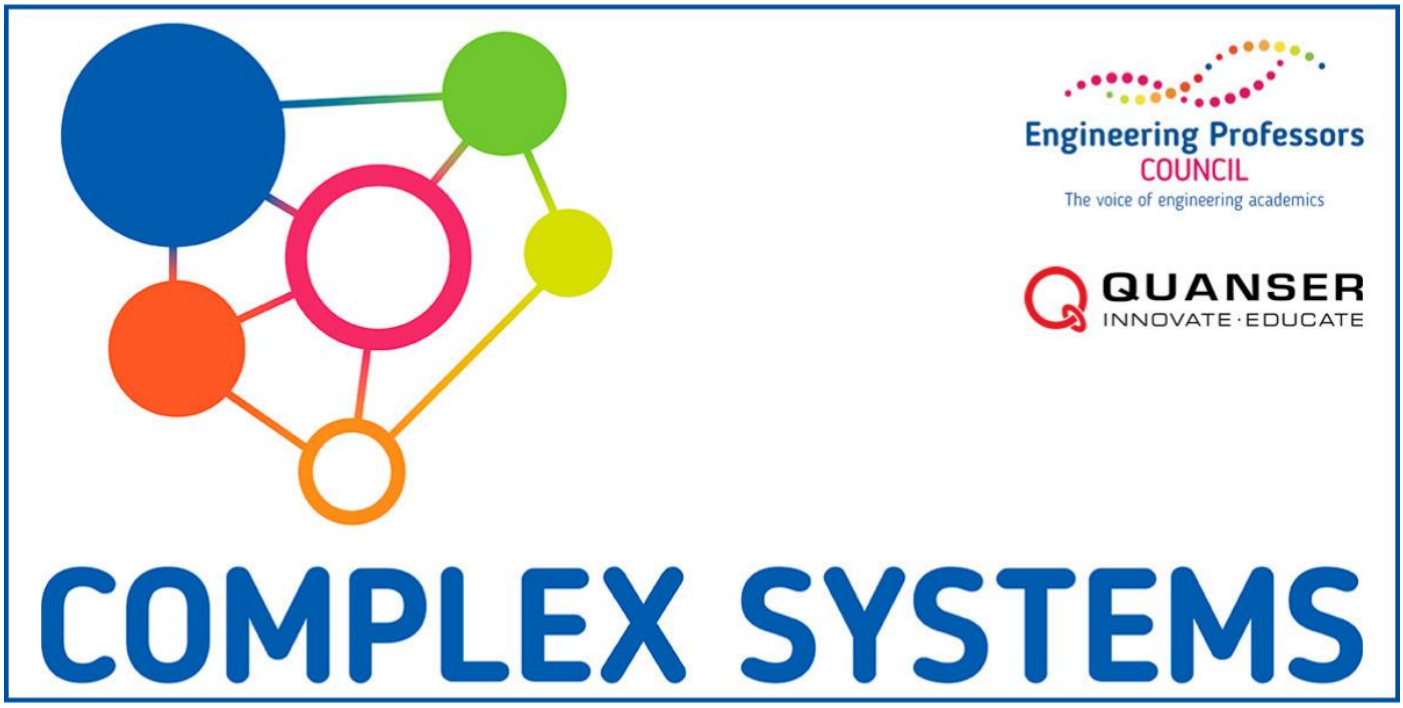

Complex Systems Toolkit: Guidance for Reviewing Teaching Activities

Thank you for reviewing a contribution to the Complex Systems Toolkit. This document will help to guide you through the review process. If you have any questions, please email Wendy Attwell at w.attwell@epc.ac.uk

Reviewer expectations

What you can expect as a Complex Systems Toolkit content reviewer:

- That we will treat you as the professional and subject matter expert that you are.
- That we will not ask you to review an unreasonable amount of content (our expectation is that this will not exceed two or three pieces of content per year).
- That we will be clear about your assignments and deadlines.
- That, once you have completed your first review assignment, we will recognise your academic citizenship by adding your bio and photo to our Contributors page.

What we expect from you:

- That you will act professionally within this role and bring your expertise to the table when reviewing content.
- That you will follow the applicable reviewer guidance document(s).
- That you will ask us for support if you feel that the content of the review assignment lies outside of your expertise.
- That you will abide by any applicable rules, regulations or laws, including those regarding privacy and data protection.
- That you will maintain confidentiality about the content of the review assignment until it is published.
- That you will work to agreed deadlines once you have accepted a review assignment.

Guidance for reviewers

This toolkit provides resources and guidance for the teaching of complex systems in engineering, spanning socio-technical, environmental, economic and policy dimensions, and the tools used to analyse, model or understand them.

- Each contribution type has distinct expectations which you can learn about in this guidance.
- After each section, questions are posed for you to consider in relation to the contribution.
- On the contribution, please use "track changes" and comments to make suggestions related to each question (as required) that can guide the author in revisions.
- Aim to summarise your thoughts on the overall contribution and how much (if any) further work it needs from the author.
- Return the contribution in Word (.doc or .docx) or equivalent format to Wendy Attwell w.attwell@epc.ac.uk
- If you prefer not to be contacted by the author to discuss your review, please let us know in advance.

Teaching activities/resources

Teaching activities are resources that users can access to help them know what to integrate and implement. These include use cases/case studies which provide examples of complex systems which can be directly utilised in teaching with the suggested tools, as well as other classroom activities such as coursework, project briefs, lesson plans, demonstration simulations, or other exercises.

Case studies (if you are reviewing another type of teaching activity, see p. 5 of this guidance):

Before you begin, you should review case studies that form a part of the EPC's Sustainability Toolkit or Ethics Toolkit, since we hope that contributions to the Complex Systems Toolkit will be fairly consistent in length, style, and tone. While complex systems cases may not have the same learning outcomes, the format and approach should be similar. Remember that the audience for these case studies is educators seeking to embed complex systems concepts within their engineering teaching.

Case studies present real-world scenarios that can be used in teaching about complex systems in engineering. They provide students with opportunities to explore complex systems tools, and trade-offs, in authentic contexts, and reflect on decisions made about them.

They are usually based on a real example, although fictionalised cases are acceptable when they are grounded in realistic detail. Case studies should enable students to identify or interpret key features of complex systems (feedback loops, interdependence or emergent behaviour) and apply relevant tools or frameworks to make sense of the situation.

Case studies will vary in length depending on scope and resource, but many are around 1500-2000 words. They should reference relevant online open-source resources.

Please see the current research on good practice in writing case studies, which you may find helpful as you review, as well as our article about a recipe for writing a case study. This 'recipe' can guide you as you review so that you can encourage authors to include or develop other aspects of the case. Both articles are from our Engineering Ethics Toolkit, but the guidance given can be adapted for complex systems cases.

Overview

- **Narrative strength**: is the case clearly structured with a compelling and coherent story?
- **System complexity**: does it explore interdependencies, multiple stakeholders and/or competing goals?
- **Tool integration**: are systems tools mentioned or incorporated (e.g. soft systems methodology, SysML, Agent-based modelling etc)?
- **Activities and Resource**s: Are there questions, prompts or teaching activities to guide discussion or classroom use?
- **Suggestions**: Have you included tracked change feedback for clarity, depth, further development or structure?
- **Corrections**: If possible, aim to correct any spelling, grammar, or punctuation mistakes as you review, but remember that editing, proofreading and formatting are the next stage of the process.

Activities and Resources

- The contributors should provide a variety of suggestions for discussion points and activities to engage learners, as well as a list of reliable, authoritative open-source online resources, to both help educators prepare and to enhance students' learning. Where information is presented from another source, it needs to be properly referenced.
    - Are there sufficient questions, prompts or teaching activities to guide discussion or classroom use?
    - What other activities should they include?
    - Are open resources or links to other toolkit materials included, and are these sufficient?
    - What additional resources or references should the author include?

References

- Where information is presented from another source, it needs to be properly referenced.
    - Are sources cited using Harvard referencing?
    - What additional references should the author include?

Educational level

- A Beginner-level case is aimed at learners who have not had much experience in engaging with a complex problem, and usually focuses on only one or two dimensions of a challenge. An Advanced-level case is aimed at learners who have had previous practice in engaging with complex systems, and often addresses multiple challenges. An Intermediate case is somewhere in between.
    - Has the author assigned an educational level to the case study?
    - Does it appear to be the correct level?

Assessment

- If possible, the author should suggest assessment opportunities for activities within the case, such as marking rubrics or example answers. This is not mandatory but is helpful to have.
    - If included, are these suitably developed and acceptable to include with the case?

Format

- Is the case study structured using the following format?:
    - Teaching notes (with learning objectives, time needed, materials): This is an overview of the case and its dilemma, and how it relates to AHEP4 and INCOSE competencies.
    - Learning and teaching resources: A list of reliable, authoritative, open-source online resources that relate to the case and its dilemma. These can be from a variety of sources, such as academic institutions, journals, news websites, business, and so on. We suggest a minimum of five sources that help to provide context to the case and its dilemmas. You may want to suggest an author flag up certain resources as suggested pre-reading for certain parts of the case, if you feel that this will enrich the learning experience.
    - Summary of system or context.
    - Narrative of the case (presenting the complexity).
    - Questions and activities.
    - Further discussion or challenge (optional).
    - References: use Harvard referencing.
    - Resources (ideally online and open source).
    - Keywords: On the submission form, authors will be prompted to provide keywords as well as to choose educational aims, issues and situations highlighted in the case. If there are keywords you would like to suggest or add, please do.

Suggestions

- Provide any further suggestions or guidance that you think would help the author(s) improve the case study.
    - Have you included comments and/or tracked changes feedback on all of the above points?
    - Have you summarised your thoughts on the overall contribution and how much (if any) further work it needs from the author?
    - Any references should use Harvard referencing.

Corrections

- If possible, aim to correct any spelling, grammar, or punctuation mistakes as you review, but remember that editing, proofreading and formatting are the next stage of the process.

Returning the reviewed case study

- Return the contribution in Word (.doc or .docx) or equivalent format to Wendy Attwell w.attwell@epc.ac.uk

Other teaching tools/activities

Purpose and Outcomes

- Teaching tools are intended to support educators' ability to apply and embed complex systems concepts within their engineering teaching.

- Educators need to quickly and easily find help with:
  - Adapting and integrating existing complex systems resources to their disciplinary context;
  - Implementing new and different pedagogies that support complex systems learning;
  - Structuring lessons, modules, and programmes so that complex systems skills and outcomes are central themes.

- Thus, these teaching tools will provide crucial guidance for those who may be teaching complex systems-related material for the first time, or who are looking for new and different ways to integrate complex systems concepts into their teaching.

- They may take the form of learning activities, project briefs, modelling or simulation activities, technical content related to complex systems, worksheets, slides, or other similar teaching materials.

- Before you begin to review, you should familiarise yourself with content that has been created to complement case studies in our Ethics Toolkit and teaching tools in our Sustainability Toolkit since we want these resources to be produced in a similar style and format.

Purpose

- Imagine that you are an engineering educator who is new to teaching complex systems concepts. You turn to this teaching tool to help you apply and embed these in your module.
  - Does this resource help introduce or develop concepts related to complex systems or systems thinking so that learners can engage with these topics in the context of engineering?
  - If not, what guidance is needed to make this possible?

Presentation and Clarity

- Depending on the resource, contributors may have chosen to provide worksheets, slides, problem sets, or narrative prompts.
  - Is the resource explained in such a way that you could understand how to use it?
  - Is the material clearly introduced and described?

Resources and Guidance

- Depending on the topic, educators may need additional resources or guidance to support their use of the material. For instance, background information may be required or a technical topic explained.
  - Is sufficient material provided so that educators can easily employ the resource?
  - Any references should use Harvard referencing.

Suggestions

- Provide any further suggestions or guidance that you think would help the author(s) improve the resource.
  - Please use either the 'Comment' or 'Track changes' function in Word to add your comments and suggestions to the review. Reviewed articles should be returned to the author in Word file format (doc or docx).

Format

- The teaching tool should follow this format:
  - Overview
    - Short description of what the resource is and what it aims to do.
    - States how it is related to complex systems or systems thinking, referring to external content such as INCOSE Competencies and AHEP 4.
    - Provides an overview of the activity, suggesting how it might be implemented and in what contexts, how long it might take, and any other relevant delivery information.
  - Details any specific materials or software required for the activity, as well as any modelling or simulation tools to be used.
  - Lists any learning and teaching resources recommended in order to undertake the activity, including suggested pre-reading or other references.
  - Explains the activity in as much detail as is required (this will vary depending on the type of material the resource addresses.)
  - If relevant, provides assessment guidance–marking rubrics, sample answers, etc.

Corrections

- If possible, aim to correct any spelling, grammar, or punctuation mistakes as you review, but editing, proofreading and formatting are the next stage of the process and we will also review for this aspect.

Returning the reviewed teaching resource

- Return the contribution in Word (.doc or .docx) or equivalent format to Wendy Attwell w.attwell@epc.ac.uk