DRAFT3

Y12 MATERIALS TECHNOLOGY
2012

COASTAL TARANAKI SCHOOL

Teacher: S. Laing

All Materials Technology courses are developed around the three learning strands of the New Zealand Technology Curriculum:

- Technological Knowledge and Understanding
- Technological Practice
- Nature of Technology.

It is recommended that students have studied Materials Technology in Year 11 because this course builds on skills taught at level 1.

Course Description:

Students are provided with an opportunity to explore a variety of materials and techniques applied to jewellery/ small artifact design. They will demonstrate their skills by manufacturing an outcome as detailed by the teacher before developing a concept and then final piece. They will be required to carry out extensive planning that will involve research, design development and mastering of technical skills, leading to the development of a prototype of their conceptual design. They will be involved in a variety of activities that require them to develop mock-ups, and models, leading to a prototype of their design. Students must manage their time and resources and some independent study is expected. Students have the opportunity to develop their own interests so it is expected that the years' work will converge into one progressive body of work.

This scheme of work has been written for jewellery but could easily be modified for a small craft artifact such as a decorative box.

Course Duration:

- Design Technology is a year long practical based course.
- The Design Technology class has up to 6 x 50 minute lessons timetabled per week. There will be a double period at least once a week.

DRAFT3

Course Design

All strands of the Technology Curriculum will be integrated into the years' work.

Achievement Objectives and Learning Outcomes at Level 7 of NZC	
TP: BRIEF DEVELOPMENT Students will: Justify the nature of an intended outcome in relation to the issue to be resolved and justify specifications in terms of key stakeholder feedback and wider community considerations. TP: PLANNING FOR PRACTICE Students will: Critically analyse their own and others' past and current planning and management practices in order to develop and employ project management practices that will ensure the effective development of an outcome to completion. TP: OUTCOME DEVELOPMENT AND EVALUATION Students will: Critically analyse their own and others' outcomes and evaluative practices to inform the development of ideas for feasible outcomes. Undertake a critical evaluation that is informed by ongoing experimentation and functional modelling, stakeholder feedback, and trialling in the physical and social environments. Use the information gained to select, justify, and develop an outcome. Evaluate this outcome's fitness for purpose against the brief. Justify the evaluation using feedback from stakeholders and demonstrating a critical understanding of the issue.	TP: BRIEF DEVELOPMENT Students can: • explore the context to select an issue • identify a need or opportunity relevant to their • selected issue • establish a conceptual statement that justifies the nature of the outcome and why such an outcome should be developed with reference to the issue it is addressing • establish the specifications for an outcome using stakeholder feedback, and based on the nature of the outcome required to address the need or opportunity, consideration of the environment in which the outcome will be situated, and resources available • communicate specifications that allow an outcome to be evaluated as fit for purpose • justify the specifications in terms of stakeholder feedback, and the nature of the outcome required to address the need or opportunity, consideration of the environment in which the outcome will be situated, and resources available. TP: PLANNING FOR PRACTICE Students can: • critically analyse existing planning tools and project management practices to inform the selection of planning tools appropriate for the technological practice to be undertaken, and for recording evidence to support any revisions to planning • use planning tools to set achievable goals, manage all resources, plan critical review points, and revise goal and resources as necessary to ensure the effective completion of an outcome • use planning tools to provide evidence for any revisions made at critical review points and justifies the appropriateness of planning tools used. TP: OUTCOME DEVELOPMENT AND EVALUATION Students can: • generate design ideas that are informed by research and critical analysis of existing outcomes • develop design ideas for outcomes that are justified as feasible with evidence gained through functional modelling • critically analyse evaluative practices used when functional modelling to inform own functional modelling • undertake functional modelling to evaluate design ideas and develop and test a conceptual design to provide evidence of the proposed outcome's ability to be fit for purpose • evaluate suitability of materials/components, based on their performance properties, to select those appropriate for use in the production of a feasible outcome • undertake prototyping to gain specific evidence of an outcome's fitness for purpose and use this to justify any decisions to refine, modify and/or accept the outcome as final • use stakeholder feedback and an understanding of the physical and social requirements of where the outcome will be situated to support and justify key design decisions and evaluations of fitness for purpose.

DRAFT3

Achievement Objectives and Learning Outcomes at Level 7 of NZC

TK: TECHNOLOGICAL PRODUCTS Students will: Understand the concepts and processes employed in materials evaluation and the implications of these for design, development, maintenance, and disposal of technological products. TK: TECHNOLOGICAL MODELLING Students will: Understand how the "should" and "could" decisions in technological modelling rely on an understanding of how evidence can change in value across contexts and how different tools are used to ascertain and mitigate risk. TK: TECHNOLOGICAL SYSTEMS Students will: Understand the concepts of redundancy and reliability and their implications for the design, development, and maintenance of technological systems.	TK: TECHNOLOGICAL PRODUCTS Students can: • discuss a range of subjective and objective evaluative procedures used to determine the suitability of materials and describe the underpinning concepts and processes involved in particular procedures • discuss examples of material evaluation procedures undertaken to support material selection decisions and justify the appropriateness of these procedures • discuss examples to explain how material evaluation impacted on design and development decisions • discuss examples to explain how material evaluation impacted on maintenance and disposal decisions. TK: TECHNOLOGICAL MODELLING Students can: • discuss examples to illustrate why the status of evidence gained from technological modelling might change across contexts • explain why different people accept different types of evidence as valid and how this impacts on technological modelling • explain the role of technological modelling in ascertaining and mitigating risk • describe examples to illustrate the strengths and weaknesses of technological modelling for risk mitigation. TK: TECHNOLOGICAL SYSTEMS Students can: • explain the concept of redundancy in relation to technological systems • discuss examples of particular technological systems to illustrate how factors related to redundancy impacted on system design, development, and/or maintenance decisions. • explain the concept of reliability in relation to technological systems • discuss examples of particular technological systems to illustrate how factors related to reliability impacted on system design, development, and/or maintenance decisions.
NOT: CHARACTERISTICS OF TECHNOLOGY Students will: Understand the implications of ongoing contestation and competing priorities for complex and innovative decision making in technological development. NOT: CHARACTERISTICS OF TECHNOLOGICAL OUTCOMES Students will: Understand that technological outcomes are a resolution of form and function priorities and that malfunction affects how people view and accept outcomes.	NOT: CHARACTERISTICS OF TECHNOLOGY Students can: • discuss examples to illustrate how socio-cultural factors influence technology and in turn technology influences socio-cultural factors in complex and ongoing ways • explain technology as a field of on-going contestation and why competing priorities arise • explain how influences and priorities have been managed in technological decisions of the past • explain how critical evaluation, informed creativity and boundary pushing impacts on technological development and public views of technology NOT: CHARACTERISTICS OF TECHNOLOGICAL OUTCOMES Students can: • explain how malfunction can impact on the design and/ or manufacture of similar and related technological outcomes • justify how the design elements appear to have been prioritised in technological outcomes • justify the fitness for purpose of technological outcomes in terms of their physical and functional nature and socio-technological environment/s they are used within.

DRAFT3

Standards to be assessed over the year offer a possible 22 internal credits & 4 external credits.

Construction and Mechanical Technologies:

- 2.20, 91344 v1 (6 internal credits) : Implement advanced procedures using resistant materials to make a specified product with special features.

Generic Technology:

- 2.2, 91355 v1 (4 internal credits): Select and use planning tools to manage the development of an outcome
- 2.3, 91356 v1 (6 internal credits): Develop an conceptual design for an outcome.
- 2.4, 91357 v1 (6 internal credits): Undertake effective development to make and trial an prototype.
- 2.6, 91359 v1 (4 external credits): Demonstrate understanding of the role of material evaluation in product development. (optional)

<table>
<tr><th>Term 1</th><th>Term 2</th><th>Term 3</th><th>Term 4</th></tr>
<tr><td>Introduction to advanced jewellery skills & concepts: planning, product analysis.</td><td>Material and product analysis
Drawing and modelling.
Stakeholder involvement.</td><td>Planning, development of ideas and techniques. Prototyping.Evaluation.</td><td>Complete portfolio and evaluations.
Essay writing</td></tr>
<tr><td colspan="2">2.20, 91344 v1 6 cr (i) : Implement advanced procedures using resistant materials to make a specified product with special features (A)</td><td>2.3, 91356 v1 (6i) : Develop an conceptual design for an outcome (B)</td><td>2.4 , 91357 v1 (6i): Undertake effective development to make and trial a prototype. (C)</td><td></td></tr>
<tr><td colspan="3">2.2, 91355 v1 (4i): Select and use planning tools to manage the development of an outcome</td><td>2.6 , 91359 v1 (4e): Demonstrate understanding of the role of material evaluation in product development.(optional). (E)</td><td></td></tr>
</table>

Course objectives/ Learning outcomes.

Students will:

- Develop Y12 practical skills competency : advanced procedures and skills in construction and decorative jewellery techniques and processes.
- Improve competency in using specialist jewellery making tools and equipment.
- Develop understanding of the importance of functional modeling (mock-ups, materials selection, testing, techniques, and sketching……)
- Develop skills in freehand sketching and rendering and use these skills to communicate design ideas.
- Develop mock-ups to demonstrate proficiency and skill.
- Develop skills to an advanced level in jewellery making techniques, for example: measuring, marking, cutting, shaping, joining, texturing, colouring, finishing.
- Research to explore ideas, link to current artists, and of materials and techniques.

DRAFT3

- Develop skills in evaluation techniques to enable selection and use of appropriate resources through informed testing, trialing.
- Develop communication skills and the ability to glean valuable information in partnership with stakeholders.
- Undertake a range of self-reflection and planning practices.
- Develop an understanding of ergonomics related to jewellery and apply this to own outcome development.
- Demonstrate how testing has occurred and it's place in the development of ideas.
- Produce a series of self-constructed final outcomes.
- Carry out a comprehensive evaluation process.

Key Competencies	Values	Principles
Thinking Use creative, critical and meta-cognitive processes to make sense of information, experiences and ideas. Develop intellectual curiosity. Using Language, symbols and text Develop and apply understanding of symbols and texts. For example, to be able to use symbols as metaphor, drawings to communicate ideas, text to inform process. Managing self Develop reliability and initiative. Guide work through planning and develop the resilience to persevere and achieve high standards. Relating to others Work cooperatively. Be open to feedback to develop own work, and provide thoughtful feedback to others. Participating and Contributing Involve others in the development of outcomes - both within school and the wider community. Become aware and responsive to different peoples ideas, beliefs and needs.	***COASTAL*** **C**o-operation: students will work along side each other, take turns, help each other and offer positive feedback. **O**penness: students will listen and be considerate of others' opinions and beliefs. They will be open to new ideas and ways of doing things to inform the development of their own ideas. **A**roha: care for themselves, each other and the workspace. Be honest, ethical and responsible. **S**ustainability: Use planning to minimise waste. Recycle when possible, and consider using recycled materials in projects. develop awareness of sustainable design and work practice. **T**olerance: respect others. Tolerance leads to a calm and productive work environment. **A**ccountability: students will be answerable to themselves, their peers and school. There will not be a culture of excuses, rather a "can do" attitude. Students will work to the best of their ability, developing and improving skills, aiming at excellence. **L**eading our learning: there is a strong student voice encouraged in this subject. Students will take responsibility for their own learning, meet deadlines, and use homework time to add breadth to their classroom studies.	High Expectations Students will pursue excellence by developing skills through practice. When learning new skills, perfection is rarely attained first time, so refining and improvement is expected. Treaty of Waitangi Biculturalism is acknowledged through displays, developing links to local Iwi and by bringing Maori design and techniques into the kete of knowledge and skills available for the students to develop. Cultural Diversity Students will consider diversity by examining their own and others' cultural beliefs through their research and development of ideas. Inclusion All students will be supported to succeed, and the curriculum will be modified to suit each individual so as to maximise their unique potential. Learning to Learn Scaffolding will assist Students to give structure to their work, and they will be encouraged to reflect and develop skills in planning and evaluation. Community engagement Local experts will be sought out and invited in to school. Visits to relevant galleries/ practitioners and educational institutions will be arranged. Coherence There will be links to other subject areas which will be emphasised, and students' study on other areas will be encouraged to feed into their work within this course. For example, science is applied in metalwork, art is an important element in design. Future focus Technology and in particular jewellery will be explored within the context of time. New innovations will be discussed and explored. Future education and training opportunities will be explored with the careers department.

DRAFT3

Assessment opportunities

Self:
- Daily reflection, evaluation and “what next” planning noted in sketch book.
- Fortnightly evaluation of progress.

Formative:
- Teacher observation, discussions, feedback & feed-forward weekly.
- Teacher notes and photographs of progress.
- Student will maintain visual diary and develop portfolio at the same time as developing practical work
- Group “critiques” where work will be on display and discussed positively with other students. Held at key stages of project development.
- Mock-ups demonstrating technical learning of skills and techniques prior to completing outcome (A) for summative assessment for (2.20) and the development and trial of an outcome (C) for AS 91357 (2.4)
- Reflection and evaluation of planning tools used throughout for AS 91355 (2.2).

Summative
Students will submit: One outcome that is teacher led (A), A conceptual design for a piece of jewellery/small artifact (B) and a prototype of that conceptual design (final piece). All design work will be submitted in a format that best demonstrates the students’ progress as below.(Students may create other means of presentation on consultation with their teacher. For example, a Blog, video, powerpoint, or a mix of these to demonstrate their technological practice):
- All mock-ups/ models, samples, technical test pieces.
- ***Outcome (A)*** that has been implemented for AS 91344 v1 (2.20) - the design and specifications will be agreed by the teacher and student prior to manufacture and will be carried out after formative examples have been completed to demonstrate the students ability to succeed.
- Evidence of ***all planning***, including research and stakeholder conversations.(AS91355 v1 2.2)(D)
- Photographs - annotated demonstrating student practice.
- ***Portfolio*** that will demonstrate Technological Practice that demonstrates the development of a conceptual design for an outcome (B) for AS 91356 (2.3).
- ***Visual Diary*** that will include drawings and visual research, planning notes and reflections from class.
- ***A prototype (C) of the conceptual idea (B)*** with evidence of the trialling, stakeholder communications and evaluation for “Undertake effective development to make and trial a prototype (AS 91357 v1 2.4)”. (C)
- ***A written report*** that demonstrates understanding of the role of material evaluation in product development.*(optional). (E)*

Subject cross curriculum links	Community links	Resources
• Science • Graphics • Art • Mathematics • English • Sustainability • Social Studies • Te Reo	• Local jewellery manufacturers • Local applied artists • Local art/design stores and galleries • Local Iwi with skills such as carving, weaving • Local museums/ libraries • Art in the community • Local manufacturers and businesses such as metal workshops, CNC workshops • Professional jewellery trades eg Regal Castings in Auckland for silver casting/ supply of tools, materials and advice. • Tertiary Jewellery Design Institutions - visits.	• Jewellery making equipment. • Teacher topic ring-binder, • Class displays, current/ historical exemplars, break down of techniques/ processes. • Examples of work in progress and finished work. • Student project guide. • A3 portfolio, sketch book and drawing equipment • Class camera/ video. • Power-points - will be project& teacher specific, e.g. freehand sketching and sketchbook examples; Contemporary New Zealand Jewellers; Designs and Techniques • Websites, you-tube. • Jewellery manufacturing books - • Well lit Display Case. • Internet • Library

DRAFT3

Learning Activities Overview - evidence towards AS91344 v1 (2.20)

Implement advanced procedures using resistant materials to make a specified product with special features (A)

Initial Research Activities

This is to establish prior knowledge, and for students to understand the requirements of the course. This will be both theoretical and practical work.

- Research – jewellery, uses, features, function. Ergonomics/aesthetics. What is important in a successful jewellery outcome?
- Teach and use specialist vocabulary. eg, anneal, pickle, solder, quench,bezel, findings, cabouchon, carat, alloy, chase, etch....
- Examine existing solutions – discuss the step up from level 1 skills and techniques to those that will be at a level to allow students to be assessed at level 2.
- Materials examination. Identifying material properties and environmental and economical factors for designing an item of jewellery. Discuss link between properties of materials and design& manufacture. eg what materials can be worked together: constraints.

Initial Research and skill development Activities:

- Teach about economy of time, materials, effort, accuracy, and how students will develop independence before manufacturing the assessment outcome.
- Teach, and develop trialing, selecting materials / techniques: e.g. Teacher demonstration – then student practice and testing techniques & skills through a series of “test pieces”.
- Revise the manufacture of a simple textured ring and the use of piercing saw and of surface treatments (L1). Discuss step up to Level 2.
- Teach silver soldering of complex shapes (use of different solders, order of construction) and extend to the creation of a hollow pierced form (practice piece).
- Teach how to manufacture a simple cabouchon bezel.
- Teach how to make a simple catch mechanism for a brooch or findings for a pendant. Students must make examples and practice soldering techniques.
- Revise surface transformations eg chasing, etching,.
- Revise and practice finishing: eg polishing, burnishing, patination
- Develop knowledge of aesthetics and ergonomics relating to jewellery.

Assessment Activity : AS 91344 v1 (2.20), 6 credits

Provide a range of options for the student to choose from to manufacture an outcome to set specifications. The detail in the specifications may be changed only on consultation with the teacher to ensure that advanced special features exist. Context will depend on teacher & student negotiation. Examples could be:

- Make a hollow form pendant/brooch which has manufactured fittings, and surface details such as texturing from chasing/etching/soldered details
- Make a ring that has more that one material and a series of joining processes (eg, bezel set stone/shell/glass) or 3D construction
- Students manufacture said product strictly adhering to the specifications that include two special features.

DRAFT3

· Learning Activities Overview:

- 2.2, 91355 v1 (4 internal credits) : Select and use planning tools to manage the development of an outcome
- 2.3, 91356 v1 (6 internal credits): Develop an conceptual design for an outcome.
- 2.4, 91357 v1 (6 internal credits): Undertake effective development to make and trial an prototype.
- 2.6, 91359 v1 (4 external credits): Demonstrate understanding of the role of material evaluation in product development. (optional)

Overview: This is an extended unit of work that includes elements from all three curriculum strands: Technological Practice, Technological Knowledge, and Nature of Technology. The focus is to develop a ***conceptual design*** for an outcome, which will then be developed into a ***prototype***. The ***planning and project management*** strategies undertaken will be assessed. The research and development offers students the opportunity to submit evidence for the external assessment at the end of the year.

Planning for Planning for Practice

- Review planning tools, class activities to teach these so that students can evaluate them to choose appropriate planning tools for their projects. May include but are not limited to: brainstorms, mind maps, idea banks, reflective journals and scrap books, plans of action, Gantt charts, flow diagrams, spread sheets, databases.
- Explore and evaluate examples of planning in different contexts eg student lives, school administration, mentors or practicing artist/makers, manufacturing industries.
- Reflect on the planning for the first unit of work (2.20): what worked/ did not work- how to use what worked and reject what didn't.
- Establish workable format for students to follow for the remainder of the year. Need to document all work so create templates to suit.
- Set over-all time frame and review points. Teach about flexibility and modification in planning informed by regular reviews.
- Teach about step ups from level 1 to level 2 and from Achieved to Merit to Excellence.

Concept Development

- Teach where development of a conceptual design stops and the development of a prototype starts.
- Discuss the brief, use planning tools to generate ideas.
- Look at existing practitioner work. Make a distinction between their concept design and development.
- Research and Analyse existing examples of jewellery/ small artifacts, relate to society, function, aesthetics, ergonomics...
- Identify stakeholders and how to use their feedback to develop ideas.
- Develop more technical skills to inform work -this will depend on the teachers' skills and student's needs. For example, introduce enamelling, casting techniques, carving, inlay as distinct elements.
- Use drawing, photography, mock-ups, models, test pieces to generate ideas for solutions to address the brief.
- Teach what "functional modelling" is and use to evaluate ideas. How does this link to "technical feasibility"?
- Teach what "fit for purpose", and "social acceptability" mean.
- Students will work on producing ideas - in a sketch book/ portfolio/ practical examples. These must be evaluated by the student and stakeholders, and teacher.
- Students will produce a concept for an outcome, and explain how it will be fit for purpose and address the brief and specifications.

Development of Prototype

Using the concept above, or a concept provided by the teacher students will develop the concept and produce a prototype. This will involve trialing and evaluation of materials and techniques, regular stakeholder consultation and demonstrating correct Codes of Practice in the manufacture of all work.

- Teach what development is - use examples from existing practitioners. Look at "Collections" - for example, how a fashion or jewellery designer will have a range of related works from one concept.
- Build technical skills as required - ensuring that "advanced" skills are included.

DRAFT3

- Teach Codes of practice and how students will show they have followed them.
- Identify what evidence a prototype conveys that will demonstrate it's "fitness for purpose". (e.g., aesthetics, ergonomics, function...)
- Research and evaluate materials that will be "fit for purpose" (may include factors such as function, cost, availability, safety, durability, ease of working...)
- Teach what "physical environment" and "social environment" means in this context.
- Teach how testing can occur and be recorded to link into planning, and development through design/manufacture modifications.
- Guide students to manufacture final prototype after thorough evaluation and justification of design and manufacturing decisions.
- Presentation of prototype and evaluation that includes stakeholder feedback and all trialing that demonstrates that the prototypes fitness for purpose.
- Present a complete portfolio and sketch book to demonstrate Technological Practice undertaken.

Learning Activities for External Assessment: AS 91539 v1 (2.6)

Demonstrate understanding of the role of material evaluation in product development.*(optional).*

- Teach how to write a report - use English teacher / ICT for consultation.
- Assist student to identify all material evaluations carried out throughout the development of their prototype.
- Teach research skills to achieve depth of knowledge of chosen materials.
- Undertake class activities that demonstrate how to evaluate materials in relation to the development of a product. eg "unpacking" existing products to identify why the materials were used and how they could/should be improved.
- Students will submit a detailed report about material evaluation in product development. It could be about or informed by their own technological practice but could also be about other product development. Teacher consultation is recommended before the report is written to ensure adequate detail is being considered.
- The report may be a written and illustrated report, powerpoint, talk or other.