DTiF
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TEACHING AND SUPPORTING *PROJECT MANAGEMENT* IN THE CLASSROOM F-6

Project management is a core concept of the Australian Curriculum. This document gives you an overview of project management and provides ideas on how you can implement project management skills, in the F-6 classroom. It explains the importance of projects, the benefits to students of managing projects and how these skills prepare students for working on projects beyond the classroom. Project management is crucial for students when designing solutions. Students need to be explicitly taught project management skills and strategies.

What is project management?

Project management involves planning, organising, controlling resources, monitoring timelines and activities, reporting and completing a project to achieve a goal that meets identified criteria for judging success.

Project management processes can be described in a variety of ways. One common description of the project life cycle identifies four phases:

1. planning
2. scheduling
3. monitoring and controlling
4. closing.

Figure 1: Students using a planning template during project work.

The benefits of teaching project management

The overarching core concept in the Australian Curriculum: Technologies is creating solutions for preferred futures. For students to do this they will need to apply learning developed through the other core concepts: Systems, Data, Interactions and impacts, Systems thinking, Computational thinking, Design thinking, Technologies process and production skills, Project management, and Entererprise skills and innovation. Project work is central to designing solutions in Technologies and provides opportunities to develop personal social capability. See Figure 2.

Effective project work requires project management knowledge, understanding and, skills. These skills are useful and applicable across a range of learning areas beyond Technologies, see Appendix 1.
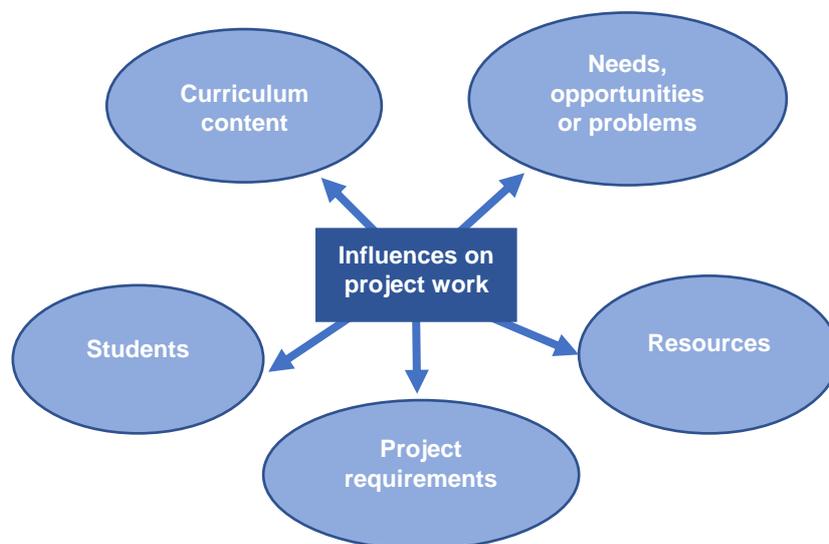

Figure 2: Influences on project work

Project management in Technologies

In Technologies, students will develop the skills to manage projects to successful completion. This includes considering resources and constraints to:

- develop resource, finance, work and time plans
- assess and manage risks and issues
- make decisions
- control quality
- evaluate processes
- collaborate and communicate with others at different stages of the process.

Students are taught to:

- plan for sustainable use of resources when managing projects
- take into account ethical, health and safety considerations
- consider personal and social beliefs and values.

Explicit teaching

Just as we do not expect students to automatically know how to write narratives, draw plans or do trigonometry, we need to explicitly teach students how to manage projects. Students need to be supported by the teacher in their management of project work.

Thorough planning and good project management will develop with practice and experience. Therefore, students' experiences in project management need to be repeated over a range of projects. Considerable time needs to be allocated for the management of projects if students are to successfully complete the project as well as learn about project management.

Through teaching project management skills and strategies students become independent and interdependent learners. They can manage their time effectively, think critically and creatively, work confidently as part of a team and it prepares students for an ever-changing workforce of the future.

How can I teach project management skills in the classroom?

There are many different ways you can teach students project management. You are most likely teaching project management in your classroom right now. You might be giving students team roles in group work, using checklists and Gantt charts or giving students constraints to complete a task.

Teaching project management may involve modelling, guiding or allowing students to work independently. For more information on explicit teaching see Appendix 2.

The approaches to be used will depend on the familiarity and expertise of the students with the specific activities required of them. This may involve simple techniques for young students such as creating a timeline of tasks with post-it notes which can be rearranged as requirements change or tasks are completed, or to identify the steps in a flow chart.

Project management and the general capabilities

During project management, students will develop their general capabilities, especially when these links are explicitly made by the teacher. Opportunities include:

- Literacy (recording, planning and managing)
- Numeracy (timetabling, budgeting, collecting data)
- Digital Literacy Capability (creating and exchanging)
- Critical and Creative Thinking (problem-solving)
- Personal and Social Capability (self-management, teamwork, roles)
- Ethical Understanding (decision making)
- Intercultural Understanding (cultural protocols).

These capabilities better equip students for life beyond school where project management is a valued skill.

Personal and Social Capability

When managing projects students need to learn to: communicate effectively; work in a team; resolve conflict and consider resources including time. This builds personal and social capability.

Skills and strategies of teaching project management F-6

The following is a list of some of the activities and techniques that may occur in each phase and how these relate to the Digital Technologies processes and production skills strand. These can be modified to suit your students. Note that students evaluate, collaborate and manage throughout the project. These aspects have been highlighted in italics.

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Planning *(Investigating and defining)*

Planning involves determining the objectives of the project and defining the scope of the project. It includes identifying:

- the problem or need
- the purpose of the project
- who is involved in the project (stakeholders/clients or audience)
- the composition of the group and its functions and objectives
- project objectives *(evaluating)*
  - criteria for success
  - final deliverables
- boundaries (assumptions, dependencies, exclusions and constraints)
- timeframe
  - deadlines
  - milestones
- individual roles and responsibilities of project team members *(collaborating and managing)*

Figure 4: Students collaborating on a project

- risks
  - factors that may jeopardise the success of the project
  - actions to reduce risks
  - monitoring of risks
  - contingency plans should risks arise
- resources
  - determine the resources you have to deliver project scope
  - allocate resources (See Figure 5)
- quality assurance
  - what needs to happen to create a quality product
- communication plan
  - who you are communicating your messages to (parents, teachers, community members or other students).

A significant amount of the total project time needs to be dedicated to the planning phase: think, plan, do.

Figure 5: Resource list

- **Tools, techniques and templates**
- There are many tools, techniques and templates that students can use to assist with the phases of project management.
- Students need to understand the advantages and disadvantages of each and how to use them.

See Appendix 3 for design process thinking and planning strategies.

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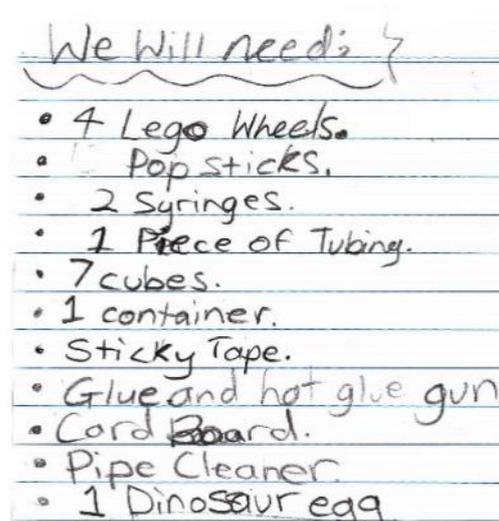
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Scheduling *(collaborating and managing)*

Scheduling involves the detailed analysis of the components of the project and how they will be sequenced. There are many different methods of scheduling projects, but some that could be used include work-breakdown structure primary example (Figure 7), Program Evaluation and Review Technique (PERT) chart, Gantt charts and critical path analysis. Some of these techniques are more appropriate for Years 9 and 10 and Senior secondary. For earlier years more guided approaches, templates and scaffolding will be required such as using checklists or visual timelines. Some of the tasks include:

- developing a detailed work-breakdown structure, involving decomposing the project into its various components
- estimating the time required for each task
- sequencing the tasks into the most efficient order
- developing a start and stop time for each task
- assigning people to each task

Figure 6: A production plan set out in a table from a Year 7 textiles and design project.

	A	B	C	D	E	F	G	H	I	J
1	Year 6 Garden Project					swimming				
2		Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday
3		01-May-18	02-May-18	03-May-18	04-May-18	07-May-18	08-May-18	09-May-18	10-May-18	11-May-18
4	Research - Understanding the problem									
5	Ideation - brainstorm possible design ideas									
6	Decision time - what will we prototype?									
7	Prototyping									
8	Testing									
9	Evaluation - test on fellow students									

Figure 7: A work breakdown set out in a spreadsheet

Monitoring and controlling *(producing and implementing/collaborating and managing)*

Once the planning and scheduling have been completed, the project needs to be managed to completion. The main focus of the activities in this phase is tracking the progress of the project and reporting to stakeholders. This includes:

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- directing and controlling the project
- measuring progress against the plan
- determining if changes to the plan are needed to keep the project on track.

Some activities that students might complete in the monitoring and controlling stage are:

- obtain resources, products or services
- quality assure a product, e.g. test that a webpage works or test a prototype
- adjust the schedule due to changes in the project
- review planning documents, e.g. review risk register by adding a new risk or update the budget
- report project progress to the team and stakeholders

Closing (evaluating)

This involves finalising and evaluating the project, including:

- ensure deliverables are completed
- review success against the success criteria
- report and evaluate how well the project ran, this might be with the project team or stakeholders
- discuss lessons learned from the project
- celebrate success!

Adapted from (NSW Department of Education and Training, 2000: 15–16)

Each of the phases in project management will occur in each project. Students need to understand and be able to apply each phase in the project management process.

Figure 8: Discussing the project with team members.

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Appendix 1: Links from classroom to industry

The project management strategies used by students and those used in professional environments have much in common. The purpose is contextualised and ideally has stakeholders, clients or an audience to provide feedback Table 1 shows some of the similarities and differences.

Table 1: Project management in education and business, commonalities and differences.

Project management step	School	Business
Purpose	**Context relates to** Australian Curriculum e.g. a project or STEM integrated unit	**Context relates to** Business purpose, e.g. telecommunications
Need, opportunity or problem	• Local, e.g. monitoring soil moisture in the school garden • Regional, e.g. fire warning in Australia and endangered animals in a specific rural area • Business opportunity, e.g. launching a piece of software; designing a product for the school fete • Global problems, e.g. pollution, environmental degradation • Wicked problems, e.g. world hunger, global warming	
Scope	Sequence of tasks which must be accomplished/criteria for success/objectives	
Organisation of people	Roles for: • individuals; groups; teams	
Timing	Milestones/deliverables/deadines/due dates	
Parameter type	• School semester, term • Resources	• Company or client driven timing • Resources
Risk	Conducting a risk analysis	
Evaluation type	• Self-assessment • Peer assessment • Teacher assessment • Milestones/deliverables (meeting criteria/ scope/ goals) • Within budget/resource allocation • Timeliness • Quality	• Key performance indicators (KPIs) • Milestones/deliverables (meeting criteria/ scope/ goals) • Within budget/resource allocation • Timeliness • Quality
Method/Process	• Project idea, brainstorm, research (Investigating and defining, Mathematics: Statistics Acquiring, managing and analysing data) • Design solution/ make prototype (Generating and designing) • Produce/ Present/ Launch/ Publish (Producing and implementing/collaborating and managing) • Evaluation (Evaluating)	• Initiating • Planning • Executing • Monitoring/controlling • Closing

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Appendix 2: Explicit teaching during project work

Careful planning and close support of students is required to maximise the likelihood of success of a project and to enhance learning from project work. Teachers play an important role in terms of both facilitating students' project work and explicitly teaching the knowledge and skills needed by students to successfully do project work, including specific aspects of:

* project management
* the development process and relevant content
* working in groups
* documentation of project work.

Students may not initially come with the skills required to complete project work. They need to be explicitly taught any new knowledge, skills, techniques and strategies necessary for the project, then guided as they develop and practice the knowledge and skills and reflect upon their learning.

Explicit phases of teaching

Explicit teaching is a model where teachers undertake specific activities to help students to gain mastery in a new area. During project work, explicit teaching will need to occur each time the students encounter a new or unfamiliar task or requirement. For example, if students are asked to create a data flow diagram (DFD) or to plan the scheduling of a project for the first time they will need to experience structured learning activities before they will be ready to undertake the task independently.

When students first begin project work they will need more explicit and systematic teaching than when they have had some experience. All students will develop their knowledge and skills at different rates, so within a classroom you may be required to undertake different explicit teaching activities with different students.

The teacher should determine and prepare modelled or guided learning activities or allow students to work independently. These activities may differ to cater for the needs of different students and should allow students to progress and refine their knowledge, understanding and skills.

The phases of explicit teaching (Figure 9) include:

* preparation and planning
* setting the context
* modelled strategies
* guided learning
* working independently
* reflection.

Figure 9: The phases of explicit teaching

Source: Cooke, P. Et al (2002) Enhancing project work in SDD and IPT, p 47.

For students to successfully undertake and complete projects, sufficient time and opportunity need to be provided to enable students to learn, practice and refine the required skills and knowledge. Students will need many opportunities working on a variety of projects if they are to develop the knowledge and experience required to undertake project work independently.
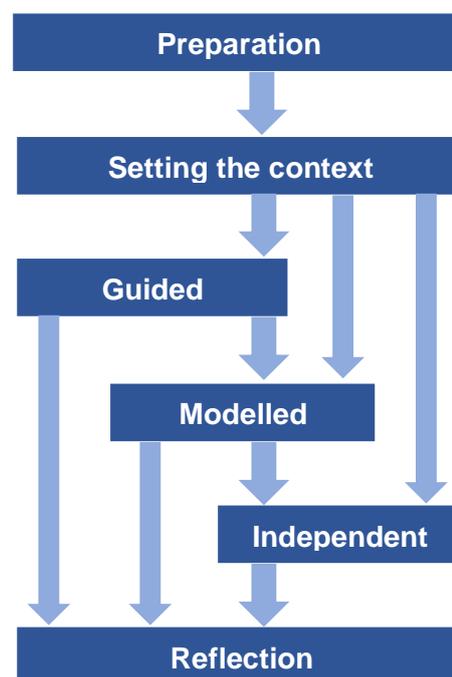
Project work considerations

Preparing and planning

The teacher determines what needs to be taught. Consider:

Where are your students now?

- What have you covered previously with your students?
- What do your students already know?
- What are the individual differences in the class?

Where are your students going?

- Determine the content (what students need to know, understand and be able to do).

How are they going to get there?

- Consider modelled, guided or independent teaching and learning activities that could be used to address the learning needs.

How will you know they are there?

- What will students be able to do or know about?
- How will you assess the students' learning?
- What feedback will be given to students?

Figure 10: A word cloud taken from the Australian Curriculum: Technologies, Key ideas web page

Setting the context

Students are introduced to what they are going to learn and apply. The teacher should:

- explain the purpose of the learning activity. This could involve discussing with students the content.
- explain how they are going to learn about the content or skill through project work
- present information clearly, both visually and orally
- make links with prior knowledge and learning experiences that students can build upon, including discussing prior teaching and learning experiences and examples from beyond school.

Modelling

The teacher provides teaching and learning activities that model and demonstrate the concepts or skills that are being learnt (Figure 9). There are many teaching methods that can be used, including:

- **demonstrating** what the students will eventually be expected to do independently, for example showing them how to develop a data flow diagram
- **completing activities together:** activities that students are undertaking for the first time can be undertaken as a whole class.

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- **showcasing previous student work** to show what is expected and the standard required. Students can then unpack why and how it was created. In industry, there is often a standard way of doing things in a company: you do not reinvent how to do something each time you want to do it.
- **reviewing case studies** to demonstrate a problem, the solution, how it has been documented, plus the process that was used to get to the solution, for example videos, online case studies
- **breaking the learning up** into meaningful chunks
- **working backwards** from an already completed project to show how a tool or technique could have been created and used during the project. Sometimes called decomposition or deconstruction.

Figure 11: A teacher showcasing previous work to her students.

- **presenting guest speakers** from community, industry or a student from the year above who has recently completed similar activities to explain how they do it.

Guiding

The students work with the teacher or more expert peers to practice their new skills. The teacher provides links between theoretical principles and practical application.

Students are provided with structured formats using scaffolds or templates, and they enter the information into the spaces.

The teacher at this stage guides and closely monitors students' progress (Figure 9). This guidance and monitoring of projects by the teacher

Figure 12: A teacher providing guidance during project work.

should occur during all projects unless students have demonstrated that they are ready to work independently. Some students will continue to need more supervision and guidance than other students. Students who are able to work independently are working at a higher level.

Monitoring independent operation

The students independently demonstrate their new knowledge and skills but are monitored by the teacher. The teacher should still require regular updates from students on their progress and should provide constructive feedback and advice. If students are having difficulties, the teacher may need to step in and provide increased guidance.

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Reflecting (Teachers and students)

Reflecting is an important step which enables both the teacher and students to learn from what they have done. For teachers there is an opportunity to:

- determine what their students have learnt (or not learnt)
- provide positive, constructive and useful feedback to students
- determine what they would need to improve in similar activities in the future.

For students there is an opportunity to:

- make links between theoretical principles and practical application
- determine what they have learnt
- understand their strengths and weaknesses and the areas they need to improve
- relate the content and outcomes they have learnt to other areas of the curriculum.

Strategies for teaching students project management

Preparing and planning

There are many different tools and techniques that students can use to manage projects. The teacher needs to determine:

- What tools and techniques for planning, scheduling, controlling and closing projects are available to students?
- What does the curriculum specify that students should be able to do?
- What do the students know about project management?
- What are you going to teach about project management?

Figure 13: Project management constraints

Setting the context

Outline what aspects of the project students are going to have to manage and the skills and knowledge they will need. This can involve:

- helping students to make the links to prior learning and knowledge about project management skills discussing earlier projects or case studies or draw on examples from beyond school (for example, organising a party) where they have learnt about and applied project management skills
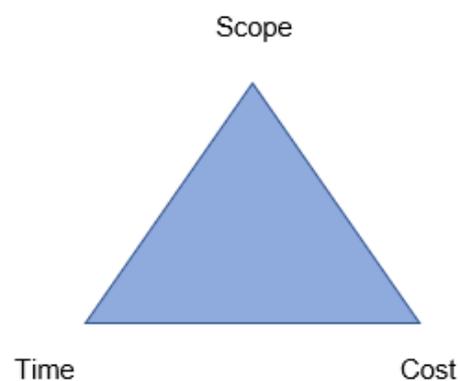
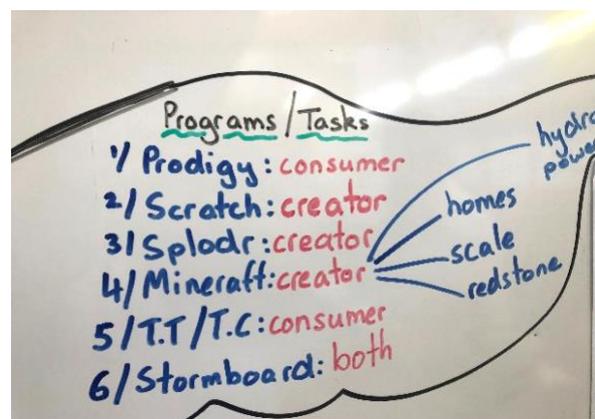- explaining the management demands for the project

Figure 14: Planning with students could include a guided discussion on resource selection such as in this example where the teacher and students discussed and recorded software selection for the project.

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- introducing the concept of project management or, as students gain expertise, introducing new techniques or tools for project management.

It is important that students understand the advantages of and reasons for using specific techniques and tools of project management.

Modelling

The following are a number of ways to introduce and model to students tools and techniques of project planning and management:

- **Do it with the class:** For the first project your class undertakes, it may be a good idea for it to be a class project where you are the project manager. As a whole class you can plan and manage the project. In this way you can model project management for your students. A useful technique involves brainstorming as a class the components of a project, which can be done using post-it notes for each separate task. These can then be grouped and ordered to determine the sequence of the project.

Figure 15: A class timetable

- **Use case studies** and samples of students planning to illustrate how projects were planned and the tools and techniques available.
- **Work backwards:** When introducing project scheduling tools to students, you might ask them to prepare a Gantt chart or similar scheduling tool, as a reflective activity for an already completed project. It is difficult for inexperienced students to anticipate what the tasks are within a project or how much time a task will take, so allow them to reflect, based on a project they have already experienced. By the time they have worked on a number of projects they will get a better sense of time management and allocation of tasks. You will need to discuss how doing the Gantt chart first would benefit project management.
- **Invite guest speakers** from industry or community such as a project manager, to explain how they manage projects and the tools they use. Students can also ask questions about the decisions and processes that are used, which often do not appear in the documentation of the project management.
- **Gradually introduce new tools and techniques:** Choose simple tools and techniques initially. As students gain confidence and skills in managing projects introduce new tools and techniques. See Appendix 3.

Discuss how students can make decisions and balance competing pressures, such as time versus quality.

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Try to focus on the project management phases, for example, scheduling, rather than simply on the specific tools, such as Gantt charts. Gantt charts are simply one strategy for scheduling and controlling activities in a project.

Guiding

Once students have worked through a class project and experienced some modelling of tools and techniques of project management, they should be ready to start managing small projects with guidance and support.

Some suggestions for guiding students include:

- **Start with group projects:** Where students complete the management as a team, so they can support and learn from each other. Before students start working in teams they should have worked through some basic group work strategies, so they can focus on project management rather than team skills and the protocols of group work.
- **Provide models and scaffolds** which students can adapt to their own project. For example, if they are asked to create a project plan, give them a sample project plan, which shows how it is presented, and how and what information is displayed. Students can then remove the sample data and replace it with their own.
- **Manage only some of the project:** If your students are not yet ready to complete all aspects of managing the project, allow them to manage selected portions of the project. For example, do the initial planning and time allocation, milestones etc. as a teacher-led activity in class, but then get the students to undertake the ongoing management (control) of the project.
- **Focus on project management:** Undertake projects where the focus is on project management, where students have all the technical skills and knowledge.
- **Match the project management requirements to students' skill levels:** Gradually increase the amount of the project management for which students are responsible.

The teacher at this stage guides and closely monitors students' progress. The teacher may need to intervene to support a student who is having difficulties in planning, scheduling, controlling or closing the project. Intervention may involve increasing levels of support to students before major problems arise.

For example, if the project gets too far behind or students are having difficulties in controlling their project, intervention could include renegotiating aspects of the project including:

- new timelines and schedules
- reduced scope of the project
- partial completion of project objectives.

Independent operation

Students who can operate independently are able to use specific tools and techniques to manage their own projects with minimal input from the teacher. To monitor the progress of a student who is operating independently the teacher should still:

- require regular progress reports from students, for example how the student is progressing against the scheduled milestones
- regularly check students' diaries and log books
- provide constructive feedback to students about their project management.

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Reflecting

The teacher can reflect on the following questions:

- What have students learnt about project management?
- What would I do differently if I did this project again next year?
- What support in project management will my students need during the next project? Did any particular students have problems?

The students can reflect on the following questions:

- What project management factors led to success and which caused difficulties?
- What would I do differently when managing the next project?
- What have I learnt about project management?
- What aspects of the curriculum content have I addressed?
- How can I apply the knowledge and experience of project management from this project to other projects in other learning areas?

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Appendix 3: Design process thinking and planning strategies

Table 4 identifies teaching and learning strategies useful for students working through the design process. The table illustrates which aspect of the design process the strategy facilitates. Click on the strategy for the template.

Table 4: Design process strategies

Strategies	Investigating and defining	Generating and designing	Producing and implementing	Collaborating and managing	Evaluating
Retrieval chart	X				
SCUMPS	X		X		X
Y chart	X				
So, what's the problem?	X	X			
Disadvantages/improvements	X				X
P.C.Q.	X				X
Expert jigsaw	X				
POOCH	X				
Thinker's keys		X			
Bloom's experiment form		X			
1:2:4 or 1:4:P:C:R or 3-step interview		X			
Paired interviews	X	X	X	X	X
2Q					X
Continuum					X
Thinker's keys: evaluation					X
Six thinking hats					X
Like/Dislike/Challenging					X
Thinking with images project zero (pg28)	X				
TASC Wheel	X	X	X	X	X
Imagine If Agency by Design/ project Zero		X			X
Parts, purpose, complexities (project Zero)		X			
Parts, purpose, complexities (project Zero)	X				
EDGE (visible and design thinking)	X	X	X	X	X

Additional resources
Project Zero Visible Thinking Core Routines, Agency by Design Thinking Routines, Tools and Practices and Mary Mannison's Interactive teaching strategies (around group work)

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