Shape of ACT Senior Secondary Curriculum:

Food Science and Nutrition

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1. PURPOSE

1.1 The *Shape of ACT Senior Secondary Curriculum: Food Science and Nutrition* will guide the writing of the Food Science and Nutrition course.

1.2 This paper has been prepared following consultation with Associate Professor Nenad Naumovski, Food Standards Australia and New Zealand, and the deliberations of the Food Science and Nutrition Advisory Group.

1.3 The paper should be read in conjunction with The Shape of the ACT Senior Secondary Curriculum located at:
http://www.bsss.act.edu.au/curriculum/bsss_course_development_consultation

2. INTRODUCTION

2.1 The Food Science and Nutrition A/T/M course will be the basis of planning, teaching, learning and assessment in ACT senior secondary schools. It will be useful for and useable by experienced and less experienced teachers.

3. BACKGROUND

3.1 The ACT Board of Senior Secondary Studies has reviewed the Food Science and Management (T) curriculum in the five -year course development cycle of improvement and renewal.

3.2 All courses under development are required to meet Board design specifications and to align with Board requirements for senior secondary curriculum. These specifications align with ACARA course design specifications and provide teachers with flexibility to plan, teach and assess according to the needs and interests of their students.

3.3 The Food Science and Nutrition course is to be developed under the Science Framework (link to the BSSS website will be added to the final version).

The rationale for this framework describes Science:

The study of Science is the unveiling of the mysteries of the universe in order to make sense of nature in all its wonder and complexity. Through knowledge, observation, questioning, experimentation, discussion, critical analysis and creative thinking in a scientific context, students develop their investigative, analytical and communication skills while cultivating an appreciation of the natural world.

Scientific processes test current understandings and are continually re-evaluated. Students are challenged to examine and reconsider their understanding of scientific concepts, inquiry methods and phenomena. Students apply their knowledge of science to solve problems, make evidence-based decisions and engage in public debate about contemporary issues from a scientific perspective. The study of science explores ways in which scientists work collaboratively and individually in a range of integrated fields to increase understanding of an ever-expanding body of scientific knowledge. They examine strategies proposed to address major scientific challenges now and in the future in local, national and global contexts.

Studying senior secondary Science provides students with a suite of cognitive and social skills and understandings that are valuable to a wide range of further study pathways and careers. Studying Science will enable students to become citizens who are more knowledgeable about the world around them and who have the critical skills to evaluate issues and make informed decisions. (page 3)

3.4 All courses based on this Framework should develop students':

- sense of wonder and curiosity about nature and an appreciation of how scientific knowledge can be used to address contemporary issues
- understanding of the theories and models used to describe, explain and make predictions about systems, structures and properties to provide a reliable basis for action
- understanding that scientific knowledge has developed over time, is used in a variety of contexts; and influences, and is influenced by, historical, social, economic, cultural and ethical considerations
- understanding that Science is experimental and has developed through independent and collaborative research, and has significant impacts on society and implications for decision making
- ability to design and conduct a variety of field and laboratory investigations involving collection and critical analysis of data, and interpretation of evidence
- ability to critically evaluate scientific concepts, interpretations and claims in order to solve problems and generate informed, considered and ethical conclusions
- ability to communicate scientific understanding, findings, arguments and conclusions using appropriate representations, modes and genres.

3.5 Concepts from the Science Framework (page 3) build on ACARA's F-10 Science curriculum:

Concepts and Knowledge

Courses developed under this Framework provide details of course content through the component units of the course. While this content will differ according to the particular course, all content will be chosen to enable students to work towards the achievement of the common and agreed goals of the Framework.

Overview

Science has three interrelated strands: Science Inquiry Skills, Science as a Human Endeavour and Science Understanding. In the practice of science, the three strands are closely integrated: the work of scientists reflects the nature and development of science, is built around scientific inquiry, and seeks to respond to and influence society. Students' experiences of school science should mirror this multifaceted view of science. To achieve this, the three strands of the *Australian Curriculum: Science* should be taught in an integrated way. The content descriptions for Science Inquiry Skills, Science as a Human Endeavour and Science Understanding have been written so that this integration is possible in each unit.

Science Inquiry Skills

Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting data; and communicating findings. This strand is concerned with evaluating claims, investigating ideas, solving problems, reasoning, drawing valid conclusions, and developing evidence-based arguments.

Science investigations are activities in which ideas, predictions or hypotheses are tested and conclusions are drawn in response to a question or problem. Investigations can involve a range of activities, including experimental testing, field work, locating and using information sources, conducting surveys, and using modelling and simulations. The investigation design will depend on the context and subject of the investigation.

In science investigations, the collection and analysis of data to provide evidence plays a major role. This can involve collecting or extracting information and reorganising data in the form of tables, graphs, flow charts, diagrams, prose, keys, spreadsheets and databases and previously published information and results. The analysis of data to identify and select evidence, and the communication

of findings, involve the selection, construction and use of specific representations, including mathematical relationships, symbols and diagrams.

Generic inquiry skills are described below and will be explicitly taught and assessed in each unit. In addition, each unit provides more specific skills to be taught within the generic science inquiry skills; these specific skills align with the Science Understanding and Science as a Human Endeavour content of the unit.

The generic science inquiry skills are:

- identifying, researching and constructing questions for investigation; proposing hypotheses; and predicting possible outcomes
- designing investigations, including the procedure/s to be followed, the materials required and the type and amount of primary and/or secondary data to be collected; conducting risk assessments; and considering ethical research
- conducting investigations, including using equipment and techniques safely, competently and methodically for the collection of valid and reliable data
- representing data in meaningful and useful ways; organising and analysing data to identify trends, patterns and relationships; recognising error, uncertainty and limitations in data; and selecting, synthesising and using evidence to construct and justify conclusions
- interpreting scientific and media texts and evaluating processes, claims and conclusions by considering the quality of available evidence; and using reasoning to construct scientific arguments
- selecting, constructing and using appropriate representations to communicate understanding, solve problems and make predictions
- communicating to specific audiences and for specific purposes using appropriate language, nomenclature, genres and modes.

Courses developed under this Course Framework may incorporate an extended scientific investigation.

Science as a Human Endeavour

The use and influence of science are shaped by interactions between science and a wide range of social, economic, ethical and cultural factors. Scientific knowledge is continually reviewed, and this review process involves a diverse range of scientists working within an increasingly global community of practice and can involve the use of international conventions and activities such as peer review.

Through science, we seek to improve our understanding and explanations of the natural world. The Science as a Human Endeavour strand highlights the development of science as a unique way of knowing and doing and explores the use and influence of science in society.

Science Understanding

The Science Understanding content in each unit develops students' understanding of the key concepts, models and theories that underpin the subject, and of the strengths and limitations of different models and theories for explaining and predicting complex phenomena.

Science understanding is evident when a person selects and integrates appropriate science concepts, models and theories to explain and predict phenomena, and applies those concepts, models and theories to new situations. Models in science can include diagrams, physical replicas, mathematical representations, word-based analogies (including laws and principles) and computer simulations.

Science Understanding should be developed through the selection of contexts that have relevance to and are engaging for students.

3.6 All courses of study for the ACT Senior Secondary Certificate should enable students to develop essential capabilities for twenty-first century learners. The Australian Curriculum General Capabilities comprise an integrated and interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the curriculum. While developing all capabilities, in particular, the Food Science and Nutrition course will engage with the capabilities of Creative and Critical Thinking, Intercultural Understanding, Ethical Understanding as well as the Cross Curriculum Perspective of sustainability.

4. THE CONTEXT OF THE ACT

4.1 Courses of study for the ACT Senior Secondary Certificate:

- provide a variety of pathways, to meet different learning needs and encourage students to complete their secondary education
- enable students to develop the essential capabilities for twenty-first century learners
- empower students as active participants in their own learning
- engage students in contemporary issues relevant to their lives
- foster students' intellectual, social and ethical development
- nurture students' wellbeing, and physical and spiritual development
- enable effective and respectful participation in a diverse society.

4.2 Each course of study:

- comprises an integrated and interconnected set of knowledge, skills, behaviours and dispositions that students develop and use in their learning across the curriculum
- is based on a model of learning that integrates intended student outcomes, pedagogy and assessment
- outlines teaching strategies which are grounded in learning principles and encompass quality teaching
- promotes intellectual quality, establish a rich learning environment and generates relevant connections between learning and life experiences
- provides formal assessment and certification of students' achievements.

4.3 In consideration of the ACT context, and in response to contemporary research and literature, a Food Science and Nutrition curriculum should include:

- a student-centred pedagogical approach
- an interdisciplinary approach
- the educational needs of young people with respect to food, nutrition, diet, health and wellbeing
- skills to assist in decision-making, based on scientific evidence and reasoning about the environment and their own health and wellbeing
- knowledge of food science, nutrition and food technology
- skills in the techniques, equipment and processes for analysing, processing, and producing food products
- the Science Framework and Achievement Standards
- awareness of local, national and global issues, and future trends
- ethical, economic, environmental and social sustainability factors

5. AIMS OF THE FOOD SCIENCE AND NUTRITION CURRICULUM

In the 21st Century food science is becoming increasingly a vital area of study and the demand for food technology skills is growing in the Australian and global economy. As Proudlove argues:

Today's food industry produces a vast range of products. New product development is a continuous process and the lifespan of new food products today can be relatively short. Consumers demand choice, variety, convenience and, above all safety. To achieve these objectives the food industry makes use of food technology and all its constituent disciplines and related areas. (Proudlove, RK. page vii).

Food is a global commodity: foods are traded and shipped around the world. This provides both opportunities and challenges for nations and communities. The food industry faces a variety of questions from consumers about the origin, including the safety and quality of products they consume each day. There are benefits but also threats and problems, for example, such as the emergence of new pathogens gaining access to food products. There is also the increasing prevalence of specific dietary requirements.

The Food Science and Nutrition course is well placed to provide students with opportunities to explore these critical issues and develop their ethical and conceptual framework for living in a complex, interconnected and changing world. The course aims to prepare students so that they can:

- engage in communication about food science and nutrition
- identify and investigate scientific questions
- draw evidence-based conclusions
- question scientific claims
- value evidence and scepticism
- design creative solutions for issues in food
- make informed decisions about their own health and wellbeing.

Food Science and Nutrition aims to provide students with a solid foundation in scientific knowledge, understanding, skills and values on which further learning and adult life can be built. The course will provide a pathway to tertiary studies and employment opportunities in Food Science, Nutrition and Food Technology by developing discipline specific knowledge, skills and understanding requisite to success at tertiary studies.

6. STRUCTURE OF THE FOOD SCIENCE and NUTRITION CURRICULUM

Food Science and Nutrition course delivers two units in each of the two domains of study: food science and human nutrition. This structure reflects the different pathways available to students who complete the course and prepares them should they wish to pursue further studies.

Rationale

Food Science and Nutrition

In Food Science and Nutrition, students integrate scientific knowledge and skills and apply them to designing and carrying out investigations that explore the links between food, health, and diet-related diseases. In practical investigations, students formulate and test hypotheses by collecting, presenting, analysing, and evaluating data in order to describe trends and clarify theoretical concepts related to food and nutrition.

Students examine factors that influence food choices and reflect on local, national, Indigenous, and/or global issues related to the study of food and nutrition. They investigate methods of food production and distribution that affect the quantity and quality of food and consider the ways in which these methods and associated technologies have evolved and influence the health of individuals and communities.

The application of science plays an important role in understanding how the properties of food are used to meet the needs of consumers and producers. Food laws and regulations govern the production, supply and distribution of safe foods. Students develop understandings and attitudes that enhance their problem-solving abilities and decision-making skills in food-related problems.

Factors that influence food availability and selection are examined and current food consumption patterns investigated. Food handling and food safety is addressed with emphasis on ensuring safety and managing the sensory characteristics and functional properties of food to produce a quality product.

Students explore innovations in science and technology and changing consumer demands. New and emerging foods have encouraged the design, development and marketing of a range of products, services and systems. Students investigate food issues and advertising strategies used to promote food products. They examine influences on the supply of food for the world's population and explore issues associated with food security, equity and sustainability.

The role of nutrition in contributing to the health of the individual and the social and economic future of Australia is explored. Production and processing practices are examined, and their impact evaluated. Contemporary food science and nutrition issues are raised, investigated and debated. This knowledge enables students to make informed responses to changes in the production to consumption continuum and exert an influence on future developments in the food industry as educated citizens and in their future careers.

The Food Science and Nutrition course enables students to connect with further education and training, university and employment pathways and enhances employability and career opportunities in areas that include nutrition, health, food and beverage manufacturing, food production, food processing and nutrition technological developments, community services, hospitality, and retail.

UNITS

(Units may be studied in any order)

- **Properties of Food**

In this unit, students investigate the properties of the components of foods. They explore how sensory, physical and chemical properties influence the selection, use and consumption of raw and processed foods. Using scientific methods, students examine the functional properties which determine the performance of food and how these properties determine the way foods are selected, stored, prepared and presented. They investigate how foods can be preserved to extend shelf life, preserve nutritional value, provide out of season availability and economic viability, and processing techniques, ingredients and additives that impact the properties of food. Students explore technologies that are applied to create innovative foods and products for consumers.

- **Food Processing and Products**

In this unit, students examine the processes of food product development and manufacture in terms of market, technological and environmental considerations. They use a variety of foods and processes to produce and evaluate food products, services or systems. Students develop their expertise with technology and communication skills to design food products, services or processing systems. They examine the role and responsibility of organisations that control foods imported into Australia and the advertising and marketing laws related to food and beverages.

- **Food Origins**

Students learn about the different sources and origins of food commodities and reasons for the development and use of varieties of food commodities, and food sustainability. They consider the social, cultural, nutritional, environmental and economic factors that impact individual choice when purchasing and consuming food and explore the ways food products are provided to meet the needs and requirements of different demographic groups. Students examine how environmental, regional and global economic issues impact sustainable practices in the production of food commodities. They investigate food selection models, dietary guidelines and the use of goal setting to achieve nutritional health.

- **Food and Nutrition**

In this unit, students develop an understanding of the purpose of food for humans and learn about the specific nutrients needed to ensure growth, development, health and well-being. Students investigate and apply information about the nutritional requirements of the individual. Through learning about food values, the food source, and the role of specific macronutrients and micronutrients in the body, they gain an understanding of a balanced diet appropriate to individual needs and optimal health. Students examine primary and secondary food processes that affect nutrition, food quality and supply. They research the effect of under-consumption and over-consumption of nutrients on health and investigate a range of diet-related health conditions that affect individuals and groups.

- **Negotiated Study**

(Two units in the course are to be completed before undertaking a Negotiated Study)

A negotiated study unit has an important place in senior secondary courses. It is a valuable pedagogical approach that empowers students to make decisions about their own learning. A negotiated study unit is decided upon by a class, group(s) or individual student in consultation with the teacher and with the Principal's approval. The program of learning for a negotiated study unit must meet all the content descriptions as appears in the unit.

7. CONSIDERATIONS

7.1 Incorporating a futures orientation

In the 21st Century food is a global commodity. Foods are traded and shipped around the world. The food industry faces a variety of threats and challenges, such as new pathogens gaining access to food products, or the effect of economic, political or environmental conditions on supply of food products. In this ever-changing environment, food science has become a vital area of study and the demand for food technology skills continues to grow.

The imperative to create a futures-oriented curriculum is a major opportunity to lead improved teaching and learning. A futures orientation will include consideration that society will be increasingly complex, with Australians interacting in a global environment needing to know how to learn, adapt, create, communicate, and interpret and use information critically.
(The Future of Education and Skills Education 2030, 2018

7.2 Food Science and Nutrition curriculum

The Food Science and Nutrition curriculum has an important place in ACT senior secondary curriculum. It challenges students to think about, respond to and create solutions to contemporary problems in food and nutrition. Students actively engage in a food and nutrition problem solving process to create food solutions that contribute positively to preferred personal, social, ethical, economic, environmental, legal, sustainable and technological futures.

7.3 Equity and opportunity

The Food Science and Nutrition course is inclusive of students' needs and interests. It provides flexibility and choice for teachers and students. The factors that influence these choices include school and community contexts, local community learning opportunities, contemporary and local issues, and available learning resources.

7.4 Connections to other learning areas

The Food Science and Nutrition course builds on knowledge, skills and understanding from students' previous studies of Australian Curriculum courses. Students learn about food and nutrition in both Health and Physical Education (HPE) and in the Technologies learning area through Design and Technologies from Foundation to Year 8. In Technologies students learn how to apply nutrition knowledge through the preparation of food. In years 9 and 10 students may have further chosen to study a food-related subject offered by their school.

At the senior secondary level, Health and Wellbeing A/T/M, Exercise Science A/T/M, Sports Development A/T/M, Biology A/T/M/, Hospitality A/T/M/V include aspects of food and nutrition relevant to the focus of the course.

7.5 Role of digital technologies

Students and teachers integrate a growing range of online information, tools and applications. These include digitised online materials such as historical documents, books, newspapers, journals, images and items from museum collections, as well as other online resources including databases, reference works and indexes to library holdings. Furthermore, use of new technological developments such as the use of augmented reality and virtual reality will also be considered.

7.6 Clarity of curriculum

The curriculum is substantial and flexible. It is sufficiently rich and descriptive to guide teachers with limited experience but avoid excessive prescription that would hamper experienced teachers from exercising their skills. The curriculum document is expressed clearly in terms that are accessible to a new teacher, while allowing all teachers to enhance it with their interests and expertise.

7.7 Breadth and depth of study

Content descriptions specify the knowledge, understanding and skills that students are expected to learn and that teachers are expected to teach. Teachers are required to develop a program of learning that allows students to demonstrate all the content descriptions.

A program of learning is what a college provides to implement the course for a subject meeting students' needs and interests. It is at the discretion of the teacher to emphasis some content descriptions over others. The teacher may teach additional (not listed) content if it meets the specific unit goals providing that it does not duplicate content in other units.

7.8 The nature of the learner

The courses address the needs of diverse learners through (T), (A) and (M) categories of study.

7.9 General capabilities

The Food Science and Nutrition curriculum develops critical and creative thinking when students explore problems, develop innovative ideas, generate solutions, and evaluate and refine their ideas. They develop personal and social capability, while working collaboratively and developing a range of self-management skills. Students develop ethical understanding as they identify and investigate the nature of ethical concepts, values and principles. They reflect on ethical principles of food choices considering animal welfare, fair trade and resource use, for example. Students develop intercultural understanding as they engage with diverse cultures in ways that recognise commonalties and differences.

7.10 Cross curriculum perspectives

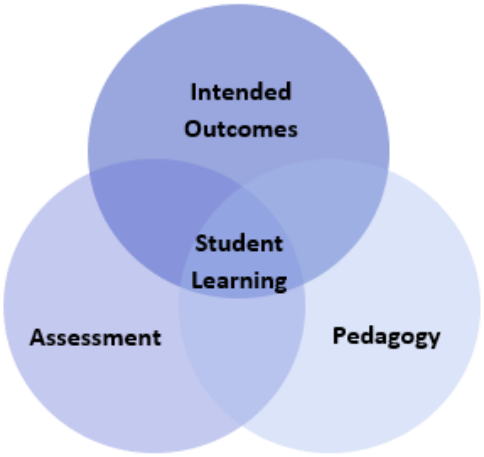
Aboriginal and Torres Strait Islander histories and cultures, Asia and Australia's engagement with Asia, and Sustainability perspectives are represented in the course in ways that are appropriate.

8. PEDAGOGY AND ASSESSMENT

The underpinning beliefs and learning principles for the development of ACT Board of Senior Secondary School curriculum as are follows:

8.1 Underpinning beliefs

- All students are able to learn
- Learning is a partnership between students and teachers
- Teachers are responsible for advancing student learning.



8.2 Learning Principles

1. Learning builds on existing knowledge, understandings and skills.

   (Prior knowledge)
2. When learning is organised around major concepts, principles and significant real world issues, within and across disciplines, it helps students make connections and build knowledge structures.

   (Deep knowledge and connectedness)
3. Learning is facilitated when students actively monitor their own learning and consciously develop ways of organising and applying knowledge within and across contexts.

   (Metacognition)
4. Learners' sense of self and motivation to learn affects learning.

   (Self-concept)
5. Learning needs to take place in a context of high expectations.

   (High expectations)
6. Learners learn in different ways and at different rates.

   (Individual differences)
7. Different cultural environments, including the use of language, shape learners' understandings and the way they learn.

   (Socio-cultural effects)
8. Learning is a social and collaborative function as well as an individual one.

   (Collaborative learning)
9. Learning is strengthened when learning outcomes and criteria for judging learning are made explicit and when students receive frequent feedback on their progress.

   (Explicit expectations and feedback).

9. CONCLUSION

The Food Science and Nutrition course is to be developed under the Science Framework. The course provides students with a suite of cognitive and social skills and understandings that are valuable to a range of further study and career pathways. Studying Food Science and Nutrition will enable students to become citizens who are more knowledgeable about the world around them and who have the critical skills to evaluate issues and make informed decisions.

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