

MAXXESHOP3D

Expert Level 3D Printing & Design Year Program

Senior secondary / extension club / enrichment

Extension program for highly capable students, innovation clubs or senior electives using 3D printing as a serious design-and-make practice.



Australian-style weekly lesson sequencing for a full school year

Skill Pathway

Expert

Advanced

Intermediate

Developer

Beginner

Expert Level • Full-Year Lesson Program

Senior secondary / extension club / enrichment

Extension program for highly capable students, innovation clubs or senior electives using 3D printing as a serious design-and-make practice.

Program overview

This program is an extension pathway for highly capable students, clubs or senior enrichment contexts. It emphasises evidence, risk, manufacture, systems thinking and public-facing communication.

Indicative year band	Senior secondary / extension club / enrichment
Suggested lesson duration	80–100 minutes
Curriculum focus	School-based extension aligned broadly to Years 9–10 Design and Technologies processes and production skills
General capabilities	Literacy, Numeracy, Critical and Creative Thinking, Personal and Social capability, Ethical Understanding, Intercultural Understanding
Term structure	4 terms • 8 core weekly lessons per term • flexible extra weeks left available for local school calendars

Term 1 • Expert Workflow and Systems Thinking

Expert Level • Term 1

Expert Workflow and Systems Thinking

8 core weekly lessons plus flexible school weeks for interruptions, excursions and assessment

Week 1 From Maker to Designer-Engineer

Week 2 Risk Registers and Production Protocols

Week 3 Systems Thinking in Product Design

Week 4 Design Research and Stakeholder Mapping

Week 5 Failure as Data

Week 6 Complex Modelling Strategies

Week 7 Multi-Criteria Decision Making

Week 8 Term 1 Proposal Defence

Essential question	How do complex systems and professional workflows change design practice?
Likely term outcome	proposal defence, documented testing, portfolio evidence and professional presentation
Teaching approach	Teacher modelling + guided practice + studio/making time + discussion + reflection

Term 1 • Week 1: From Maker to Designer-Engineer

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind from maker to designer-engineer and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "From Maker to Designer-Engineer" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

Maker culture helped popularise desktop 3D printing, but professional practice goes further: designers and engineers gather evidence, manage risk, test ideas and document decisions so a product can be trusted and improved.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "From Maker to Designer-Engineer" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 2: Risk Registers and Production Protocols

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind risk registers and production protocols and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts

	or failed prints, projector/display, 3D printer, prepared slicer screenshots or demo files
Safety	Make safety the main teaching focus: identify hazards, rehearse shutdown routines, discuss hot surfaces and moving parts, and record classroom expectations before any hands-on activity.

Teacher note

This week's lesson positions "Risk Registers and Production Protocols" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Risk Registers and Production Protocols" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 3: Systems Thinking in Product Design

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind systems thinking in product design and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability

Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Systems Thinking in Product Design" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Systems Thinking in Product Design" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 4: Design Research and Stakeholder Mapping

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind design research and stakeholder mapping and apply them to a design-and-make context appropriate to the expert pathway.

Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Design Research and Stakeholder Mapping" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Design Research and Stakeholder Mapping" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 5: Failure as Data

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind failure as data and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Failure as Data" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Failure as Data" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students

who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 6: Complex Modelling Strategies

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind complex modelling strategies and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display, internet-connected devices, Tinkercad accounts, mouse if available
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Complex Modelling Strategies" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Complex Modelling Strategies" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.

5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 7: Multi-Criteria Decision Making

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind multi-criteria decision making and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Multi-Criteria Decision Making" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Multi-Criteria Decision Making" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.

3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 1 • Week 8: Term 1 Proposal Defence

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind term 1 proposal defence and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	No prior lesson knowledge is required beyond classroom expectations and curiosity.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Term 1 Proposal Defence" inside the term theme of expert workflow and systems thinking. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame “Term 1 Proposal Defence” as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Advanced Manufacture and Testing

Expert Level • Term 2

Advanced Manufacture and Testing

8 core weekly lessons plus flexible school weeks for interruptions, excursions and assessment

Week 1 Design for Additive Manufacture in Depth

Week 2 Additive vs Subtractive vs Formative Processes

Week 3 Tolerance Stacking and Assemblies

Week 4 Custom Jigs, Fixtures and Templates

Week 5 Mechanical Behaviour and Print Anisotropy

Week 6 Test Plans, Evidence and Iteration

Week 7 Production Documentation and Handover

Week 8 Term 2 Technical Review

Essential question	How do expert designers connect modelling decisions to testing and manufacture?
Likely term outcome	proposal defence, documented testing, portfolio evidence and professional presentation
Teaching approach	Teacher modelling + guided practice + studio/making time + discussion + reflection

Term 2 • Week 1: Design for Additive Manufacture in Depth

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind design for additive manufacture in depth and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Design for Additive Manufacture in Depth" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Design for Additive Manufacture in Depth" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 2: Additive vs Subtractive vs Formative Processes

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind additive vs subtractive vs formative processes and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display

Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.
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Teacher note

This week's lesson positions "Additive vs Subtractive vs Formative Processes" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

Manufacturing has never been only one thing. Blacksmithing and casting are formative; machining is subtractive; 3D printing is additive. Comparing all three helps students see why engineers choose different processes for different jobs.

Discussion prompts

- Why would an engineer still choose machining or laser cutting if 3D printing is available?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Additive vs Subtractive vs Formative Processes" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 3: Tolerance Stacking and Assemblies

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind tolerance stacking and assemblies and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.

Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display, calipers or rulers, sample test parts
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Tolerance Stacking and Assemblies" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

Precision became more important as machines and interchangeable parts became central to manufacturing. The idea of tolerance sits behind everything from screws that fit properly to machines that can be repaired.

Discussion prompts

- Why can two parts look correct on screen but fail to fit in real life?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Tolerance Stacking and Assemblies" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 4: Custom Jigs, Fixtures and Templates

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind custom jigs, fixtures and templates and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes

	risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Custom Jigs, Fixtures and Templates" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Custom Jigs, Fixtures and Templates" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 5: Mechanical Behaviour and Print Anisotropy

Duration	80–100 minutes
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Learning intention	Students understand the key ideas behind mechanical behaviour and print anisotropy and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display, 3D printer, prepared slicer screenshots or demo files
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Mechanical Behaviour and Print Anisotropy" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Mechanical Behaviour and Print Anisotropy" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students

who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 6: Test Plans, Evidence and Iteration

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind test plans, evidence and iteration and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Test Plans, Evidence and Iteration" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

Many famous designs only succeeded after repeated testing and revision. Engineering history rewards teams that treat failures as information, not embarrassment.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Test Plans, Evidence and Iteration" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 7: Production Documentation and Handover

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind production documentation and handover and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display, 3D printer, prepared slicer screenshots or demo files
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Production Documentation and Handover" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Production Documentation and Handover" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.

3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 2 • Week 8: Term 2 Technical Review

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind term 2 technical review and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students draw on Term 1 foundations and a shared design vocabulary from earlier lessons.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Term 2 Technical Review" inside the term theme of advanced manufacture and testing. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame “Term 2 Technical Review” as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Innovation, Sustainability and Enterprise

Expert Level • Term 3

Innovation, Sustainability and Enterprise

8 core weekly lessons plus flexible school weeks for interruptions, excursions and assessment

Week 1 Emerging Applications: Medical, Aerospace and Robotics

Week 2 Ethics, IP and Responsible Innovation

Week 3 Sustainable Materials and Circular Design

Week 4 Low-Volume Production and Enterprise

Week 5 Client Communication and Design Review Culture

Week 6 Advanced Troubleshooting and Root-Cause Analysis

Week 7 Designing for Repair, Upgrade and Reuse

Week 8 Term 3 Venture or Research Checkpoint

Essential question	How do ethics, sustainability and enterprise influence advanced design work?
Likely term outcome	proposal defence, documented testing, portfolio evidence and professional presentation
Teaching approach	Teacher modelling + guided practice + studio/making time + discussion + reflection

Term 3 • Week 1: Emerging Applications: Medical, Aerospace and Robotics

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind emerging applications: medical, aerospace and robotics and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Emerging Applications: Medical, Aerospace and Robotics" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

The space industry embraced additive manufacturing because lightweight, custom and low-volume parts can be incredibly valuable when every gram and every design change matters.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Emerging Applications: Medical, Aerospace and Robotics" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 2: Ethics, IP and Responsible Innovation

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind ethics, ip and responsible innovation and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts

	or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Ethics, IP and Responsible Innovation" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Ethics, IP and Responsible Innovation" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 3: Sustainable Materials and Circular Design

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind sustainable materials and circular design and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the

	year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up. Add correct filament storage, avoiding contaminated material and supervising any discussion of fumes or ventilation.

Teacher note

This week's lesson positions "Sustainable Materials and Circular Design" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

The materials available in any era shape what people can make. From bronze and steel to polymers and composites, manufacturing history is partly a story about learning what materials can do.

Discussion prompts

- How do material choices affect cost, strength, sustainability and print quality?
- When is a 3D print genuinely sustainable, and when is it just convenient?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Sustainable Materials and Circular Design" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 4: Low-Volume Production and Enterprise

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind low-volume production and

	enterprise and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display, 3D printer, prepared slicer screenshots or demo files
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Low-Volume Production and Enterprise" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Low-Volume Production and Enterprise" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 5: Client Communication and Design Review Culture

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind client communication and design review culture and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Client Communication and Design Review Culture" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

Professional designers rarely work in isolation; they work with clients, communities or users. Listening well has always mattered because poor assumptions lead to poor products.

Discussion prompts

- How do we avoid designing only for ourselves?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Client Communication and Design Review Culture" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 6: Advanced Troubleshooting and Root-Cause Analysis

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind advanced troubleshooting and root-cause analysis and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Advanced Troubleshooting and Root-Cause Analysis" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Advanced Troubleshooting and Root-Cause Analysis" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.

4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 7: Designing for Repair, Upgrade and Reuse

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind designing for repair, upgrade and reuse and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Designing for Repair, Upgrade and Reuse" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Designing for Repair, Upgrade and Reuse" as a professional decision-making task.

2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 3 • Week 8: Term 3 Venture or Research Checkpoint

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind term 3 venture or research checkpoint and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students build on the design and planning work from the first half of the year.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Term 3 Venture or Research Checkpoint" inside the term theme of innovation, sustainability and enterprise. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?

- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame “Term 3 Venture or Research Checkpoint” as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Capstone Studio

Expert Level • Term 4

Capstone Studio

8 core weekly lessons plus flexible school weeks for interruptions, excursions and assessment

Week 1 Select and Frame a Capstone Challenge

Week 2 Concept Generation Sprint

Week 3 Prototype Pathways and Validation

Week 4 Iterative Build Cycles

Week 5 Evidence Collection and Technical Reporting

Week 6 Exhibition Design and Public Communication

Week 7 Portfolio Curation and Career Pathways

Week 8 Capstone Expo and Reflection

Essential question	How do we turn a challenging idea into a polished, evidence-rich final outcome?
Likely term outcome	proposal defence, documented testing, portfolio evidence and professional presentation
Teaching approach	Teacher modelling + guided practice + studio/making time + discussion + reflection

Term 4 • Week 1: Select and Frame a Capstone Challenge

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind select and frame a capstone challenge and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Select and Frame a Capstone Challenge" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Select and Frame a Capstone Challenge" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 2: Concept Generation Sprint

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind concept generation sprint and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display, 3D printer, prepared slicer screenshots or

	demo files
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Concept Generation Sprint" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Concept Generation Sprint" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 3: Prototype Pathways and Validation

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind prototype pathways and validation and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more

	independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Prototype Pathways and Validation" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Prototype Pathways and Validation" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 4: Iterative Build Cycles

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind iterative build cycles and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and

	technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Iterative Build Cycles" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Iterative Build Cycles" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 5: Evidence Collection and Technical Reporting

Duration	80–100 minutes
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Learning intention	Students understand the key ideas behind evidence collection and technical reporting and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Evidence Collection and Technical Reporting" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Evidence Collection and Technical Reporting" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 6: Exhibition Design and Public Communication

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind exhibition design and public communication and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Exhibition Design and Public Communication" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Exhibition Design and Public Communication" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 7: Portfolio Curation and Career Pathways

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind portfolio curation and career pathways and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Portfolio Curation and Career Pathways" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Portfolio Curation and Career Pathways" as a professional decision-making task.
2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.

4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.

Term 4 • Week 8: Capstone Expo and Reflection

Duration	80–100 minutes
Learning intention	Students understand the key ideas behind capstone expo and reflection and apply them to a design-and-make context appropriate to the expert pathway.
Success criteria	frame and test complex design decisions using evidence, trade-offs and technical language; document a professional-style workflow that includes risk, testing and iteration; communicate implications for manufacture, users and sustainability
Prior knowledge	Students apply knowledge and routines from earlier terms to a more independent final project.
Vocabulary focus	systems thinking, validation, anisotropy, enterprise, iteration, stakeholder, lifecycle
Resources	teacher slides or board notes, student design journals, sample printed parts or failed prints, projector/display
Safety	Review hot-end/nozzle awareness, moving parts, tidy cable management, respectful workstation behaviour and safe handling of sharp tools used for print removal or clean-up.

Teacher note

This week's lesson positions "Capstone Expo and Reflection" inside the term theme of capstone studio. It is written to begin with a motivating hook, move through explicit teaching, and then give students time to think, talk, design or test so the concept feels active rather than abstract.

Background / history hook

This lesson is connected to the broader history of manufacturing and design, where people continually refine tools, materials and processes to solve real problems more effectively.

Discussion prompts

- What would make students care about this problem in the real world?
- Where do we see this issue in homes, schools, sport, health or industry?
- What trade-off matters most here: speed, cost, strength, appearance, waste or safety?
- When does a digital design become 'good enough' to print?

Suggested lesson sequence

1. Provocation (5–10 min): use a challenging case, brief or industry example to frame "Capstone Expo and Reflection" as a professional decision-making task.

2. Mini-lesson (10–15 min): teach the core technical idea, linking it to evidence, manufacture and broader systems thinking.
3. Design review / workshop block (20–35 min): students apply the concept to their project, produce documentation and gather evidence.
4. Critique or validation (10–15 min): peers or teacher question assumptions, risks, cost, user impact and sustainability.
5. Professional reflection (5–10 min): students log decisions, revisions and next actions in a portfolio or engineering journal.

Assessment and differentiation

Assessment: Assess portfolios, evidence-based iteration, technical reporting, critique participation and final presentation quality. Differentiation: Use coaching conferences and milestone reviews to support students who need structure. Extend high performers through deeper research, more rigorous validation and public-facing presentation requirements.