



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

DESIGN AND TECHNOLOGY

**in the
National Curriculum
in Wales**

Key Stages 2–3

Title of document

Design and Technology in the National Curriculum in Wales

Audience

Headteachers and governing bodies of maintained schools in Wales; local education authorities; teacher unions and school representative bodies; church diocesan authorities; national bodies in Wales with an interest in education.

Overview

This document sets out the Welsh Assembly Government's proposed changes to design and technology in the national curriculum in Wales.

Action required

Responses to this consultation document must be received by 30 March 2007. Responses can be sent to the address shown below, using the freepost envelope provided, or submitted electronically to curriculum@beaufortresearch.co.uk. Alternatively, online questionnaires are available at www.wales.gov.uk/consultations

Further information

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Additional copies

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Or by visiting the Welsh Assembly Government's website
www.wales.gov.uk/consultations

Address for return of comments

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This document contains the proposals for design and technology in the national curriculum in Wales. These are for consultation. The consultation lasts until 30 March 2007. It would be helpful if you would submit your views on the response questionnaire provided with the consultation pack or respond via the website at www.wales.gov.uk/consultations

Wales Curriculum 2008: The objectives

The Welsh Assembly Government intends that, from 2008, there exists in Wales:

- a single coherent framework for curriculum, assessment and qualifications 3–19 which will help schools to raise standards of achievement and widen educational opportunity
- a set of revised subject Orders which are manageable and reflect whole curriculum characteristics and those of each key stage.

The agenda for the development of this revised curriculum and assessment framework for Wales is based on the Minister's acceptance of the key recommendations in ACCAC's *Review of the school curriculum and assessment arrangements 5–16: A Report to the Welsh Assembly Government April 2004*. That report described the context for the review and the evidence that was gathered to inform ACCAC's advice.

Advisory groups for cross-phase (primary and secondary) and additional educational needs worked alongside the personal and social education and subject advisory groups to help revise the curriculum.

In revising the subject Orders, opportunities have been taken to:

- revise the Common Requirements section to clarify each subject's contribution to developing skills across the curriculum, the Curriculum Cymreig, and personal and social education
- review the use of the icons for skills and other requirements to give a fuller picture of opportunities for skills development and application
- revise the 'Access for all pupils' text to clarify breadth and depth of study, and to ensure inclusion and accessibility for all pupils, especially those with additional educational needs
- revise and rename focus statements to reflect the focus on skills development and application, and to provide an overview of what is involved in each key stage for each subject

- develop a common structure – Skills and Range – initially identifying the required skills for each subject and then the range of contexts, opportunities and activities through which these skills should be developed
- use the non-statutory skills framework to underpin the review of the subject Orders, adding text consistent with that used in the skills framework to indicate where opportunities and contexts exist to develop skills across the curriculum
- update and reduce content where necessary to ensure relevance to the twenty-first century, taking account of learners' personal development and well-being, their preparedness for citizenship, community life and employability within a bilingual Wales, and education for sustainable development and global citizenship
- add non-statutory examples where necessary to clarify key experiences and learning opportunities
- re-draft level descriptions, where necessary, to indicate clearly progression in skills relevant to each subject, and to recognise the progress of pupils who are working below Level 1
- remove references to the Key Stage 2 and 3 Programmes of Study from the level descriptions
- reduce the level of prescription in the Key Stage 4 Programme of Study to allow qualifications that provide different and more inclusive pathways through each subject, giving learners greater opportunities for choice and participation.

Commentary on the proposals: key changes

The main changes to the current (2000) Order are:

- In the Skills section, Making has been subdivided into generic making skills and those related to Food, Resistant materials and textiles, and Systems and control at both Key Stages 2 and 3.
- Practical food preparation skills have been made compulsory at Key Stages 2 and 3.
- Food and Rigid and flexible materials have been made compulsory at Key Stage 2.
- Food and Resistant materials and textiles have been made compulsory at Key Stage 3. Systems and control remains compulsory.
- Examples at Key Stages 2 and 3 in both the Skills and Range sections have been updated to reflect life in the twenty-first century.
- More emphasis has been given to health and safety issues under Range at both key stages.
- A statement has been added to Range at both key stages to focus on issues of sustainability and responsibility for the environment.
- Level descriptions have been revised in order to clarify progression.



Responsibilities on schools

Under the requirements of equal opportunities legislation covering race, gender and disability, schools in Wales have a duty towards present and prospective learners to:

- eliminate discrimination and harassment and promote positive attitudes
- promote equal opportunities and encourage participation in all areas of school life.

Every learner should develop a sense of personal and cultural identity that is receptive and respectful towards others. Schools should plan in all subjects to develop the knowledge and understanding, skills, values and attitudes that will enable learners to participate in our multi-ethnic society in Wales. Schools should develop approaches that support the ethnic/cultural identities of all pupils and reflect a range of perspectives, to engage learners and prepare them for life as global citizens.

Schools must work to reduce environmental and social barriers and provide an inclusive curriculum which will offer opportunities for **all** learners to achieve in school in preparation for further learning and life.

Schools will need to plan and work with specialist services to ensure relevant and accessible learning experiences for all. For learners with disabilities in particular, they should make reasonable adjustments in order to:

- improve access to the curriculum
- increase access to education and associated services
- provide information in a range of formats.

Schools should provide access to appropriate equipment and approaches with alternative/adapted activities to ensure the full participation of all learners including those who use a means of communication other than speech.

For learners whose first language is neither English nor Welsh, schools should take specific action to help them learn both spoken and written English and/or Welsh through the curriculum. Schools should ensure that learners are provided with material that is appropriate to their ability and previous education/experience, and that extends their language development and challenges them cognitively.

Learner entitlement

Schools in Wales should teach all programmes of study and frameworks in ways appropriate to learners' developing maturities and abilities. Schools should ensure that learners' preferred systems of communication are used to maximise access to the curriculum and should recognise the value of the home language in learning. Learners should experience a variety of styles to extend their learning.

To enable **all** learners to access relevant skills, knowledge and understanding at an appropriate level, schools may use content from earlier or later phases/key stages within the curriculum. Schools should present material in ways suitable for the learners' age, experience, understanding and prior achievement to engage them in the learning process.

For learners working **significantly** below the expected levels at any key stage, schools should design their curriculum to meet the priority needs of their learners. Sufficient flexibility exists within the curriculum to meet the needs of all learners without the need for disapplication. Where it is not possible to cover **all** of the programmes of study for each key stage, the statutory requirement to provide a broad, balanced curriculum can be met by using the full range of subjects as contexts for learning.

For learners working at higher levels, greater challenge should be incorporated by presenting material in ways that extend breadth and depth of study. The level of demand may also be increased through the development and application of communication, number, ICT and thinking skills across the curriculum.

Schools should choose material (to be covered in depth or in outline) that will:

- provide a meaningful, relevant and motivating curriculum for their learners
- meet the specific needs of their learners and further their all-round development.

Developing skills across the curriculum

A non-statutory Skills Framework has been developed in order to provide guidance about continuity and progression in thinking skills, communication, number and ICT for learners from 3–19.

At Key Stages 2 and 3, learners should be given opportunities to build on skills they have started to acquire and develop at Foundation Phase. Learners should continue to acquire, develop, practise, apply and refine these skills through group and individual tasks in a variety of contexts across the curriculum. Progress can be seen in terms of the refinement of these skills and by their application to tasks that move from: concrete to abstract; simple to complex; personal to the 'big picture'; familiar to unfamiliar; and supported to independent and interdependent.

Thinking

Learners develop their thinking across the curriculum through the processes of **planning**, **developing** and **reflecting**.

In design and technology, learners design and make products through the iterative process of creating and developing ideas, designing products, planning, making and reflecting on their decisions and outcomes in terms of their finished product.

Communication

Learners develop their communication skills across the curriculum through the skills of **oracy**, **reading**, **writing** and **wider communication**.

In design and technology, learners ask questions and seek out information to develop and support their design ideas. They communicate and record their ideas and intentions by explaining, writing, sketching, using detailed technical drawings and three-dimensional models

ICT

Learners develop their ICT skills across the curriculum by **creating**, **presenting**, **finding and developing information and ideas** and by using a wide range of equipment and software.

In design and technology, learners research and develop their ideas by using ICT to find information from databases and the Internet. They communicate and present their ideas using word processors, presentation software, computer-aided design (CAD) and computer-aided manufacture (CAM).

Number



Learners develop their number skills across the curriculum by **using mathematical information, calculating, and interpreting and presenting results.**

In design and technology, learners use mathematical information and data, presented numerically and graphically, to research and develop their ideas. They use number to measure and calculate sizes, fits and materials.

Curriculum Cymreig and personal and social education across the curriculum

At Key Stages 2 and 3, learners should be given opportunities to build on their experiences at the Foundation Phase and promote their knowledge and understanding of Wales, and their personal and social development and well-being.

Curriculum Cymreig

Learners should be given opportunities to develop and apply their knowledge and understanding of the cultural, economic, environmental, historical and linguistic characteristics of Wales.

In design and technology, learners should be given opportunities to use the rich characteristics and resources of Wales as a source of inspiration and a context to design and make products.

Personal and social education

Learners should be given opportunities to promote their health and well-being and moral and spiritual development; to become active citizens and promote sustainable development and global citizenship; and to prepare for lifelong learning.

In design and technology, learners should work in contexts that allow them to make decisions based on the values that underpin society, helping them become active and informed citizens. They should be made aware of human achievements and the big ideas that have shaped the world. They should be encouraged to be enterprising and innovative, in their designing and making, while having regard for sustainability and environmental issues in the twenty-first century.

Design and technology at Key Stage 2

At Key Stage 2, learners should be given opportunities to build on their experiences during the Foundation Phase. They should be taught to design and make simple products by combining their designing and making skills with knowledge and understanding in contexts that support their work in other subjects and help develop their understanding of the made world. Learners should be made aware of human achievements and the big ideas that have shaped the world. They should be encouraged to be creative and innovative in their designing and making while being made aware of issues relating to sustainability and environmental issues in the twenty-first century.

Design and technology at Key Stage 3

At Key Stage 3, learners should be given opportunities to build on the knowledge, understanding and skills acquired at Key Stage 2. They should be taught to design and make products by combining their designing and making skills with knowledge and understanding in contexts that allow them to make decisions based on the values that underpin society, helping them become active and informed citizens. They should be made aware of human achievements and the big ideas that have shaped the world. They should be encouraged to be enterprising and innovative, in their designing and making, while having regard for sustainability and environmental issues in the twenty-first century.


Key Stage 2 Programme of Study

Skills

Designing


Pupils should be given opportunities to:

1. use a range of information sources to generate ideas for products, e.g. *books, recipes, CDs, Internet*
2. investigate how existing products look and function as a source of ideas for their own products, e.g. *examine a range of products related to their task, toys, puppets, healthy eating*
3. develop a simple specification/recipe for their products indicating their intentions and approach 
4. demonstrate their creative thinking when considering and recording solutions to problems that arise during their designing and making, e.g. *realise that it would be quicker and easier to use ready-made materials, components and ingredients rather than make their own*
5. develop and communicate their design ideas in a variety of ways, using ICT where appropriate, e.g. *sketching, accurate drawing, graphics software packages, models* 


6. consider the safety and reliability of their activities/products, e.g. *consider how use or misuse of their products might cause injury, damage or poor health* 
7. evaluate their design ideas as they develop
8. consider the needs of the user, e.g. *check against their original specification/recipe.*

Making

Pupils should be given opportunities to:

1. work to their specification/recipe to make products
2. choose appropriate materials, ingredients, equipment, tools/utensils and techniques, from a range made available to them
3. measure, mark out, cut, shape, join, weigh and mix a range of materials and ingredients, using appropriate tools/utensils, equipment and techniques 
4. find alternative ways of making if the first attempt fails, e.g. *use Velcro on a textiles product where buttons are difficult to fix*
5. apply appropriate finishes to their products, e.g. *food garnishing, textile embellishment, painting, cladding in card*

Range

Pupils should be given opportunities to develop their design and technology capability through:

- tasks in which they explore and investigate simple products in order to acquire technological knowledge and understanding that can be applied in their designing and making
- tasks in which they develop and practise particular skills and techniques that can be applied in their designing and making

- tasks in which they design and make products, focusing on different contexts and materials.

They should be given opportunities to:

- be creative
- be innovative
- work independently and in groups.

Taken together, these tasks should cover a range of materials and components, including food, rigid and flexible materials and systems and control.



6. discuss their products, and evaluate their work, e.g. *explain why and how they made their product and what they think about its function, features, performance, taste*



Food

1. plan and carry out a broad range of practical food preparation tasks safely and hygienically
2. apply current healthy eating messages and consider nutritional needs when undertaking food preparation tasks, e.g. *high fibre, low fat, fruit, vegetables*
3. classify food by commodity/group and understand the characteristics of a broad range of ingredients, including their nutritional, functional and sensory properties, e.g. *meat, fish, fruit, vegetables*



Rigid and flexible materials

1. use a range of materials and components, making choices based on their developing knowledge of how they should be used, e.g. *using square-section timber or lollypop sticks to strengthen a cardboard structure*
2. learn about the efficient use of materials, e.g. *planning cutting from sheet materials to minimise waste*



3. use techniques for reinforcing and strengthening structures in their products, e.g. *use triangulation and gussets in frame structures, use fabric reinforcing in bags, clothing and kites*

4. learn about the responsible use of materials considering issues of sustainability



Systems and control

1. construct simple mechanisms to produce different types of movement, e.g. *use simple levers to move the wings on a bird made from flat card*
2. build simple low-voltage electrical circuits within products, e.g. *add a simple lighting system to a model house that includes a battery, switch and bulbs*
3. use programmable/computer control systems that can create, test, modify and store instructions to control events, e.g. *enter and store instructions in a programmable toy, write a simple programme for a floor turtle, control their products using computer hardware/software.*



Health and safety

Pupils should be taught how to use tools/utensils and equipment safely and to consider the hazards and risks in their activities, behaviour and lifestyle. They should be able to follow instructions to control risk to themselves and others, e.g. *ensure that food preparation areas are scrupulously clean; risk associated with hot melt glue guns.*

They should be made aware of the impact on their health and safety of certain behaviour, e.g. *healthy eating.*

Key Stage 3 Programme of Study

Skills

Designing

Pupils should be given opportunities to:

1. use given design briefs, and where appropriate, develop their own to clarify their ideas for products
2. identify and use appropriate sources of information to help generate and develop their ideas for products
3. be creative and innovative in their thinking when generating ideas for their products
4. identify and apply technological and health and safety knowledge and understanding to develop ideas for products that are achievable and practical
5. develop a specification/recipe for their product
6. explore, develop and communicate design ideas in a range of ways, including annotation, drawings and CAD, e.g. *clip art libraries, internet resources, scanners, digital cameras*
7. model and refine their design ideas in 3-D form or food prototyping where appropriate



8. evaluate, refine and modify their design ideas as they develop in relation to aesthetics, sensory requirements, healthy lifestyle, function, safety, reliability, properties of materials, ingredients and components, and cost
9. evaluate their final design ideas against their initial specification/recipe.

Making

Pupils should be given opportunities to:

1. develop the skills and to select and work with a range of materials and ingredients in a variety of contexts to make products
2. use hand and machine tools/utensils, as well as a range of equipment and processes, to mix, shape, form and join materials and ingredients
3. be creative in finding alternative ways of making if the first attempt is not achievable
4. develop techniques to ensure consistency and accuracy including the use of CAM, e.g. *CAM software linked to a cutter/plotter, lathe, milling machine or sewing machine*



Range

Pupils should be given opportunities to develop their design and technology capability through:

- activities in which they investigate, analyse and evaluate products in order to acquire technological and health and safety knowledge and understanding that can be applied in their designing and making
- reflecting on the work of designers, inventors, architects and chefs
- activities in which they develop and practise particular skills and techniques that can be applied in their designing and making

- activities in which they design and make products, focusing on different contexts and materials.

They should be given opportunities to:


- be creative
- be innovative
- work independently and in groups.

Taken together, these activities should cover a range of materials and components, including food, resistant materials and textiles, and include work with systems and control, e.g. *electrical, electronic, mechanical*.




5. test and evaluate their product against their original specification/recipe

Food



1. use a broad range of skills, techniques and equipment, as well as standard recipes, to cook meals and products
2. plan and carry out a broad range of practical cooking tasks safely and hygienically
3. apply current healthy eating messages in relation to the nutritional needs of different groups in society and consider issues of sustainability in order to make informed choices when planning, preparing and cooking meals or products 
4. classify food by commodity/group and understand the characteristics of a broad range of ingredients, including their nutritional, functional and sensory properties

Resistant materials and textiles

1. learn about the properties and characteristics of materials and apply this knowledge and understanding when designing and making products
2. undertake materials testing, to determine suitability for intended use

3. combine and process materials in order to create enhanced properties and desired aesthetic characteristics
4. understand that loads can cause material failures in structures by bending, twisting and stretching
5. be aware of current developments in materials technology, e.g. 'smart' materials
6. consider issues of sustainability when choosing and using materials 

Systems and controls

1. learn about the properties and characteristics of electrical/electronic and mechanical components and apply this knowledge and understanding when designing and making products
2. interconnect mechanisms to achieve different kinds of movement in products 
3. build electronic components into control systems within products
4. understand feedback in control systems
5. design and interconnect systems and sub-systems for application in products
6. build microprocessor and computer control systems into products. 

Health and safety

Pupils should be taught how to use tools/utensils and equipment safely and to consider the hazards and risks in their activities. They should be able to follow instructions to control risk to themselves and others, e.g. *electrical tools/utensils, rotating machinery, sewing machines*. When designing and making, pupils should take account of user safety, e.g. *the build quality of products, how hygiene standards should be maintained in the production of a food product*.

They should be made aware of the impact on their health and safety of certain behaviour, e.g. *healthy eating*.



National curriculum outcomes

The following national curriculum outcomes are non-statutory. They have been written to recognise the attainment of pupils working below Level 1. National curriculum outcomes 1, 2 and 3 align with the Foundation Phase outcomes 1, 2 and 3.

The national curriculum outcomes describe the types and range of performance that pupils working at a particular outcome should characteristically demonstrate. In deciding on a pupil's outcome of attainment at the end of a key stage, teachers should judge which description best fits the pupil's performance. Each description should be considered in conjunction with the descriptions for adjacent outcomes.

Outcome 1

Pupils explore their immediate and familiar environment and use words, signs or symbols to communicate their observations. They recognise themselves and familiar people in pictures and stories and show knowledge of daily routines. Pupils begin to use basic tools and assemble familiar resources.

Outcome 2

Pupils begin to group objects together, recognising similar characteristics. They handle and explore the use of a range of tools and materials safely to make simple constructions. Pupils make straightforward choices and respond to questions ('what?', 'where?') about recent events and familiar stories. They offer their own ideas, sometimes making connections to earlier experiences. Pupils begin to match specific activities to certain times of day or week, and show some appreciation of differences between present and past. They gain confidence in finding their way in familiar surroundings, developing knowledge of roles of familiar people in school and the local community.

Outcome 3

Pupils sort objects and materials according to simple criteria, and with help safely cut, shape and assemble these to make simple products that are meaningful to them. They communicate their developing knowledge of items in everyday use and often ask 'how?' and 'why?' Pupils may suggest where to find information and begin to record their observations and intentions using symbols, pictures, drawings or simple phrases. They take part in the planning of future activities and begin to make predictions by thinking about

and talking through earlier experiences. Through enquiry, pupils are able to identify changes in their environment and in materials, natural features, pictures and artefacts. They are able to follow simple instructions and sequence events in stories and creative activities. Pupils are beginning to use everyday terms about their surroundings and the passing of time, remembering significant events in the past and anticipating events in the future.

Level descriptions

The following level descriptions describe the types and range of performance that pupils working at a particular level should characteristically demonstrate. In deciding on a pupil's level of attainment at the end of a key stage, teachers should judge which description best fits the pupil's performance. Each description should be considered in conjunction with the descriptions for adjacent levels.

By the end of Key Stage 2, the performance of the great majority of pupils should be within the range of Levels 2 to 5, and by the end of Key Stage 3 within the range 3 to 7. Level 8 is available for very able pupils and, to help teachers differentiate exceptional performance at Key Stage 3, a description above Level 8 is provided.

Level 1

When designing and making, pupils talk about existing and familiar products in terms of appearance, function, likes and dislikes. They assemble and rearrange given materials, ingredients and components in different ways to make simple constructions and products. They use simple tools/utensils safely and talk about what they will make and how they will make it.

Level 2

When designing and making, pupils ask questions and suggest ideas for making things based on their examination of familiar products and their experience of using materials, ingredients and techniques. They use pictures and words to convey what they want to do. They manipulate simple tools/utensils safely and assemble, join and mix materials and ingredients in a variety of ways. Pupils talk about what they like or dislike about what they have made.

Level 3

With guidance, pupils gather given information to support their ideas when designing and making. They draw on their developing knowledge and understanding of materials, ingredients and components to develop their ideas, and begin to consider environmental issues related to the materials and ingredients they are working with. They use labelled sketches, and/or models to develop and show the detail of their designs. Pupils use simple tools/utensils and techniques to cut, shape, join and mix materials and ingredients. Their products are similar to their design intentions and any changes are identified.

Level 4

When designing and making, pupils gather information independently and use it to help generate a number of ideas. They develop ideas for products recognising that users have views and preferences. They illustrate alternative ideas using sketches, models and/or ICT, and make choices between them based on their experiences. Pupils outline what they are going to make and how they are going to make it. They select and use appropriate tools/utensils and equipment when working with a range of given materials and ingredients, and produce functional or edible products. They evaluate their work as it develops, making changes when necessary.

Level 5

When designing and making, pupils develop an outline design specification/recipe using supporting information gathered from various sources, and use it to help generate a number of ideas for products considering the user, health and safety and the environment. They research a range of their ideas using sketches, models and/or ICT, and make choices between them based on their knowledge and understanding. Pupils produce drawings/patterns/recipes with outline dimensions and sequence what they are going to do. They select and use appropriate tools/utensils and equipment to measure, mark out, cut, join and mix a range of materials and ingredients, and produce products of acceptable quality, function or taste. They evaluate their work as it develops, bearing in mind their original intentions.

Level 6

Pupils identify and use a range of information sources to research and develop a specification/recipe. They recognise the need to refine or change ideas in the light of their research, user needs and health and safety. Pupils produce formal drawings/patterns/recipes with details of manufacture using a range of skills, including the use of CAD. They sequence the manufacture of their product and use tools/utensils and equipment safely and accurately, adapting to unforeseen problems. They choose from a range of materials and ingredients and produce products to an appropriate standard of construction, finish or taste. They evaluate the final product comparing it with their original specification/recipe, and suggest improvements.

Level descriptions

Level 7

Pupils seek out relevant information sources to research details of their ideas and generate a detailed specification/recipe. Their work demonstrates elements of originality, innovation and creativity, and they modify or change ideas in the light of their research and knowledge and understanding. They consider user needs, health and safety and issues of sustainability when making decisions about their products. They annotate design ideas and, where appropriate, model them in order to aid development. They communicate appropriately, using a range of skills including the use of CAD. Pupils order and sequence the manufacture of their product, and use tools/utensils and equipment safely with increasing precision, making changes in the light of unforeseen problems. They choose from a range of materials and ingredients, and produce products to a high standard of construction, finish or taste. They evaluate the final product comparing it with their original specification/recipe and identify possible improvements.

Level 8

Pupils are focused and selective when identifying and using research materials, and in the way they explore and evaluate existing products. They demonstrate originality, innovation and creativity in generating and developing design solutions. They can cross-reference ideas in their specification/recipe to their research. They use high-level communication skills, including detailed annotation of development sketches, accurate drawings and CAD models. Pupils are responsive to limitations such as cost, user preferences, health and safety, and sustainability. They can sequence manufacture and become increasingly independent in the selection of equipment and potential materials and ingredients. They are able to make products with precision and a high standard of manufacture, finish or taste. They use a range of evaluation strategies, including detailed testing against the specification/recipe, considering user response and future developments.

Exceptional Performance

Pupils systematically seek out information to aid their design thinking, recognising the needs of a variety of client groups. They draw on their accumulated knowledge and understanding to arrive at a justifiable optimum solution through modelling, and communicate to others the key features of their designs, together with information that will aid manufacture in a detailed specification/recipe. Pupils produce and work from plans that specify how each stage in the making is to be achieved, and that make best use of the time and resources available. They work to a high degree of precision to make products that are healthy, sustainable, reliable, robust, and that fully reflect the quality requirements and detail given in the specification/recipe. They devise evaluation procedures, use these to indicate ways of improving their products, and implement those improvements.

