a full line space between paragraphs makes it much easier for any markers reading on-screen (which is most these days).
- Justification: It looks professional to justify the text both left and right.
- Margins: leave decent margins at the sides and tops and bottoms of your pages. The Word default settings work fine!
- Colour: Colour figures are of course easy to read, and titles in a different colour to the main text can enhance clarity. But please use colour sparingly!
- Spelling: It doesn’t matter whether you use UK or US spelling but please be consistent!

Don't forget to add page numbers!

Proof-read your EMA before submission to avoid typos or grammatical ambiguities. It is OK to ask someone else to read through your work, but he/she/they must not alter the scientific content of the writing, and they should be acknowledged by name in the Acknowledgements.

9 Contact with your TS

Your TS is there to support you throughout the year. Some of this support will almost certainly be scheduled as regular contact; you are likely to want to use more support time at the beginning of the module for planning and discussion purposes.

Most regular contacts with your TS will be by telephone or email. You can find contact details for your TS via your StudentHome page. Telephone has the benefit of immediacy in discussion, but it is more difficult both to ensure that you have covered all the planned points and to record the details of the discussion. So it is advisable to note down major issues to be raised before you make the call and then make a record of the discussion in your log afterwards. You can always email this to your TS so that there are no misunderstandings.

On the other hand, you may prefer the slower turn around and build-up of a discussion via email. This is for you and your TS to negotiate. Many students use both routes of communication at different times throughout the year.

We advise you to make regular monthly (at a minimum) contact with your TS. We feel you should be able to use these contacts to solve problems that arise during your studies and to get constructive criticism of your planned work, as well as to test out new ideas. If there are unforeseen crises between regular planned contacts, you should try to get in touch immediately. You may feel worried initially that discussing problems may be reflected in the assessment of your work by your TS: this will not be the case. The role of your TS is to help you succeed in your project.

Consequently, your TS will want to monitor your progress if only to find out whether your work is proceeding satisfactorily and on schedule. You are expected to do this during the regular contacts and by providing your TS with your log and plan. If you are behind schedule you need to discuss how you are going to readjust your targets. To help you achieve your goals, your TS will also listen to and discuss ideas and offer constructive criticism.

You need to submit your TMAs at the agreed times. If there are unplanned delays, your TS will expect you to contact them about this *before* the due dates have passed. Your tutor can only authorise TMA extensions *before* the due date!

10 Avoiding common mistakes

A number of errors that regularly inhibit successful completion of project tasks are worth mentioning.

- Starting with a closed mind – for instance, only searching for information or data that support your established point of view.
- Experience has shown that many students collect numerous articles but do not realise the amount of time it will take to read them. Start your critical reading as soon as possible. You will probably find that you need to read key papers more than once – you will glean different points from the paper every time you read it.
- Imperfectly or ambiguously defined hypotheses and/or objectives can lead to a project that is too broad. A huge quantity of material may be collected that has insufficient ‘in-depth’ quality.
- Projects must be big enough (but not too big) to fulfil the criteria for the module. You must be able to demonstrate both critical skills and enough work of an academic nature at MSc level. However, your work must fit within the limited timescale of the module. The guideline is 600 hours’ work, so you need to balance the competing criteria of time, depth and analysis.
- Another frequent cause of panic involves starting to assemble the final report too late, perhaps because you are trying to polish your work unnecessarily or do not recognise a finishing point, or simply because you procrastinate about getting on with writing it. The earlier you start writing, the easier you will find the process. Furthermore there is nothing like getting words down on paper to focus the mind!
- If your computer fails, you risk losing your work. To avoid this, **save all your work (text, figures, tables) regularly, and back up everything** onto another medium (e.g. a memory stick, external hard drive or cloud-server such as Dropbox or Google +) every time you finish a work session. You may want to print out your report at various stages to read through. If so, keep these draft copies; at least if you lose the electronic version you have something from which to start again.
- It is important to try and produce your own figures and tables that show the results of your analysis/findings rather than using previously published ones.

11 Support

It is very important that you talk to your TS at an early stage if there are any academic problems, if only to decide whether you need to modify your plans – for instance, if you find you cannot get the data you require, or if you have difficulty interpreting it. However, if you maintain contact and dialogue throughout the planning stage and in preparing the TMAs, any major problems with the project design and implementation should be minimised.

If things go wrong in the early stages there may be time to design a modified or new investigation – with the help of your TS, of course. Later on, the way ahead may involve cutting back on your original objectives. However, always discuss any changes in objectives with your TS.

If you experience personal difficulties, your TS may be able to help with rescheduling your TMA submission dates. Please bear in mind that the EMA cut-off date is fixed. *You will not be granted extensions on the EMA date*.

If, for whatever reason, you find that you are unable to complete your project by the EMA cut-off date you may be able to withdraw (before the cut-off date) and then join the next presentation to complete your module. The University no longer offers extensions to the submission date of examinable work. You can find more information about the University's Deferral and Withdrawal policy and assessment banking on the Assessment page of the Student Policies and Regulations page or by contacting the Student Support Team (details available via StudentHome).

If you experience personal difficulties that you think have affected your ability to perform to your best ability on any TMA or the EMA then please make sure you submit a special circumstances form (PT39 Continuous assessment special circumstances and/or E39 Examination and examinable work special circumstances) information regarding special circumstances can be found here.

12 Assessment policy and structure

The MSc project module consists of two formative TMAs, two summative TMAs and an end-of-module (EMA) component (the project report). Table 1 summarises this information and the weighting of the various components. The assignments help to keep you on track and develop the skills required to produce the report at the end of the module. All elements of the module assessment are marked by reference to the module learning outcomes.

Table 1 Assessment items and their weighting in relation to the marks available for the module.

Assessment item	Weighting
TMA 01	formative but compulsory
TMA 02	formative but compulsory
TMA 03	10%
TMA 04	10%
EMA	80%

To be sure of a pass for the module, you need to achieve an overall score above 40% ***and*** at least 40% in the EMA component. Descriptions of content for the TMAs and EMA (project report) are on the Assessment page of the module website.

12.1 Vivas and re-submissions

A student whose project report is of borderline quality may be asked to defend and expand their work in an oral examination (viva) to determine their final grade. This is exceptionally rare.

A student whose report is less than satisfactory, but who is deemed to be capable of improving it through better use of analyses or background literature, may be offered the opportunity to make such improvements and then re-submit it for examination.

You will receive feedback on your project report. If you need to re-submit, this feedback will show you the areas of your work that need development.

12.2 Plagiarism and ethical practice

A critical skill for any scientist is learning how to take complex information and re-write it in your own words at a level that is suitable for your audience. With a vast resource of information available to you, for example on the internet, in books and in journal papers, it is relatively easy to copy other people's work rather than re-write it in your own words.

However, if you submit an assignment that contains work that is not your own, without indicating this to the marker (that is, clearly acknowledging your sources by differentiating quotations from the rest of the text), you are committing plagiarism, and this is an offence.

Plagiarism might occur in an assignment when:

- using a choice phrase or sentence that you have come across in the literature or from another source
- copying word-for-word directly from a text
- paraphrasing the words from a text very closely
- using text downloaded from the internet
- borrowing statistics or assembled facts from another person or source
- copying or downloading figures, photographs, pictures or diagrams without acknowledging your sources
- copying from the notes or essays of a fellow student
- copying from your own notes on a text, tutorial, video or lecture that contain direct quotations.

Although you are encouraged to show the results of your reading by referring to and quoting from works on your subject, copying from such sources without acknowledgement is deemed to be plagiarism and will not be accepted by the University. This means that you must make it clear which words and ideas are yours and which have come from elsewhere, through the use of quotation marks, italics or different coloured font, as well as in-text citations.

Such poor academic practice may occur due to inexperience, so you should study the 'Developing good academic practices' website, which is available in the 'Referencing and good academic practice' section on the Resources page of the module website. Another resource which might be useful is the 'Presenting your findings' page on the Postgraduate study skills website, the link to which is available in the 'Presenting your research' section on the Resource page.

All TMAs and the EMA on the MSc Project module will be checked for potential plagiarism using text-comparison software, as part of the quality assurance processes. Scripts containing text of concern will be referred for further investigation and could result in a disciplinary penalty.

12.3 Confidential information and other relevant issues

Your project may focus around commercially – or personally – sensitive information. If so, you should get permission from your employer (or other owner of the data) to use this information.

Other important issues to be considered are the way data are collected and interpreted, use of experimental animals or human participants, confidentiality of individuals' responses, and requirements for consent and ethical approval. You should consult the 'Responsibility, rights and ethics' and 'Research methods' sections on the Resources page for links to material on these subjects and you are advised to read these carefully to check whether such issues might affect your research.

If you are recording personal data or responses that can be traced back to an individual, you should check the latest guidance on data protection on the module website.

Appendices

These are the knowledge-based learning outcomes of the taught module that would be appropriate to use as the basis of your MSc project proposal.

S818 Space Science

1. Demonstrate a knowledge and understanding of the space environment within the Solar System.
2. Demonstrate a knowledge and understanding of the design and operation of space-based instrumentation.
3. Demonstrate a knowledge and understanding of the aspects of space mission design and operation relevant to scientific applications.
4. Demonstrate a knowledge and understanding of scientific debates within planetary and space sciences, based on current research findings.

The following project suggestions have previously been offered, and a similar list will be offered to students this year who are interested in areas of Space Science and Technology.

Sub-surface conditions on Europa

The south polar region of Mars

Defining extraterrestrial habitable zones

Martian alteration minerals – how did they get there?

Geology of the planet Mercury

Investigating variable stars

Using *Gaia* data to investigate blue stragglers in open clusters

The evolution of massive stars

The effects of hypervelocity micrometeoroid impacts on space-based observatories

Appropriate materials for simulating hypervelocity micrometeoroid impacts

Multi axis pyroshock tests for spacecraft systems

Electric propulsion systems for spacecraft

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15