

# A Summary of Teaching & Facilitation Methodologies

*“Leaving Certificate Computer Science is underpinned by collaboration and working with others.”*

## **LCCS specification (2017)**

Methodologies previously referenced in this resource are explained in further detail below. There is particular reference to how key skills can be embedded within teaching and learning of Computer Science in general and Computers and society in particular. Each key skill has associated elements and learning outcomes and these are set out in the [Key Skills Framework](#). This summary is not intended to be a comprehensive course in all the elements and learning outcomes of each key skill. Please consult the Key Skills Framework for full details.

We cannot take for granted that students have the necessary skills to be able to engage in genuine dialogue and debate and to work collaboratively and effectively with each other. Skills of listening, summarising, encouraging, criticising ideas (and not people), negotiating differences of opinions, etc. all need to be taught. They also need to be reflected upon through group processing.

Throughout the course students need to be given opportunities to develop the key skills in an integrated way. The use of these types of facilitation methodologies will help to build key skills in senior cycle students.



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## Brief description of methodologies

### BRAINSTORMING

Brainstorming is a technique which involves generating a list of ideas in a creative, unstructured manner. The goal of brainstorming is to generate as many ideas as possible in a short period of time. The key tool in brainstorming is “piggybacking,” or using one idea to stimulate other ideas. During the brainstorming process, ALL ideas are recorded, and no idea is disregarded or criticised. After a long list of ideas is generated, these can be prioritised as most/least important, most/least helpful, plus/minus, etc. They can also be ranked 1-5 in order of importance or in the order in which they might be useful in planning a response.

**Carousel Brainstorming** is another useful technique.

1. The class is arranged into small groups. Each group has a different colour marker.
2. The teacher poses a question on a flip chart, e.g. *Will AI benefit humans in the long run?*
3. The flipchart question is passed from group to group. (To speed up the process you may have a number of pages going around)
4. Each group must add two original suggestions.
5. The flipchart page(s) are displayed for all to see.
6. You can see which group has suggested each idea (by colour) and ask them more about their idea.

### THINK-PAIR-SHARE-SNOWBALL (TPSS)

This is an activity to encourage higher-order thinking that involves students thinking individually, then pairing with a partner, then snowballing those ideas with the wider group. The sequence generally begins with the teacher posing an open-ended question, to which there may be a range of responses. Think time or wait time is followed by discussion with a partner. The pair may then pair up to form a square, or share it out to the wider group, and build on each other's ideas. TPSS is also suggested in the lesson resources on the NCCA website for teaching and learning of Programming Concepts.

### WALKING DEBATE

This is a well know methodology that can be used and adapted for the Computer Science classroom.

At one end of the room, place an 'I agree' sign on the wall, and on the other end an 'I disagree' sign. Place 'I'm not sure' in the middle of the room and ask the students to stand in this space.

Call out statements and as the students consider each one they move to the position that reflects their opinion. The closer they move towards each sign, the more they agree or disagree. Emphasise that it is okay to stay in the middle and it is also okay to move position according as students hear different views.

In the CS class the teacher can show the complexity of an issue by airing as many different perspectives as possible. Walking debates have been suggested in different sections of the evolution of CS. For example, Can Machines Think? The teacher can also push students to explain and justify their position with evidence by asking questions such as 'Can you give an example of that?' 'What is the evidence to support that view?' 'What have people like Alan Turing or Stephen Wolfram said about this?' 'What will it take for computers to demonstrate they are thinking in such a way to convince humans?' etc.

## THE POWER OF PERSUASION

Another strategy to get students thinking is to pose a question which has more than one correct answer: *Why increased automation is a bad idea for society?* Or *Why the CS revolution will have a very different impact on the developing world than the developed world?* Then get the class to generate four possible answers to a question and vote on their preferred answer.

Count the votes for each answer. Ask the students to sit with their preferred answer groups. Now the job of each group is to persuade others from different answer groups to come over to their group. Give them some time to formulate their campaign strategy. The following questions may be useful to prompt debate:

- ▶ Who is going to speak? What argument will they use? What evidence can they provide to support their argument?
- ▶ Are they going to have a campaign slogan?
- ▶ Which other group will they target?
- ▶ Will they focus on the strengths of their own argument, or on the weakness of the opposition?

During the 'campaign' the teacher acts as chairperson, although this role may also be assigned, especially as the class becomes familiar with the strategy. In the course of the lesson, learners may change sides, or revert to original positions. Leave enough time at the end of the lesson to think about the campaign and the tactics used. A good follow-up homework task for further learning is for students to generate a paragraph or a statement beginning with *I was persuaded because....* or *Answer A won because....*

## IN THE HOT SEAT

This is a powerful strategy of putting a learner in a HOT seat, taking the role of a character from fiction or from history. Or of a person from another part of the world or facing a particular challenge.

In the section on the invention of the Web, there is a *Stimulate a Debate* exercise on access to personal data. It suggests that as part of the teaching and facilitation methodology at the end of the exercise, that the HOT seat be taken by the government, then by a major hi-tech multinational, then by a citizen or a consumer. All students can be involved by preparing questions in advance, or by turning the spotlight and putting the whole class in the HOT seat.

## PROBLEM BASED LEARNING

Problem based learning offers many benefits. When students are centrally involved in working out what the problem is, and coming to their own understanding of the problem, they will have a deeper understanding of the issue. In problem based learning, it is important that the problem chosen drives the learning rather than providing an example of concepts or theories already taught in class. To be effective problems 'should not be over circumscribed' and instead should be 'ill defined or ill structured so that aspects of the problem are emergent and definable by the learners' (Jonassen 1999).

The characteristics of good problem based learning are

- ▶ multiple criteria for evaluating solutions can be used;
- ▶ uncertainty about which concepts, rules, and principles are necessary for the solution or how they are organized;
- ▶ an absence of prescribed rules or principles for describing or predicting the outcome
- ▶ a necessity for learners to make judgements about the problem, defend their solutions, and express personal opinions or beliefs.

The ALTs described in the specification, the task-based NCCA supports and the PDST manuals all support opportunities for problem-based learning.

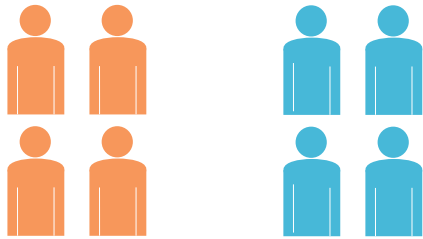
### JIGSAW LEARNING TECHNIQUE

Jigsaw groups are a very effective way of organising group work. In this scenario, students are arranged into groups and each group is given a different subtopic related to the one topic. For example, the overarching topic might be 'the role of adaptive technology in all human lives' (related to LO 1.17) and students might be put in groups and given examples to research (special needs, real-time translation of foreign languages, robotic home help for dependents, etc...) They must become 'expert' on their topic and agree how they are going to teach it to their classmates. When they are ready, the groups are mixed up so that there is now one expert on each subtopic in each group. They take turns 'teaching' their subtopic to each person in the group.

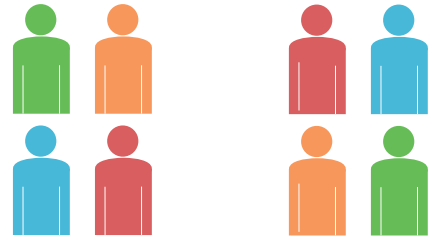
### JIGSAW TECHNIQUE



**Step 1:**



**Step 2:**



## PLACEMATS

Adapted from Barrie Bennett, *Beyond Monet*

Place mat is a form of collaborative learning that combines writing and dialogue to ensure accountability and involvement of all students. It involves groups of students working both alone and together around a single piece of paper to simultaneously come up with lots of alternative ideas.

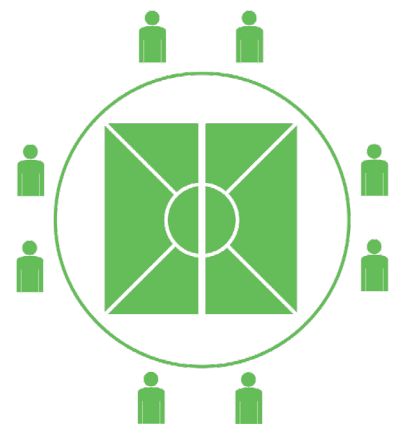
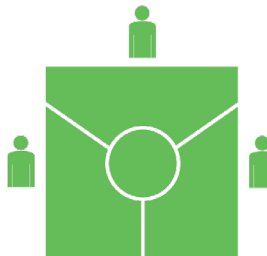
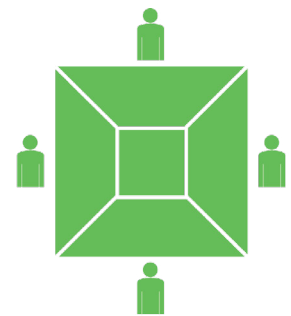
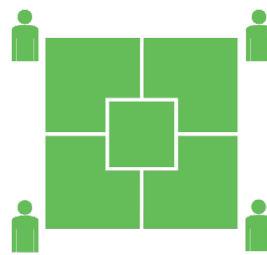
Materials: Flip chart paper is preferable, but not necessary.

The paper is divided up into sections based on the number of member in the group with a central square or circle.

### Steps

1. Carefully construct the task or question.
2. Assign students into small groups (3–4 works best)
3. Hand out the task/question with the flip chart page.
4. Students work alone first, using their section of the place mat to record their ideas.
5. Then students share their ideas with the group
6. Then they prioritize the 2–3 big ideas that have emerged from the group and these go on the centre placemat.
7. Sharing then takes place between groups.

Below shows different ways of designing your placemats depending on the number of students in each group. A large poster or flip chart paper works well.



## PEER TEACHING / PAIR PROGRAMMING

Peer-to-peer presentation or collaborative paired programming is a methodology that involves students teaching with, and learning from, each other. This is very effective as students must understand a topic in order to teach it to their peers or they can bootstrap their learning from a peer. This type of activity boosts understanding and also builds strong communication and information processing skills as students must think how best to transmit the information.

## Stimulate a Debate Strategy

The strategy below can be used to explore the complex relationship between computing technologies and society, and the ethics surrounding the relationship. There are many examples of how to use this strategy throughout this resource. Learning Outcomes [1.11 to 1.18](#) in particular can be achieved, depending on the topic being researched and debated. The 4 steps of the classroom strategy to stimulate and facilitate debates are:

1. Watch a Stimulus Video or read a stimulus piece.
2. Prompt questions to provoke class discussion and elicit initial viewpoints.
3. Divide into research groups to explore the topic from key standpoints.
4. Choose a teaching / facilitation methodology.

### 1. Watch a Stimulus Video or read a stimulus piece.

It could be background information or provocative arguments around the topic.

### 2. Prompt questions to provoke class discussion and elicit initial viewpoints.

For example:

- ▶ What will happen to employment – will the growth of computing technology and AI in particular, be a net creator or destroyer of jobs?
- ▶ Will our quality of life improve through cheaper, faster and higher quality health care and greater access to knowledge?
- ▶ Will the rich get richer, and corporations more powerful?
- ▶ Will ordinary citizens be more active and better heard by their government or will government have access to all the data it needs on its people, without consulting them?
- ▶ Will our privacy be assured on this electronic network or will Big Brother end up knowing more about all of us?
- ▶ Should we amend our laws to protect against this new computing technology?
- ▶ How might war and peace be affected? How has the nature of warfare changed?
- ▶ How will human relationships be affected by the accelerated progress of technology and new modes of interpersonal communication?

*(These are sample prompt questions based partially on the teachers institute at yale)*

### 3. Divide students into research groups to explore the topic from key standpoints.

These will be typical opposing standpoints in the usual tradition of debating. Students must explore the topic from the assigned standpoint. For example:

- ▶ Military innovations, including wartime inventions, have an overall positive impact on society and on technology.

Equally another research group will investigate:

- ▶ Military innovations, including wartime inventions, have an overall negative impact on society and on technology.

### 4. Choose a teaching / facilitation methodology.

From the summary of teaching and facilitation strategies, there is a range of strategies such as *Think Pair Share*, *Snowball (TPSS)*, *HOT seat*, *Power of Persuasion*. In addition a *Jigsaw Learning Technique* can be used effectively after research has been done, as well as other classroom strategies that encourage dialogue, debate and feedback.

## Further NCCA resources

### NCCA RESOURCES FOR SELF-REFLECTION

The [NCCA classroom resources](#) are designed for ePortfolios and for self-reflection. All html resources are designed with minimal code to encourage students to edit the code, modify the resource and include their own programs and reflections. All NCCA resources designed for CS, in the Programming Concepts and ALT sections, are designed as platforms for students to re-use and to develop their own unique resources. Teachers can help students to develop their skills of personal effectiveness in a number of ways. These are described fully in the Building key skills in the Computer Science classroom resource.

### NCCA FORMATIVE AND REFLECTIVE BOOKLETS



Giving students opportunities to support each other in their learning through reviewing their own work and their peers' work and giving and receiving feedback.



Encouraging students to record their goals and review their progress, for example, through a journal/blog or the use of student reflection sheets. This helps them to understand their achievements, identify the areas they need to improve upon and plan for future learning.

Download these resources, and more, at this link <https://www.ncca.ie/en/junior-cycle/assessment-and-reporting/focus-on-learning>.

Developing [key skills in the Politics and Society classroom](#) has many strategies similar the ones described in this resource, and many more that are applicable to exploring and discussing ideas in the classroom.

## Helpful tips for groups and discussions

### ASSIGNING STUDENTS TO GROUPS - TIPS FOR SUCCESS

- ▶ Assign the groups yourself.
  - At times, each group should have a mix of abilities, gender, motivation levels, etc.
  - At times, [generate teams randomly](#). This has the added bonus of de-personalising the selection. Teacher discretion should also be applied here.
- ▶ Start out with small groups (2 or 3) until students become skilful in group work.
- ▶ The shorter the time available, the smaller the learning group should be.
- ▶ Assign each student a job or role but rotate them frequently.
- ▶ Graduate the tasks so that there are some tasks that everyone can do with ease and some more challenging tasks or questions. That way, everyone can contribute something to the group.
- ▶ Make your expectations clear so that students know what you want them to do and how to behave.
- ▶ Agree ground rules.
- ▶ Observe and monitor students working.
- ▶ Teacher's role is to set the task, to keep students focused on the task, support students if they get stuck on the task and give positive feedback.

### HELPFUL PHRASES FOR COLLABORATION AND DISCUSSION

- ▶ I think... because (evidence)
- ▶ I agree/disagree because...
- ▶ Let's examine our solutions/ideas we have so far ...
- ▶ Do I understand you correctly, are you saying....?
- ▶ I'm not sure what you mean. Can you say a bit more about that?
- ▶ How can we back-up this idea with evidence?
- ▶ Let's summarise our main ideas so far
- ▶ Let's take turns to make sure that everyone has a chance to speak.
- ▶ Let's check to see if everyone has aired their view or is there another perspective on this?
- ▶ Let's hear from someone who hasn't had a chance to speak yet.
- ▶ I think that's an interesting point but we'd better stick with the question we're working on right now.



