

Full title: Learning Logs in SXPS288 – Employability skills for remote experiments

Short title: Learning Logs in SXPS288

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Executive summary

Within the physical sciences curriculum, employability and skills development elements are being incorporated into modules in order to address the Open University Employability Policy and also to address the employability and careers development requirements of Institute of Physics (IoP) accreditation for named degrees in the physical sciences.

First presented in 2019J, SXPS288 *Remote experiments in physics and space* is the mainstream experimental module at Level 2 on the physical sciences pathways. With employability elements including personal development planning (PDP) and skills development having previously been addressed at Level 1 in the modules S111 *Questions in science* and SM123 *Physics and space*, the 2019J rewrite of SXPS288 provided the opportunity to integrate employability by design into a module at Level 2. SXPS288 was the ideal module for this, being the first of the Level 2 physical sciences modules to receive a major rewrite at this time, and being based around practical, skills-based activities including experimental projects and groupwork. SXPS288 is also a required module on both the astronomy / planetary science and the physics pathways at Level 2, meaning that students on both strands would encounter the module during their studies, helping the degree pathways to meet the IoP accreditation criteria.

Skills development weeks were introduced to SXPS288, working in parallel with the experimental investigations. To enable students to document and reflect on their progress in developing these skills the module makes use of *Learning Logs*, which are a student-led tool based around familiar forum technology. These Learning Logs, which are personal to each student, had previously been used successfully on engineering modules, but SXPS288 was the first module to use them in the physical sciences. In each of the Skills Weeks there are activities and case studies relating to careers and employability. As part of these activities, students are encouraged to use the Learning Logs to document their skills development acquired both during the experimental work and in the Skills Weeks themselves. Reflective questions in the assessments (three TMAs and the final EMA) refer to these activities and require students to present and discuss evidence from the Learning Logs as part of the assessment.

The purpose of the present study was to assess the level of student engagement with the Learning Logs and to identify potential changes to increase participation and make the Logs and their associated exercises meaningful and relevant to all students including those without immediate career aspirations.

VLE and PowerBI analytics were used to quantify student interaction and student surveys to obtain both targeted and untargeted feedback. The analytics showed that the majority of students did engage with the Learning Logs to some extent, although a significant number interacted only marginally or not at all, indicating scope for improving participation. The concentration of Learning Log interactions in the assessment weeks indicates either that participation was largely assessment-driven or that students were making return visits to refer to previous Log entries in those weeks. Analysis of posts by category showed that the types of information recorded in the Learning Logs correlated strongly with the assessment questions again suggesting a link with assessment.

Responses to the survey questions included student requests for more guidance on the purpose and functionality of the Learning Logs and more instructions and examples of their use. Recommendations to this effect have been passed to the SXPS288 module team for possible inclusion in future presentations. Within the physical sciences, Learning Logs are currently only used on SXPS288 with other tools used on other modules. Tighter integration between the various personal development tools and more consistency across modules, should be considered.

Abstract

Purpose - Learning Logs, a forum-based tool for recording skills development, have been used on SXPS288 from the 2019J presentation. The purpose of the current study was to investigate student engagement with the Logs, and to identify ways to improve engagement and make them more relevant and meaningful to students.

Methods - Quantitative data on overall student engagement with the Learning Logs was collected and analysed using module website (VLE) analytics tools. The timing of student interactions was analysed using the PowerBI analytics tool. Tags applied by students were used to categorise and analyse Learning Log posts by content. Qualitative feedback on student perception of the Logs was collated from post-module SEaM surveys, and from a targeted, questionnaire-based student survey.

Results - The overall engagement figures showed that, while the majority of registered students did engage with the Learning Logs at some point in the module, almost half (48%) made only small numbers of posts (between 1 and 5), and 17% did not engage with the Learning Logs at all. A small number (7%) made more extensive use of the Logs, with more than 15 posts. Visits to the Learning Logs were concentrated in the assessment weeks. 61% of posts were tagged as relating to the module Learning Outcomes and 38% to skills development. Just under half of the posts (48%) related to the experimental investigations and 27% to Python programming. Some student survey responses were positive while other students felt the Learning Logs were not relevant or requested additional instructions.

Conclusions - While the majority of students did engage with the Learning Logs to some extent, more than half made fewer than five posts or none at all, indicating the scope for improving participation. The concentration of Learning Log interactions in the assessment weeks indicates either that participation was largely assessment-driven or that students were making return visits to refer to previous Log entries in those weeks. Further analysis is required to establish which. Survey responses indicated that some students were unaware of the full capabilities and facilities of the Learning Logs, suggesting that additional guidance would be beneficial.

Key words

Learning Logs, Skills Development, Employability, SXPS288, Remote Experiments

Introduction (Aims and scope of project)

Employability in the physical sciences

In recent years, increasing emphasis has been placed on the development of employability skills in undergraduate and postgraduate degree programs. This is especially relevant in the physical sciences, where transferable skills are known to be highly valued by employers (UK Space Agency, 2023; Mason, Williams, and Cranmer, 2009) . Within the Open University, the Careers and Employability Service (Open University, 2023a) provides students with extensive employability advice, support and resources and a range of free courses and articles on its Employability Hub (Open University, 2023b). In addition, the Careers and Employability Service works closely with central academics, Boards of Studies and module teams to embed and integrate skills development into module materials and the overall curriculum. Within the physical sciences, the Physical Sciences Subject site (Open University, 2023c) provides additional forums, resources and support for students as they plan and work through their studies.

Experimental skills for physical science

Practical experimental skills are a crucial part of any sciences degree. The module SXPS288 *Remote experiments in physics and space* is the mainstream experimental module at Level 2 on the physical sciences pathways, including the BSc (Hons) in Natural Sciences (Q64) and the named degree BSc (Hons) Physics (R51). Students on these pathways will typically study either Physics (S207) or Astronomy (S284) and Planetary Science (S283) prior to taking SXPS288 (Open University, 2023d).

SXPS288 was first presented in 2019. Based on the previous experimental module SXPA288, the module was extensively rewritten and redesigned for the 2019J presentation, with a new planetary sciences experiment based on the exploration of Mars. The module has always featured a strong skills element and the rewrite provided the opportunity to embed skills development as an integral part of the module materials and assessment strategy.

Through groupwork and real time experimental projects, the module encourages and enables students to develop their experimental skills and also other vital employability skills such as working with others, awareness and assessment of their abilities and progress, and their knowledge of requirements and opportunities in the space sector.

A skills strand runs through the module, working in parallel with the academic and scientific content. Skills Weeks interspersed at regular intervals between the main experimental projects in Astronomy, Physics and Planetary Science cover skills in Scientific Communication, Experimental design, Programming for data analysis, and Group working, together with reflective activities on reviewing and evaluating individual progress. These skills are also developed in the course of each of the experimental investigations and the module assessment strategy includes elements relating to the skills development and reflective activities.

Learning Logs in SXPS288

To enable students to document and reflect on their progress in developing these skills the module makes use of *Learning Logs*, which are a student-led tool based around familiar forum technology. These Learning Logs, which are personal to each student, have previously been used successfully on engineering modules, but SXPS288 was the first module to use them in the physical sciences.

Learning Logs and skills development have been integrated into SXPS288 to address the Open University Employability Policy (Open University, 2023e), which states that:

"Developing employability is a vital component of student success; enabling them to build the skills, behaviours, experience and knowledge to achieve their personal, educational and career outcomes."

The Employability Strategy contained within the Policy also sets out the following aims:

- *Embed employability more explicitly in the curriculum*
- *Enable our students to evidence, reflect upon and articulate core employability skills and attributes gained through OU study*

Both of these aims have been addressed by embedding employability and skills development explicitly in the design of SXPS288, with the Learning Logs and related assessments providing the mechanism for recording and reflecting on this skills development.

The strategic plans of Board of Studies of the School of Physical Sciences include Institute of Physics (IoP) accreditation. The IoP accreditation criteria (Institute of Physics, 2022) for undergraduate and integrated master's (IM) qualifications state that (KE12) :

"Programmes must provide training in a broad range of BSc and IM transferable skills and their use should be demonstrated throughout the programmes."

giving as an example:

"students keeping a personal development portfolio where they identify and reflect on the knowledge, understanding and skills taught and developed during their study"

The IoP accreditation also recommends that *"skills [be] fully embedded within the physics curriculum and be as authentic as possible"* and that *"skills [be] assessed in as authentic manner as possible"*. These criteria and recommendations are addressed in SXPS288 through the Skills Weeks, Learning Logs and related assessments.

Each student on the module has a personalised Learning Log, visible only to themselves and to their tutor. The Learning Log presents a familiar interface to students, working in the same way as forum posts. Activities in each of the Skills Weeks, and questions on each assessment encourage students to post notes, reflective thoughts, items of evidence and other reference materials in the Log to document their skills development. Logs are persistent across modules, allowing students to continue to build an evidence base as they progress through subsequent modules. Examples of typical Learning Log posts are shown in **Figure 1**.

The purpose of the project was to investigate the effectiveness of this new approach to skills development and recording, and to look at ways to make it more relevant and meaningful to students. Using student feedback (e.g. SEaM survey) from the 2021J student cohort on SXPS288 regarding engagement with Learning logs, together with data analytics and focused student surveys, the project aims to identify changes that can be made to make the employability and skills development aspects of the module most effective for those aiming to work in the space sector and related industries while at the same time making them relevant for those without immediate career goals.

KS2 - Use computer programming and scripting to organise and process experimental data and to present results. Attachments: [BokehTEST.ipynb](#) [UsingBokeh.ipynb](#)

Wednesday, 30 Nov 2022, 16:17

Relevance to work done so far

Relevant to work done so far.

SJ Comments

Very relevant here. Learning how Python works, how the various packages can be implemented, and imagining ways in which this can assist in sorting data/results has been very helpful

Progress
Partial

Evidence provided
Evidence of Python Worksheets (This will be added to as and when I complete the ARROW work)

[Permalink](#) [Edit](#) [Delete](#) [Add your comment](#)

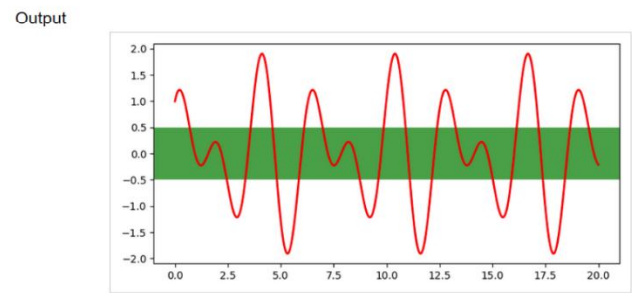
Annotating altitude-temperature plot - shaded areas in matplotlib

Tuesday, 4 Apr 2023, 11:37

For TMA03, Q2 I wanted to find a way to use Matplotlib to shade areas to replicate figures that resemble Figure 4.7 (which I think is neat).

Example

```
import numpy as np
import matplotlib.pyplot as plt
plt.rcParams["figure.figsize"] = [7.00, 3.50]
plt.rcParams["figure.autolayout"] = True
x = np.linspace(0, 20, 500)
y = np.cos(3*x) + np.sin(2*x)
plt.plot(x, y, c='red', lw=2)
y1 = 0.5
y2 = -0.5
plt.axhspan(y1, y2, color='green', alpha=0.75, lw=0)
plt.show()
```



Consulting the official matplotlib documentation helped me create the plots:

matplotlib.pyplot.axhspan

```
matplotlib.pyplot.axhspan(ymin, ymax, xmin=0, xmax=1, **kwargs)
```

Add a horizontal span (rectangle) across the axes.

Draw a horizontal span (rectangle) from `ymin` to `ymax`. With the default values of `xmin = 0` and `xmax = 1`, this always spans the x-range, regardless of the `xlim` settings, even if you change them, e.g. with the `set_xlim()` command. That is, the horizontal extent is in axes coords: 0=left, 0.5=middle, 1.0=right but the `y` location is in data coordinates.

Parameters:

- ymin**: float
Lower limit of the horizontal span in data units.
- ymax**: float
Upper limit of the horizontal span in data units.
- xmin**: float, optional, default: 0
Lower limit of the vertical span in axes (relative 0-1) units.
- xmax**: float, optional, default: 1
Upper limit of the vertical span in axes (relative 0-1) units.

https://matplotlib.org/3.1.1/api/_as_gen/matplotlib.pyplot.axhspan.html accessed 4 Apr 2023

Spectacular Spectroscopic Space Substance Scrutiny

Monday, 3 Apr 2023, 08:44

I was thrilled and deeply grateful to have been granted the opportunity to work with the Ptolemy instrument, developed for the Rosetta mission and flown on actual space missions. Conducting spectroscopy using this thermal valve was a wonderful experience that allowed me to hone my long-desired skill in this field. In particular, performing infrared spectroscopy with analogue atmospheres to identify different gases was a challenging and engaging puzzle that I thoroughly enjoyed. While simple, the physics behind infrared spectroscopy is truly remarkable, especially the fact that bond vibrations are quantized. This allows for the identification of specific gases or materials based on their absorption or emission spectra as energy goes into stretching or bending bonds (and is released as the bonds settle down).

Tags: [spectroscopy](#), [infrared](#), [teamwork](#), [space science](#), [remote working](#), [atmospheres](#), [Mars](#)

[Permalink](#) [Edit](#) [Delete](#) [Add your comment](#)

Figure 1: Examples of typical Learning Log posts (edited to remove identifying features). a) Text-based post detailing progress towards a named module learning outcome (KS2). Evidence is attached to the post in the form of two Python notebooks (.ipynb files). b) Post detailing use of the Matplotlib Python library (part of Skills Week with embedded program code excerpts and output. This post contains an excerpt from the official Matplotlib documentation with link. c) Post detailing participation in the Spectroscopy project with extract from analysis spreadsheet and graphical output. This post shows how entries can be categorised using tags, allowing later searching and retrieval of information. Students can return to Learning Log entries at a later date to refer to information and also to update the content and add tags or attachments.

Materials and methods (Project activities)

All of the procedures and studies in this project were carried out in accordance with the principles of the Open University's Human Research Ethics Process and any student contact made with approval from the Student Research Project Panel (SRPP). All student-related data were anonymised at source and handled subject to a relevant Data Protection Impact Assessment (DPIA) and with appropriate approvals from the Human Research Ethics Committee (HREC).

Student participation and use of the Learning Logs was analysed and interpreted using a variety of tools, including quantitative data on student participation and engagement, and qualitative feedback from both open and structured student surveys.

Quantitative analysis

Quantitative data on student engagement with the Learning Logs was obtained from three sources. Firstly, module website analytics were used to track user participation. This provided information on total numbers of posts and also on numbers of posts made by each participant. These data were anonymised before use and aggregated to show the distributions of the numbers of posts made. Using the tagging function, posts were also categorised according to the type of content. A total of 320 students were registered at the start of the 2022J presentation (October 2022) with 235 still registered by date of the third assignment (April 2023).

Secondly, the PowerBI VLE Tools Usage analysis tool was used to track engagement with the Learning Logs by study week. This analysis was carried out for each of the four presentations 2019J to 2022J. These data were already aggregated into numbers of interactions with the Logs within each study week thereby preventing any back-tracing to individual participants. Of particular interest in this analysis was the timing of interactions in relation to the assessment weeks, each of which included a question relating to skills development and the Learning Logs.

Finally, to understand the ways in which students made use of the Learning Logs, a selection of individual posts were assessed and categorised according to the type of post. These were then analysed in terms of frequency of posts by category.

Qualitative analysis

Unstructured and structured student feedback was also obtained by means of the annual SEaM (Student Experience on a Module) survey and through a targeted survey of the 2021J student cohort.

The SEaM survey is offered at the end of each presentation of a module and is open to all students completing that module. Questions on the SEaM survey are generic, consisting of 23 questions on the module materials and tuition answered on a 1 to 5 scale (where 1=strongly agree to 5=strongly disagree) together with three free-text questions relating to suggestions for improvement; further comments on the teaching, assessment and module materials; and any other comments on the study experience on the module. Student responses are anonymised at source, preventing identification of individual students. Since the survey is generic, none of the questions asked specifically about the Learning Logs but the free-text responses were analysed for mention of the study skills aspects of the module and of the Learning Logs in particular. From 282 students initially registered on the 2021J presentation of SXPS288, 163 completed the module by submitting the EMA and of these 41 responses to the SEaM survey were received. Of these 41 responses, only five explicitly mentioned skills development or the Learning Logs.

To overcome the generic and open-ended nature of the SEaM survey, students from the 2019J and 2020J presentations were also invited to take part in a focused survey consisting of 18 questions specifically relating to the use of Learning Logs on SXPS288. The survey was hosted on JISC (Joint Information Systems Committee, 2022) and participant information anonymised at source. There was a low uptake to the initial survey in 2021 (covering the 2019J and 2020J presentations) with only six responses. Also, of these six respondents, only one replied to the invitation to a focus group (originally scheduled for July 2021). As it is clearly not feasible to hold a focus group with only one participant, this aspect of the study was dropped.

For these reasons, a follow up survey (2021J presentation) was carried out in June 2022. Timings were adjusted for this survey, resulting in slightly higher responses (8 responses). SRPP approval was obtained for both surveys and in each case only those students approved by SRPP were contacted and invited to take part.

The response numbers from both surveys are too small to allow meaningful statistical or thematic analysis. While some of the survey data are numerical in nature, the discussion of these results has therefore been restricted to a qualitative assessment of the student survey data rather than a detailed numerical analysis. However, it has been possible to carry out more quantitative analysis on the analytics data.

Results

Quantitative results 1: Overall engagement

Overall engagement with the Learning Log was assessed using the website analytics tools built in to the VLE. The **View all participation** tool was used to download a list of participants and the number of posts made by each. The data were filtered to exclude postings from the module team, tutors and other staff leaving only student posts, and then aggregated to produce the distribution of posting behaviour shown in **Figure 2**. Of the 282 students who originally started the 2022J presentation of the module in October 2022, 235 were still registered at the time of TMA03 in April 2023. Of these 235 students, the largest number (112) made between 1 and 5 posts. 8 students made 20 or more posts, and 39 students had made no posts at all.

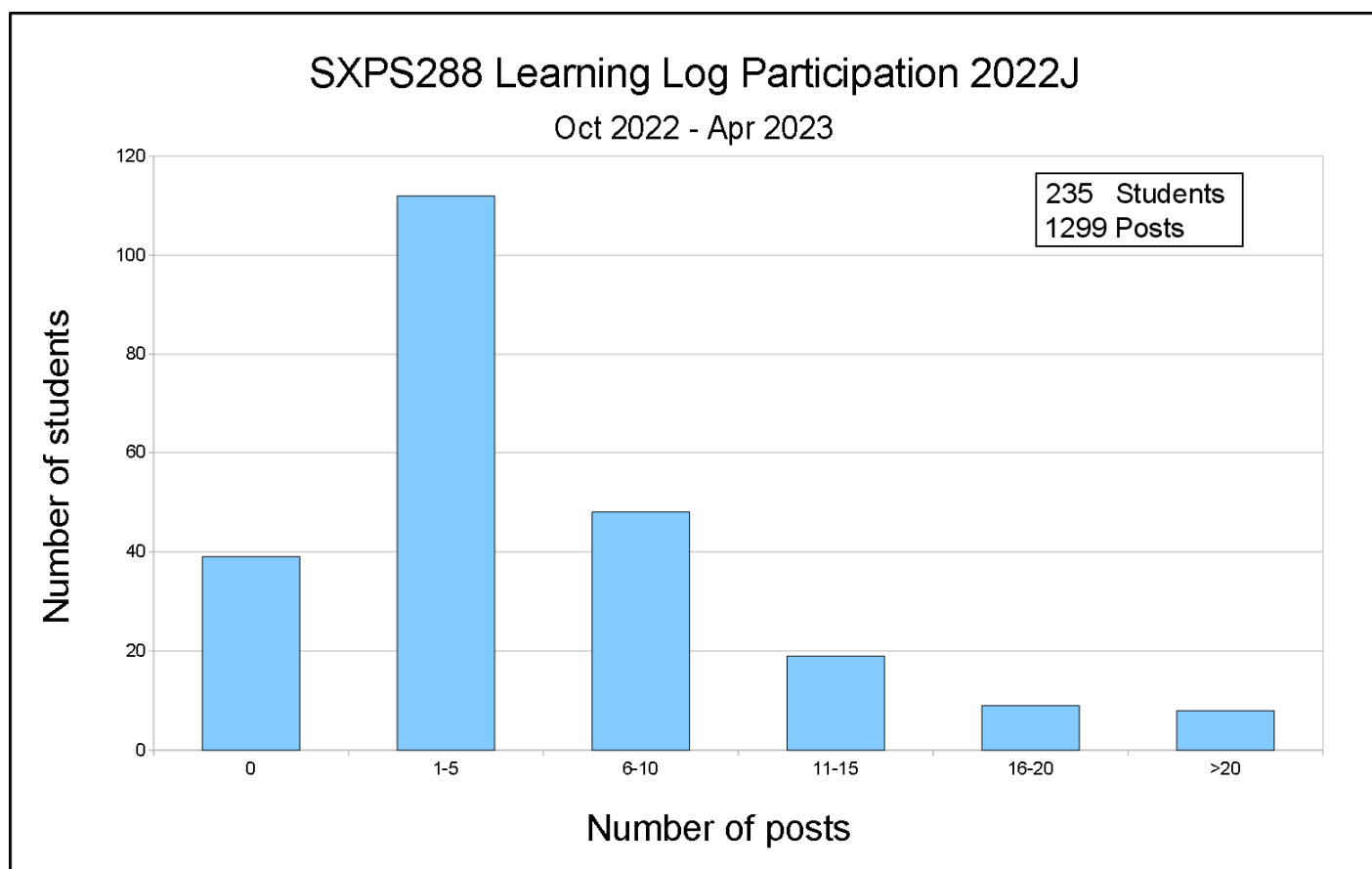


Figure 2: Distribution of posts to Learning Logs made by students on the 2022J presentation between module start in October 2022 and TMA03 in April 2023. A total of 1299 posts were made by the 235 students still registered on the module in April 2023. The largest students (112) made between 1 and 5 posts. 8 students made 20 or more posts, and 39 students had made no posts at all.

Quantitative results 2: Timing of engagement

To understand when students made use of the Learning Logs, the PowerBI VLE tool was used to analyse student interactions with the Learning Logs as a function of study week. **Figure 3** shows the number of interactions (as a percentage of registered students) for each of the first four presentations of SXPS288 (2019J to 2022J). In this tool, the horizontal scale is labelled with calendar weeks from the start of each presentation. These vary slightly from the module study weeks as calendar weeks do not take account of the Christmas and Easter breaks (for example, TMA02 takes place in module Study Week 18, but since this is after the two-week Christmas break it shows in the PowerBI charts as calendar week 20). The EMA takes place in Study Week 32 (calendar week 35) and the calendar week timing of TMA03 varies slightly depending on the date of Easter each year. The figure shows that interactions with the Learning Log peak in each assessment week and in the week of the final EMA. It should be noted that this tool records visits to the Learning Log section of the module website, rather than numbers of posts. In this way, a student returning to the Log in an assessment week to review a post made earlier would be recorded as a separate visit, as would a return visit made to edit an earlier post.

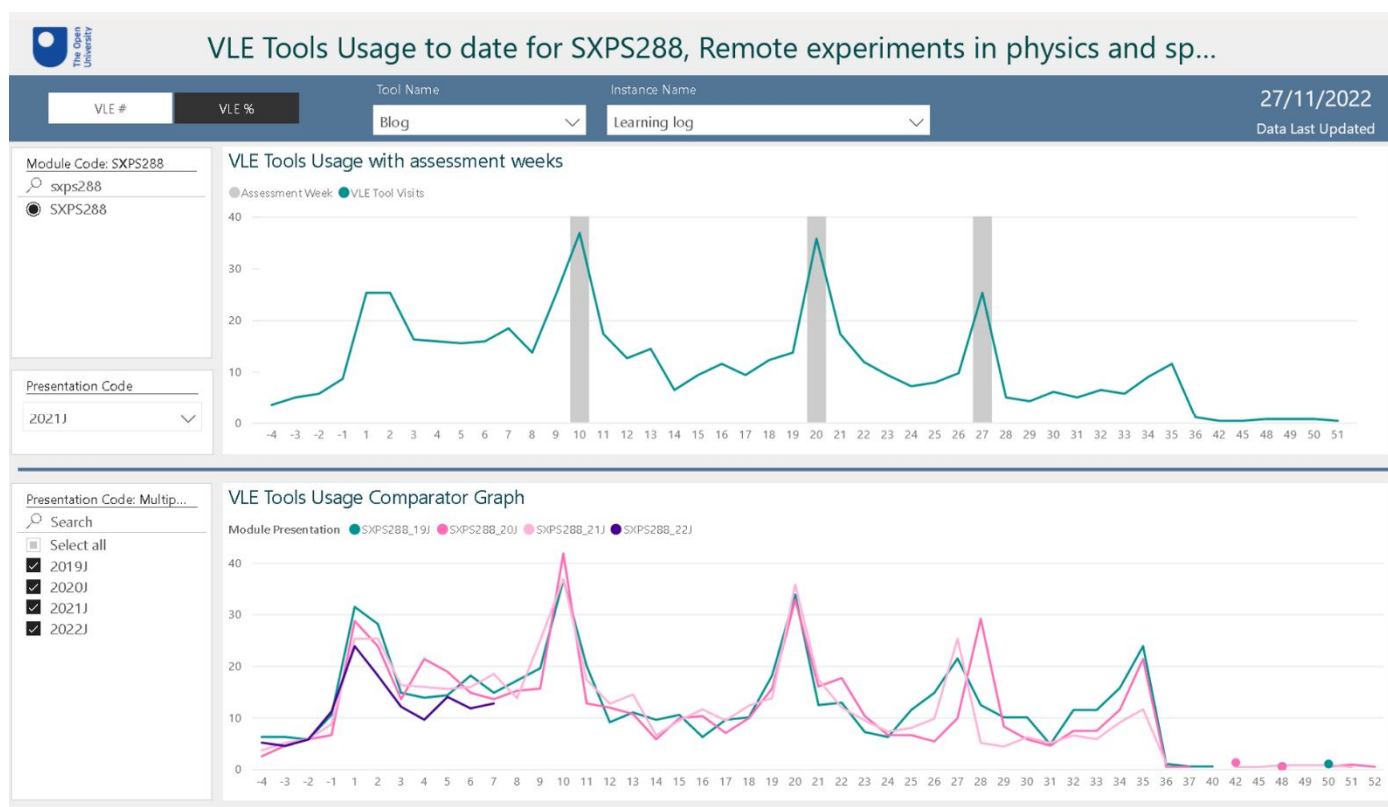


Figure 3: Learning Log usage as a function of study week. The upper chart shows the number of visits made to the Learning Log tool each week for the 2021J presentation, as a percentage of the number of registered students. The grey bars indicate the assessment weeks (with the EMA submission in week 35). The lower chart shows data from the first four presentations of SXPS288 from 2019J to 2022J. Note that the horizontal scale is labelled with calendar weeks from the start of each presentation and these vary slightly from module study weeks. The calendar week timings of TMA03 vary slightly between presentations as a result of the movable date of Easter each year.

Quantitative results 3: Distribution of posts by content

Posts were also analysed according to content. The Learning Log includes a tagging facility which allows students to label each post with one or more tags indicating the nature of the content. This can be used later for searching and categorising. These tags were analysed in terms of the frequency of posts in each category to understand the most frequent types of postings made, as categorised by the students.

A total of 500 unique tags were created to label the 1299 posts. Each tag was typically used to label multiple posts, with the most frequently used tags being "sxps288-19j" (used 1364 times) followed by "python" (460). Some posts were labelled with multiple tags while others had only one or two, and some posts had no tags attached. Many tags were equivalent, being only variations in spelling or capitalisation: for example the tags "python" (460) and "Python" (89) were treated by the system as distinct tags (as was the mis-spelling "pyhton" (2)). These variants were combined for the analysis. To further simplify the analysis, tags were combined into eight overall functional groups as shown in **Table 1**. For example, the tags "Python", "Matplotlib", "Astropy", "Python programming" and other programming-related tags were combined into a single category, as were groupings of tags relating to Skills Development, Learning Outcomes, Assessment, and the other categories listed in Table 2. After posts labelled with the module code, the most common tags related to the module Learning Outcomes, to the experimental projects, and to skills development and the skills weeks.

Category	Description	Number of tags	Tags as percentage of posts
Module code	Posts labelled with the module code SXPS288	1971	66%
Learning Outcomes	Tags relating to named Learning Outcomes (KU1 etc.)	1834	61%
Experiments	Posts relating to specific aspects of the experiments	1438	48%
Skills Development	Skills development or skills weeks	1150	38%
Python programming	Python programming and packages	819	27%
Evidence / Reference	Reference information (e.g. evidence for jobs)	223	7%
Assessment	Posts relating to the assignments (TMAs) and EMA	120	4%
Other	Other tags	176	6%

Table 1: Learning Log posts by category, as labelled by students using tags. After posts simply labelled with the module code, the most common tag was to identify posts relating to the module learning outcomes. These are followed by posts relating to the experimental investigations, skills development and the skills weeks, and Python programming. Posts containing information for reference included those identifying items of evidence for use (e.g.) in future job applications. Some posts were labelled with multiple tags, whereas some posts had no tags. The percentages shown are relative to the total number of posts (2999) and reflect that some posts had multiple tags.

Qualitative results 1: SEaM feedback

At the end of each presentation of a module, students are invited to complete the Student Experience on a Module (SEaM) survey. This optional survey is offered across all modules and responses are anonymised before being collated and passed to module teams. The survey consists of a number of questions answered on a 1-5 scale, together with three free-text questions asking about difficulties and suggestions for improvement; comments on teaching, assessment and learning; and any other comments on the study experience on the module. The questions are generic and do not include questions about specific aspects of individual modules. While the survey for SXPS288 does not contain any questions specifically relating to the use of Learning Logs, some students did mention Learning Logs in their free-text responses.

Of the 41 responses to the 2021J survey, four explicitly mentioned skills development or the Learning Logs and one response related to both. Three of the four responses mentioning skills development were positive (mentioning usefulness in applying for jobs or placements) and one negative (commenting that skills development was not relevant to someone retired and without career plans). Both replies relating to Learning Logs were positive, one noting usefulness in applying for jobs or placements and one commenting that the Logs would have been useful on other modules as well.

Qualitative results 2: Survey responses

Following SRPP approval, 74 Students from the 2019J presentation and 112 from the 2020J presentation were invited to participate in the JISC survey in March 2021 with a reminder sent in May 2021. From these 186 students, a total of only 6 responses were received.

A second survey was held for students from the 2021J presentation. To address the low response rate, the timings were adjusted with an initial invitation sent in February 2022 and the survey held open until June 2023. From 235 students initially registered on the 2021J presentation, a total of 163 completed the module by submitting the EMA. Of these 163 students, 97 were selected by SRPP and invited to participate in the survey, and from these invitations, 8 responses were received.

Each survey consisted of 18 questions, as shown in **Table 2**. Question types included free text, Yes/No, selection from a list of options, and five-point scale (e.g. "Not useful" to "Very useful"). To increase the statistics, results from both rounds of surveys (2021 and 2022) were combined for analysis (a total of 14 responses).

Question	Question Type
1. Did you think the purpose of the Learning Log (e.g. how and when to use it) was made clear in the module materials ?	5-point scale
2. If you felt its purpose was not clear, could you suggest any ways this could be improved ?	Free text
3. Did you find the Learning Logs easy to use ?	5-point scale
4. How often do you think you visited the Learning Log tab ?	5-point scale
5. Did you make any posts other than those directed by the module ?	Yes / No
6. How did you use Learning Logs ? Please select all that apply	List
7. Did you adapt / change how you used the Learning Logs as you worked through the module ? 7a: If you answered yes above, can you briefly explain how you changed your use of Learning Logs ?	Yes / No Free text
8. How comfortable do you feel about sharing your Learning Log posts with your tutor ?	5-point scale
9. Have you revisited any of your posts since you made them ? (Either during the module or after) 9a: If yes, please indicate the reasons for revisiting (select all that apply): 9b: If you selected Other, please describe here:	Yes / No List Free text
10. Do you think the Learning Log was a useful tool during your study ? 10 a: If you think the Learning logs were useful, can you briefly explain which aspect or aspects you found most useful ?	5-point scale Free text
11. Did you find the opportunity to use your learning log to evaluate progress with the module learning outcomes helpful ?	5-point scale
12. Did you make use of the export function, to collate and keep a document of selected posts ?	Yes / No / Not aware
13. If you haven't already, do you plan to export a copy of your Learning Log posts ?	Yes / No
14. Would you like the Learning Log tool to be available in other modules ?	Yes / No
15. Would you like to be able to share Learning Logs with fellow students ?	Yes / No / No opinion
16. Would you encourage a friend or fellow student to use the Learning Log if they didn't seem enthusiastic ?	Yes / No
17. Have you used something similar to Learning Logs before ? 17a: If so, did it offer any helpful functionality which you feel is missing from the Learning Log tool in SXPS288 ?	Yes / No Free text
18. Is there anything else that you feel would improve the use of Learning Logs in SXPS288 ?	Free text

Table 2: Survey questions for the JISC targeted survey.

The combined responses to the survey questions were as follows:

Question 1: a total of 8 responses felt that the purpose of the Learning Logs was made Reasonably Clear or Very Clear, with 4 responses for Slightly unclear or Very unclear and 2 No opinion.

Question 2: the four responses given for finding the purpose unclear three felt that more examples of how to use the Logs were needed, and two requested more guidance on use of the Logs in relation to TMAs. One respondent felt the Logs were not at all helpful, and one respondent was unaware that the Logs were persistent and independent of any particular module.

Question 3: 11 respondents found the Learning Logs Very Easy or Reasonably Easy to use, 2 Slightly difficult and only 1 Very difficult.

Question 4: 6 respondents said they used the Logs a few times a month, 1 only when reminded by the module materials, and 7 stated that they only used the Logs around TMA times.

Question 5: 7 Students stated Yes, that they made posts other than those directed by the module. The other 7 replies stated No.

Question 6: The most common responses to how the Logs were used were: Skills logging (8), Python programming (7), storing results such as data, plots, images and screenshots (6), No students reported using the Logs for career development or for reference for future modules.

Question 7: 5 respondents stated Yes, that they did adapt or change how they used the Logs, and 9 responded No. Of those who did change their use (Q7a) one started using the Logs halfway through the module, and one started using their Log as a notebook to store reminders and useful information.

Question 8: 12 of the respondents stated that they were comfortable sharing Log posts with their tutor, with 2 selecting No opinion. There were no responses stating that they were uncomfortable or preferred to keep them private.

Question 9: 12 respondents stated that they had revisited posts, and only 2 that they had not. The main reason given (Q9a) was for use in a TMA or EMA question, either for information when answering a question (5) or for direct inclusion in an answer (12). 4 respondents also revisited posts to edit or update them, and 2 used posts for reference in a later activity.

Question 10: 5 replies stated that the Learning Logs were Very useful or Slightly Useful, 6 Not very useful and 3 Not at all useful. Of those who found the Logs useful (Q10a), reasons given were for saving notes and for keeping track of learning outcomes.

Question 11: 4 respondents felt that using the Logs to think about progress with learning outcomes was helpful, 7 found it unhelpful, with 3 having no opinion.

Question 12: None of the respondents had used the export function. 6 respondents answered No, and 8 stated that they were not aware of the export function.

Question 13: Only 3 replies stated that they intended to export a copy of their Log. The other 9 stated that they did not.

Question 14: 50% of the responses (7) indicated Yes, that they would like the Learning Log to be available in other modules. The other 50% (7) replied No.

Question 15: Only 2 of the respondents indicated that Yes, they would be happy to share posts with fellow students, with 5 stating No, and 7 No opinion.

Question 16: 5 replies indicated Yes, that they would encourage a fellow student to use the Learning Log, with 9 replying No..

Question 17: 4 replies stated Yes, that they had used something similar before, with 10 replying No. Additional functionality requested included: links, hypertext, latex; cross-module access; and improved formatting. Two replies additionally noted similarities with other tools (FutureYou and SM123). One reply suggested a hybrid of OpenStudio and the Learning Logs.

Question 18: Suggestions for improvement included: improved guidance and more examples (3); additional facilities / ease of editing (3); and alignment with other tools (e.g. OpenStudio) (2). While most replies were positive / constructive, 2 used this question as an opportunity to express general dissatisfaction with the Learning Logs.

Discussion

The overall engagement statistics show that 83% of the 235 students enrolled on the 2021J presentation at the time of analysis had engaged with the Learning Logs to some extent (having made at least one post). However, almost half of the students (48%) had made only small numbers of posts (between 1 and 5 posts), with only 35% making more than 5 posts. A very small number (7%) made extensive use of the Logs, with over 16 posts.

Given that each of the three Tutor Marked Assessments (TMAs) included a question relating to the Learning Logs, this suggests that the majority of students engaged with the Learning Logs only to the minimum extent required to complete the assessments. Several of the assessment questions ask students to provide evidence of having demonstrated individual Learning Outcomes, explicitly identifying them with the codes given in the module materials and this is likely to have influenced the large numbers of posts tagged with these codes (61%). These observations are consistent with the Power BI data on the timing of interactions with the Logs, which show that visits to the Learning Logs peaked strongly during the assessment weeks. This lends weight to, but does not confirm, the hypothesis that linking use of the Logs to assessments encourages engagement. In the absence of a control group (e.g. a similar module where use of Logs was not assessed) this is difficult to establish definitively, but could perhaps be investigated further by varying the assessment strategy on future presentations of the module. The two metrics studied here (participation and timing) represent overall statistical information on interactions with the Logs. A more detailed analysis of the posting behaviour of individual students would be required to establish a stronger correlation between Log use and assessment (e.g. to establish how many students made posts solely when prompted to do so by the assessments).

Given that the Learning Logs were linked to assessment, it is possible that some of the 39 (17%) of students who had not engaged with the Logs at all would have been passive withdrawals (i.e. remaining registered on the module but without submitting one or more assignments). Further detailed analysis of the submission records of these 39 students would be required to establish this.

The breakdown of the content of posts based on student tags (Table 1) indicates that students were generally using Learning Log posts for the purposes intended by the module, in particular those relating to the assessment questions (tracking Learning Outcomes, skills development and making notes relating to the experimental investigations and Python programming).

The survey results also support the hypothesis that engagement with the Logs was driven by assessment. In response to Questions 4 and 5, 7 of the 14 respondents (50%) stated that they used the Logs only around the times of the TMAs and 7 (50%) also stated that they did not make any posts other than those directed by the module materials. This is consistent with the 50% of participants who made only small numbers of posts (between 1 and 5 posts).

The figure of 50% with minimal engagement is also reflected in the number of responses indicating whether they found the Logs helpful / useful and/or that they would like the Logs to be available on other modules (Questions 10, 11, 14). In each case, there were equal or greater numbers of negative or neutral responses than positive responses.

Several of the survey questions related to ease of use of the Learning Logs (Questions 1, 2, 3) and several to features and functionality (Questions 12, 17, 18). The answers to these indicate that students would appreciate more guidance and instructions on the purpose and use of the Learning Logs. The feature requests related almost exclusively to features that are in fact available in the Learning Log tool (e.g. LaTeX editing, hypertext linking, formatting, use on mobile devices, availability across modules). Since the Learning Logs are based on forum technology, this lack of familiarity with the capabilities of the Logs may indicate a lack of experience or of engagement with the more regular module forums. A follow-up study cross-referencing engagement with module forums against engagement with the Logs would help to clarify this.

Our study does have some limitations. Firstly, the numbers of responses to the SEaM survey and to the targeted JISC survey were too low to allow any statistical or thematic analysis. Also, the low response meant that it was not possible to hold a focus group as was originally intended. Sampling will always be limited as SXPS288 is a low population module but numbers could perhaps be improved by combining survey results from several presentations, as was done here with the 2021 and 2022 surveys.

Secondly, the tools used to track engagement with the Learning Logs use slightly different metrics. The VLE user participation analytics report numbers of posts made, whereas the PowerBI VLE Tool Usage tool reports numbers of *visits* to the Learning Log, including return visits as well as new posts. Separating these would help to better understand the extent to which the high numbers of visits during the assessment weeks represent students returning to review posts made earlier, or whether students made posts only when prompted to do so by the assessment questions. While time-consuming, this could be achieved by making a detailed analysis of posts made by date of posting.

Finally, there is the possibility of selection bias. Given the small number of responses, there is a risk that only those with strongly held views on the Learning Logs (either positive or negative) chose to respond to the invitation to take part in the survey, making the responses not representative of the student body as a whole. This could perhaps be circumvented to a certain extent by collecting additional feedback during the presentation (e.g. informal polls in tutorials).

Conclusions (Findings and Impact)

Responses to the targeted survey were limited in number, meaning that they could be used for qualitative analysis only. Means to increase the response rate for future surveys should be considered. These could include adjustment of survey timings and wording of invitation letters.

Website analytics and PowerBI provided powerful tools for generating statistical information on Learning Log usage and engagement. However, some of the tools used different metrics and were hosted in different locations. Tighter integration between analytics tools would make cross-referencing and correlation between, for example, Learning Log use and engagement with assessments, easier.

Although the most students did engage with the Learning Logs to the extent of making some posts, the majority of these made only the minimum number of posts required for the assessments. The main reasons given for non-engagement or negative perception of the Logs related to students without career aspirations who found the Logs not relevant to their situation. More materials or case studies relating to the use of the Learning Logs as a general purpose personal reference and recording tool, outside of use for assessment or skills development tracking, could help encourage wider takeup among this group.

A small number of students made extensive and creative use of the Learning Logs. With their permission and suitably anonymised, selected examples of these posts could be made available as case studies for future presentations.

The concentration of Learning Log interactions in the assessment weeks indicates either that participation was largely assessment-driven or that students were making return visits to refer to previous Log entries in those weeks. Further analysis is required to establish which.

While the module materials, specifically the Skills Weeks, include detailed instructions and information on the purpose and use of the Learning Logs, many students asked for more instruction, guidance and examples. Additional examples provided in the module materials would help to address this concern, and instructions given in different formats (for example video walkthroughs) to supplement written materials.

Within SPS, Learning Logs are currently integrated into the module materials only on SXPS288, with other tools (FutureYou, OpenStudio, radar diagrams) used on other modules in the pathway. While the Learning Logs are available to students across modules, few students were aware of this and their use is not promulgated in other modules. Tighter integration between the various personal development tools, and more consistency across modules, should be considered.

Anticipated impacts: The primary finding from the student survey was that students requested additional guidance and examples on the use of the logs. While the module currently does provide extensive written instruction, additional guidance in the form of case studies and video screencasts illustrating the use of the Logs could be added. We anticipate that this would give students more confidence in the use and purposes of the Learning Logs and hence have a positive impact on student engagement with this aspect of the module. These findings and associated recommendations will be communicated to the SXPS288 module team and SPS board of studies as appropriate for consideration on future presentations of SXPS288 and as part of any ongoing module maintenance (e.g. mid-life review) and also for consideration as part of the wider strategic review of the embedding of employability and skills development in the physical sciences curriculum.

Compliance with ethical standards and data protection

SRPP - All surveys were carried out in accordance with the ethical standards and requirements of the Student Research Policy Panel (SRPP). Approval from the Student Research Project Panel was obtained according to the Open University's code of practice and procedures before embarking on this project. (SRPP Application number 2021/1781).

Ethical review - The research was carried out in accordance with the ethical standards and requirements of the Human Resources Ethics Committee (HREC). An ethical review was obtained according to the Open University's code of practice and procedures before embarking on this project. (Reference number: HREC/3883/Cayless).

Data Protection Impact Assessment and Compliance Check - All survey responses were anonymised at source, and data stored and handled in accordance with the Open University guidelines and requirements on Information Governance. A Data Protection Impact Assessment/Compliance Check was obtained according to the Open University's code of practice and procedures before embarking on this project. (DPIA registration number AN_ATC 21.01.21).

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#

Tables and Table Legends

Category	Description	Number of tags	Tags as percentage of posts
Module code	Posts labelled with the module code SXPS288	1971	66%
Learning Outcomes	Tags relating to named Learning Outcomes (KU1 etc.)	1834	61%
Experiments	Posts relating to specific aspects of the experiments	1438	48%
Skills Development	Skills development or skills weeks	1150	38%
Python programming	Python programming and packages	819	27%
Evidence / Reference	Reference information (e.g. evidence for jobs)	223	7%
Assessment	Posts relating to the assignments (TMAs) and EMA	120	4%
Other	Other tags	176	6%

Table 1: Learning Log posts by category, as labelled by students using tags. After posts simply labelled with the module code, the most common tag was to identify posts relating to the module learning outcomes. These are followed by posts relating to the experimental investigations, skills development and the skills weeks, and Python programming. Posts containing information for reference included those identifying items of evidence for use (e.g.) in future job applications. Some posts were labelled with multiple tags, whereas some posts had no tags. The percentages shown are relative to the total number of posts (2999) and reflect that some posts had multiple tags.

Question	Question Type
1. Did you think the purpose of the Learning Log (e.g. how and when to use it) was made clear in the module materials ?	5-point scale
2. If you felt its purpose was not clear, could you suggest any ways this could be improved ?	Free text
3. Did you find the Learning Logs easy to use ?	5-point scale
4. How often do you think you visited the Learning Log tab ?	5-point scale
5. Did you make any posts other than those directed by the module ?	Yes / No
6. How did you use Learning Logs ? Please select all that apply	List
7. Did you adapt / change how you used the Learning Logs as you worked through the module ? 7a: If you answered yes above, can you briefly explain how you changed your use of Learning Logs ?	Yes / No Free text
8. How comfortable do you feel about sharing your Learning Log posts with your tutor ?	5-point scale
9. Have you revisited any of your posts since you made them ? (Either during the module or after) 9a: If yes, please indicate the reasons for revisiting (select all that apply): 9b: If you selected Other, please describe here:	Yes / No List Free text
10. Do you think the Learning Log was a useful tool during your study ? 10 a: If you think the Learning logs were useful, can you briefly explain which aspect or aspects you found most useful ?	5-point scale Free text
11. Did you find the opportunity to use your learning log to evaluate progress with the module learning outcomes helpful ?	5-point scale
12. Did you make use of the export function, to collate and keep a document of selected posts ?	Yes / No / Not aware
13. If you haven't already, do you plan to export a copy of your Learning Log posts ?	Yes / No
14. Would you like the Learning Log tool to be available in other modules ?	Yes / No
15. Would you like to be able to share Learning Logs with fellow students ?	Yes / No / No opinion
16. Would you encourage a friend or fellow student to use the Learning Log if they didn't seem enthusiastic ?	Yes / No
17. Have you used something similar to Learning Logs before ? 17a: If so, did it offer any helpful functionality which you feel is missing from the Learning Log tool in SXPS288 ?	Yes / No Free text
18. Is there anything else that you feel would improve the use of Learning Logs in SXPS288 ?	Free text

Table 2: Survey questions for the JISC targeted survey.

Figures and Figure Legends

KS2 - Use computer programming and scripting to organise and process experimental data and to present results.

Attachments:
[BokehTEST.ipynb](#)
[UsingBokeh.ipynb](#)

Wednesday, 30 Nov 2022, 16:17

Relevance to work done so far

Relevant to work done so far.

SJ Comments

Very relevant here. Learning how Python works, how the various packages can be implemented, and imagining ways in which this can assist in sorting data/results has been very helpful

Progress
 Partial

Evidence provided
 Evidence of Python Worksheets (This will be added to as and when I complete the ARROW work)

Permalink Edit Delete Add your comment

Annotation altitude-temperature plot - shaded areas in matplotlib

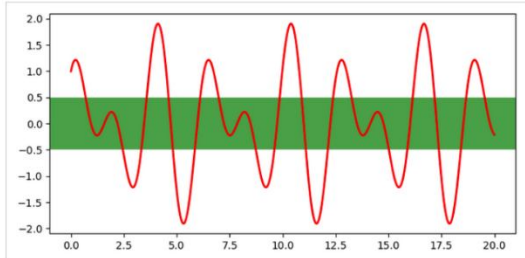
Tuesday, 4 Apr 2023, 11:37

For TMA03, Q2 I wanted to find a way to use Matplotlib to shade areas to replicate figures that resemble Figure 4.7 (which I think is neat).

Example

```
import numpy as np
import matplotlib.pyplot as plt
plt.rcParams["figure.figsize"] = [7.00, 3.50]
plt.rcParams["figure.autolayout"] = True
x = np.linspace(0, 20, 500)
y = np.cos(3*x) + np.sin(2*x)
plt.plot(x, y, c='red', lw=2)
y1 = 0.5
y2 = -0.5
plt.axhspan(y1, y2, color='green', alpha=0.75, lw=0)
plt.show()
```

Output




Consulting the official matplotlib documentation helped me create the plots:

Spectacular Spectroscopic Space Substance Scrutiny

Monday, 3 Apr 2023, 08:44

I was thrilled and deeply grateful to have been granted the opportunity to work with the Ptolemy instrument, developed for the Rosetta mission and flown on actual space missions. Conducting spectroscopy using this thermal valve was a wonderful experience that allowed me to hone my long-desired skill in this field. In particular, performing infrared spectroscopy with analogue atmospheres to identify different gases was a challenging and engaging puzzle that I thoroughly enjoyed. While simple, the physics behind infrared spectroscopy is truly remarkable, especially the fact that bond vibrations are quantized. This allows for the identification of specific gases or materials based on their absorption or emission spectra as energy goes into stretching or bending bonds (and is released as the bonds settle down).



Tags: [spectroscopy](#), [infrared](#), [teamwork](#), [space science](#), [remote working](#), [atmospheres](#), [Mars](#)

Permalink Edit Delete Add your comment

matplotlib.pyplot.axhspan

```
matplotlib.pyplot.axhspan(ymin, ymax, xmin=0, xmax=1, **kwargs)
```

source

Add a horizontal span (rectangle) across the axis.

Draw a horizontal span (rectangle) from `ymin` to `ymax`. With the default values of `xmin = 0` and `xmax = 1`, this always spans the x-range, regardless of the `xlim` settings, even if you change them, e.g. with the `set_xlim()` command. That is, the horizontal extent is in axes coords: 0=left, 0.5=middle, 1.0=right but the `y` location is in data coordinates.

Parameters:

- ymin**: float
Lower limit of the horizontal span in data units.
- ymax**: float
Upper limit of the horizontal span in data units.
- xmin**: float, optional, default: 0
Lower limit of the vertical span in axes (relative 0-1) units.
- xmax**: float, optional, default: 1
Upper limit of the vertical span in axes (relative 0-1) units.

https://matplotlib.org/3.1.1/api/_as_gen/matplotlib.pyplot.axhspan.html accessed 4 Apr 2023

Figure 1: Examples of typical Learning Log posts (edited to remove identifying features). a) Text-based post detailing progress towards a named module learning outcome (KS2). Evidence is attached to the post in the form of two Python notebooks (.ipynb files). b) Post detailing use of the Matplotlib Python library (part of Skills Week with embedded program code excerpts and output. This post contains an excerpt from the official Matplotlib documentation with link. c) Post detailing participation in the Spectroscopy project with extract from analysis spreadsheet and graphical output. This post shows how entries can be categorised using tags, allowing later searching and retrieval of information. Students can return to Learning Log entries at a later date to refer to information and also to update the content and add tags or attachments.

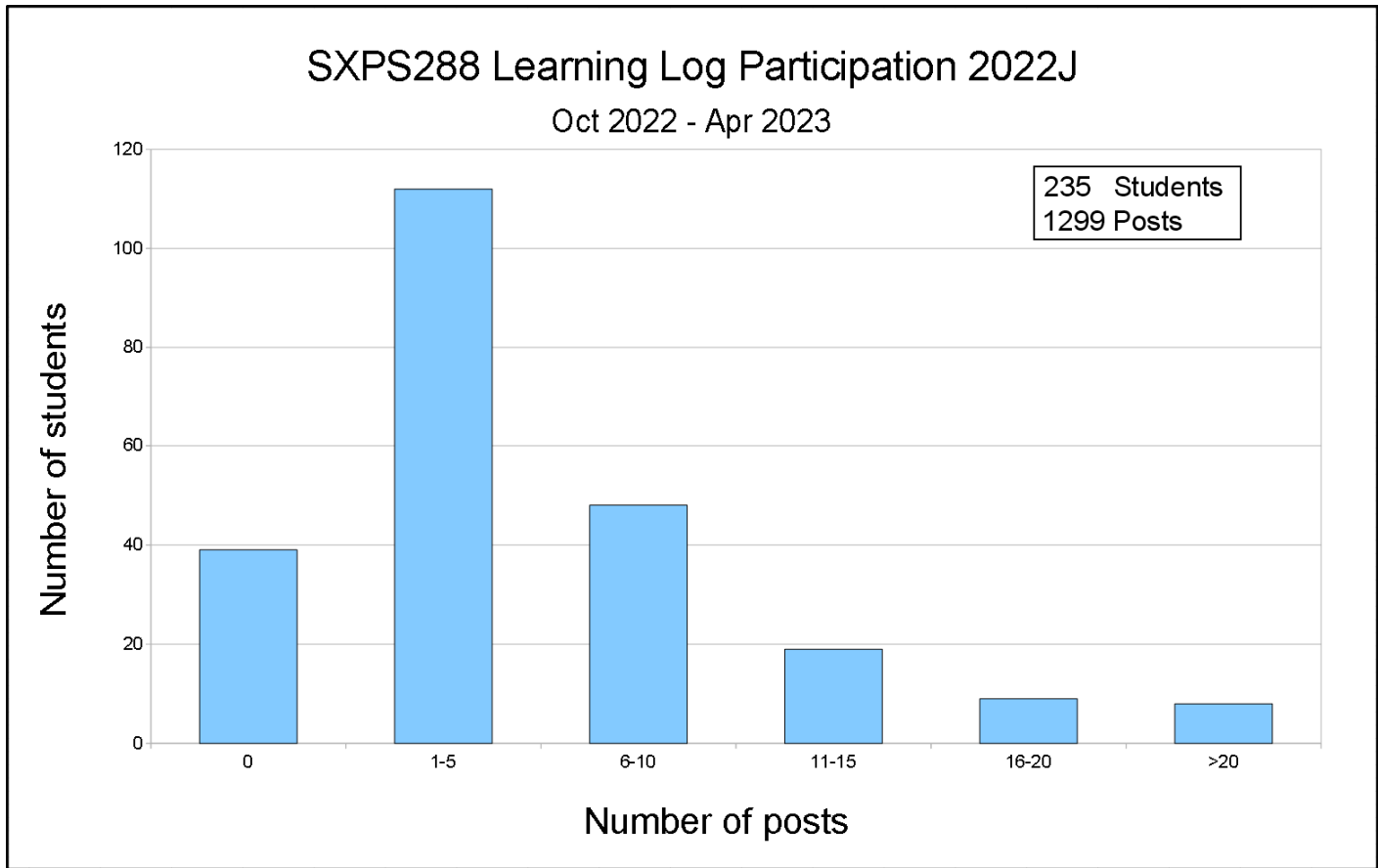


Figure 2: Distribution of posts to Learning Logs made by students on the 2022J presentation between module start in October 2022 and TMA03 in April 2023. A total of 1299 posts were made by the 235 students still registered on the module in April 2023. The largest students (112) made between 1 and 5 posts. 8 students made 20 or more posts, and 39 students had made no posts at all.

