

Project title:	Utilising the Teaching Tricky Topic process to Identify and Address Student Misunderstandings across Three OU Modules
Project leads:	Elizabeth FitzGerald (LTI), Rob Janes (STEM), Elaine Moore (STEM), Jo Iacovides/Julia Sargent (LTI)
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Key staff associated with the project:	June Barrow-Green (STEM), Christothea Herodotou (LTI), Anne Adams (LTI), Lesley Boyd (PhD student – LTI), Anne Pike (Research Associate - LTI)
Contact points:	Elizabeth FitzGerald (LTI) and Rob Janes (STEM)

Executive Summary

In summary, this project aimed to create shared understandings of disciplinary misconceptions (Tricky Topics) in particular modules, and to create new ways of overcoming those misconceptions.

Threshold concepts – referred to here as ‘Tricky Topics’ – are key conceptual problems that students face, which act as barriers to learning. They may arise from incomplete pre-knowledge, gaps in essential concepts, issues with terminology, or existing intuitive beliefs.

A [Tricky Topics process](#) was developed from the EU-funded Juxtalearn project and has been successfully implemented in contexts such as secondary education and with the UK police, a process that includes face-to-face workshops.

We aimed to combine learning networks doctoral research with a Tricky Topics pilot in three OU modules (S215, MST124 and H800), as part of a funded eSTeEM project. The learning networks (a type of discussion forum) were used to prime online conversations amongst geographically-separated Associate Lecturers (ALs) before a Tricky Topics workshop, held either online or face-to-face.

The workshops lead to the identification and prioritising of key Tricky Topics by the module team and ALs. The module teams were asked to consider putting in place new interventions into their modules to address one or more of these Tricky Topics. This was underpinned by the ambition to help students increase their understanding and lead to higher student success rates/satisfaction and progression.

Results of the project are mixed, with very positive results from one particular module (S215), and more ambiguous results from the other two modules (MST124 and H800). However, the process itself has been evaluated and shown to produce excellent outcomes, when key elements are in place. The most critical of these we have identified, is the engagement, or *buy-in* of the module chair(s) and also the ALs; however this is heavily related to, and dependent upon, available time in which to put in place any subsequent interventions.

Aims and scope of your project

This project aimed to identify and address students’ conceptual misunderstandings across three OU modules through the use of a newly-developed Teaching Tricky Topic process.

In the current economic climate there are serious barriers to creating internal OU impacts from pedagogical and technological learning innovations. One of the key barriers has been the process of developing joint understanding between learners, teachers and faculty needs, which are appropriately met by a particular innovation, in a design that is usable. Often our interventions solve problems that the learners, teachers and faculties don’t feel exist.

We need to identify where innovations should occur and why they are needed, i.e. we need to start with learner needs and the barriers they have to learning. To do this, we need a practice-based understanding of which conceptual problems our students are experiencing. We framed this project within current teaching practice, which has shifted from misconceptions and threshold concepts (Meyer & Land, 2003) to Tricky Topics in teaching (<http://tricky-topics-guide.ac.uk>). To identify learner needs and barriers, a process is required for assuring a joint understanding between those that teach the students (ALs), the students themselves, those who develop the learning resources/activities (Central Academics) and those that support solutions (LTI). This project therefore sought to bring ALs, Central Academics and LTI together within three modules (S215, MST124 and H800). The process can

be used in the future within faculties to support developing appropriate solutions for learners, teachers and appropriate support mechanisms.

In short, this 18-month project aimed to create shared understandings of disciplinary misconceptions in particular modules, and to create new ways of overcoming those misconceptions.

The project engaged ALs in helping the module teams to identify examples of where students struggle (Tricky Topics), then the module team were invited to produce an innovative intervention (with input from ALs) to assist in the understanding of this topic. The effects of these intervention were then evaluated, although due to circumstances beyond our control, some interventions were not brought about in the timescale of this project and hence we are unable to report on their effects. However, this project has successfully evaluated the process as a whole, to see if this can be modelled in other modules and potentially be brought into the learning design process across the OU.

Activities

This project took a technology-enabled participatory action research perspective (Coghlan and Brannick, 2014), where learning was self-reflective and collaborative, taking place through an unfolding and emergent process. It meant that for us, joint ownership was critical to the work, with both full-time academic staff and Associate Lecturers working together equitably on the discussion, planning and implementation of the project components.

The process of the project for each module was thus:

- Phase 1: A time period over which a learning network was used, to connect together different stakeholders, followed by a short analysis by the workshop leader to seed the workshop
- Phase 2: Tricky Topic workshop (either face-to-face or online, decided by the module team and ALs and related to the geographical spread of the ALs), leading to the identification and prioritisation of key Tricky Topics from each module
- Phase 3: The module team decide which Tricky Topic to focus on, from the top 3 priorities, and then take this forward to create a new intervention to address those misunderstandings
- Phase 4: The module team leads the creation of new interventions based on Phase 3, and link into current presentation via the VLE page for that module.

The learning networks were set up and managed by Lesley Boyd, a PhD student, and she worked closely with Dr Anne Pike, an existing AL who has expertise in Tricky Topics and who worked on the Juxtalearn project. Dr Pike also organised and facilitated the Tricky Topic workshops. Project management and evaluation was led by LTI academics (Elizabeth FitzGerald [project management], Jo Iacovides and Julia Sargent [evaluation]), who worked closely with the module chairs, negotiating the dates for each project phase, and reporting to the eSTeEM centre.

There has been mixed success to this project. One module managed to carry out all four phases (S215), whilst two modules (MST124 and H800) only completed phases 1 and 2. Further details for these modules are as follows.

S215: Initial Tricky Topics were suggested and discussed via the initial learning network forum (carried out with ALs), who went on to take part in an online Tricky Topics workshop – the first online one ever done (the need for an online format was dictated by geographic spread of the S215 ALs.) It worked well and identified some key Tricky Topics for the module team to take on board. The module team, in conjunction with the ALs from the workshop, chose which topics they wanted to take forward, and utilised AL resource to create four new videos to help support students in these Tricky Topics for the 17J presentation. The module team and ALs have all been very engaged and motivated to take part, right from the start of the project. As a side note, because of the relatively low student numbers on S215 (and

its predecessor), tutorials have been online for a number of years and tutor briefings have been held online so that ALs are used to working and interacting with each other and the module team online.

MST124: The initial learning network forum and face-to-face Tricky Topic workshop both ran successfully in 2017, and identified a number of tricky topics within the module. There was clearly the express intent from the module team to feed these into developing new resources to aid student learning of particular tricky topics for the 18B presentation. However, this particular module has had severe challenges that have meant it has not been possible to develop these new resources. Specific problems exist around:

- the motivation and buy-in of ALs to the project and its aims (e.g. many did not take part in the forum, or express interest in attending the workshop, even though they live locally and could claim the staff development rate for their time);
- ongoing uncertainty and pressures of resourcing due to staff redundancies (both from the module team and ALs)
- wider distractions as part of the ongoing OU restructuring and ‘feeling under siege’
- issues with content from pre-cursor/related modules e.g. MU123
- issues around a large number of students who have assessment-banked and who often subsequently drop out
- extreme time pressures of, and other pressing commitments demanded from, the core module team

Many of these problems were not directly related to the project but are part of the wider context in which the module team operates and will tend to take priority over less pressing issues such as the creation of new module materials. However, should future time/resourcing allow, the module team now has a clear list of identified Tricky Topics for which to prioritise developing (or re-developing) module materials, for future presentations. However, an ongoing challenge is the engagement of the ALs on the module, many of whom have felt under-valued and disengaged for some time (prior to this project starting, and through no fault of the module team), and unwilling to participate in any ‘additional’ activities, even if they are paid for them.

H800: This module was included to see how the process could be translated to a non-STEM module and also aimed to utilise one that was in production (H880) rather than in presentation (its pre-cursor, H800). However, since we needed to utilise ALs for the learning network forum and workshop, it was felt that we needed to involve ALs from H800 for this. The remake module H880 will be based on the same learning outcomes as H800, and involve some of the same taught content, so the findings from the H800 ALs will be directly translatable to H880 and should inform the production/authoring process. However, it was also felt that if there were any important findings from the forum/workshop, it might be possible to create some resources to support H800 in its final 18B presentation. However, although the learning network forum and online workshop took place, creating new interventions has not been possible during this last presentation of the module, due to lack of time available from the module chair, who was brought in to replace the original H880 module chair and unfortunately did not have the resource to participate in Phases 3 and 4. However, Tricky Topics identified from the workshop were presented to the H880 module production team by Lesley Boyd on 8 May 2018, and has had a direct influence on the authoring and content creation for H880.

In order to evaluate this project, qualitative data were gathered, as follows:

- 7 interviews, 2 per module (1 with the module chair and 1 with an AL who took part in the project) and one with the workshop facilitator

- Observation notes from each workshop by an LTI academic, in the role of evaluator

Informed consent was obtained from those who agreed to be interviewed and they were clearly informed about the storage and processing of their data.

Findings

The learning network sites were used very effectively to engage ALs in identifying Tricky Topics in all three of the modules. The discussions provided a very useful precursor to the Tricky Topics workshops. Issues raised were summarised by the workshop convener in conjunction with a nominated AL, and then used to prime the workshops, thus increasing their efficacy and engagement.

From a doctoral research perspective, the various aspects of the learning network interactions have been analysed using Grounded Theory Method (GTM), and a first stage integrative diagram produced (see Figure 1, below). The integrative diagram starts to build up a picture of the components of a successful learning network used to achieve practical improvement outcomes, in which project participants are engaged in an active and collaborative manner. The learning network can make the successive stages and collaborative thinking in the organisational learning cycle visible and explicit, including the construction of issues, planning action, taking action, and evaluation, using a range of discussion strategies and supporting artefacts. The integrative diagram has been converted to an interactive spreadsheet, which can be used to organise and share the evidence at each stage with participants and interested stakeholders.

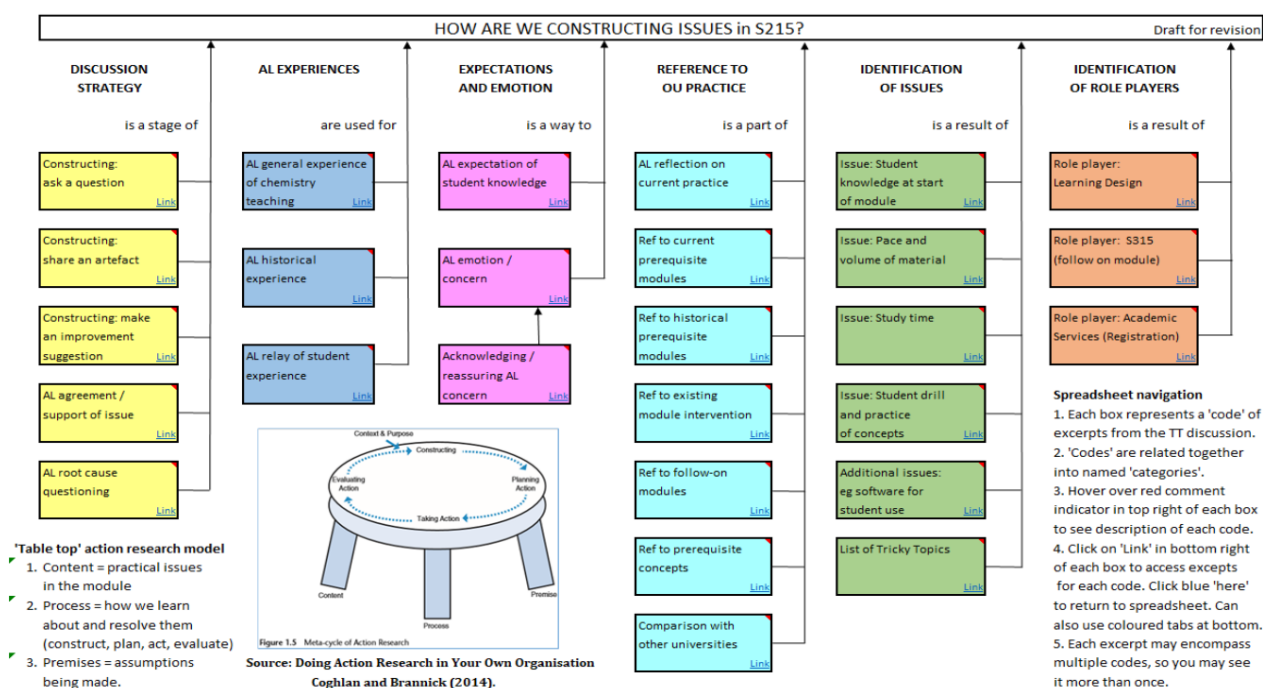


Figure 1: Integrative diagram of open codes using Spradley's (1979) semantic relationships (Constructing issues stage)

The interviews were analysed using thematic analysis and drew upon principles of a constructivist approach to grounded theory. Each interview was coded and more focused codes were

used to create themes within each module and themes across the modules. Memo writing was used to support the theme development and to draw out key quotes and examples from the analysis process.

Across the interview data and modules, there was an overall positive perception of the project in terms of the general structure (i.e. learning networks feeding into the workshop), facilitator and information generated. The process was successful in identifying Tricky Topics that could be taken on board by the module team to create intervention that address students' understanding. There was a sceptical perspective in some cases in terms of the outcomes and the process of being able to implement the changes.

Factors facilitating the process included the support of the learning networks, the mode of delivery and active participation. Barriers or challenges to the process included the perception of a lack of funding and/or resources, lack of flexibility in OU processes (i.e. the organisational structure) and other priorities.

Thematic analysis of the observation notes also identified a number of findings. These are as follows:

- Participants:
 - Most participants seemed to enjoy the opportunity to get together and discuss issues. Those that attended likely to be more proactive and engaged than some who did not get involved in any aspect of the process.

- Roles and responsibilities of key stakeholders:
 - The involvement of module team was crucial. Even for S215, which was the most engaged module in this study, one of the ALs suggested they could have been more involved within the forum and workshop discussions. Some of the module team seemed to take on the role of observer, wanting to oversee discussion, rather than see themselves as participants.
ALs seen as having the knowledge about student experiences but they see module teams as having relevant expertise.

- Interventions:
 - Those that were involved in developing interventions seemed to enjoy it. However, it wasn't clear how, or if, these interventions would subsequently be evaluated.

- Barriers:
 - Some ALs indicated that participation wasn't seem to be entirely voluntary, as they were 'selected' to be involved with the module team.
 - There was some confusion about what a tricky topic is – and needing to be convinced it is something useful to consider in the module (one AL didn't think they had any problems, at least none the students couldn't work out; another AL questioned whether they worked very well for their discipline)
 - Having an AL collate topics from the learning network discussion and then after from the workshop can be difficult if they struggle with the Tricky Topic concept – one needs to make sure that collated topics reflect wider discussions not just individual interests
 - Buy-in from module team was also a barrier as well as an enabler – this project identified just how critical it is to have this buy-in, as this can impact on the success of the work.
 - Time and resourcing were particular issues, with module chairs and ALs reporting higher priorities due to institutional demands.
 - Another issue was how to move from ideas to making changes, and what those changes (interventions) might be. In this situation, calling upon help from additional colleagues

- can be beneficial (e.g. in S215, they had additional resources and support, and made use of their in-house SWIM Team to help make videos).
 - There was some confusion about what was to happen next and who should take responsibility for this – some colleagues thought that the workshop facilitator would develop and implement the changes, but the module teams should be the ones to do this.
 - There was some lack of communication between colleagues, meaning that some of this valuable data about what the Tricky Topics might be lost for the future – this also tied in with barriers relating to lack of time and resourcing, and module chair buy-in.
- Process
 - Some solutions were suggested for one of the online workshops, but for these online participants it can be hard to type info in and read everything on the online chart.
 - There is a need for communication after the workshop – either to say what has happened and why, or to explain why changes cannot be made.
 - A suggestion was made from the facilitator that the Tricky Topic process should be integrated in AL development days. This would be a good way to get people talking about issues and normalise the Tricky Topic process.

As mentioned above, a number of challenges have impacted on the success of the project. We add to, and expand on these below, to provide more detail:

- Availability of staff to engage in the workshops – we have had to reschedule dates on occasion to ensure sufficient attendance.
- The capacity of module teams to carry out interventions for their next presentation – these are mostly symptomatic of the wider institutional changes currently under way across the whole of the OU and could not be counteracted successfully within the limited remit of this project.
- Not always having sufficient engagement in the learning network forums: ALs had to be reminded several times in order to foster effective discussions. Including references to being able to claim for staff development time in the subsequent workshop may have helped in motivating them, but actually just valuing their input and acknowledging their expertise also went a long way.
- Module chair engagement was found to be critical in terms of AL interest and recruitment, and in terms of prioritising resources and time to create subsequent interventions.

Impact

a) Student experience

S215: The interventions produced are now key components of the module preparatory material. Students are also referred to the video material at later points in the module. One video (“Curly Arrows”) is used to support teaching of Block 6 (early February 2019). It’s difficult to ascertain the extent the effectiveness of these interventions, other factors are coming into play – not least the changes to level one curriculum which *may* mean we are taking on more underprepared students.

MST124: Academic staff and ALs found it useful to collaboratively identify particular Tricky Topics that their students experience consistently, and to share these with colleagues across the module. However, due to circumstances already detailed in this report, interventions to address these have not been made and so the impact on students has been somewhat limited. That said, it has been useful to highlight and share the common problems that students have, in terms of developing ALs’ shared knowledge and insights, so that they might recognise these problems more quickly and be able to act accordingly.

H800: The Tricky Topics identified have been passed onto colleagues involved with the H800 remake, H880, to inform module production and attempt to pre-emptively help students with particular concepts that also occur in H880, which they might find difficult. As H880 is yet to start its first presentation, we cannot as yet ascertain how useful this has been. However, anecdotal evidence from production staff has suggested it was very helpful in determining which aspects of the course may need a particular emphasis, or a variety of different support mechanisms/resources, and could be used to prioritise specific topics for future course re-designs or tweaks.

b) Teaching

S215:

For S215, this project has been very positive and has led to tangible outcomes – notably this was a desire raised at the workshop session. The stylistic approach to video production – i.e. tutors discussing “this is where my students struggle” or “in TMAs I often see this misconception” followed by “this is how I address the issue” – has been picked up by others subsequently.

MST124:

As the module team from MST124 were unable to implement any new interventions, there has been limited impact from this project on the teaching and learning for this module. However, the process has highlighted which are the main aspects of the course that students find most troublesome, with the creation of a list of these Tricky Topics for future consideration by the module team.

H800:

As H800 had just started its final presentation when the Tricky Topics workshop was held, there was limited opportunity for the creation of new interventions unless there was something fundamental that needed adding, specifically for the second half of the module (to give enough time to create something and make it available to students). Once the list of Tricky Topics had been compiled, the module chair decided not to take any of these forwards for the current presentation, but to make them available to colleagues involved in the production of the successor module, which would be covering similar concepts.

c) Strategic change and learning design

This work was planned in consultation with the OU’s Learning Design (LD) unit, who are very interested in how this might align with existing working practices and indeed look to roll it out more widely with other modules and faculties. However, due to recent institutional restructuring and changes in staffing across the LD team, we have been unable to discuss this work at length with them nor has it yet been implemented into practice as yet. Conversations with LD colleagues are continuing and we hope to have an impact on university policy in due course, when the Learning Design policies are refreshed.

However, greater impact has resulted from the use of the Tricky Topics concept for Academic Professional Development, where this project has provided case studies for Tricky Topics training courses. These courses are open to all academic members of OU staff and will be repeated in the future, thus ensuring onwards capacity-building and dissemination/knowledge building.

This project has also developed further the Tricky Topics process, by conducting 2 out of the 3 workshops online, where in the past these have always been carried out face-to-face. Seeing the success of how they work online has helped us refine the workshop process and created some additional guidelines for (and by) the facilitator in how to transfer this to an online rather than face-to-face process. It also

highlighted just how essential it is to have a workshop facilitator, particularly one that is familiar with the Tricky Topic process and can guide participants in its use.

List of deliverables

This project has been showcased at both the eSTEEem 2018 conference (25/26 April 2018, poster) and at the CALRG (Computers And Learning Research Group) 2018 conference* (short paper presented by Lesley Boyd, see http://www.open.ac.uk/blogs/CALRG/?page_id=24). It also links strongly into Lesley's PhD on institutional improvements. Follow-on work has resulted in Lesley partnering with the module chair for S215 in a subsequent eSTEEem project, again linked with her PhD.

In this newly-funded eSTEEem project, a second cycle of collaborative work has started, building on the analysis from this first project. A pilot discussion in S215 18J has shared and interpreted analytics visualisations such as Learning Design mapping and VLE usage data for tutors, sought feedback on its usefulness, and discussed ideas for in-presentation teaching improvements and adjustments in the light of expressed concerns about pace and volume of material. The project leaders then plan to extend the learning network to cover two further modules in the next stages of the OU chemistry pathway, to track issues, concerns and Tricky Topics across the qualification. The analysis will be extended to consolidate and strengthen the emerging conceptual framework of technology-enabled organisational learning, and compared back to other existing and emerging conceptual frameworks in the literature. Finally they will assess whether this approach can be extended to other modules.

Lesley also gave a presentation at the OU's OpenTEL 'Show and TEL' event on [6 November 2018](#), relating to the project. Her presentation was entitled '*Using technology-enabled learning networks to drive module improvements in STEM*' and gave some in-depth reflections on the evaluation work carried out with the S215 module.

A journal paper about the project is currently being written (authors: Elizabeth FitzGerald, Anne Adams and Julia Sargent), where this work will form a case study as part of the wider Tricky Topics context. The paper is expected to be submitted in Spring/Summer 2019.

**Paper citation in full:*

Boyd, L. (2018) Using learning networks and Tricky Topics to drive module improvements in the OU. *Proceedings of the CALRG 2019 conference, Milton Keynes, UK, 18-19 June 2018.*

Figures and tables

Figure 1: Integrative diagram of open codes using Spradley's (1979) semantic relationships (Constructing issues stage)

References

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