

## Problem-centred learning for ESD: teaching resources

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### Introduction

This guide is a practical set of resources including example learning outcomes, and example learning activities to support the introduction and development of student's abilities to engage with complex 'wicked' sustainability problems. This guide focuses primarily on the integrated problem-solving and collaboration competencies for sustainability.

See the [Learn more about Education for Sustainable Development \(ESD\)](#) guide for more information about the theory and practice that underpins problem-centred learning for ESD.

If you have any resources that you use in your teaching that you think will be support this topic and will be accessible to other subject areas, please contact [cie@liverpool.ac.uk](mailto:cie@liverpool.ac.uk)

### Engaging students with complex 'wicked' problems

Because complex 'wicked' problems (complex, un-certain, diverse stakeholder perspectives) by definition do not have clear solutions and readily available solutions, careful consideration needs to be given to how they can be integrated into your learning and teaching.

### Student emotions

Some students may find engaging with uncertainty and complexity emotionally difficult – especially students from educational backgrounds where they have been used to learning set approaches to solving defined problems. Global challenges such as climate change or poverty can seem overwhelming, insolvable and frightening to some students.

- Provide opportunities for students to express and capture their thoughts and emotions about issues, the future, and the skills and values they think they are developing using contemplative learning opportunities such as reflective accounts.
- Present to student's positive hopeful examples of how real-world complex and uncertain sustainability challenges have been overcome by individuals and organisations.

## Co-create problems with students

Where practical enable students to have an input to the specific problem issues that you want them to focus on:

- Local or smaller sub-problems (not starting with solving global climate change!) will have more meaning for students enabling them to focus on what poverty means within their home country or city, particularly for international students, for example.
- Some students may have particular issues and aspects of sustainability problem that they find motivational.
- Important to select problems that are perceived by students as messy and ill-defined or else they may resort to simple linear problem-solving techniques.

## Academic culture

Foster a welcoming and open learning culture between staff and students – learning that is open to diverse positions and practices, learning from one another and sharing ideas.

## Transferable skills

The context for the problem that students are presented with will affect the development of transferable skills. A student's ability to transfer knowledge gained in one problem situation to another will be affected by whether the student expects the principles used in solving the two problems to be related.

Developed from McCune et al, 2021.

## Example learning outcomes for problem-centred learning for ESD

Problem-centred learning for ESD can, if designed appropriately, support the development of all of the eight sustainability competencies but is most aligned with the development of integrated problem-solving and collaboration competencies.

## Example learning outcomes for integrated problem-solving competencies

A student with integrated problem-solving competency can:

## Knowledge

- Describe the potential for their discipline to interconnect with other disciplines or areas of expertise and make creative leaps forward.
- Describe how aspects of their own area of study contribute to sustainable development and connects to the UN Sustainable Development Goals.
- Appreciate research methods from different disciplines.
- Understands the academic norms of a discipline and explore disciplinary integrity.

## Skills

- Use and apply established frameworks and methodologies for analysing the impact(s) of a behaviour or process, utilising the skills and expertise developed through their own area(s) of study.
- Apply different problem-solving frameworks to complex sustainable development problems.
- Develop viable, inclusive, and equitable solutions.
- Effectively engage with real-life problems relevant to sustainable development.
- Combine different sources and types of evidence, drawing from different disciplines, to view and address a problem.

## Attributes and values

- Utilise appropriate competencies to identify and solve problems.
- Communicate effectively with others to identify solutions to complex problems.
- Listen critically when presented with alternative ideas or frameworks, systems, and ideas.
- Work effectively in multidisciplinary and interdisciplinary groups.
- Consider academic norms and ways of thinking across different disciplines and subject areas, bringing them into play as appropriate.

## Example learning outcomes for collaboration competencies

A student with collaboration competency can:

## Knowledge

- Understand the value of collaborating with others offering different knowledge, views, and experiences.
- Identify and critique differing approaches to collaboration.
- Recognise group management strategies.

- Recognise verbal and non-verbal communication skills and their role in group cohesion.
- Recognise the goals, skills and needs of others as part of successful collaboration.

#### Skills

- Communicate effectively through listening, clarity of expression and constructive inquiry.
- Engage in interdisciplinary discussion to inform their thinking about sustainable futures and seek holistic, creative solutions to problems.
- Identify the importance of encouraging and enabling individuals and organisations to work together to create new knowledge.
- Clearly communicate complex sustainable development issues to others.
- Facilitate and mediate progressive discussions among interested parties (stakeholders) to help resolve dilemmas and conflicts.
- Listen actively and critically.
- Connect, adapt, and synthesise what they learn.
- Address conflict and develop mediation skills.
- Utilise appropriate leadership styles.

#### Attributes and values

- Learn from others including peers, professionals, expert groups, and communities.
- Deal with conflicts in a group.
- Facilitate collaborative and participatory problem solving.
- Assist others through peer learning.
- Question norms, practices, and opinions.
- Understand and respect the needs, perspectives, and actions of others.
- Empathise with the views and experiences of others.
- Collaborate equitably across gender, ethnicity, and other groups.

See also [Example Learning Outcomes Aligned with Competencies for Sustainable Development](#) particularly the systems thinking and strategic competencies.

Developed from QAA, 2021.

## Overview to teaching approaches

It's important to choose problems at the appropriate level of students' learning abilities to promote active learning and develop problem solving skills. Early in a programme when students are new to your subject discipline, focus on developing students problem-solving

skills, group work processes, and introducing real-world sustainability examples relevant to your subject discipline.

As the programme progresses students can be exposed to a variety of more complex problems to further enhance their problem-solving, interdisciplinary, intercultural and stakeholder collaboration skills within novel contexts. The series of projects across a programme must form a coherent learning experience.

Taken from Advance HE, 2023.

There are four categories of teaching approaches that can be used to scaffold students problem-solving for sustainability competencies across a programme:

**1. Case studies**

Introduce students to real-world complexity aligned to your subject discipline that models practical problem-solving approaches used in outside organisations.

**2. Scenarios and simulations**

Provide opportunities for students to engage with complex systems, diverse interdisciplinary and stakeholder perspectives in environments where they can take risks, reflect on consequences, and explore potential solutions in a supportive and reflective environment.

**3. Design thinking**

Engaging with practical problem solving approaches (product or service) to support sustainable change commonly used in many sectors.

**4. Participatory design**

Opportunities for students to engage with diverse stakeholder communities and groups to define and explore solutions to problems.

## Teaching approaches to develop students integrated problem-solving competencies

### Case studies

Aims:

- Introduce students to complex problems and issues.
- Model problem-solving solutions that work for complex problems.
- Foundational to other approaches described below that support integrated problem-solving and collaboration competences.

Learning activities:

- In class case discussions on introduced cases.
- Co-teaching with colleagues from other subject disciplines to add diverse perspectives on sustainability problems.
- Support in-class discussion and reflection through student pair/ small group discussions or classroom polling technologies.

The [UN Sustainable Development Goals \(SDGs\): teaching resources](#) guide can be a good source of case studies for sustainability related problems and issues.

Student generated case studies (ETH case study method):

Aims:

- Enable student to engage with stakeholders to investigate a problem within a real-world context.
- Requires students to engage with knowledge from different disciplines in the field.
- Can support external stakeholders to investigate a real-world problem or issue that could benefit their organisation.

Learning activities:

- Students are asked to work with an external stakeholder to generate the new case study.
- Cases can be used in classroom teaching etc. or shared online for students to explore if different case studies are created from multiple organisations for example.

Developed from Steiner et al, 2006.

## Scenarios and simulations

Problem-centred learning:

- Essentially a simpler flexible version of traditional problem-based learning that can be used for any student group work project.
- Students are presented with a complex ill-defined real-world scenario and staff facilitate the group learning process.
- Project scenarios are carefully designed to trigger and prompt student learning.

See Appendix 2 for detailed resources for developing problem-centred learning activities with your students.

Classroom simulations:

- Classroom simulation sessions enable students to be taken through a complex real-world problem and asked at key points to reflect on their understanding, perceptions, and explore decisions about courses of action.
- Classroom polling technologies (Poll Everywhere for example) can be used to gather student feedback or asking them to make decisions on specific possible actions to stimulate their thinking. Action options can be related to real-world actions – you can use these to illustrate courses of action that were taken and their positive or negative consequences.

#### Group simulations:

- Students working in small groups are asked to simulate what they would do within a specific real-world context and asked to make decisions and consider the consequences of their actions – including unintended consequences and outcomes
- Different groups could simulate different stakeholder groups with diverse perspectives, values and goals.

Contact CIE [cie@liverpool.ac.uk](mailto:cie@liverpool.ac.uk) for more information about sustainability related simulations we can support with our students. For example:



[2030 SDGs Game](#) simulates a group of students (or staff!) over a 1.5 hour workshop how they could meet the UN's Sustainable Development Goals to create an inclusive, prosperous and environmentally balanced world.

[En-Roads](#) simulates the impact on climate change that different stakeholder groups could make using different net zero strategies.

## Design thinking



### The Design Council's Double Diamond Framework

#### Aims:

- Introduces students to the key stages in a practical design thinking process commonly used in many sectors for product or service design within complex contexts.
- Process of exploring an issue or problem in greater depth from different stakeholders perspectives (divergent thinking) and then taking focused practical action (convergent thinking).
- Opportunity for students to consider ethical issues and the practical application of the principles of circular economy if developing a product.

#### Learning activities:

Students are presented with a complex real-world based scenario or problem area (ill-defined, no simple immediate solution) working individually or in groups.

For given sustainability problem ask students to complete and reflect on the following design process stages:

- Discover – explore the problem area in greater detail than their initial preconceptions by gathering information, talking to stakeholders (this could be simulated) so they immerse and 'empathise' more deeply into the problem.
- Define – using the information from the previous stage, ask students to frame the problem in a different way than their initial interpretation.
- Develop – multiple possible solutions to the framed problem seeking inspiration from elsewhere.
- Deliver – test out different solutions (prototype) at small-scale. Select with stakeholders preferred practical solutions for implementation and evaluation – this final stage could be simulated to give students real-world examples of problems they might encounter or un-intended consequences etc.

Based on the Design Councils' ['Double Diamond' framework for innovation](#) model. See also:



[Design Thinking for Higher Education](#) (Lancaster University)

[Design thinking defined](#) (IDEO)

[Design thinking for educators](#) (IDEAO) – designed for school education but useful to explore to see design thinking in operation. IDEO uses different terminology in their design process – discovery, interpretation, ideation, experimentation and evolution.

### **Systemic design thinking**

A problem-solving approach that combines systems thinking tools and processes to frame problems, with design thinking solutions orientated methods. Co-design – external stakeholders can also be involved in the process (this could be simulated).

Aims:

- Introduce to students the key components of systemic co-design approaches used in many sectors focusing on complex sustainability problems.
- Builds on student's collaboration, communication, and design thinking skills developed in previous activities to incorporate systems thinking and co-design processes.

Learning activities:

For a given complex 'wicked' sustainability problem ask students individually or in groups to complete and reflect on the following process stages:

- Understanding the system – using [systems thinking tools](#), rich pictures, the Iceberg model (see appendix 1) to capture from different stakeholder perspectives (you may have to simulate this) systems and sub-systems within the problem area. Ask students to ensure they also capture in their systems analysis:
  - Multiple perspectives: who are the stakeholders, their values, motivations, how they see or frame the problem.
  - Interconnections: how the components, knowledge, stakeholders interconnect.
  - Boundaries: scope and scale of the system and sub-systems, agreements on how to structure the problem, what might constitute improvements for different stakeholders.
  - Influences: what drives the system in particular directions, drivers, trends, enablers, blocks, leverage points.
- Co-design solutions – jointly develop actions plans and solutions with stakeholders (you may have to simulate this stage) using design thinking processes.

- Assess and adapt – develop outcomes and monitoring plans for design solutions e.g. outcomes mapping, reflective practices.

Go to the [Systems thinking and systemic design concepts and tools](#) (sustainability for Learning) guide for greater detail and resources to support this design process.

See also:

[A field guide to systemic design](#) (CoLab)

[Theory U](#)

[Participatory Co-design for Sustainable Development](#)

[Co-design and facilitation: keys to sustainable change](#)

## Participatory design approaches for sustainability

Aims:

- Processes that enable multiple stakeholders to collaborate to define problem areas and explore potential solutions.
- Democratic design processes focused on empowering people that are often marginalised in decisions that affect them.
- Designer not central authority in the process.
- Useful in certain contexts – social sustainability situations, local communities, diverse social groups etc.

Learning activities:

- The practicality of engaging students in this type of problem-solving activity will depend on your subject discipline.
- One option could be to simulate a real-world process aligned to your subject area where students role-playing different stakeholder groups.
- Utilise collaboration and communication skill development in any student simulated design process as outlined below.
- Explore research contacts etc opportunities for your students to engage in for example, city region consultation projects.

Additional resources:

[Cross-sector partnerships and collaborations](#) (Learning for Sustainability)

[Donut Economics Action Lab](#) (DEAL)

Other city region [DEAL projects](#)

[Design Empowerment: Participatory Design Towards Social Sustainability](#)

[Designing Smart for Sustainable and Resilient Communities: The Role of Participatory Design in Addressing the UN Sustainable Development Goals](#)

The university is involved with [Citizens UK](#) – contact CIE [cie@liverpool.ac.uk](mailto:cie@liverpool.ac.uk) to explore possible Liverpool city region community based projects that your students

## Example learning activities to develop student's collaboration competencies

Introductory communication and trust building learning activity suggestions that you can adapt to include in student group projects etc.

### Active listening ([Non-violent communication](#))

Aims:

- Go beyond our first interpretation of what is being expressed and try to listen deeper in any communication situation.
- Foster a space for shared understanding.

Learning activities:

Students can be asked to practice this in pairs before engaging with external stakeholders but this activity could also be practiced with students of other subject areas in an interdisciplinary project etc to build relationships.

For a given topic or problem that has multiple perspectives and interpretations ask students to:

- Take turns to listen to each other.
- Each student speaks for a few minutes (1-2 minutes) on a topic with the other student listening, acknowledging what they are saying without interjecting their own thoughts and opinions, and asking further questions to deepen their understanding.
- Finally, the student listening can briefly summarise what the other student has said to confirm their understanding.
- Students then swap roles and after each has had a turn speaking and listening. They can then have an open discussion on what they noticed and felt about the process.

You could include a short demonstrate to the whole class at the beginning to demonstrate this activity and include a plenary session at the end to gather whole group feedback and reflection.

## Building trust within a diverse group

This activity can be modified and shortened for different contexts:

Aims:

- Variation on common team building activities that are focused on students or stakeholder participants getting to know each other on a personal level to build a climate of trust before they engage with a specific sustainability problem.

Learning activities:

- Each participant is given paper and pens etc and are asked to draw a large 'shield' on the paper and divide into four quadrants.
- In each quarter each participant is asked to describe themselves in pictures (not words) based on four different themes.
- Themes can be varied to meet the context. For example, a difficulty I got over, I am proud of this, this is what you don't know about me, my dream is to...
- Each participant one at a time shares there shield with the rest of the group for about a minute.
- The rest of the group listens and makes positive feedback notes to present back after each person has presented their shield.
- Final feedback session for each person one at a time.

For further information see the Inner Development Goals [The shield](#) activity.

For other examples of collaboration and communication activities: [Inner Development Goals toolkit](#).

## Framing problems with diverse stakeholders (rich pictures)

Aims:

- To enable groups of students (and external stakeholders) to systematically explore and frame a complex problem from their different perspectives.
- Helps identify specific problems within an ill-defined situation with multiple perspectives.

Learning activities:

- Hand out large pieces of paper and coloured pens (or online using appropriate software e.g. [Miro](#)) to each group of participants.
- Before the rich picture is started, get each participant to write down individually on a separate piece of paper what they already think and have articulated about the problem.
- Ask participants to then draw on a single large piece of paper what they see as problematic or significant, groupings or relationships on the given problem.
- Participants review and discuss each other's pictures – exploring what's missing, any new connections, and diversity of how people see the problem etc.

See also the Open University's resources on developing [Rich Pictures](#)

## Iceberg model

Aims:

- Introduce students to approaches used in many contexts to systematically explore a complex problem area.

Learning activities:

- Ask students (individually or in groups) to 'frame' and define a sustainability issue or problem as they see it using the Iceberg model. Select an issue or problem that is relevant to your subject area and is sufficiently complex.
- Ideally, enable students to have an input to the issue or problem selection – something they are interested in exploring and is relevant to them.

The Iceberg model (see Appendix 1) captures information about the problem from four perspectives:

- Events – incidents, 'happenings' and things that have alerted is to the 'problem.'
- Patterns – history or events, trends of data over time.
- Systemic structures – interactions between drivers and factors that cause the problem.
- Mental models – beliefs, world views, motivations, values that underlie and affect all human decisions and actions.

For more information about this approach go to: [Systems Thinking Resources The Iceberg model](#) (The Donella Meadows Project).

## References

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## Appendix 1: Iceberg model for framing problems

| Stages:                                                                                                                                                                                                | Notes: |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <b>Events:</b> incidents, 'happenings' and things that have alerted is to the 'problem.'<br>For example, flooding.                                                                                     |        |
| <b>Patterns:</b> history or events, trends of data over time.<br>For example, the history of floods                                                                                                    |        |
| <b>Systemic structures:</b> interactions between drivers and factors that cause the problem.<br>For example, human factors (land use) or natural factors (heavy rain) that cause or exacerbate floods. |        |
| <b>Mental models:</b> beliefs, world views, motivations, values that underlie and affect all human decisions and actions.                                                                              |        |

## Appendix 2: problem-centred learning task design guidelines

### Designing problem scenarios

An important component of PCL (developed from traditional problem-based learning) is the careful design of the problem scenario that you present to students. The design process will include the following staff steps:

1. Identifying a sustainability problem 'trigger.'
2. Analysing the trigger material and carry out further background research.
3. Framing the problem (set objectives, boundaries, and any constraints).
4. Defining the specific student task(s) and associated success criteria.

During the group work process students will be required to take responsibility for the following steps:

5. Identifying areas for investigation/research to seek data including engaging with other disciplines and stakeholders in required.
6. Finding, sorting and critically evaluating data to acquire relevant information.
7. Applying appropriate information.
8. Producing required deliverables.
9. Reflecting on learning experience.

### Identifying a problem 'trigger'

A problem can be a scenario, a case, a challenge, a visual prompt, a dilemma, a design brief, a puzzling phenomenon, or some other trigger designed to mobilise learning. Most subject areas you will be able to create a problem 'trigger' issue to use as the basis for your problem scenario.

- Problems must represent one that the learners are likely to encounter in the real-world that are open-ended with a variety of possible solutions.
- Problems should be topical, unsolved projects rather than historic cases.

### Framing the problem

Important to select real-world 'ill-defined' or 'ill-structured' sustainability problem that does not have clearly defined solutions nor a clear process to arrive at a solution. Well-structured problems generally have clearly defined solutions.



The following problem scenario is taken from: [Problem-Based Learning: A Case Study of Sustainability Education](#) ref page 23

A framed problem scenario from a year 1 undergraduate business programme at the University of Keele:

"You are working for Uniformsdirect, a company which designs and supplies uniforms to a range of different sectors, including the hospitality and entertainment sector. The company is based in the centre of Stokeon-Trent and has about 70 people directly employed in the main offices and distribution warehouse. The main offices are housed in a 1960s office building which has not had any major renovations since it was built. The majority of employees live in North Staffordshire; some live in Manchester and Birmingham. The clothing is manufactured in a factory on the rural outskirts of the busy city of Jakarta, Indonesia. Many factory workers in these areas are migrants from Indonesia's poorer eastern islands who have travelled to Jakarta for work.

The cotton used to produce uniforms is imported into Indonesia from the cotton growing regions of central Asia, mainly from Uzbekistan, and the clothes dyes are imported from India. Once clothes are manufactured they are shipped to Dover in England before being transported via lorry to the central distribution warehouse in Stoke. Recently the company has not been winning tenders from clients that they would have normally expected to win tenders from. The senior management have heard rumours from prospective clients that this is because Uniformsdirect are not seen as considering the sustainability agenda enough to satisfy their own stakeholders. However, not everyone on the senior management board at Uniformsdirect is convinced that it is worth investing in sustainability issues, particularly in current economically difficult times.

No-one in the company has any environmental management background but you have been asked as a team to take responsibility for environmental and sustainability issues within the company. Some prospective clients have asked whether your company has an Environmental Management System or a Sustainability Policy in place but no-one really knows what this means. Your team have been asked to provide a five minute oral brief to the senior management of Uniformsdirect on what steps the company should be starting to take to address its environment and sustainability responsibilities."

In this example the framing of the problem has deliberate 'trigger' sentences that should direct students towards specific areas of research and investigation. For example:

'the main offices are housed in a 1960s office building which has not had any major renovations since it was built.'

'many factory workers in these areas are migrants from Indonesia's poorer eastern islands who have travelled to Jakarta for work'

'However, not everyone on the senior management board at Uniformsdirect is convinced that it is worth investing in sustainability issues, particularly in current economically difficult times'

It's important to think through what you expect students to do in response to each trigger, if they are able to investigate each issue to an appropriate level, and how the combination of conflicting issues and challenges will enable the student to develop creative practical evidence-based solutions.

How do you expect students to be able to identify and create solutions to the complexity in the scenario dealing with the interrelationships between social, economic and environmental factors, trade-offs, unknown impacts, values differences within the group and stakeholders, and other ambiguities?

### Defining the student task and success criteria

In addition to providing students with information about group working give students clear information about:

- Their role in the scenario – consultant, employee, agency etc.
- The extent and nature of any research you expect the groups to conduct.
- Any instructions, timescales, and outputs.
- Assessment criteria.

If working on a real project with external stakeholders:

- Information about and expectations for working with an external organisation etc.

Student task from the Keele University example:

"Your task as a group is to present a five-minute oral brief to senior management on what steps the company should be starting to take to address its environment and sustainability responsibilities.

To do this you need to have a greater understanding of the relevant issues and will need to carry out some more research before presenting the brief to the senior

management in class on the 7th February. You will have a short amount of time in class next week to prepare how your group will present its ideas but most of your group work should be done before the session. You do not need to produce any PowerPoint slides or typed documents. This task is not assessed.

By the end of this week's session, you must have decided as a group four things that you need to do more research about before presenting the brief next week; these will be your 'Agreed Learning Objectives'. Be as specific as possible and write these on your group's 'Agreed Learning Objectives' form (attached). It might be a good idea to assign one learning objective/research area to each person.

The brief must be a short summary of the issues that you decide (as a group) are most important to get across to the senior management to help them to decide how (and whether) to start to address sustainability considerations within the company."

### Ensuring the student task is align to sustainability competencies

Think though how you will design your problem scenario and student tasks to develop all or a selection of the eight UNESCO student's sustainability competencies.

A problem-centred learning project within a single discipline, not involving wider stakeholders for example, will probably not fully develop student's collaboration, integrated-problem solving, and normative competencies. A few example tasks aligned to each of the eight sustainability competencies:

| Sustainability competencies                                                                                                                                      | Example Tasks                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Systems thinking</b> - approaching problems that analyse how all the elements within a system influence one another.                                          | "Utilise systems thinking to assess the interconnections between social, economic, and environmental factors."                                                                                     |
| <b>Anticipatory/ futures thinking</b> - understanding and meaningfully contributing towards current and future challenges, whether in a local or global context. | "Apply futures thinking to envisage various potential futures (probable, possible, desirable) for the problem, factoring in global trends, technological advancements, and environmental changes." |
| <b>Critical thinking</b> - conceptualising, applying, analysing, synthesising and evaluating information.                                                        | "Critically evaluate potential solutions for their practicality, sustainability, and impact on different community groups."                                                                        |

|                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Strategic competence</b> – transitioning to sustainable alternatives or developing sustainable solutions to current problems or issues requiring strategy.</p>                                                                   | <p>“Project deliverables to include:<br/>A detailed report outlining the proposed sustainability strategy.<br/>A presentation showcasing your vision, including visual aids and models.<br/>A financial plan, including potential sources of funding and investment.”</p>                                              |
| <p><b>Collaborative competency</b> – communicating effectively with colleagues, clients and stakeholders, ethically and professionally across platforms, disciplines, cultures, national boundaries and cyber-physical interfaces.</p> | <p>“Develop community engagement strategies to ensure local voices are heard and incorporated.”<br/>“Conduct a series of stakeholder meetings, where students engage with various groups to gather input and negotiate solutions.”</p>                                                                                 |
| <p><b>Integrated problem-solving competency</b> – responding to complex, ill-defined problems that can include missing, contradictory, or contested information.</p>                                                                   | <p>“Develop a comprehensive plan addressing economic development, social welfare, and environmental protection. This could include strategies for green infrastructure, initiatives to foster inclusive economic growth, and programs to enhance social welfare.”</p>                                                  |
| <p><b>Self-awareness competency</b> – recognising how students' emotions, motivations and personality impact on their actions and behaviours.</p>                                                                                      | <p>“Individually create a reflective journal to record your thoughts, emotions, values, and critically assess your problem-solving and group work skill development as the project progresses.”</p>                                                                                                                    |
| <p><b>Normative competency</b> – understanding and reflecting on the norms and values that underpin students' own actions and those of other stakeholders.</p>                                                                         | <p>“Understand the values, beliefs, and motivations that drive each stakeholder group.”<br/>“Conduct simulated interviews, surveys, or focus groups with representatives from each stakeholder group.”<br/>“Actively listen to and document the concerns, aspirations, and suggestions of each stakeholder group.”</p> |

For more information about the eight sustainability competencies go to the [Learn more about Education for Sustainable Development \(ESD\)](#) guide.

## Student group work considerations

From the University of Keele example:

“Read through your chosen project. Following the 6 steps below will help you to successfully complete your group projects:

“Highlight and clarify unfamiliar terms and concepts – make sure you know what everything means and make sure you are clear about what your group task is asking of you.”

“Formulate group learning objectives for further research. Learning objectives are a list of things that your group needs to find out and research to be able to complete the task. You may want to split your research into 4/5 areas so each team member takes responsibility for one part of the research.”

“In-between class sessions you should research the topic/area/issue that was assigned to you, through the internet, books, articles, etc. and be ready to share this research with your group the next time you meet.”

“Remember to keep in regular contact with your group and discuss ideas and progress via your Facebook or Blackboard discussion groups. You should also meet up as a group in person in-between class sessions.”

“Module staff will be monitoring online group interaction. Please feel free to ask the module facilitator any questions related to your project via email, Blackboard or Facebook. The facilitator is there to provide guidance and support through the group projects.”

## Setting the ground rules and context for the student groups

- **Introduce the project to students** – communicate to students why PCL is being introduced, how it is aligned to programme and module learning outcomes, and its aim to develop student sustainability, group work, employability, and problem-solving skills.
- **Your role** – clearly explain the role of the facilitator(s) as this may be a change of expectation for students. For example: facilitators role is to assist each group to formulate learning objectives, monitor progress, drip-feed information as appropriate

to support the learning process (without revealing possible solutions etc.), and to intervene in if the groups are not working well.

- **Your expectations** – provide students with clear information about timetabling, meeting expectations, and any engagement with external stakeholders.
- **Tools and methods** – if appropriate, introduce to student's appropriate tools or methods that you expect them to use within the project e.g. systems thinking methodologies.

### Tips for facilitating problem-centred learning student groups

- **Group formation** – if using interdisciplinary or intercultural groups where students are less familiar, use social and fun group forming activities to enable students to get to know each other before they engage fully with the problem task.
- **Help students to get started** – tutors can initiate the group process by making explicit connections between the problem, theory and practice (help them see the 'bigger picture' context) already introduced in your teaching as these may not be apparent to the students at their current level of abilities and knowledge. Provide more than simply information about the problem – learners may struggle if left only with the problem and not support about how to start approaching the problem.
- **Engage prior learning** – help learners, recall, explain or discuss what they already know about the problem as a foundation for building new knowledge.
- **Model expert behavior** – learners can gain from hearing how an expert would approach and solve the problem through demonstration of procedures, visualisations of process, or modelling behaviours.

