

Dear Dr Glessmer,

Thankyou for your positive and rapid handling of our manuscript. As requested, please find below the list of individual reviewer comments and author responses.

If you have any further comments or requirements, please do not hesitate to get in touch.

Kind Regards

Adam

Reviewer 1:

Dear Jamie,

The authors would like to express their gratitude for your rapid, detailed, and constructive review of our manuscript. We were pleased to hear that you feel this form of student learning enhancement would be beneficial during the current situation. Below, we provide individual responses to each of the general points you have raised. We then provide responses to each of the individual comments you have provided in the PDF file.

- 1) The introduction is well written, gives the rationale, but probably a paragraph needs to be added on other virtual efforts to complement traditional teaching resources, see annotated PDF.**

We have now added further information on the variety of complementary teaching resources applied to Geoscience and associated fields, including suitable references.

- 2) The paper aim/objectives also need to be clearer and in one place, see notes on PDF. I also note different ones are presented as discussion points (4) in the discussion, these seem clearer to me than then ones you gave in the introduction? Worth a rejig I think.**

The end of the Introduction section has been re-structured to provide further clarification on the aims of the project. We have also added a sentence to the beginning of the discussion to further link our aims to the themes of the discussion. Although these to do not tally directly, we feel that the themes we have selected can now be linked to one or more of the aims of the project more easily.

- 3) L180-196 – you describe in the text how you generate the resource in Thinglink, I’m wondering if a summary table/workflow may be of use/interest to the reader? I think that would be more useful than Fig3 which is self-explanatory.

The authors agree that this will be useful, and our intention is to provide a more detailed account of the methods we used in a further publication. This study is intended as a proof-of-concept, which demonstrates the validity of the approach, using a prototype resource which does not necessarily reflect the full potential of a Thinglink-based resource in terms of scale.

- 4) For section 4 – the questionnaire results are already summarised as a multiple pie chart figure, I would try and condense the descriptive text down on this somewhat.

We acknowledge that this section was quite wordy for its content and is best shown via the summary figure and table. We have drastically reduced the overall size of this section, as suggested.

- 5) In the discussion, useful to discuss the overarching themes, so may want to adjust aims to reflect these?

See response to point 2 above.

- 6) Conclusions are good but seems to be missing a paragraph on study limitations?

The conclusions have been updated to include direct references to the limitations of the project, as well as the steps which will be taken to address these as the project develops further.

- 7) Fig1 scales need to be bigger (I cant read them)

The figure scales have been adjusted as requested.

Minor comments:

Line 8: Changed as suggested

Line 35: References added as suggested

Line 46-48: This section has now been expanded to include a number of references, covering a range of methods and approaches towards virtualisation.

Line 54-56: The end of the introduction has been re-structured to provide clarification on the aims of the project, as suggested.

Line 64-67: See previous comment

Line 69-70: See previous comment.

Line 71: This has been changed to “Project Background and Context” to clarify that this entire section is intended to provide an overall background on the subject, the problem, available resources, and the Thinglink platform.

Line 85: Changed as suggested

Line 156: Changed as suggested

Line 169: Changed as suggested

Line 175-176: This sentence has been altered to reflect the authors experiences.

Line 179: Adobe and Thinglink version added as suggested.

Line 183: ‘And’ is correct here.

Line 188: Changed as suggested

Line 203: Reference added as suggested

Line 216: This information has now been added to this section.

Line 231: We acknowledge and accept your concerns regarding the distribution of the data. In this case, this study is intended to act as a preliminary indication of potential demand and a proof-of-concept, based on a simple prototype resource. We feel that it has been successful in this regard, and we now intend to develop and disseminate a significantly expanded resource which will provide greatly enhanced interactivity and content. Our intention is to gather more rigorous feedback from a much larger cohort, potentially expanding to external institutions with this new resource, the creation of which has been justified by this study.

Line 298-299: The aims of the study have been adjusted and a number of minor changes have been made at the beginning of the discussion to strengthen the links between the aims of the project and the themes employed in the discussion. For example, Theme 4 (Continued Resource Development) contributes directly to Aim 4.

Line 307-308: Further clarification has been added to this section on the potential costs associated with this form of support.

Line 316: Sentence now reads *“...confusion with the use of both question mark and magnifying glass symbols...”*

Line 348: This section has been updated to include a number of new references.

Line 364: This section heading has been changed to “Continued Resource Development” to clarify that this refers to the development of the resource itself.

Line 416: Sentence now reads *“...aiming to cover the key lithologies and textures that might be required for a PMG-based course in higher or further education.”*

Reviewer 2:

Dear Edward,

The authors are extremely grateful for your considered thoughts and suggestions on our manuscript. We were particularly pleased to hear that this form of resource would have been helpful for you during your undergraduate education, as this is a commonly-occurring opinion expressed in the feedback. Below, we provide individual responses to each of the points you have raised:

1) Introduction Are there any more references that you add into the first paragraph to back up your claims of the use of thin section petrography? I feel there should be particular references to back up the SEM (L.35) and optical microscopy (L.37) comparison.

Three references have been added and this section has been slightly reworded to provide clarification. The section now reads:

“Of these, the latter is dependent upon expensive, specialist facilities, which introduce some limitations on its potential for teaching due to purchase and running costs, as well as availability of instrumentation for individual learning, requiring resource management and learning resource creation to mitigate accessibility restrictions and remove barriers to success (e.g. Shin, 2003; Childers & Jones, 2015). By contrast, optical microscopy requires comparatively cheap facilities (polarising light microscopes), and it is common for individual learners in large group classes to be able to undertake independent study with their own microscope (e.g. Penn et al., 2007).”

2) Section 3.2 – Collection of Feedback Could you clarify the age group of the students? Are these A-Level, Undergrad, Postgrad students or a mix?

This section has been altered to provide clarification on the nature of the participants, and now reads as follows:

“The prototype learning resource was disseminated to the potential users via a link provided in an e-mail invitation. The provided link gave potential users (including undergraduate and postgraduate students enrolled on Geoscience-based degree programmes, as well as university academic staff members) direct access to the learning resource via personal computer, laptop, or tablet, without any requirement for payment, licence, or registration.”

3) Section 3.2 – Collection of Feedback Is there any possibility to get some more feedback from students? Even though this is a resource that has been designed primarily for the use of students, a majority of the feedback you gained was from staff members. While I understand staff gave more in depth comments, would it not be more important to gain feedback from the main target audience of the resource? I feel this would also make for more valid statistical comparisons between the student and staff feedback made throughout Section 4.

We acknowledge and accept your concerns regarding the distribution of the data. In this case, this study is intended to act as a preliminary indication of potential demand and a proof-of-concept, based on a simple prototype resource. We feel that it has been successful in this regard, and we now intend to develop and disseminate a significantly expanded resource which will provide greatly enhanced interactivity and content. Our intention is to gather more rigorous feedback from a much larger cohort, potentially expanding to external institutions with this new resource, the creation of which has been justified by this study.

4) Section 5.4 – Continued Development Potential for a database input? In regard to the student's feedback in Section 4.6 requesting additional samples, and from experience, university modules that utilise thin sections have students looking at a vast number of samples, have you put any thought into how you might achieve the ambitious goal of creating so many samples? Would there be a way to develop the resource to allow other institutes to contribute their own thin sections, or collaborate with the Open University's VMESP?

Our intention is to develop this resource to greatly expand the number of samples available, ensuring that the resource is applicable to all areas of geoscience, including igneous, metamorphic, and sedimentary petrology, as well as potentially including micropalaeontology. To this end, we have already created a significant number of high-resolution thin section scans which will be integrated into the resource. At the moment, this is based entirely on the resources that the authors have available to them, but we are entirely open to collaboration between universities and colleges to develop a resource which could be made available to as many users as possible, if useful to them.

Once again, we would like to express our gratitude for your constructive comments.