



MINISTRY OF EDUCATION

Food and Nutrition for Senior High Schools

TEACHER MANUAL



YEAR ONE



NATIONAL COUNCIL FOR
CURRICULUM & ASSESSMENT
OF MINISTRY OF EDUCATION

MINISTRY OF EDUCATION



REPUBLIC OF GHANA

Food and Nutrition

for Senior High Schools

Teacher Manual

Year One



**NATIONAL COUNCIL FOR
CURRICULUM & ASSESSMENT
OF MINISTRY OF EDUCATION**

FOOD AND NUTRITION TEACHER MANUAL

Enquiries and comments on this manual should be addressed to:

The Director-General

National Council for Curriculum and Assessment (NaCCA)

Ministry of Education

P.O. Box CT PMB 77

Cantonments Accra

Telephone: 0302909071, 0302909862

Email: info@nacca.gov.gh

website: www.nacca.gov.gh



©2025 Ministry of Education

This publication is not for sale. All rights reserved. No part of this publication may be reproduced without prior written permission from the Ministry of Education, Ghana.



CONTENTS

LIST OF TABLES AND FIGURES	VIII
INTRODUCTION	1
ACKNOWLEDGEMENTS	4
SCOPE AND SEQUENCE	11
SECTION 1: NUTRITION, COMMODITIES AND FOOD HABITS	13
Strand: Nutrition and Health	13
Sub-Strand: Food for Healthy Living	13
Week 1: Basic concepts in food and nutrition	15
Focal Area 1: Concepts in Food and Nutrition	15
Focal Area 2: Application of Basic Concepts of Food and Nutrition in Daily Life	17
Week 2: Classification of Food Commodities under various Food Groups	21
Focal Area: Food Commodities	21
Week 3: Processing Convenience Foods	27
Focal Area: Convenience foods	27
Week 4: Analyse the effect of heat on the nutritional values of the various food commodities	31
Focal Area: Effects of heat on food nutrients	31
Week 5: Food nutrients and their effect on growth and development	34
Focal Area 1: Food Nutrients and their effects on growth	34
Focal Area 2: Effects of nutrient deficiencies	35
Week 6: Food habits/lifestyle and their implications on nutritional status	38
Focal Area: Food habits/lifestyle	38
Week 7: Factors that influence food habits/lifestyle	41
Focal Area: Factors that influence food habits/ lifestyle	41
APPENDIX A: Sample Portfolio Assessment	44
APPENDIX B: Sample Group Project	46
APPENDIX C: Sample Experiment Assessment	49
APPENDIX D: Sample Scoring Rubric for Poster Assessment	51
APPENDIX E: Sample Table of Specification for Mid-Semester Examination	53
SECTION 2: FOOD SECURITY, STORAGE AND SPOILAGE	54
Strand: Nutrition and Health	54
Sub-Strand: Food Security	54
Week 8: The Concepts in Food Security and Its Implications	56
Focal Area: The concepts of Food Security and its Implications	56

Week 9: Factors Influencing Food Security	60
Focal Area: Factors Influencing Food Security	60
Week 10: The Concept and Principles of Food Storage	66
Focal Area: The Concept and Principles of Food Storage	66
Week 11: Causes of Food Spoilage and its Implications for Food Safety	69
Focal Area: Causes of Food Spoilage and its Implication for Food Safety	69
Week 12: Appropriate Food Handling, Storage and Hygienic Food Practice	71
Focal Area: Appropriate food handling, storage, and hygienic food practice	71
APPENDIX F: Research Work	76
APPENDIX G: Sample Table of Specification for End of Semester 1 Examination	78
SECTION 3: FOOD LABORATORY AND HYGIENE	80
Strand: Food Production	80
Sub-Strand: Food Production Technology	80
Week 13: Concepts of food laboratories	82
Focal Area: Concept of food laboratories and their functions in food production	82
Week 14: Types of kitchen laboratories layout.	84
Focal Area: Types of kitchen laboratories layout and their implication in food production	84
Week 15: Factors that affect the planning and layout of food laboratories	90
Focal Area: Factors that affect the planning and layout of food laboratories	90
Week 16: Ways of re-designing/renovation/refurbishment of a food laboratory	92
Focal Area: Redesigning a Food Laboratory	92
Week 17: Hygiene in the food laboratory	94
Focal Area: Personal, food and environmental hygiene in the food laboratory	94
APPENDIX H: Individual Project Work	97
APPENDIX I: Case Study	100
APPENDIX J: Group Case Study	102
SECTION 4: BEVERAGES	104
Strand: Food production	104
Sub–Strand: Food processing techniques	104
Week 18: Types of Beverages	106
Focal Area: Types of beverages and their uses	106
Week 19: Scientific principles in selection, processing and preservation of beverages	110
Focal Area: Scientific principles involved in the selection, processing, and preservation of beverages	110
Week 20: Enrichment and Fortification of Beverages (1)	113
Focal Area: Enrich or fortify beverages	113
Week 21: Enrichment and Fortification of Beverages (2)	116
Focal Area: Functions, nutritional and food safety, beverage enrichment and fortification	116

Week 22: Experiment on Non – Alcoholic Beverages (1)	118
Focal Area: Experiments to produce non-alcoholic beverages	
118	
Week 23: Experiment on Non – Alcoholic Beverages (2)	121
Focal Area: Experiments to produce non-alcoholic beverages (2)	121
Week 24: Scientific principles in alcoholic beverages	125
Focal Area: Alcoholic beverage production	125
APPENDIX K: Sample Table of Specification for Mid-Semester Examination	130
APPENDIX L: Practical Assessment	131
APPENDIX M: Sample Table of Specification for End of Semester 2 Examination	133

LIST OF TABLES AND FIGURES

List of Tables

Table 1.1: Concepts in Food and Nutrition	15
Table 1.2: Food commodities and groups	21
Table 1.3: Classification of Effects of Heat on Food Commodities	24
Table 1.4: Food nutrients, their functions and deficiencies	35
Table 2.1: Food storage	66
Table 3.1: Similarities and differences between traditional and modern kitchens	86
Table 3.2: Traditional kitchen laboratory	86
Table 3.3: Modern kitchen laboratory	86
Table 4.1: Benefits and risks associated with fortified beverages	116

List of Figures

Figure 1.1: Classification of food (Food Pyramid, n.d.)	22
Figure 1.2: Food habits/lifestyle	38
Figure 2.1: Fish in freezer	73
Figure 2.2: Onions in basket	73
Figure 2.3: Cereals in Airtight containers	73
Figure 3.1: Shows a traditional kitchen with a fire and a modern kitchen with cabinets	84
Figure 3.2: Hand washing under running water	94
Figure 3.3: A fruit seller handles fruits with clean hands	94
Figure 3.4: Shows a woman cleaning a wooden surface with detergent	95
Figure 4.1: Alcoholic beverages (Alcoholic beverages, n.d.)	106
Figure 4.2: Non-alcoholic beverage (Non-alcoholic beverages, n.d.)	107
Figure 4.3: Select fruits (oranges)	119
Figure 4.4: Squeeze oranges	119
Figure 4.5: Bottle orange juice	119
Figure 4.6: Local fortified beverage	121
Figure 4.7: Local drink Pito production. (Pito production, n.d.)	125

INTRODUCTION

The National Council for Curriculum and Assessment (NaCCA) has developed a new Senior High School (SHS), Senior High Technical School (SHTS) and Science, Technology, Engineering and Mathematics (STEM) Curriculum. It aims to ensure that all learners achieve their potential by equipping them with 21st Century skills, competencies, character qualities and shared Ghanaian values. This will prepare learners to live a responsible adult life, further their education and enter the world of work.

This is the first time that Ghana has developed an SHS Curriculum which focuses on national values, attempting to educate a generation of Ghanaian youth who are proud of our country and can contribute effectively to its development.

This Teacher Manual for Food and Nutrition covers all aspects of the content, pedagogy, teaching and learning resources and assessment required to effectively teach Year One of the new curriculum. It contains this information for the first 12 weeks of Year One, with the remaining 12 weeks contained within Book Two. Teachers are therefore to use this Teacher Manual to develop their weekly Learning Plans as required by Ghana Education Service.

Some of the key features of the new curriculum are set out below.

Learner-Centred Curriculum

The SHS, SHTS, and STEM curriculum places the learner at the center of teaching and learning by building on their existing life experiences, knowledge and understanding. Learners are actively involved in the knowledge-creation process, with the teacher acting as a facilitator. This involves using interactive and practical teaching and learning methods, as well as the learner's environment to make learning exciting and relatable. As an example, the new curriculum focuses on Ghanaian culture, Ghanaian history, and Ghanaian geography so that learners first understand their home and surroundings before extending their knowledge globally.

Promoting Ghanaian Values

Shared Ghanaian values have been integrated into the curriculum to ensure that all young people understand what it means to be a responsible Ghanaian citizen. These values include truth, integrity, diversity, equity, self-directed learning, self-confidence, adaptability and resourcefulness, leadership and responsible citizenship.

Integrating 21st Century Skills and Competencies

The SHS, SHTS, and STEM curriculum integrates 21st Century skills and competencies. These are:

- **Foundational Knowledge:** Literacy, Numeracy, Scientific Literacy, Information Communication and Digital Literacy, Financial Literacy and Entrepreneurship, Cultural Identity, Civic Literacy and Global Citizenship
- **Competencies:** Critical Thinking and Problem Solving, Innovation and Creativity, Collaboration and Communication
- **Character Qualities:** Discipline and Integrity, Self-Directed Learning, Self-Confidence, Adaptability and Resourcefulness, Leadership and Responsible Citizenship

Balanced Approach to Assessment - not just Final External Examinations

The SHS, SHTS, and STEM curriculum promotes a balanced approach to assessment. It encourages varied and differentiated assessments such as project work, practical demonstration, performance assessment, skills-based assessment, class exercises, portfolios as well as end-of-term examinations and final external assessment examinations. Two levels of assessment are used. These are:

- Internal Assessment (30%) – Comprises formative (portfolios, performance and project work) and summative (end-of-term examinations) which will be recorded in a school-based transcript.
- External Assessment (70%) – Comprehensive summative assessment will be conducted by the West African Examinations Council (WAEC) through the WASSCE. The questions posed by WAEC will test critical thinking, communication and problem solving as well as knowledge, understanding and factual recall.

The split of external and internal assessment will remain at 70/30 as is currently the case. However, there will be far greater transparency and quality assurance of the 30% of marks which are school-based. This will be achieved through the introduction of a school-based transcript, setting out all marks which learners achieve from SHS 1 to SHS 3. This transcript will be presented to universities alongside the WASSCE certificate for tertiary admissions.

An Inclusive and Responsive Curriculum

The SHS, SHTS, and STEM curriculum ensures no learner is left behind, and this is achieved through the following:

- Addressing the needs of all learners, including those requiring additional support or with special needs. The SHS, SHTS, and STEM curriculum includes learners with disabilities by adapting teaching and learning materials into accessible formats through technology and other measures to meet the needs of learners with disabilities.
- Incorporating strategies and measures, such as differentiation and adaptative pedagogies ensuring equitable access to resources and opportunities for all learners.
- Challenging traditional gender, cultural, or social stereotypes and encouraging all learners to achieve their true potential.
- Making provision for the needs of gifted and talented learners in schools.

Social and Emotional Learning

Social and emotional learning skills have also been integrated into the curriculum to help learners to develop and acquire skills, attitudes, and knowledge essential for understanding and managing their emotions, building healthy relationships and making responsible decisions.

Philosophy and vision for each subject

Each subject now has its own philosophy and vision, which sets out why the subject is being taught and how it will contribute to national development. The Philosophy and Vision for Food and Nutrition is:

Philosophy: The next generation of learners in Food and Nutrition will be empowered through observation, curiosity, innovation, and exposure to practically relevant concepts that link food to health, culture, environment, and economic development. The curriculum promotes hands-on activities that encourage learners to apply scientific principles in food preparation, nutrition

planning, food preservation, and sustainable consumption. Delivered in a learner-centred environment, the subject fosters holistic development and provides pathways for further education and careers in nutrition, food science, hospitality, and public health.

Vision: The subject envisions to equip learners with lifelong skills and competencies in Food and Nutrition to make informed dietary choices, promote healthy lifestyles, ensure food safety, and contribute to food-related entrepreneurship and national development.

ACKNOWLEDGEMENTS

Special thanks to Professor Samuel Ofori Bekoe, Director-General of the National Council for Curriculum and Assessment (NaCCA) and all who contributed to the successful writing of the Teacher Manuals for the new Senior High School (SHS) curriculum.

The writing team was made up of the following members:

National Council for Curriculum and Assessment	
Name of Staff	Designation
Eric Amoah	Deputy Director-General, Technical Services
Reginald Quartey	Ag. Director, Curriculum Development Directorate
Anita Cordei Collison	Ag. Director, Standards, Assessment and Quality Assurance Directorate
Rebecca Abu Gariba	Ag. Director, Corporate Affairs
Anthony Sarpong	Director, Standards, Assessment and Quality Assurance Directorate
Uriah Kofi Otoo	Senior Curriculum Development Officer (Art and Design Foundation & Studio)
Nii Boye Tagoe	Senior Curriculum Development Officer (History)
Juliet Owusu-Ansah	Senior Curriculum Development Officer (Social Studies)
Ayuuba Sullivan Akudago	Senior Curriculum Development Officer (Physical Education & Health)
Godfred Asiedu Mireku	Senior Curriculum Development Officer (Mathematics)
Samuel Owusu Ansah	Senior Curriculum Development Officer (Mathematics)
Thomas Kumah Osei	Senior Curriculum Development Officer (English)
Godwin Mawunyo Kofi Senanu	Assistant Curriculum Development Officer (Economics)
Joachim Kwame Honu	Principal Standards, Assessment and Quality Assurance Officer
Jephtar Adu Mensah	Senior Standards, Assessment and Quality Assurance Officer
Richard Teye	Senior Standards, Assessment and Quality Assurance Officer
Nancy Asieduwaa Gyapong	Assistant Standards, Assessment and Quality Assurance Officer

National Council for Curriculum and Assessment	
Name of Staff	Designation
Francis Agbalenyo	Senior Research, Planning, Monitoring and Evaluation Officer
Abigail Birago Owusu	Senior Research, Planning, Monitoring and Evaluation Officer
Ebenezer Nkuah Ankamah	Senior Research, Planning, Monitoring and Evaluation Officer
Joseph Barwuah	Senior Instructional Resource Officer
Sharon Antwi-Baah	Assistant Instructional Resource Officer
Dennis Adjasi	Instructional Resource Officer
Samuel Amankwa Ogyampo	Corporate Affairs Officer
Seth Nii Nartey	Corporate Affairs Officer
Alice Abbew Donkor	National Service Person

Subject	Writer	Designation/Institution
Additional Mathematics	Dr. Nana Akosua Owusu-Ansah	University of Education Winneba
	Gershon Kwame Mantey	University of Education Winneba
	Innocent Duncan	KNUST Senior High School
Agricultural Science	David Esela Zigah	Achimota School
	Prof. J.V.K. Afun	Kwame Nkrumah University of Science and Technology
	Issah Abubakari	Half Assini Senior High School
	Mrs. Benedicta Carbilba Foli	Retired, Pope John SHS and Minor Seminary
Agriculture	Esther Fobi Donkor	University of Energy and Natural Resources, Sunyani
	Prof. Frederick Adzitey	University for Development Studies
	Eric Morgan Asante	St. Peter's Senior High School
Automotive and Metal Technology	Dr. Sherry Kwabla Amedorme	Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED)
	Kunhyuuri Philip	Kumasi Senior High Technical School
	Emmanuel Korletey	Benso Senior High Technical School
	Philip Turkson	G E S

Subject	Writer	Designation/Institution
Electrical and Electronics Technology	Walter Banuenumah	Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED)
	Akuffo Twumhene Frederick	Koforidua Senior High Technical School
	Gilbert Second Odjamgba	Ziavi Senior High Technical School
Building Construction and Woodwork Technology	Wisdom Dzidzienyo Adzraku	Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED)
	Michael Korblah Tsorgali	Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED)
	Dr. Prosper Mensah	CSIR-FORIG
	Isaac Buckman	Armed Forces Senior High Technical School
	Firmin Anewuoh	Presbyterian College of Education, Akropong-Akuapem
	Lavoe Daniel Kwaku	Sokode Senior High Technical School
Arabic	Dr. Mohammed Almu Mahaman	University for Development Studies
	Dr. Abas Umar Mohammed	University of Ghana
	Mahey Ibrahim Mohammed	Tijjaniya Senior High School
Art and Design Studio and Foundation	Dr. Ebenezer Acquah	University of Education Winneba
	Seyram Kojo Adipah	GES – Ga East Municipal Education Directorate
	Dr. Jectey Nyarko Mantey	Kwame Nkrumah University of Science and Technology
	Yaw Boateng Ampadu	Prempeh College
	Kwame Opoku Bonsu	Kwame Nkrumah University of Science and Technology
	Angela Owusu-Afriyie	Opoku Ware School
Aviation and Aerospace Engineering	Opoku Joel Mintah	Altair Unmanned Technologies
	David Kofi Oppong	Kwame Nkrumah University of Science and Technology
	Sam Ferdinand	Afua Kobi Ampem Girls' Senior High School
Biology	Paul Beeton Damoah	Prempeh College
	Jo Ann Naa Dei Neequaye	Nyakrom Senior High Technical School
	Abraham Kabu Otu	Prampram Senior High School

Subject	Writer	Designation/Institution
Biomedical Science	Dr. Dorothy Yakoba Agyapong	Kwame Nkrumah University of Science and Technology
	Davidson Addo	Bosomtwe Girls STEM SHS
	Jennifer Fafa Adzraku	
Business Management	Ansbert Baba Avoile	Bolgatanga Senior High School
	Dr. Emmanuel Caesar Ayamba	Bolgatanga Technical University
	Faustina Graham	Ghana Education Service, HQ
Accounting	Nimako Osei Victoria	SDA Senior High School, Akyem Sekyere
	Emmanuel Kodwo Arthur	ICAG
	Bernard Adobaw	West African Examination Council
Chemistry	Awumbire Patrick Nsobila	Bolgatanga Senior High School
	Paul Michael Cudjoe	Prempeh College
	Bismark Kwame Tunu	Opoku Ware School
	Michael Amissah	St. Augustine's College
Computing and Information Communication Technology (ICT)	Raphael Dordoe Senyo	Ziavi Senior High Technical School
	Kwasi Abankwa Anokye	Ghana Education Service, SEU
	Osei Amankwa Gyampo	Wesley Girls High School, Kumasi
	Dr. Ephriam Kwaa-Aidoo	University of Education Winneba
	Dr. Gaddafi Abdul-Salaam	Kwame Nkrumah University of Science and Technology
Design and Communication Technology	Gabriel Bofo	Kwabeng Anglican Senior High Technical School
	Joseph Asomani	Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED)
	Phyllis Mensah	Akenten Appiah Menka University of Skills Training and Entrepreneurial Development (AAMUSTED)
Economics	Dr. Peter Anti Partey	University of Cape Coast
	Charlotte Kpogli	Ho Technical University
	Salitsi Freeman Etonam	Anlo Senior High School

Subject	Writer	Designation/Institution
Engineering	Daniel Kwesi Agbogbo	Kwabeng Anglican Senior High Technical School
	Prof. Abdul-Rahman Ahmed	Kwame Nkrumah University of Science and Technology
	Valentina Osei-Himah	Atebubu College of Education
English Language	Esther Okaitsoe Armah	Mangoase Senior High School
	Kukua Andoh Robertson	Achimota School
	Beatrice Antwiwaa Boateng	Oti Boateng Senior High School
	Perfect Quarshie	Mawuko Girls Senior High School
French	Osmanu Ibrahim	Mount Mary College of Education
	Maurice Adjetey	Retired, CREF
	Mawufemor Kwame Agorgli	Akim Asafo Senior High School
General Science	Dr. Comfort Korkor Sam	University for Development Studies
	Robert Arhin	SDA Senior High School, Akyem Sekyere
Geography	Raymond Nsiah-Asare	Methodist Girls' High School
	Prof. Ebenezer Owusu-Sekyere	University for Development Studies
	Samuel Sakyi-Addo	Achimota School
Ghanaian Languages	David Sarpei Nunoo	University of Education Winneba
	Catherine Ekuia Mensah	University of Cape Coast
	Ebenezer Agyemang	Opoku Ware School
Government	Josephine Akosua Gbagbo	Ngleshie Amanfro Senior High School
	Augustine Arko Blay	University of Education Winneba
	Samuel Kofi Asafua Adu	Fettehman Senior High School
History	Dr. Anitha Oforiwah Adu-Boahen	University of Education Winneba
	Prince Essiaw	Enchi College of Education
Management in Living	Grace Annagmeng Mwini	Tumu College of Education
	Dorcas Akosua Opoku	Winneba Secondary School
Clothing and Textiles	Jusinta Kwakyewaa (Rev. Sr.)	St. Francis Senior High Technical School
	Rahimatu Yakubu	Potsin T.I Ahmadiyya SHS
Food and Nutrition	Ama Achiaa - Afriyie	St. Louis SHS
	Millicent Ansomah Boadi	Adukrom Presbyterian Senior High Technical School

Subject	Writer	Designation/Institution
Literature- in-English	Blessington Dzah	Ziavi Senior High Technical School
	Juliana Akomea	Mangoase Senior High School
Manufacturing Engineering	Benjamin Atribawuni Asaaga	Kwame Nkrumah University of Science and Technology
	Dr. Samuel Boahene	Kwame Nkrumah University of Science and Technology
	Ali Morrow Fatormah	Mfantsipim School
Mathematics	Edward Dadson Mills	University of Education Winneba
	Zakaria Abubakari Sadiq	Tamale College of Education
	Collins Kofi Annan	Mando Senior High School
Music	Pros Cosmas W. K. Mereku	University of Education Winneba
	Prof. Emmanuel Obed Acquah	University of Education Winneba
	Joshua Amuah	University of Ghana
	Benjamin Ofori	CRIG Primary School, Akim Tafo
	Davies Obiri Danso	New Juaben Senior High School
Performing Arts	Dr. Latipher Amma Osei Appiah-Agyei	University of Education Winneba
	Prof. Emmanuel Obed Acquah	University of Education Winneba
	Chris Ampomah Mensah	Bolgatanga Senior High School
Core Physical Education and Health	Dr. Mary Aku Ogum	University of Cape Coast
	Paul Kofi Yesu Dadzie	Accra Academy
Elective Physical Education and Health	Sekor Gaveh	Kwabeng Anglican Senior High Technical School
	Anthonia Afosah Kwaaso	Jukwa Senior High School
Physics	Dr. Linus Kweku Labik	Kwame Nkrumah University of Science and Technology
	Henry Benyah	Wesley Girls' High School, Cape Coast
	Sylvester Affram	Kwabeng Anglican Senior High School

Subject	Writer	Designation/Institution
Christian & Islamic Religious Studies	Dr. Richardson Addai-Mununkum	University of Education Winneba
	Dr. Francis Opoku	Valley View University College
	Dr. Francis Normanyo	Mount Mary College
	Dr. Haruna Zagoon-Sayeed	University of Ghana
	Kabiru Soumana	GES
	Seth Tweneboa	University of Education Winneba
Religious and Moral Education	Anthony Mensah	Abetifi College of Education
	Joseph Bless Darkwa	Volo Community Senior High School
	Clement Nsorwineh Atigah	Tamale Senior High School
Robotics	Dr. Eliel Keelson	Kwame Nkrumah University of Science and Technology
	Isaac Nzoley	Wesley Girls' High School, Cape Coast
Social Studies	Mohammed Adam	University of Education Winneba
	Simon Tengan	Wa Senior High Technical School
	Dr. Adwoa Dufie Adjei	University Practice Senior High School
	Dr. Isaac Atta Kwenin	University of Cape Coast
Spanish	Setor Donne Novieto	University of Ghana
	Franklina Kabio-Danlebo	University of Ghana
	Mishaël Annoh Acheampong	University of Media, Art and Communication
Technical Support	Benjamin Sundeme	St. Ambrose College of Education
	Dr. Isaac Amoako	Atebubu College of Education
	Eric Abban	Mt. Mary College of Education

SCOPE AND SEQUENCE

Food and Nutrition Summary

S/N	STRAND	SUB-STRAND	YEAR 1			YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI	CS	LO	LI
1.	Nutrition and Health	Food For Healthy Living	3	2	8	4	4	11	2	2	6
		Food Security	2	2	5	2	2	5	2	2	4
2.	Food Pro-duction	Food Production Technology	2	2	5	2	2	4	2	2	4
		Food Processing Techniques	2	2	5	2	2	7	1	1	4
Total			9	8	23	10	10	27	7	7	18

Overall Totals (SHS 1 – 3)

Content Standards	26
Learning Outcomes	25
Learning Indicators	68

SECTION 1: NUTRITION, COMMODITIES AND FOOD HABITS

Strand: Nutrition and Health

Sub-Strand: Food for Healthy Living

Learning Outcomes

1. *Apply knowledge of food commodities to select and utilise food appropriately to meet the nutritional needs of individuals and families for a healthy lifestyle.*
2. *Apply scientific knowledge of nutrients and their effects on growth and development to promote healthy living.*

Content Standards

1. Demonstrate knowledge and understanding of food commodities, select and use food to meet the needs of individuals and families for healthy living.
2. Demonstrate scientific knowledge of food nutrients and their implication to growth and development among individuals, families and the community.
3. Demonstrate scientific knowledge in food habits/lifestyles and its implications on growth and development on individuals and families.

Hint



Assign Portfolio Assessment for the academic year by Week 2. Portfolio should be submitted by Week 22. **See Appendix A** at the end of Section 1 and Teacher Assessment Manual and Toolkit pages 22–25 for more information on how to organise a portfolio assessment.

Assign Group Project for the semester by Week 3. The project should be submitted by Week 6. **See Appendix B** at the end of section 1 for more information on how to organise a group project.

INTRODUCTION AND SECTION SUMMARY

Food and Nutrition comprises two strands: Nutrition and Health, and Food Production Technology. The sub-strands are Food for Healthy Living, Food Security, Food Production and Food Processing Techniques. The section begins with Nutrition for Health, which seeks to equip learners with knowledge, understanding and skills related to nutrition, diet and overall well-being of the individual, family and society at large. Recognising the critical role of a balanced diet in the physical and mental development of learners, the section endeavours to promote lifelong habits that contribute to a healthy and fulfilling life. The basic competencies

required of the learners include the classification of Food Commodities under the various food groups, food habits/lifestyle and their implications on the nutritional status of individuals, families and societies.

The weeks covered by the section are:

Week 1: *Basic concepts in food and nutrition*

Week 2: *Classification of food commodities under various food groups*

Week 3: *Convenience foods and processing techniques*

Week 4: *Effect of heat on the nutritional values of the various food commodities*

Week 5: *Food nutrients and their effects on growth and development*

Week 5: *Effects of nutrient deficiencies on growth and development*

Week 6: *Food habits/lifestyles and their implications on nutritional status*

Week 7: *Factors that influence food habits/lifestyles*

SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher should use varied pedagogical strategies relevant to the lesson to make it more learner-focused. The use of group work (considering ability, mixed-ability, mixed-gender, mixed-cultural and friendship groupings), structured talk for learning, and problem-based learning approaches, which consider the use of samples, charts, videos, posters, etc. on Nutrition and Health, could be adopted. The learner is required to understand the Concept of Nutrition and Health. The adoption of experiential learning approaches, where students are assigned to watch videos, role-play and do projects and present their findings in class, could also be considered. The teacher should also incorporate GESI (Gender Equality and Social Inclusion), SEN (Special Educational Needs), SEL (Social and Emotional Learning), 21st Century skills, Core National Values and ICT (Information, Communication and Technology) in the lesson delivery and differentiation strategies to address the varied learning requirements of all learners, being mindful that learners cannot always accomplish the same task. Particular attention should be paid to learners with special educational needs, making relevant accommodations to ensure their full participation in all activities. To support teachers with their approach to differentiation, this manual sometimes refers to learners as Approaching Proficiency (AP), Proficient (P) and those working at a High level of Proficiency (HP).

ASSESSMENT SUMMARY

The teacher is expected to use varied assessment strategies and tasks to assess learners' levels of achievement in relation to the Depth of Knowledge (DoK). It is equally noteworthy to align the assessment activities with the learning indicators as well as the pedagogical exemplars, to create linkages between the learning indicators, the pedagogical exemplars, and the assessment strategies. Teachers are entreated to administer these assessments and record them for onward submission into the Student Transcript Portal (STP). The following assessment would be conducted and recorded for each learner:

Week 1: *Class Exercise*

Week 5: *Poster*

Week 2: *Homework*

Week 6: *Mid – semester examination*

Week 3: *Group Discussion*

Week 7: *Group Class Work*

Week 4: *Experiment*

WEEK 1: BASIC CONCEPTS IN FOOD AND NUTRITION

Learning Indicator: Explain basic concepts in food and nutrition and their implication to healthy living.

FOCAL AREA 1: CONCEPTS IN FOOD AND NUTRITION

1. The basic concepts in food and nutrition include food, nutrients, nutrition, digestion, and metabolism. Food and Nutrition help us understand what food does in our bodies and how it helps us grow, stay strong, and live a healthy life. Let's revise the basic concepts and also look at what happens to food after we eat it—through digestion, absorption, and metabolism.

Table 1.1: Concepts in Food and Nutrition

S/N	Basic concepts in Food and Nutrition	Meaning
a.	Food	Anything solid or liquid, raw or cooked, which when taken into the body promotes growth, provides heat and energy and regulates body processes
b.	Nutrients	The chemical substance that provides nourishment essential for the maintenance of life and growth.
c.	Nutrition	The study of food, nutrients and how food intake affects the body processes such as growth, development and metabolism.
d.	Digestion	It is the process of breaking down food into substances the body can use for energy, tissue growth and repair.
e.	Metabolism	It is the processes or chemical changes that take place in living cells to maintain life.

2. The Journey of Food in the Body: Example with Cooked Rice and Stew

Cooked rice and tomato stew with fish are used as an example to explain how digestion, absorption, and metabolism work.

a. Digestion (Breaking Down Food)

- i. Digestion starts the moment you take a bite.
- ii. In the mouth: You chew the rice and stew. Saliva in your mouth starts breaking down the starch in the rice.
- iii. In the stomach: The food is mixed with stomach juices. Proteins in the fish start to break down.
- iv. In the small intestine: More juices from the liver and pancreas help break down the rice (carbohydrates), oil (fats), and fish (proteins) into very tiny parts.

At this stage, the food is now in the simplest form:

- Carbohydrates → glucose (sugar)
- Proteins → amino acids
- Fats → fatty acids and glycerol
- Vitamins, minerals, and water remain unchanged but are released

b. Absorption (Taking in the Nutrients)

- i. The tiny food parts move into the walls of the small intestine.
- ii. Blood vessels pick up the nutrients and carry them around the body through the bloodstream.
- iii. Glucose gives energy, amino acids help repair the body, fats help with warmth and body functions, and vitamins and minerals support growth and health.

Example: The glucose from the rice goes to your muscles and brain to give you energy.

3. Metabolism (Using the Nutrients)

Once the nutrients are in the blood:

- a. Cells use glucose** for energy to walk, run, and think.
- b. Amino acids** build or repair tissues like skin, muscles, and blood.
- c. Fats** are stored for future energy or used for body warmth and to make hormones.
- d. Vitamins and minerals** support body processes like healing, fighting sickness, and building bones.

Even when you're sleeping, your metabolism is still working—helping you breathe, pump blood, and repair cells.

Example: After eating rice and stew, your body breaks it down, absorbs it, and uses the nutrients to give you energy during school and playtime.

Learning Task

Explain the basic concepts of Food and Nutrition in detail.

1. Digestion
2. Metabolism
3. Nutrients
4. Nutrition
5. Food

Pedagogical Exemplars

Learners will work in groups to research the basic concepts of Food and Nutrition: Nutrients, Food, Nutrition, Digestion, and Metabolism. Teachers should encourage learners to use a range of resources including the internet and other sources of information. Learners should be encouraged to make notes of their findings to present them to the whole class for discussion using different presentation modes. In small groups, learners should be assigned roles and responsibilities to produce a role-play to demonstrate how knowledge of the basic concepts of

nutrition can affect their food habits/lifestyle. Teachers should use probing and direct questions to ascertain individual learners understanding of the concept.

- 1. Talk for Learning Approaches:** In pairs/groups, use think-pair-share, mingling/talking points to review knowledge on food and nutrition learnt in JHS Career Technology.
- 2. Group Work and Collaborative Learning Approaches:** Learners will work in mixed-ability groups to discuss the application of basic concepts of Food and Nutrition in real-life situations to meet the nutritional needs of individuals, families and society.
- 3. Experiential learning:** They will research using the internet and other sources the basic concepts of Food and Nutrition and discuss how they will apply the concepts in their daily activities. In groups, learners will undertake a role-play to outline how knowledge of the basic concepts of nutrition can affect their food habits/lifestyle.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of Conceptual Understanding

In pairs, explain the following basic concepts in Food and Nutrition orally or in written format:

- a. Food
- b. Nutrients
- c. Nutrition
- d. Digestion
- e. Malnutrition

2. DoK Level 4: Extended critical thinking and reasoning

- a. Describe how digestion occurs after eating Protein foods and explain how it helps the individual to grow.
- b. In groups, organise a role-play on how one's knowledge of the basic concepts of nutrition can affect our choice of foods.

FOCAL AREA 2: APPLICATION OF BASIC CONCEPTS OF FOOD AND NUTRITION IN DAILY LIFE

Food and nutrition are part of everyday life. Applying the basic concepts of food and nutrition helps individuals make healthy choices, maintain good health, and prevent disease. Below are the key ways that these concepts apply to daily living:

1. Understanding Nutrients and Their Functions

Every food we eat provides nutrients—chemical substances our bodies need to function properly. These nutrients include:

- a. Carbohydrates – Provide energy (e.g., rice, yam, bread)
- b. Proteins – Help with the growth and repair of body tissues (e.g., meat, beans, eggs)

- c. Fats – Provide long-lasting energy and support body functions (e.g., oil, nuts, avocado)
- d. Vitamins and Minerals – Support body processes and help prevent diseases (e.g., fruits, vegetables, fish)
- e. Water – Keeps the body hydrated and helps with digestion

Example: Ama knows proteins repair muscles, so she eats eggs and beans after sports activities.

2. Meal Planning and Balanced Diet

Meal planning means preparing meals that include all food groups in the right amounts. A balanced diet includes:

- a. Carbohydrates (energy)
- b. Proteins (growth and repair)
- c. Vegetables and fruits (vitamins and minerals)
- d. Dairy (calcium for strong bones)
- e. Fats (energy and body function support)

Planning meals this way ensures every family member gets the nutrients they need for health and energy.

Example: A family includes boiled yam (carb), Palava sauce with fish (protein and vegetables), and fruit juice in a meal to make it balanced.

3. Promoting Healthy Eating Habits

Good nutrition habits should start early and last a lifetime. These habits include:

- a. Eating more fruits and vegetables
- b. Limiting sugary drinks and snacks
- c. Eating at regular times and avoiding overeating
- d. Drinking enough water daily

These habits help prevent lifestyle diseases like obesity, diabetes, and hypertension.

Example: Kojo reduces sugary drinks to stay healthy and avoid becoming overweight.

4. Food Safety and Hygiene

Safe food handling prevents foodborne illnesses. Important practices include:

- a. Washing hands before eating or cooking
- b. Keeping the kitchen clean
- c. Properly storing and cooking food
- d. Covering food to prevent contamination by pests or germs

Example: Afia always washes her hands and stores leftovers in the fridge to avoid food poisoning.

5. Smart Food Purchasing

Being smart about buying food means:

- a. Reading food labels to understand what's inside

- b. Comparing products to choose the healthier option
- c. Buying fresh, nutritious foods within budget
- d. Avoiding foods high in sugar, salt, and unhealthy fats

Example: Kweku chooses whole-grain bread instead of white bread because it has more fibre and keeps him fuller longer.

6. Nutritional Needs Across Life Stages

People need different nutrients at different stages of life. For example:

- a. Babies and children need more protein and calcium for growth
- b. Teenagers need iron and vitamins to support development
- c. Pregnant women need more iron and folic acid for the baby's health
- d. Older adults may need less fat but more calcium and fibre
- e. People with health conditions (like diabetes) need specific diets

Example: A pregnant woman eats green leafy vegetables and beans for iron to support her baby's growth.

7. Cooking at Home

Preparing meals at home is often healthier and safer. You can:

- a. Choose fresh ingredients
- b. Avoid too much oil, sugar, or salt
- c. Cook cleanly and safely
- d. Serve food that meets your family's health needs

Example: Kwame's family prefers homemade soup with fresh vegetables rather than buying fast food.

8. Regular Physical Exercise

Good nutrition works best when combined with physical activity. Exercise helps to:

- a. Burn excess body fat
- b. Strengthen muscles and bones
- c. Improve mental health and sleep
- d. Keep the heart and body healthy

Example: Adjoa jogs every morning and eats a healthy breakfast. This keeps her fit and focused in school.

Learning Tasks

1. What are the main types of nutrients our bodies need?
2. Why is protein important for the body?
3. Give examples of foods that give us energy.

4. Explain a balanced diet.
5. What problems can happen if we eat too much sugar or oily food?
6. How does exercise help our body stay healthy?

Pedagogical Exemplars

Learners will work in groups to research the basic concepts of Food and Nutrition and how these concepts can be applied in daily activities to meet the nutritional needs of individuals, families, and society. Teachers should encourage learners to use a range of resources, including the internet and other sources of information. Learners should be encouraged to make notes of their findings to present them to the whole class for discussion using different presentation modes. In small groups, learners should be assigned roles and responsibilities to produce a role-play to demonstrate how knowledge of the basic concepts of nutrition can affect their food habits/lifestyle. Teachers should use probing and direct questions to ascertain individual learners' understanding of the concept.

1. Group Work and Collaborative Learning Approaches

- a. Learners will work in mixed groups to discuss the application of basic concepts of Food and Nutrition in real-life situations to meet the nutritional needs of individuals, families and society.
- b. They will research using the internet and other sources the basic concepts of Food and Nutrition and discuss how they will apply the concepts in their daily activities.
- c. In groups, learners will undertake a role-play to outline how knowledge of the basic concepts of nutrition can affect their food habits/lifestyle.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. DoK Level 4: Extended critical thinking and reasoning

- a. Explain at least three ways the basic concepts of Food and Nutrition can be applied in real-life situations to meet the nutritional needs of individuals, families and society.
- b. Explain how knowledge of the basic concepts of nutrition can affect an individual's food habits/lifestyle choices.

WEEK 2: CLASSIFICATION OF FOOD COMMODITIES UNDER VARIOUS FOOD GROUPS

Learning Indicator: *Classify food commodities under the various food groups to enhance food selection and utilisation*

FOCAL AREA: FOOD COMMODITIES

1. Food Commodities

Food commodities refer to basic agricultural products or raw materials that are traded and used as essential ingredients in the production of food and beverages. It can be classified under the following six Ghanaian food groups. The table below shows the six Ghanaian food groups with examples.

Table 1.2: Food commodities and groups

S/N	Food Groups	Examples	Nutritional value
a.	Animal and Animal Product	Meat, fish, milk and eggs, and game	Protein – for body building
b.	Beans, Nuts and Oily Seeds	Beans, groundnut, agushi, soya beans and neri	Plant protein – for body building
c.	Cereals and Grains	Maize, millet, rice, fonio	Carbohydrate – for Energy giving
d.	Starchy Roots and Plantain	Plantain, cocoyam, sweet potato, cassava and yam	Carbohydrate – for energy giving
e.	Fats and Oils	Shea butter, palm oil, coconut oil, margarine, lard and groundnut oil	Energy giving/ heat
f.	Fruits and Vegetables	Cocoyam leaves, pumpkin leaves and tomatoes, mango, alefu, orange, cabbage, green pepper, banana and pawpaw, etc	Vitamins/minerals – for protection

2. Functional Food Groups

- a. **Body Building Foods:** Body building foods are nutrient-dense foods that help in building up, repairing worn-out tissue and maintaining the body. Examples of these food sources include;
 - i. **Meats:** chicken, beef, Chivon, mutton
 - ii. **Fish:** herrings, salmon, tilapia, anchovies
 - iii. **Eggs:** whole egg, egg white
 - iv. **Diary:** cheese, milk, yoghurt
 - v. **Nuts and Seeds:** almonds, walnuts, chia seeds

- vi. **Legumes:** soybeans, black beans, lentils
- b. **Protective Foods:** Protective foods are food groups that help protect the body against diseases and support the overall health of the body. Examples include fruits and vegetables such as oranges, apples, kontomire, cabbages, pineapples, mango, banana, etc.
- c. **Energy Giving Foods:** These foods provide the body with heat and energy (carbohydrates) to help the body carry out daily activities. They include;
 - i. **Cereals:** such as rice, maize, oats,
 - ii. **Starchy roots:** such as cassava, yam, cocoyam

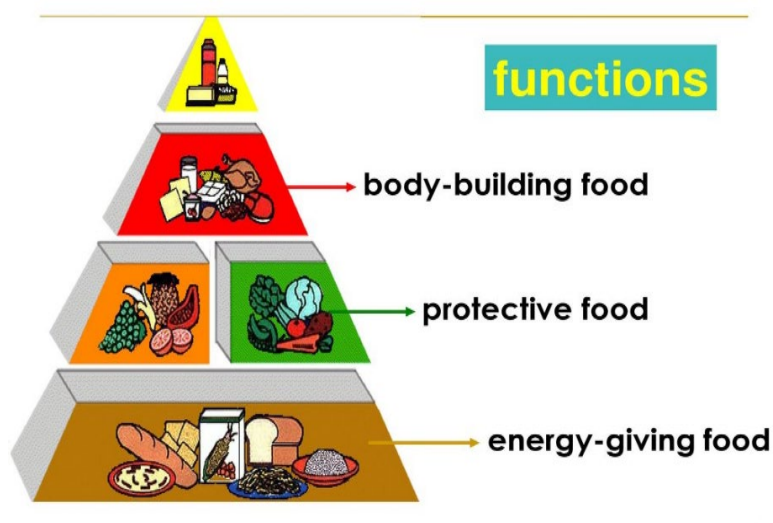


Figure 1.1: Classification of food (Food Pyramid, n.d.)

3. Importance of Food Commodities

Food commodities are very important for human survival, economic growth, and global food security. The importance of food commodities includes:

- a. **Food Security:** Food commodities provide food security, make food available, and provide the essential nutritional calories for proper growth.
- b. **Economic Growth:** Food commodities are significant to farmers, processors, and traders. It creates employment and revenue for traders, caterers, and hoteliers.
- c. **Nutrition and Health:** Food commodities have essential nutrients, vitamins, and minerals for optimal growth, necessary for maintaining good health, preventing diseases, and promoting well-being.

4. Effects of heat on food commodities

Heat performs a significant role in food preparation, affecting the texture, flavour, colour, nutrient content and safety of food. The effects of heat vary depending on the type of food commodity, such as carbohydrates, proteins, fats, vitamins and minerals. The effect of heat on food commodities can have both positive and negative outcomes depending on the type of food, the duration of exposure and the temperature used.

a. Carbohydrates

- i. **Starch gelatinisation:** When heated in water, starch granules swell, absorb water, and burst, thickening the mixture (e.g., in sauces, porridge).
- ii. **Caramelisation:** Sugars melt and brown when heated, creating a rich flavour and brown colour as in caramel and roasted vegetables.
- iii. **Dextrinisation:** Starch breaks down into simpler sugars when dry heat is applied, giving a brown colour and a toasted flavour as in bread crusts.

b. Proteins

- i. **Coagulation:** Heat causes protein molecules to unfold and bond together, changing from a liquid to a solid or semi-solid state, like boiled eggs and cooked meat.
- ii. **Denaturation:** Proteins lose their natural structure when heated, affecting their texture and digestibility.
- iii. Excessive heat can make proteins tough and dry, especially in meat and fish. E.g., is dried fish 'adwene' and dried meat 'mpunam'

c. Fats

- i. Fats melt when heated and can be used for cooking.
- ii. On further heating, fats can break down and smoke, producing harmful compounds if overheated (smoke point), which irritate the throat.
- iii. Used in browning and flavour enhancement as in sautéing and baking.

d. Vitamins

- i. Heat can cause the loss of water-soluble vitamins such as Vitamin C and B-complex due to their sensitivity to heat and water.
- ii. Fat-soluble vitamins (A, D, E, K) are more stable but may still degrade at high temperatures or during long cooking times.
- iii. Steaming or microwaving retains more nutrients than boiling.

e. Minerals

Minerals are generally heat-stable. However, they may be lost in cooking water, especially during boiling and discarded if the water is not consumed.

f. Pigments and Colours

- i. Heat can alter natural pigments in food:
- ii. **Chlorophyll:** Green vegetables may turn olive green in prolonged heat.
- iii. **Anthocyanins:** Red/blue in berries may change with pH and heat.
- iv. **Carotenoids:** Orange/yellow in carrots are more heat-stable.

g. Flavours and Aromas

- i. Cooking enhances natural flavours, such as browning meat and roasting spices.
- ii. Overcooking may lead to unpleasant flavours or the destruction of natural aromas.

h. Texture

- i. Heat softens tough fibres, as in vegetables and meat.
- ii. Overheating can cause sogginess like overboiled vegetables or excessive dryness of overbaked cakes, etc.

5. Classification of Effects of Heat on Food Commodities

Table 1.3: Classification of Effects of Heat on Food Commodities

S/N	Positive Effects of Heat on Food	Negative Effects of Heat on Food
a.	Improved Taste and Texture - Maillard Reaction: Heat causes the Maillard reaction, which creates new flavours and browning in foods, particularly in meats and baked goods. - Caramelisation: Sugar reacts to heat to produce caramelised flavours in dishes like roasted vegetables or candies. - Increased Digestibility: - Cooking breaks down complex molecules like starches and proteins, making them easier to digest. For instance, cooking vegetables and grains improves the bioavailability of nutrients.	Nutrient Loss - Vitamins: High temperatures can cause the degradation of heat-sensitive vitamins such as vitamin C and several B vitamins, leading to nutrient loss. Boiling vegetables can result in the loss of water-soluble vitamins. - Antioxidants: Some antioxidants may break down when exposed to high heat, reducing the health benefits of certain foods.
b.	Food Safety: Heat kills harmful bacteria, parasites, and viruses, making food safer to consume. Cooking meats, eggs, and certain fruits/vegetables at the correct temperatures can eliminate pathogens like Salmonella or E. coli.	Formation of Harmful Compounds Acrylamide: When starchy foods like potatoes and bread are exposed to high heat during frying or baking, they can form acrylamide, a potential carcinogen. Trans Fats: Prolonged exposure of oils to heat can lead to the formation of trans fats, which are harmful to health.
c.	Nutrient Preservation in Some Cases In some cases, heat can enhance the availability of certain nutrients. For example, cooking tomatoes increases the bioavailability of lycopene, an antioxidant.	Loss of Texture and Appearance - Overheating can result in the loss of desirable texture and appearance, such as overcooking vegetables, which can become mushy and less appetising. - Proteins like meat can become tough and dry if overcooked due to excessive heat, affecting their palatability.

d.	Extended Shelf Life: Processes like canning, blanching, and pasteurisation involve heat and can help extend the shelf life of food commodities, preventing spoilage and growth of harmful microorganisms.	Potential for Overcooking - Excessive cooking can result in the loss of flavour, moisture, and nutrients, especially with delicate foods like fish, poultry, and some fruits and vegetables. - When nuts or seeds are exposed to high heat for long periods, their natural oils may oxidise, leading to rancidity and loss of flavour, etc.
----	--	---

Learning Tasks

1. Review food commodities and the three functional groups learnt in JHS.
2. Research Information on food commodities and write a report explaining the use, nutritive value, effects of heat on nutrients and the importance of food commodities.
3. Produce a labelled chart/diagram of the Six Food Groups for a gallery walk.

Pedagogical Exemplars

Teachers should review the content of Food Commodities and Classification into three functional groups learnt in JHS (Junior High School). In groups, instruct learners to classify Food Commodities under the various food groups and to discuss the uses, nutritive value, importance, and effects of heat on the nutritional content of a given food commodity. They should include convenience foods as part of this discussion (presentation/talking points/panel discussion). Learners should also produce a labelled chart/diagram of the six food groups for a gallery walk. Teachers should provide learners with suitable resources to complete this task. Provide constructive feedback to learners during and after the exercise. Promote peer tutoring by encouraging learners to assist each other.

There is a range of tasks within this section, and learners who are not actively participating (AP) may need additional guidance in the form of direct instructions, modelling, targeted questions, and provision of information sources. Learners who exhibit clear understanding and the ability to perform tasks independently (P) and (HP) should rise to the challenge of researching, analysing information and producing charts/diagrams, projects and presentations.

1. **Collaborative Learning/Group Work Approaches:** In mixed groups, use a talking point/panel discussion, review food commodities and the three functional groups learnt in JHS.

E.g.,

- a. Body-building food
- b. Energy-giving food
- c. Protective food

2. **Structuring Talk for Learning Approaches:** With the aid of a chart or realia of the Ghanaian six food groups, discuss their sources, functions and nutritional values.

3. **Group Work:** In mixed groups, discuss the uses, nutritive value, importance and effects of heat on the nutritional content of a given food commodity and present in class.
4. **Experiential Learning:** Individually/in pairs draw and label the Ghanaian six-food group chart and illustrate how it can be used to support individuals and family's food selection and utilisation. Paste the work for a gallery walk.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. **DoK Level 2: Skills of conceptual understanding**
 - a. Explain the concept of food commodities and food classification.
 - b. Classify at least **five** food commodities under each of the six Ghanaian food groups using either concept map, a chart or table.
2. **DoK Level 3: Strategic reasoning**
 - a. Discuss at least two groups of food you like and justify the reasons for your choice.
 - b. Describe at least **one** of the following functional food groups with specific examples.
 - i. Protective food
 - ii. Energy-giving food
 - iii. Body-building food

WEEK 3: PROCESSING CONVENIENCE FOODS

Learning Indicator: *Analyse ways convenience foods can be processed and used to promote healthy nutritional practice in households.*

FOCAL AREA: CONVENIENCE FOODS

Convenience foods are pre-prepared or partially prepared food products that reduce the time and effort needed for meal preparation. They come in various forms and are designed to meet the needs of busy households.

The main types of convenience foods include

1. Ready-to-Eat Foods
2. Ready-to-Cook Foods
3. Ready-to-Heat Foods
4. Baking and Dessert Mixes
5. Instant Foods (on-the-go meals/snacks)

Ready-to-Eat (RTE) Foods

Pre-cooked, pre-packaged foods that can be eaten immediately

- a. Canned goods (vegetables, fruits, meats)
- b. Frozen meals (pizza, meat and cheese)
- c. Sandwiches, salads, and fruit cups

Ready-to-Cook (RTC) Foods

Pre-prepared foods that need minimal/limited cooking or heating

- a. Frozen vegetables and meats
- b. Pre-cut and pre-seasoned ingredients (stir-fry mixes, meat)
- c. Pre-made pizza dough and sauce

Ready-to-Heat (RTH) Foods

Pre-cooked foods that just need reheating

- a. Canned soups and stews
- b. Frozen meals (meat)
- c. Pre-cooked meats

Baking and Dessert mixes

- a. Bakery mixes are a mixed formulation of ingredients used for cooking baked goods that require the addition of a small number of other ingredients, such as water. They can be used for making bread, pizza dough, biscuits, and pancakes.

- b. Dessert/Cake mixes are a mixture of dry ingredients that can be mixed with water, milk, eggs, oil, etc. to make a cake or dessert.

Instant Foods

Foods that can be prepared quickly using hot water or a microwave

- a. Instant noodles and soups
- b. Instant coffee and tea
- c. Popcorn
- d. Microwaveable rice and vegetables

Convenience Foods: Processing, Uses, and Service Methods

Convenience foods are pre-prepared food products that undergo various processing methods to improve their shelf life, taste, and ease of use. These foods help save time in meal preparation while offering variety and accessibility.

3. Processing Methods of Convenience Foods

To ensure convenience foods remain fresh, flavourful, and usable for extended periods, they undergo various processing techniques

- a. Freezing
 - i. Freezing is one of the most common methods used to preserve convenience foods.
 - ii. Low temperatures inhibit the growth of bacteria and slow down food spoilage.
 - iii. Examples include frozen vegetables, ready-made frozen meals, meat products, and seafood.
- b. Canning
 - i. Involves sealing food in airtight containers and heating to kill harmful microorganisms.
 - ii. Extends shelf life significantly while maintaining taste and texture.
 - iii. Examples include canned fruits, vegetables, soups, and meats.
- c. Dehydration (Drying)
 - i. Removes moisture from food, preventing bacterial growth and spoilage.
 - ii. Commonly used for dried fruits, powdered milk, and instant noodles.
 - iii. Dehydrated foods are lightweight and have extended storage periods.
- d. Pasteurisation
 - i. Applies controlled heat to destroy pathogens and prolong shelf life.
 - ii. Used mostly for dairy products like milk, juices, and certain sauces.
- e. Precooking and Packaging
 - i. Some convenience foods are pre-cooked and packaged for immediate use or easy final preparation.
 - ii. Examples include instant pasta meals, microwaveable meals, and pre-cooked rice.

- iii. Vacuum-sealing and modified atmosphere packaging help retain freshness.

4. Uses of Convenience Foods in Meal Preparation

Convenience foods serve multiple roles in meal preparation

- a. Ready-to-Eat Meals
 - i. Some convenience foods require no preparation and can be consumed immediately.
 - ii. Examples include pre-packaged sandwiches, salads, and snack bars.
- b. Ingredients in Cooking
 - i. Many processed foods act as ingredients in home-cooked meals.
 - ii. Examples include canned tomatoes in pasta sauce, frozen meat for stews, and dehydrated soup mixes.
- c. Side Dishes or Accompaniments
 - i. Some convenience foods complement main meals to enhance variety.
 - ii. Packaged mashed potatoes, frozen vegetables, and bread rolls are often served as side dishes.
- d. Quick Desserts and Baking
 - i. Convenience foods simplify baking and dessert preparation.
 - ii. Instant cake mixes, frozen dough, and canned fruit fillings help create desserts with ease.
- e. On-the-Go Meals and Snacks
 - i. Ideal for busy lifestyles, many convenience foods are portable and require minimal preparation.
 - ii. Examples include protein bars, packaged nuts, instant noodles, and ready-to-drink beverages.

5. Service of Convenience Foods

To enhance the appeal and nutritional value of convenience foods, proper serving methods are essential:

- a. **Plating and Presentation**
 - Convenience foods can be elevated by creative plating and garnishing.
 - Adding fresh herbs, sauces, or artistic arrangements can improve visual appeal.
- b. **Combination with Fresh Ingredients**
 - Combining convenience foods with fresh produce boosts nutrition and taste.
 - For example, serving packaged pasta with freshly chopped vegetables or pairing canned soup with whole-grain bread.
- c. **Reheating and Serving**
 - Proper reheating ensures the food is safe and enjoyable to eat.

- Methods include microwaving, baking, stovetop warming, and air frying.
- Attention to recommended heating instructions enhances taste and texture.

Learning Tasks

1. Explain the basic concept of convenience foods.
2. Explain the types of convenience foods and relate them to their uses.

Pedagogical Exemplars

Learners to work in groups and visit any nearby market or watch videos on convenience foods available and how they are processed and used to promote healthy nutritional practice at home.

1. Experiential Learning

- a. Individually/in pairs visit a local market in your community or watch a video to identify the types of convenience food that are available for household purchases.
- b. Conduct interviews to find out how convenience foods are processed and used in meal preparation and service.

2. Talk for Learning/Group Work

In groups discuss your findings from the market or video and present your report for a whole class discussion using different presentation modes.

3. Collaborative Learning/Group Work Approaches

In mixed groups, use talking point/panel discussion, analyse ways convenience foods can be processed and used to promote healthy nutritional practice in households and present a report in class.

Key Assessment

The teacher should focus on formative assessments choosing from the following exemplars or create their own formative assessment activities.

1. DOK Level 2: Skills of conceptual understanding

- a. Describe the main types of convenience foods.
- b. Briefly explain at least **three** uses of convenience foods.

2. DOK Level 3: Strategic reasoning

Describe how convenience foods can be served attractively and nutritional value enhanced.

Hint



*The recommended Mode of Assessment for week 3 is **Group Discussion**. The outline indicating a detailed scope and rubrics for learners on their poster assessment has been provided in **Appendix D**. See the **Teacher Assessment Manual and Toolkit** pages (52–54) for more information on how to organise a discussion as an assessment mode.*

WEEK 4: ANALYSE THE EFFECT OF HEAT ON THE NUTRITIONAL VALUES OF THE VARIOUS FOOD COMMODITIES

Learning Indicator: *Analyse the effect of heat on the nutritional values of the various food commodities*

FOCAL AREA: EFFECTS OF HEAT ON FOOD NUTRIENTS

1. Effects of Heat on Food Nutrients

Heat plays a significant role in cooking, altering the nutritional value, texture, and taste of food. While cooking enhances digestibility and food safety, it can also lead to nutrient loss and structural changes.

a. Texture Changes

- i. Heat causes proteins in food to denature, leading to changes in texture. This is why eggs solidify when cooked and meat becomes more tender or tough, depending on the cooking method.
- ii. Cellulose in vegetables softens upon heating, making food easier to chew and digest.
- iii. Gelatinisation of starches occurs when heat breaks down starch granules in foods like rice, pasta, and potatoes, making them more palatable.

b. Nutrient Retention and Loss

- i. Heat-sensitive vitamins, such as vitamin C and B-complex vitamins, can be destroyed if food is overcooked or boiled excessively.
- ii. Water-soluble vitamins leach into cooking water, reducing their nutritional value unless the cooking liquid is consumed.
- iii. Fat-soluble vitamins (A, D, E, and K) tend to be more stable but may degrade under extreme heat.

2. Food Safety Enhancement

- a. Heat is crucial in killing bacteria, viruses, and parasites, ensuring food safety.
- b. High-risk foods such as meat, poultry, milk, and eggs require thorough cooking to eliminate pathogens.
- c. Pasteurisation and sterilisation rely on controlled heat to make food safe for consumption.

3. Flavour and Aroma Development

- a. Heat triggers chemical reactions that enhance flavour, such as the Maillard reaction and caramelisation.
- b. Roasting and grilling intensify natural flavours by breaking down complex compounds in meats, vegetables, and sugars.

- c. Spices and herbs release volatile compounds that improve aroma when exposed to heat.

4. Moisture Content Adjustments

- a. Cooking reduces water content, making food drier and more concentrated.
- b. Dehydration is useful for preserving foods like pasta, rice, beans, and millet.
- c. Foods like sauces and soups require controlled heat to maintain the right balance of moisture for proper texture and consistency.

5. Colour Changes

- a. Heat induces colour transformations, often causing food to brown or caramelize due to the Maillard reaction.
- b. Green vegetables may turn yellow or olive-coloured when overcooked due to breakdown of chlorophyll.
- c. Meat darkens as proteins coagulate, and sugars caramelize under high temperatures.

6. Enzyme Inactivation

- a. Heat destroys enzymes responsible for ripening and food spoilage.
- b. This helps prolong food freshness and shelf life, especially for fruits and vegetables.
- c. Cooking stops enzymatic browning in foods like apples and potatoes.

7. Additional Effects of Heat on Foods

- a. Pectin in fruits is released, aiding in the setting of jams and jellies.
- b. Protein shrinks and coagulates, changing the texture of meat and dairy products.
- c. Carbohydrates gelatinize (with moist heat) and dextrinize (with dry heat), impacting baking and frying outcomes.
- d. Minerals can leach into cooking liquids, requiring careful cooking techniques to retain nutrients.
- e. Sugar undergoes melting, caramelization, and further breakdown into treacle or carbon at high temperatures.

Learning Tasks

1. Experiment on the effects of heat on specific foods.
2. Explain the changes that occur when both dry and wet heat is applied to
 - a. Fats and oil
 - b. Sugars
 - c. Proteins
 - d. Carbohydrate

Pedagogical Exemplars

In groups, learners should be supported to undertake an experiment on the effect of heat on foods by providing samples of the food items to be heated. Groups should analyse the results and present findings for class discussion.

1. Talk for Learning Approaches

Use the KWL approach, brain-write and share what you know and what you want to know about the **effect of heat on the nutritional values of the various food commodities**.

2. Group Work and Collaborative Learning approaches

- a. In mixed groups conduct an experiment to analyse the effect of heat on the nutritional value of food commodities.
- b. Groups should present their findings on the experiment to the class.

Key Assessment

1. DoK Level 2: Skills of conceptual understanding

Explain the effects of heat on food commodities.

2. DoK Level 3: Strategic reasoning

Describe the stages sugar will go through after applying heat to it.

3. DoK Level 4: Extended critical thinking and reasoning

Experiment on the effects on heat on a particular food and show how desirable it may be on cooking a particular food.

Hint



The recommended mode of assessment for Week 4 is Experiment. Refer to **Appendix C** at the end of Section 1 and the teacher assessment manual and toolkit page 133 for further information on how to go about this assessment mode.

WEEK 5: FOOD NUTRIENTS AND THEIR EFFECT ON GROWTH AND DEVELOPMENT

Learning Indicators

1. *Identify food nutrients and their effects on growth and development in the body.*
2. *Discuss the effects of nutrient deficiencies on growth and development of the individual, family and society.*

FOCAL AREA 1: FOOD NUTRIENTS AND THEIR EFFECTS ON GROWTH

1. Classification of nutrients. The two main types:

- a. **Macronutrients** – The major function of these nutrients are to provide energy and support the growth and development of the body. They are needed in large amounts or quantities, measured in grams or calories. Examples: Carbohydrates, Protein, Fats
- b. **Micronutrients** – These nutrients support various bodily functions, such as immune function and nerve function, they are also needed in smaller amounts and measured in milligrams or micrograms. Examples: Vitamins (e.g., Vitamin A, Vitamin D), Minerals (Calcium, Iron), Trace elements (Zinc, Iodine)

Macronutrients

- Carbohydrates: Provide energy for growth and development, support healthy digestion.
- Protein: Builds and repairs tissues, supports growth and development, maintains healthy skin, hair, and nails.
- Fats: Provide energy, support brain development, and aid in absorption of vitamins.

Micronutrients

- Vitamin A: Supports healthy vision, immune function, and skin health.
- Vitamin D: Essential for bone growth and development, immune function.
- Calcium: Crucial for bone growth and development, muscle function.
- Iron: Vital for healthy red blood cells, supports brain development.
- Zinc: Supports immune function, wound healing, and growth and development.

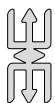
2. Other Essential Nutrients

- a. Fibre: Supports healthy digestion, satiety.
- b. Probiotics: Supports healthy gut bacteria, immune function.
- c. Omega-3 fatty acids: Supports heart health, brain development.

3. Effects on Growth and Development

- a. Optimal growth: Adequate nutrition supports healthy growth and development.
- b. Cognitive development: Essential nutrients support brain development and function.

- c. Immune function: A well-nourished body is better equipped to fight off infections.
- d. Healthy skin, hair, and nails: Adequate nutrition supports healthy skin, hair, and nail growth.



Note

A balanced diet that includes a variety of whole foods can provide the necessary nutrients for optimal growth and development.

Learning Tasks

1. Discuss the importance of macronutrients in the development of the body.
2. Explain the differences between the two main types of nutrients.

Pedagogical Exemplars

Learners are to use KWL approach to identify food nutrients in found in foods and how they function in the growth and development of the body.

1. **Talk for Learning Approaches:** Use the KWL approach, brain-write to identify food nutrients found in foods.
2. **Group Work and Collaborative Learning approaches:** In mixed groups use mingling/ onion ring/pyramid discuss the functions of food nutrients in human growth and development.

Key Assessment

1. **DoK Level 2: Skills of conceptual understanding**
Explain the functions of at least **five** nutrients found in food.
2. **DoK Level 3: Strategic reasoning**
Discuss the functions of macronutrients and how they help in the growth and development of the body.

FOCAL AREA 2: EFFECTS OF NUTRIENT DEFICIENCIES

1. Food nutrients, their functions and deficiencies

Table 1.4: Food nutrients, their functions and deficiencies

Nutrients	Food sources	Functions	Deficiencies
Carbohydrate	• Yam • Rice • Plantain • Potatoes • Gari	• Supply heat and energy • Contributes to the synthesis of fat • Dietary fibre prevents constipation	• Hypoglycaemia • Marasmus

Protein	• Meat • Fish • Beans • Melon seeds	• For the growth and repair of worn-out tissues • Serves as a source of energy in the absence of carbohydrates • Form enzymes, hormones and antibodies	• Stunted growth • Kwashiorkor in children • Slow healing of wounds
Fats and oils	• Margarine • Butter • Lad • Coconut oil • Palm oil	• Provides higher source of heat and energy • Provides high satiety level • Facilitates the absorption of fat soluble vitamins (ADEK)	• Dry, scaly skin • Fatigue • Brittle nails and hair
Vitamins	• FRUITS • Orange • Mango • Melon • Apple VEGETABLES • Cucumber • Carrot • Cabbage	• Vitamin A (Retinol) – for good eye sight	• Poor vision
		• Vitamin D (Cholecalciferol) – aids in bone health and calcium adsorption	• Poor formation of bone and teeth
		• Vitamin C (ascorbic acid) acts as antioxidant and aids in iron adsorption	• Slow healing of wounds • Poor iron adsorption

2. Effects of nutrient deficiencies on individuals, family and society

Effects on the Individual

- Impaired growth and development: Deficiencies in essential nutrients can lead to stunted growth, delayed puberty, and other developmental issues.
- Increased susceptibility to illnesses: Weakened immune systems and exposes individuals to infections and diseases.
- Cognitive impairment: Deficiencies in nutrients like iron, vitamin B12, and omega-3 fatty acids can affect cognitive function and development of individuals, it affects learners academically.
- Poor wound healing: nutrient deficiencies in protein, vitamin C, and zinc can impede wound healing of individuals.

Effects on Families

- Increased healthcare cost of families due to illnesses and conditions related to nutrient deficiencies.
- Reduced productivity due to fatigue, decreased energy, affecting family income.
- Nutrient deficiencies can bring about stress, anxiety, and depression, affecting family relationships.

Effects on Society

- a. Nutrient deficiencies can lead to significant economic costs, including healthcare expenses, lost productivity, and reduced economic growth.
- b. Nutrient deficiencies can affect social and cultural development, including education, employment, and community engagement, putting stress on society.
- c. Nutrient deficiencies can have long-term effects on future generations, perpetuating cycles of poverty and poor health, putting financial stress and under developmental state on the society.

Learning Tasks

1. Discuss the food sources of food nutrients.
2. Discuss the deficiencies of food nutrients.

Pedagogical Exemplars

Learners work in mixed ability groups to discuss nutrients and their food sources, deficiencies that affect individuals, families and society. Teachers should encourage learners to use a range of resources, including the internet and other sources of information. Learners should be encouraged to make notes of findings to present them for discussion using different modes of presentation.

1. **Talk for Learning Approaches:** In pairs/groups, use think-pair-share to discuss the food sources of nutrients
2. **Group Work and Collaborative Learning Approaches**
 - a. In mixed ability groups, learners discuss the effects of deficiencies of food nutrients.
 - b. Present your findings for a whole-class discussion.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. **DOK Level 2: Skills of conceptual understanding**
Describe the food sources of food nutrients
2. **DoK Level 3: Strategic reasoning**
Explain the effects of nutrient deficiencies on individuals, families and societies.

Hint



The recommended mode of assessment for Week 5 is **Poster**. Refer to **Appendix D** at the end of Section 1 and the teacher assessment manual and toolkit pages 76 and 144 for further information on how to go about this assessment mode.

WEEK 6: FOOD HABITS/LIFESTYLE AND THEIR IMPLICATIONS ON NUTRITIONAL STATUS

Learning Indicator: Discuss food habits/lifestyle and their implications on the nutritional status of individuals, families and societies.

FOCAL AREA: FOOD HABITS/LIFESTYLE

Food habits refer to how and why individuals eat, which food they eat, and with whom they eat, as well as the ways individuals obtain, prepare serve, store, and discard food.

Lifestyle is a typical way of life of an individual, group or culture, which reflects their attitudes and values.

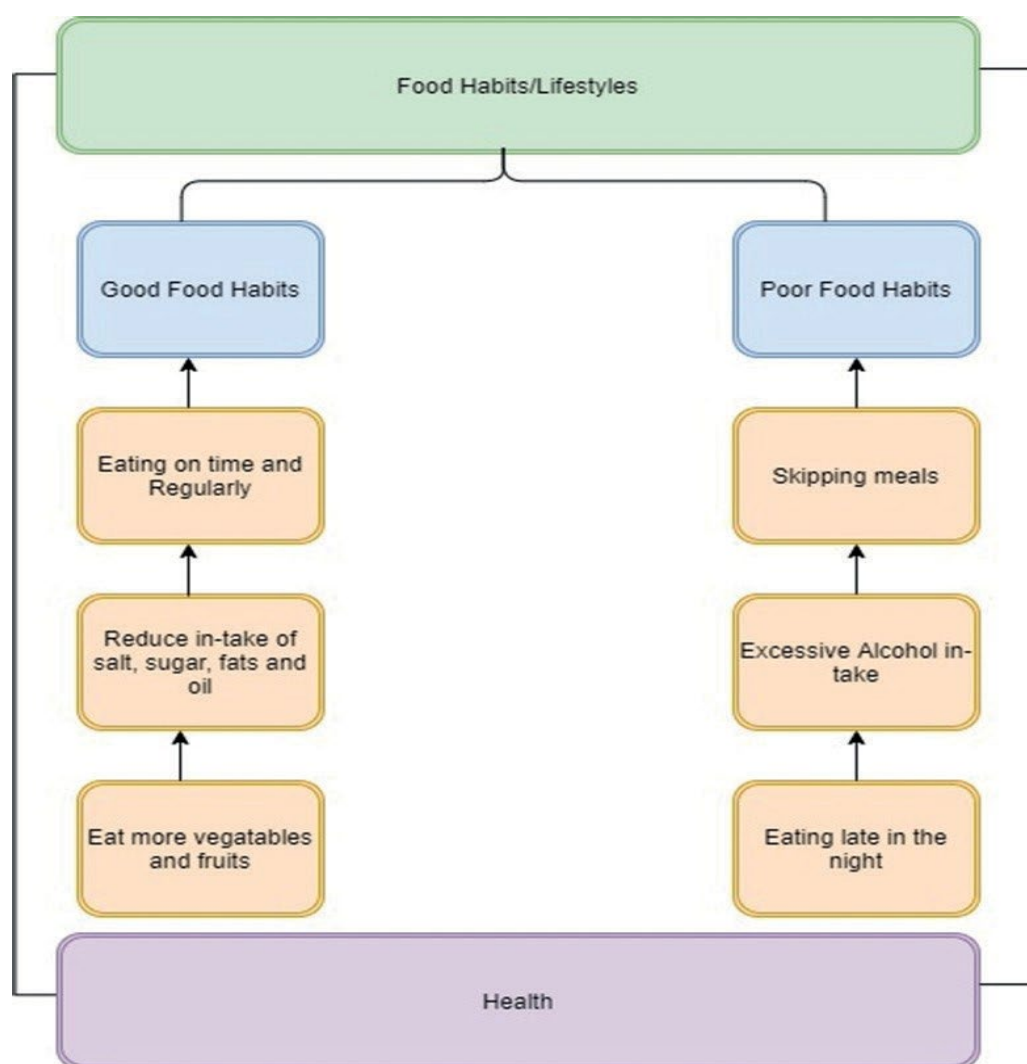


Figure 1.2: Food habits/lifestyle

1. **Good food habits**
 - a. Eat on time and regularly.
 - b. Reduce salt, sugar, fats and oil intake.
 - c. Eat more vegetables and fruits.

- d. Eat balanced meals.
- e. Drink about two to three litres of water daily, etc.

2. Implications of good food habits

- a. Good health
- b. Reduces financial burden
- c. Improves good interpersonal relations
- d. Poor food habits, etc.

3. Bad eating habits

- a. Eating too much fat, sugars, salt, red meat and processed food
- b. Skipping meals
- c. Food fads
- d. Excessive alcohol intake
- e. Snacking/eating between meals
- f. Eating late at night, etc.

4. Implications of poor food habits

- a. Food habit-related diseases: Diabetes, Heart attack
- b. Overweight/obesity, etc.

Learning Task

Interview people of different cultural backgrounds to find out their food habits/ lifestyles and discuss interventions to support the following groups

- a. Diabetes
- b. Heart attack
- c. Overweight/obesity

Pedagogical Exemplars

Engage learners to use the KWL approach to brain-write and share what they know and what they want to know about the factors that influence food habits and lifestyles. Teachers should ensure that they make the links between poor food habits/lifestyle and health, particularly in relation to the following diseases: Kwashiorkor, Marasmus, Rickets, Scurvy, Night blindness, and Obesity. Encourage learners to share ideas with others and engage learners in their groups to research different sources on food habits/lifestyles and the links with health and nutrition amongst individuals, family, and society in their community.

Group projects should be focused on at least **three** people of different ages and socio-cultural backgrounds, and the teacher should provide case studies/ scenarios on which the learners base their research and projects. Provide constructive feedback and support to learners during and after the exercise.

There is a range of tasks within this section, and learners who are not actively participating (AP) may need additional guidance in the form of direct instructions, modelling, targeted questions, and provision of information sources. Learners who exhibit clear understanding and the ability to perform tasks independently (P) and (HP) should rise to the challenge of researching, analysing information and producing charts/diagrams, projects and presentations.

1. **Talk for Learning Approaches:** Use the KWL approach, brain-write and share what you know and what you want to know about the factors that influence food habits and lifestyles.
2. **Group Work and Collaborative Learning Approaches**

In mixed groups, use mingling/onion ring/pyramid, explore the meaning of food habits and lifestyles and their implications on the following:

- a. Individual
- b. Family
- c. Society
- d. Nation

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

DoK Level 3: Strategic reasoning

1. Discuss at least three food habits/ lifestyles and their implications on the nutritional status of individuals, families, and societies.
2. Describe the concepts of food habits and lifestyle, providing specific examples to support your explanation.

Hint



The recommended mode of assessment for Week 6 is **Mid-semester examination**. Refer to **Appendix E** at the end of Section 1 for further information on how to go about this assessment mode.

WEEK 7: FACTORS THAT INFLUENCE FOOD HABITS/LIFESTYLE

Learning Indicator: *Analyse factors that influence food habits/lifestyle practices in daily nutrition.*

FOCAL AREA: FACTORS THAT INFLUENCE FOOD HABITS/LIFESTYLE

Food habits and lifestyle choices are shaped by various factors, including geographical influences, cultural traditions, technological advancements, and individual health concerns. Understanding these factors helps explain dietary preferences and consumption patterns across different communities.

a. Geographical Location

- i. Where people live determines the availability of food resources, influencing their dietary habits.
- ii. Climate and landscape affect agricultural production, leading to regional differences in staple foods. For example, rice is common in tropical regions, while wheat-based products dominate temperate zones.
- iii. Coastal areas favour seafood consumption, whereas inland regions may rely more on meats, grains, or dairy products.

b. Culture and Ethnicity

- i. Cultural background plays a significant role in shaping food preferences and traditional diets.
- ii. Certain cuisines are deeply embedded in ethnic identities, such as Italian pasta dishes, Japanese sushi, or Indian curries.
- iii. Food customs, taboos, and cooking methods vary among cultures, influencing meal preparation and ingredients.

c. Technology

- i. Advances in technology have transformed food production, processing, and consumption.
- ii. Modern preservation methods such as freezing, dehydration, and pasteurisation extend food shelf life.
- iii. Food delivery apps and smart kitchen appliances make meal preparation more convenient.
- iv. Genetic modifications and food engineering influence the availability and nutritional content of food.

d. Religion

- i. Religious beliefs often dictate dietary restrictions and food preparation methods.

- ii. Some religions prohibit or encourage certain foods based on spiritual principles, such as:
 - Islam and Judaism prohibit pork consumption due to religious laws.
 - Hinduism discourages beef consumption as cows are considered sacred.
 - Fasting practices are common in Christianity (Lent), Islam (Ramadan), and Buddhism.
 - Ritualistic food preparations and consumption ceremonies may also be significant.

e. Education

- i. Knowledge about nutrition and health affects food choices and lifestyle.
- ii. People who are aware of dietary guidelines tend to make healthier decisions.
- iii. Education fosters an understanding of food safety, balanced diets, and the effects of processed foods.
- iv. Cooking skills and exposure to different cuisines broaden food preferences.

f. Income and Economic Status

- i. Financial capabilities significantly influence food accessibility and variety.
- ii. Higher-income individuals often have more options to purchase organic or specialty foods, whereas lower-income groups may rely on affordable, processed foods.
- iii. Economic disparities affect meal frequency, nutritional intake, and food security in communities.
- iv. Affluent societies tend to engage in fine dining and luxury food trends, whereas economically challenged populations prioritise staple foods.

g. Health Status

- i. Personal health conditions play a vital role in food choices and dietary habits.
- ii. People with dietary restrictions (e.g., diabetes, hypertension, or allergies) must adjust their food intake to maintain their well-being.
- iii. Ageing affects metabolism, making elderly individuals opt for softer, nutrient-rich foods.
- iv. Weight management and fitness goals influence meal plans, with some favouring high-protein diets or plant-based meals.
- v. The rise of mental health awareness has also led to food choices aimed at enhancing mood and cognitive functions, such as omega-3-rich foods for brain health.

Learning Task

Investigate the factors that influence people's food habits/lifestyles

Pedagogical Exemplars

Learners are asked to identify factors that influence food habits/lifestyles. use a pyramid discussion to analyse and present the factors that influence food habits/lifestyle, or methods to

encourage learners to share ideas with each other. In group discussions, take the opportunity to question any misconceptions that they may have about these food habits/lifestyles. Ask groups to present findings for a whole-class discussion using different forms of presentation.

1. Group Work/Collaborative Learning Approach

- a. In mixed groups, identify factors that influence food habits/lifestyles.
- b. In groups, use pyramid discussion to analyse and present the factors that influence food habits/lifestyle.
- c. Present findings for a whole-class discussion using different forms of presentation to present work.

2. Talk for Learning Approaches: Brain-write and share learning experiences to complete the KWL by stating what they learnt in the lesson in the plenary session.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

DoK Level 3: Strategic reasoning

Explain with specific examples of how **one** of the following factors influences food habits/lifestyle: geographical location, culture/ethnicity, technology, religion, and education.

Hint



The recommended Mode of Assessment for week 7 is **Report writing**. Refer to **Appendix H** for a detailed scope and rubric for learners on report writing and the Teacher Assessment Manual and Toolkit (pages 74–75) for more information.

Section 1 Review

The Food for Healthy Living section in the Year 1 curriculum addresses the unique cultural context of Ghana, emphasising traditional dietary practices, while incorporating contemporary nutritional guidelines that combines the theoretical knowledge with practical skills on basic concepts of food and nutrition, food commodities and their classification, basic food nutrients and their functions and deficiencies in the body to enhance healthy growth and development. Food habits/lifestyle that influence the choice of food, food preparation, meal service and mealtimes among individuals, families and societies. The positive and negative food habits and their implications to the nutritional status of individuals, families, and society. The learner will be well informed to talk and share ideas confidently among their peers and assess the factors that influence the personal and family food habits/lifestyle practices. The interactive and innovative approaches, as well as assessment strategies prescribed will equip learners with the relevant skills of making informed dietary choices, promoting a lifelong commitment to health and well-being. Core skills of making informed food and dietary choices. Learners will have the ability to confidently explain and share ideas on basic concepts of Food and Nutrition, select and use Food Commodities effectively and demonstrate respect for individual and cultural differences in the utilisation of food.



APPENDIX A: Sample Portfolio Assessment

Task

Compile and submit a comprehensive portfolio that represents your work for the entire academic year. The portfolio should include a selection of exercises/assignments, project works, reflective pieces and both mid-semester and end of semester examination papers

Structure and Organisation of the Portfolio

As part of the structure of the portfolio assessment, make sure the following information has been provided:

1. Cover Page with
 - a) Learner's name
 - b) Class
 - c) Subject
 - d) Period/date, etc.
2. Table of Contents, which has the list of items included with page numbers.
3. Brief description/background of items, such as background information for each included artefact, etc

Learners' work to be included in the Portfolio

1. Clearly explain the purpose of the portfolio and its various components to the learners. Provide examples and templates for each section to guide them in their work.
2. Set up regular review sessions, every 4 weeks, to monitor learners' progress. During these checkpoints, they offer feedback and guidance to help them improve their portfolios.
3. Share the scoring rubrics with the learners and thoroughly explain how their work will be evaluated

Set the final due date for portfolio submission in Week 22 of the academic calendar. Offer a grace period for learners to make revisions based on the final feedback they receive.

Mode of Submission/Presentation

1. Inform all learners of the final deadline for portfolio submission to ensure that all work is completed and submitted on time.
2. Learners should organise their portfolios clearly and logically, with each section clearly labelled and easy to access.
3. Learners may submit their portfolios either in physical form or via the school's online submission system.
4. For digital submissions, learners should upload their portfolios either as a single file or in well-organised folders within the online platforms.
5. Ensure the portfolio contains all required components: assignments, projects, quizzes, tests, reflective pieces, mini-research work, as well as mid-semester and end of semester examination papers.

Feedback Strategy

1. Schedule regular meetings to review learners' progress, set new goals, and make any necessary adjustments to their learning strategies.
2. Provide helpful comments throughout the learning process to support learners' development. Ensure that learners clearly understand how to use this feedback to continually improve their work and achieve better results.

Scoring Rubric/Marking Scheme

Learner's pieces of work	Items	Marks per item	Total Marks
Assignment/Exercise	2	1 mark each	2 marks
Project works (individual/Group)	2	2.5 marks each	5 marks
Mini-project work (week 21)	1	2marks	2 marks
Reflective Piece (week 13)	1	2marks	2 marks
Mini-research work (week 10)	1	2marks	2 marks
Mid-Semester Examination Papers	2	2marks each	4 marks
End of Semester Examination	1	3 marks	3 marks
Total Marks			20 marks



APPENDIX B: Sample Group Project

Project Title

“Healthy Eating, Healthy Living: Exploring Nutrition and Food Choices in Our Homes and Communities”

Learning Indicators Addressed

The project combines the following indicators

1. Explain basic concepts in food and nutrition and their implication to healthy living.
2. Classify food commodities under the various food groups to enhance food selection and utilisation.
3. Analyse ways convenience foods can be processed and used to promote healthy nutritional practices in households.
4. Analyse the effect of heat on the nutritional values of various food commodities.
5. Discuss the effects of nutrient deficiencies on growth and development of the individual, family and society.
6. Discuss food habits/lifestyle and their implications on nutritional status.

Project Overview

In groups of 4–6, learners will investigate how food choices, preparation methods, and habits in their households or communities affect health and development. They will gather information, carry out basic observations or interviews, prepare or demonstrate a local meal or convenience food, and analyze its nutritional value. The project will culminate in a presentation or mini-exhibition.

Project Timeline (3 Weeks)

Week	Activity	Expected Output
1	Project Launch & Research Phase: - Form groups - Select a topic/theme (e.g., convenience foods, food habits, food groups, nutrient deficiencies) - Collect data via interviews, home observation, or community market visits	Project Plan (1-page outline): topic, goal, group roles, sources of information
2	Analysis & Food Demonstration Phase: - Classify selected foods by food group - Analyse a commonly prepared food or meal (especially a convenience food or heat-processed food) - Observe/describe how heat affects the food's nutritional content - Begin preparing a chart, write-up, or demonstration meal	Report Draft (with food classification, meal analysis, effects of heat, nutrient values) Photos or drawings of food

3	Presentation Phase: - Prepare group presentation (oral + visual aids like charts, drawings, photos, or food sample) - Discuss nutrition problems like nutrient deficiencies or poor food habits in the community - Share findings with class	Final Presentation or Mini-Exhibition Group Report (4–5 pages max)
----------	---	---

Suggested Low-Cost Resources (Easily Found in Ghanaian Communities)

Resource	Use in Project
Yam, cassava, rice, plantain, kontomire, beans, fish, groundnuts, tomatoes, eggs	Food analysis, preparation, observation
Charcoal stove, firewood, gas stove	Cooking & heat effect observation
Used packaging (e.g., sardine tins, noodles packs)	Discussion on convenience foods
A4 paper, markers, old cardboard	Posters/charts for presentation
Phones with cameras (optional)	Take photos of meals or observations
Interviews with family members or market vendors	Gather local data on food habits and availability

Assessment Rubric (Total: 20 Marks)

Criteria	Excellent (5 marks)	Good (4 marks)	Satisfactory (3 marks)	Needs Improvement (1–2 marks)
1. Food Classification & Nutrient Identification	Accurately classifies foods into correct food groups and identifies main nutrients with clear examples (e.g., yam as a carbohydrate, kontomire as iron-rich).	Mostly accurate classification and nutrient identification with a few minor errors.	Some classification done but lacks details or has errors.	Incorrect or incomplete classification of foods and nutrients.
2. Heat Effect & Food Processing Analysis	Clearly explains how heat affects nutrients in the selected food(s); describes processing methods (e.g., boiling reducing vitamin C).	Gives basic explanation of heat effects and processing methods; missing one or two key points.	Limited or vague explanation of how heat affects food.	No clear explanation or understanding of heat and nutrient loss.

3. Understanding of Nutrition Concepts & Deficiencies	Thoroughly explains basic nutrition concepts (balanced diet, food habits, deficiencies); connects to local household/community issues.	Explains most concepts with some community relevance.	Some concepts addressed but lacks clarity or connection to real life.	Weak or no understanding of nutrition concepts and implications.
4. Group Report or Presentation Quality	Report is clear, well-organized, uses visuals (charts/photos), and communicates ideas effectively. Presentation is engaging.	Report is mostly organized with some visuals; presentation is understandable.	Report or presentation lacks organization or detail.	Unclear or incomplete presentation/report.
5. Participation & Team Collaboration	All members participated actively; task roles were clear; work was completed on time.	Most members contributed; few issues in collaboration.	Uneven participation or unclear roles; some deadlines missed.	Poor teamwork or very little contribution from group members.

Tips for Teachers

- Allow groups to choose different food themes to reduce duplication.
- Support groups with question prompts like:
 - “Why do some people prefer processed/convenience foods?”
 - “What happens when we fry vs. boil food?”
 - “What are signs of protein deficiency?”
- Encourage creativity—charts, role plays, recipe books, or food tasting.
- Ensure that **special education needs learners** are supported with simplified tasks or paired roles.



APPENDIX C: Sample Experiment Assessment

Title of Experiment

Investigating the Effects of Heat on a Selected Food and Evaluating Its Desirability in Cooking

Purpose of the Experiment

Learners will observe and analyze how heat (boiling, frying, steaming, or baking) affects a selected food item (e.g., egg, yam, plantain, tomato, fish). They will examine changes in **texture, color, taste, appearance, and nutritional value**, and reflect on how these changes influence the **desirability** of the food during cooking.

Mode of Administration

1. Group learners into small, manageable teams based on ability, gender, or interest.
2. Set clear expectations:
 - Learning Outcomes: Understand heat effects on food.
 - Skills: Observation, analysis, teamwork, presentation.
 - Knowledge: Types of heat transfer, food changes, safety.
3. Provide detailed instructions:
 - Outline materials, step-by-step procedures.
 - Include safety measures (e.g., careful use of hot surfaces).
4. Allow groups to **rehearse or plan** their demonstration.
5. Distribute low-cost, locally available materials (e.g., yam, tomato, frying pan, stove, water, etc.).
6. Clarify learner questions after rehearsals.
7. Adjust the task for learners with special needs (simplify roles, assign peer support, etc.).

Guidelines During the Experiment

- Each group has **15–20 minutes** for demonstration and brief explanation.
- Teachers should:
 1. Observe learners' practical execution and teamwork.
 2. Ensure safety and intervene in hazardous situations.
 3. Monitor learners' understanding through questioning.
 4. Support learners as needed (without doing the task for them).
 5. Assess in real-time using the rubric below.
 6. Record strengths and areas for improvement for each group.

Reflection and Feedback Strategy

1. Provide **verbal or written feedback** to groups immediately or after the session.

- Highlight areas done well (e.g., good safety, clear explanation) and areas needing improvement (e.g., unclear observations, rushed work).
- Support struggling learners with extra guidance or mini demos.
- Share the **marking rubric** in advance so learners know what's expected.
- Allow **peer feedback**: "What did you like about their demonstration?"
- Recommend further reading or simple experiments learners can try at home.

Marking Scheme (Total: 20 Marks)

Criteria	Excellent (5 pts)	Good (4 pts)	Satisfactory (3 pts)	Needs Improvement (1–2 pts)
1. Clarity of Objective (Understanding the Purpose)	Clearly explains the aim of the experiment and the expected changes in the food.	Explains the aim with minor gaps in expected outcomes.	States the aim but unclear about expected outcomes.	Aim is vague or missing.
2. Procedure & Demonstration	Follows correct steps with smooth flow; food is well handled; safety is fully observed.	Mostly correct steps; slight issues in flow or safety.	Several missed steps or unclear procedures.	Poor or unsafe handling of procedure.
3. Observation & Description of Changes	Accurately describes physical and sensory changes (texture, colour, taste).	Describes most changes correctly.	Few changes are described or lacks depth.	Very limited or inaccurate observations.
4. Explanation of Desirability & Practical Use	Strong, clear connection between heat effect and food desirability (taste, safety, preference).	Fair connection between heat and food quality.	Weak or incomplete connection made.	No clear link to desirability or practical use.
5. Teamwork, Communication & Clean-up	Excellent collaboration, clear roles, good communication, proper clean-up.	Good teamwork and communication; minor clean-up issues.	Some teamwork evident; roles unclear; clean-up incomplete.	Poor cooperation or left area untidy.



APPENDIX D: Sample Scoring Rubric for Poster Assessment

Design a simple poster on “Understanding Nutrients and Deficiencies: Impacts on Individuals, Families, and Societies”

Task Instruction (To Be Given to Learners)

You are to create a **poster** that clearly shows:

- **Six food nutrients** (e.g., carbohydrates, proteins, fats, vitamins, minerals, water) and how they affect **growth and development**.
- At least **two specific effects** of **deficiencies** of these nutrients on:
 - **Individuals**
 - **Families**
 - **Societies**

You must **use examples** (from real life or your community) and **illustrate the information clearly** with **drawings, charts, pictures, or diagrams**. The poster should be **creative, accurate, and easy to understand**.

Suggested Low-/No-Cost Materials

Material	Purpose
A4/A3 paper or old cardboard	Poster base
Crayons, coloured pencils, pens, markers	Drawing, labelling, colouring
Old newspapers or magazines	Cutting out pictures (optional)
Glue or tape	Attaching visuals
Lined paper	Drafting content
Phone (optional)	Taking photos of food or people (for examples)

Assessment Rubric (Total: 20 Marks)

Criteria	Excellent (5 marks)	Good (4 marks)	Satisfactory (3 marks)	Needs Improvement (2 marks)	Poor (1 mark)
1. Nutrient Identification & Function	Clearly identifies 6 key nutrients and explains their role in growth and development using clear examples (e.g., protein builds muscles).	Identifies 5–6 nutrients with brief but accurate explanation.	Identifies 3–4 nutrients; explanation is basic or incomplete.	Identifies fewer than 3 nutrients or gives vague roles.	Nutrients are not identified or explanations are incorrect.

2. Deficiency Effects (Individual, Family, Society)	Gives at least 2 specific, detailed effects per category (total of 6+), with real-life relevance.	Gives at least 1 effect per category, well explained.	Gives 1 effect for 2 categories or vague details.	Effects are inaccurate or too general.	No valid effects described.
3. Use of Examples	Uses specific examples (e.g., “protein deficiency causes kwashiorkor in children”), clearly linked to the topic.	Uses at least one relevant example for any category.	Examples are vague or loosely related.	Poor or unclear examples.	No examples provided.
4. Visual Clarity & Organisation	Poster is well-organised, visually appealing , and enhances understanding through neat labelling, charts, or drawings.	Poster is mostly clear and well-organized with few distractions.	Poster has adequate layout but can be improved for clarity.	Poster is cluttered or hard to follow.	Poster lacks structure and is difficult to read.

What Teachers Should Look For When Scoring

- **Correct use of nutrition vocabulary:** e.g., terms like malnutrition, stunting, deficiency, growth, development
- **Visual effort:** Use of illustrations, symbols (like broken bones for calcium deficiency), flow charts, etc.
- **Accuracy:** Nutrient roles and deficiency effects must be biologically and socially sound.
- **Creativity and communication:** Poster should be engaging and informative, even without verbal explanation.



APPENDIX E: Sample Table of Specification for Mid-Semester Examination

WEEK	FOCAL AREA	TYPE OF QUESTIONS	DOK LEVELS				TOTAL
			1	2	3	4	
1	Basic concepts in food nutrients	Multiple choice	1	2	1		4
		Essay		1	1		2
2	Food Commodities	Multiple choice	1	1	2		4
3	Convenience foods	Multiple choice	2	1	1		4
		Essay	-	1	-		1
		Practical	-	-	-		-
4	Effects of heat on food nutrients	Multiple choice	1	2	1		4
		Essay	-	1	-		1
		Practical	-	-	-		-
5	Food Nutrients and their effects on growth	Multiple choice	2	1	1		4
	Nutrient Deficiencies	Essay	-	1		-	1
Total			7	11	7		25

Total Number of Questions

Multiple choice question	20
Essay	5

SECTION 2: FOOD SECURITY, STORAGE AND SPOILAGE

Strand: Nutrition and Health

Sub-Strand: Food Security

Learning Outcomes

1. Apply knowledge and understanding of basic food security concepts and their components to promote sustainable access to safe and nutritious food in everyday living.
2. Analyse ways of applying scientific knowledge and principles of food spoilage and food storage to prevent food deterioration and ensure food safety for healthy living.

Content Standards

1. Demonstrate knowledge and understanding of how to apply the concept of food security and its components to ensure sustainable access to nutritious food in everyday living.
2. Demonstrate knowledge and understanding of applying food storage principles to prevent food spoilage and promote food.

INTRODUCTION AND SECTION SUMMARY

Food Security is the second sub-strand under Nutrition and Health. This section is focused on providing learners with a detailed understanding of food security, food spoilage and food storage. It covers the concepts of food security and its implications in everyday living, factors influencing food security, concepts and principles of food storage, causes of food storage and some appropriate ways of handling food to minimise contamination and ensure food safety. The section aims to equip learners with knowledge, understanding and skills of securing food and preventing food spoilage to ensure the availability of highly nutritious food all year round for healthy living.

The weeks covered by the section are:

Week 8: *The concept of food security and its implications*

Week 9: *Factors influencing food security at the household and national levels*

Week 10: *Concept and principles of food storage*

Week 11: *Causes of food spoilage and its implications on food safety*

Week 12: *Appropriate food handling, storage and hygiene food practices*

SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher is required to use varied pedagogical strategies relevant to the lesson to make it more learner-focused. The use of group work (considering ability, mixed-ability, mixed-gender, mixed-cultural and friendship groupings), structured talk for learning and problem-based learning approaches, which consider the use of samples, charts, videos, posters, etc, on Food security, food spoilage and storage could be used to enhance understanding of concept. The adoption of experiential learning approaches, where students are assigned to watch videos, role-play and do projects and present their findings in class, could also be considered. The teacher should also incorporate GESI (Gender Equality and Social Inclusion), SEN (Special Educational Needs), SEL (Social and Emotional Learning), 21st Century skills, Core National Values and ICT (Information, Communication and Technology) in the lesson delivery and differentiation strategies to address the different learning needs of all learners, being mindful that learners cannot always accomplish the same task. Particular attention should be paid to learners with special educational needs, making relevant accommodations to ensure their full participation in all activities. To support teachers with their approach to differentiation, this manual sometimes refers to learners as Approaching Proficiency (AP), Proficient (P) and those working at a High level of Proficiency (HP).

ASSESSMENT SUMMARY

Teachers are encouraged to employ a range of assessment methods and tasks to evaluate learners' achievement levels in relation to the Depth of Knowledge (DoK). It is important that these assessment activities are aligned with the learning indicators and the pedagogical exemplars to ensure coherence between what is taught, how it is taught, and how learning is assessed. Teachers are also required to carry out these assessments, document the results, and submit them through the Student Transcript Portal (STP). Each learner will be assessed and recorded based on the following:

Week 8: Class Presentation

Week 11: Research Work

Week 9: Group Discussion

Week 12: End of Semester Examination

Week 10: Class Exercise

WEEK 8: THE CONCEPTS IN FOOD SECURITY AND ITS IMPLICATIONS

Learning Indicator: *Explain the concept of food security and the implications of its components in everyday living*

FOCAL AREA: THE CONCEPTS OF FOOD SECURITY AND ITS IMPLICATIONS

Concept of Food Security

Food Security is the process where people at the same time have physical, social, psychological and economic access to adequate, safe and healthy foods to meet nutritional needs for an active life. Every aspect of daily living is impacted by food. Food security is having consistent and reliable supplies of safe food. It encompasses availability, access, utilisation, and stability of food supplies.

Importance of Food Security

1. Improved health and healthcare – reduce malnutrition, hunger and food-related health problems and aids in the prevention and management of chronic diseases such as diabetes, heart diseases, etc.
2. Economic Growth – A stable food supply contributes to economic development, poverty reduction and improved standard of living.
3. Ensures basic human rights – Food security is essential for human growth and well-being, which is a fundamental human right.
4. Increases productivity – A well-nourished and healthy individual is more productive, which leads to higher economic output.
5. Fosters community development – food security programmes can bring communities together to promote social bond, connections, a safer community and oneness.
6. Supports sustainable development – food security is essential for achieving sustainable development goals (SDG 2)

Components of Food Security

Availability and affordability – Food availability refers to the availability of food in a given community. It addresses the supply side of food security and is determined by the level of food production, stock levels. Food affordability deals with the financial resources to purchase the food they need to maintain a healthy and active life. Food availability and affordability encompasses the following

1. Food production – the amount of food produced within a given area.
2. Food imports – the amount of food imported from other areas or countries
3. Food storage – the capacity of stored foods for future use
4. Food distribution – the ability to get food from farms, markets, or storage facilities to consumers.

5. Food prices – the cost of food products, including freshly produced and processed ones.
6. Income levels – the amount of money individuals and families have available to spend on food.
7. Food budget – the portion of an individual's income allocated for food purchase.
8. Dependency ratio – the number of people dependent on a family influences their purchasing power.
9. Food Assistant Programmes – Government programmes and initiatives that provide financial assistance to help individuals or families purchase food.

Accessibility, quality and safety

Food accessibility refers to individuals and families having continuous access to food that is nutritious, safe for their health. Food quality is the characteristics and attributes of food that make food safe, nutritious and appealing to consumers. Food safety is the practice or measure taken to ensure that food is safe for human consumption, free from contaminants, pathogens and other hazards that cause illness or harm. Food accessibility, quality and safety consist of various factors such as

- a. Freshness and shelf life - the condition and duration of food, including its capacity to withstand transportation and storage without spoilage.
- b. Nutritional content – the presence of essential nutrients, such as macro and micro nutrients, should be contained in the food.
- c. Food handling and storage – the methods used in farming, harvesting and processing of food should not affect the food quality.
- d. Foodborne pathogens – microorganisms such as bacteria, etc, can affect food safety.
- e. Food distribution – the way food is distributed and marketed can have a great impact on food accessibility.

Utilisation and diversity

Food utilisation refers to the ability of individuals and families to wisely use food available to them in order to maintain a healthy and satisfied life. Food diversity refers to the variety of different foods that are available and used within families, society or a region. It includes the following factors

- a. Cultural and social factors – cultural and social factors, such as food preferences, taboos, food fallacies and food fads, can affect food diversity.
- b. Economic factors – economic factors such as income and a ready market can affect food
- c. Globalisation and trade – Globalisation and trade can increase food diversity through the introduction of new foods.
- d. Food knowledge – An individual's knowledge about food, such as nutrition, food safety, and cooking techniques, affects food utilisation
- e. Food resources – resources such as time, money, energy and the right equipment to prepare and cook food can affect food utilisation

- f. Food skills – the ability to prepare, cook and serve meals, as well as food handling skills, can affect food utilisation

Stability and sustainable practices

Food stability refers to the continuous availability and access to sufficient, safe and nutritious food for all people at all times.

Sustainable food practice refers to the production, processing, distribution and consumption of food in a way that reduces harm to the environment, conserves natural resources and promotes social equity.

The following factors affect food stability and sustainable practice;

- a. Climate change – climate change can affect food stability by reducing crop yields and increasing food prices.
- b. Conflict – conflicts can affect food stability by disrupting systems and reducing food access.
- c. Local food system – promoting local food production and consumption can lead to sustainable food practice.
- d. Reduction in food wastage – reducing food waste through the supply chain of production to consumption affects sustainable food practice
- e. Packaging – using biodegradable or recyclable packaging materials can reduce waste and minimise environmental impacts.

Learning Tasks

1. Explain the concepts of food security in everyday living.
2. Research information on the importance of food security to sustainable living.
3. Discuss the key components of food security and its implications in everyday living.

Pedagogical Exemplars

Learners will work in groups to brainstorm the basic concepts of Food security and Nutrition and how these concepts can be applied in daily activities to ensure the availability of nutritious food all year round. Teachers should encourage learners to use a range of resources, including the internet and other sources of information. Learners should be encouraged to make notes of their findings to present them to the whole class for discussion using different presentation modes. In small groups, learners research the importance of food security to sustainable living. With a pyramid group/concept map/spider web, learners should discuss the key components of food security. Learners should be encouraged to surf the internet for further information on key components of food security. Teachers should use probing and direct questions to ascertain individual learners' understanding of the concept.

1. **Group work/Collaborative Learning:** In friendship/mixed ability/buzz groups, brainstorm to explain the basic concept of food security in everyday living.

2. Group work

- a. With a pyramid group/concept map/spider web, discuss the key components of food security. Surf the internet for further information on key components of food security.
- b. Share the group report in the meeting session for peer review.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

Briefly explain the concept of food security and its importance

2. DoK Level 3: Strategic reasoning

Assess the key component of food security and its implications in everyday living

WEEK 9: FACTORS INFLUENCING FOOD SECURITY

Learning Indicator: *Analyse the factors influencing food security at the household and national levels.*

FOCAL AREA: FACTORS INFLUENCING FOOD SECURITY

The means to have enough safe and nutritious food that serves the needs of all members in the family and the community at large can be hindered by a number of essential factors. In Ghana, food security faces challenges from a complex interplay of factors including climate variability, economic disparities and infrastructure limitations impacting food availability, access and utilisation, particularly in rural areas.

1. Factors Influencing Food Security

Factors influencing food security can be classified as Socio-economic, environmental, and Political factors

a. Socio-Economic Factors

i. Poverty and income levels

Poverty and low-income levels are strong predictors of food security, as they limit access to sufficient and nutritious food, and this can lead to a cycle of poverty and food insecurity. Poor households often have less income to purchase items. They also often don't have access to resources such as land, technology and credit, which are essential for food production. This can have serious consequences on their health and well-being.

ii. Unemployment

Unemployment greatly impacts food security by reducing household income, leading to decreased ability to afford food and potentially increasing food insecurity. Unemployment translates to a loss of income for individuals and families, making it difficult to purchase enough food. Individuals and families may struggle to afford basic necessities, including food, because of unstable income brought by unemployment.

iii. Education and awareness

Education and awareness are crucial for food security. It empowers individuals and families to make informed decisions about food production, consumption, and access, which ultimately leads to better nutrition and healthy living. It equips individuals and families with the knowledge and skills to adopt sustainable agricultural practices, improve food storage and processing techniques and make them understand the importance of a healthy diet. Education and awareness campaigns also raise public understanding of food security issues, including the causes of hunger, malnutrition, and the importance of well-balanced nutritional diet. It also provides information about food availability, prices, and nutritional values, enabling individuals and families to make informed choices of good food.

iv. Infrastructure and market access

Infrastructure and market access are fundamental issues for food security as they directly impact the ability of farmers to produce and distribute food which adversely influence household food availability and affordability. Adequate infrastructure including roads, irrigation systems and storage facilities, is essential for good agricultural productivity. Efficient transportation networks enhance the movement of foods from farms to market and consumers, preventing spoilage, wastage and reducing food prices. Storage facilities help minimise post-harvest losses, ensuring food availability throughout the year. Improved market access allows farmers to sell their produce at better prices, increasing their income and improving their livelihoods. Consumers can also have access to a wider variety of foods to improve dietary diversity and better nutrition for healthy living.

b. Environmental Factors

i. Climate change and extreme weather

This significantly threatens food security by disrupting agricultural production, increasing prices of food, and negatively impacting access to food. Extreme weather events intensify drought, floods, storms, and heatwaves that damage crops and livestock and this can lead to high losses in food production. Altered rainfall patterns, rising temperatures and increased evaporation rates can also negatively affect crops and the overall stability of food systems.

ii. Soil degradation and desertification

Climate change can contribute to soil degradation, reducing its fertility and ability to support food production. Soil degradation is the decline in soil quality, in various forms like soil erosion, loss of nutrients in soil and reduced water-holding capacity. Degraded soils are less fertile, leading to lower crop yields, directly affecting food availability.

Desertification, on the other hand is the process by which fertile land becomes desert, loses its vegetation, often due to climate change and human activities like deforestation, galamsey, etc. Desertification can also lead to water scarcity, which impacts agricultural production and livelihood.

iii. Water scarcity

Water scarcity influences food security because crops and livestock require water to survive and grow. Water scarcity refers to a lack of sufficient water resources or lack of access to safe water supplies. Crop failures, livestock deaths, and increased malnutrition and waterborne diseases are all caused by water scarcity.

c. Political Factors

i. Government policies on agricultural support

Government policies on agricultural support significantly influence food security by impacting production, trade, prices and ultimately access to food. Interventions like input subsidies (fertilisers, seeds), irrigation projects, prices support, infrastructural supports (building of silos) and agricultural extension services, state farms play a very important role in agricultural production and the availability of food.

ii. Conflict and political instability

Conflict – induced displacement leads to mass movement of people, creating difficulties on resources and threatening food security especially in vulnerable populations like some villages in Ghana. It disrupts supply chains, leading to high food prices for the few foods available and making food less affordable and accessible.

Conflict often disrupts agricultural production, as farmers abandon their lands, and infrastructure like irrigation systems and storage facilities (silos) are damaged or destroyed. Major infrastructures like roads, markets, and storage facilities also gets destroyed making it difficult to transport and store foods.

iii. Trade policies and globalisation

Trade can improve food security by allowing countries to import food during shortages to make food available, but trade liberalisation can also lead to increased dependence on food imports, potentially harming local farmers and threatening food security. Globalisation also facilitates the transfer of agricultural technologies and best practices, which have helped to increase productivity and improve food security.

iv. Land ownership and land use policies

Changing land usage, such as converting agricultural land to other purposes like building or galamsey, can reduce the availability of land for food production, leading to lower yields. In towns and cities, land values increase rapidly, which causes the displacement of small farmers and reduced access to land for food production. Land use policies should prioritise sustainable land management practices to ensure long-term food security and prevent land degradation.

2. Challenges of Food Security

Challenges of food security among individuals, households, and communities in everyday life.

a. Individual Level

- i. Low income and unemployment –Low income and unemployment can make it difficult for individuals to afford nutritious food. Low income among individuals can limit access to nutritious food and make affected individuals rely on cheaper, less healthy options.
- ii. Lack of food knowledge and awareness – Lack of food knowledge and awareness, such as knowledge about healthy eating, misconceptions about food, and limited understanding of food labels, can affect individuals to understand how to read food labels to make informed choices. Certain misconceptions can lead to confusion and poor decision-making about certain nutrients, which may constitute poor food choices.
- iii. Health conditions and disabilities – health conditions may require individuals to follow specific diets, which can be challenging to manage. Certain health conditions such as HIV/AIDS, diabetes, etc, may require individuals to have increased nutritional needs. Physical disabilities, cognitive disabilities, sensory disabilities, and developmental disabilities can affect an individual's ability to plan and prepare food.

b. Household Level

- i. Financial constraints – Financial constraints on households may limit the choices to have enough money to purchase nutritious foods. High food prices can make it difficult for households to afford certain foods.
- ii. Poor food storage and waste – households may not have adequate storage facilities such as refrigerators, freezers, or a storeroom for proper storage of food. This can affect food security, leading to food spoilage, food contamination because of poor handling practices, which may lead to food waste.
- iii. Family size and dependents – larger families require more food to meet the nutritional needs of all household members. This put much pressure on household resources and cooking facilities. Large families may face challenges in sharing food fairly among household members and children may be suffer for that.
- iv. Gender inequality in food access – women with limited access to education and employment opportunities can affect their ability to earn income and access food. Societal expectations and norms may dictate that women prioritise household responsibilities over jobs, leading to limited access to food.

c. Community Level

- i. Climate change and natural disasters – changes in temperature, such as droughts, floods and heat waves, can damage crops, infrastructure and livelihoods, leading to a shift in growing seasons and crop suitability, impacting negatively on food availability and access. Natural disasters can destroy infrastructure, including roads, bridges, storage facilities, livelihoods, crops, livestock and fisheries, which affect food access and result in food prices.
- ii. Poor infrastructure and market access – limited access to good roads and transportation, storage facilities can make it difficult for farmers to get their food produce to the market, leading to food waste and reduced income.
- iii. Political instability and conflicts – Political instability can disrupt food systems, including production, processing and distribution. This results in limited access to resources such as land, water, and credit, making it difficult for farmers to produce food in the community.
- iv. Urbanisation and land use changes – Urbanisation and rezoning have serious consequences on food security among communities, affecting availability, access, utilisation and stability of food, as a result of conversions of agricultural lands, increased food demand, changes in food consumption patterns and increased food waste.
- v. Lack of Government Support and Policies – Lack of government support and policies such as limited access to credit and financial services, limited access to technology and innovations, insufficient support to the vulnerable populations can make it difficult for farmers and other food produces to invest in their food production to make food available to the society. Inadequate access to technology and innovations will make it difficult for farmers and other producers to improve productivity.

3. Addressing Food Security Challenges

- a. Food distribution and Marketing – improving access to good roads, markets, and storage facilities can reduce food waste and enhance food distributions all year round
- b. Policy and programme intervention – conscious efforts should be made to implement policies and programmes that support food security. These may include food assistance programmes, agricultural subsidies, etc.
- c. Education and support – adequate knowledge on food security can promote food sustainability practices that ensure the availability of stable foods all year through, and it will help people to make well-informed decisions about food choices of food
- d. Promotion of climate-resistant agricultural practices such as drought-tolerant crops, soil conservation practices to reduce erosion, and afforestation that promotes biodiversity and reduces greenhouse gas emissions.
- e. Conservation agriculture – reduce still farming to reduce erosion and use technology to optimise group yield and reduce waste.

Learning Tasks

1. Brainstorm to explain the challenges of food security in everyday life.
2. Analyse the factors that influence food security and classify them under socio-economic, environmental, and political factors.
3. Discuss to explain the challenges of food security among individuals, households and the community.

Pedagogical Exemplars

Learners will work in friendship mixed ability groups to brainstorm on the challenges of food security in everyday life and how it affects livelihood. Teachers should encourage learners to use a range of resources, including the internet and other sources of information. Learners should be encouraged to make notes of their findings to present them for a whole-class discussion using varied presentation modes and styles. In small groups, learners research and analyse the factors that influence food security classify them into sub-headings. With a pyramid group/ concept map/spider web, learners should discuss the challenges of food security among individuals, households and the community while suggesting ways to address them. Learners should be encouraged to surf the internet for further information on the challenges of food security among individuals, households, and the community. Teachers should use questions and answers to probing to assess individual learners' understanding of the concept.

1. Group work/Collaborative Learning

- a. In friendship/mixed ability/buzz groups, brainstorm to explain the challenges of food security in everyday life.
- b. In your groups, analyse factors that influence food security and classify them under the following sub-headings:
 - i. Socio-economic
 - ii. Environmental
 - iii. Political factors influencing food security, etc.

2. Group Work

- a. With a pyramid group/concept map/spider web, task learners to explain challenges of food security among individuals, households and communities in everyday life.
- b. Learners are to share a group report in a plenary session for peer review.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

Identify **three** challenges of food security in everyday life and suggest ways to address them.

2. DoK Level 3: Strategic reasoning

Prepare a report on the socio-economic factors influencing food security in Ghana.

WEEK 10: THE CONCEPT AND PRINCIPLES OF FOOD STORAGE

Learning Indicator: Explain the concept and principles of food storage and their role in preventing food spoilage.

FOCAL AREA: THE CONCEPT AND PRINCIPLES OF FOOD STORAGE

1. Concept of Food Storage

This is the act of keeping food at appropriate temperatures, conditions, and places to avoid spoilage and prolong its shelf life until it is ready for consumption. It is important to store food correctly to prolong the life span of food, ensure food security, preserve quality and nutritional value to save money and prevent foodborne illness. Non-perishable and Perishable Food Products should be stored in different ways.

Table 2.1: Food storage

Non-Perishable Food	Storage
Dry beans	In sack
Flour	In tight-fitting containers
Maize	In sacks or containers
Rice	In sacks or containers
Onion	In baskets
Perishable Food	Storage
Meat	Fridge/Freezer
Fish	Fridge/ Freezer
Vegetables	Fridge
Yam	Bury in the soil
Cassava	On airy racks and barns

a. Categories of Food Storage

- Dry storage: Storing non-perishable items like grains, flour, and canned foods at room temperature.
- Refrigerated storage: Keeping perishable foods like dairy, fruits, and vegetables in refrigerators at temperatures below 5°C.
- Frozen storage: Storing highly perishable foods like meat, poultry, and seafood at freezing temperatures (-18°C or below).

b. Impact of food storage on food safety

- i. Prevention of food spoilage
- ii. Reduction of foodborne illnesses
- iii. Minimisation of cross-contamination
- iv. Preservation of nutritional value
- v. Reduction of food waste and economic loss

2. Importance of Food Storage on Food Safety

- a. Prolong the life span of food.
- b. Prevention of contamination of food from damaging agents.
- c. Delay or prevention of microorganisms in food.
- d. Reduce food waste and economic loss by preserving unused food for later use.
- e. Enable a better-balanced diet throughout the year.
- f. To ensure food security.
- g. Help to preserve quality and nutritional value to save money.
- h. Help prevent foodborne illness from consuming decomposing food.

3. Application of Food storage Principles to Prevent Food Spoilage

- a. Store non-perishable items like grains, flour, and canned foods at room temperature. (Dry storage)
- b. Keep perishable foods like dairy, fruits, and vegetables in refrigerators at temperatures below 5°C. (Refrigerated storage)
- c. Store highly perishable foods like meat, poultry, and seafood at freezing temperatures (-18°C or below) etc. (Frozen storage)
- d. Store dry foods in airtight containers to prevent moisture and pest infestation.
- e. Keep perishable foods refrigerated or frozen at appropriate temperatures.
- f. Label food items with dates to track expiration and freshness.
- g. Use the FIFO (First In, First Out) method to prevent older food from expiring.
- h. Avoid overloading refrigerators and freezers to allow proper air circulation.

Learning Tasks

1. Share experiences on how foods are stored in your homes and use the experiences to explain the concept of food storage.
2. With the aid of pictures/realia/videos, discuss how to store both perishable and non-perishable food appropriately.
3. Surf the internet for information to examine how individuals and families can apply the principles of food storage to prevent food spoilage and promote food safety practices for healthy living.

Pedagogical Exemplars

Review the concept of food spoilage and food storage learnt in JHS Career Technology. Provide resources such as pictures/realia/videos to prompt discussion about ways to store both perishable and non-perishable foods appropriately. Encourage learners to share their experiences on how various foods are stored in their homes. Based on the experiences shared in the discussion, explain the term Food Storage. Ask questions to ascertain understanding of the concept and reinforce learning. Learners are encouraged to research other ways that people store food in the community and present their findings as a project using a range of presentation techniques (pictures, drawings, role play).

Some learners who are approaching proficiency (AP) may need additional guidance in the form of direct instructions, questions, and support with information gathering from the community. They may be encouraged to do this research using targeted questions produced in class, with support provided to analyse the results and produce a report. Learners who exhibit a clear understanding and the ability to perform tasks independently (P) and (HP) should rise to the challenge of information gathering, analysing information, and producing reports to present to the class.

1. Structured Talk for Learning

Learners in mixed ability/gender/cultural groups should use mingling/onion ring/pyramid to,

- a. brainstorm to share lessons learnt on the concept of food storage in Career Technology in JHS.
- b. share experiences on how foods are stored in their homes and use these experiences to explain the term food storage
- c. With the aid of pictures/realia/videos, discuss how to store both perishable and non-perishable food appropriately.

2. Group Work: Learners will use think-pair-share to explore the importance of storing food.

3. Experiential Learning: In groups, learners will examine how individuals and families can apply food storage principles to prevent food spoilage and promote food safety practices for healthy living.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

- a. Explain the concepts of food spoilage, food storage, and the importance of food storage.
- b. Describe how to store perishable and non-perishable foods in the home.

2. Dok Level 3: Strategic reasoning

Critically examine **four** ways individuals and families can apply the principles of food storage in everyday life to prevent food spoilage and promote food safety.

WEEK 11: CAUSES OF FOOD SPOILAGE AND ITS IMPLICATIONS FOR FOOD SAFETY

Learning Indicator: Discuss the causes of food spoilage and its implication for food safety.

FOCAL AREA: CAUSES OF FOOD SPOILAGE AND ITS IMPLICATION FOR FOOD SAFETY

1. Definition of Food Spoilage

Food spoilage refers to the deterioration of food quality due to biological, chemical, or physical factors, making it unsafe or undesirable for consumption. It is the state in which food has gone bad and is usually dangerous to eat. Spoiled food can lead to foodborne illnesses, economic losses, and wastage, affecting both households and the food industry.

2. Causes of Food Spoilage

- a. Microbial spoilage: Bacteria, mould and fungal contamination as well as yeast fermentation
- b. Enzymatic activity: Ripening and over-ripening, and browning reactions.
- c. Chemical reactions: Oxidation and Rancidity
- d. Physical factors: Temperature, moisture, and improper handling can cause food spoilage, etc.

3. Implications of Food Spoilage on Food Safety

- a. Health risks and foodborne diseases
- b. Economic losses and food waste
- c. Environmental impact
- d. Preventive measures to reduce food spoilage, etc.

Learning Tasks

1. Discuss the definition of food spoilage with the aid of realia, videos. Pictures of sample spoiled food.
2. Review the causes of food spoilage in different food commodities and how it can be prevented.
3. Learners should surf the internet for more information on the implications of food spoilage on food safety.

Pedagogical Exemplars

1. **Structured Talk for Learning:** In mixed groups, discuss the definition of food spoilage with the aid of realia, videos, pictures, and samples of spoiled food.
2. **Group Work:** In their groups, learners present their findings for whole-class discussion and peer review.

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities

DoK Level 3: Strategic reasoning

As a group, investigate local/modern ways people store food commodities in the community and write a report on your knowledge and understanding of the concept of food spoilage and food storage for appraisal.

Hint



*The recommended mode of assessment for Week 11 is **Research Work**. Refer to **Appendix F** at the end of Section 2 and the teacher assessment manual and toolkit pages 84 and 151 for further information on how to go about this assessment mode.*

WEEK 12: APPROPRIATE FOOD HANDLING, STORAGE AND HYGIENIC FOOD PRACTICE

Learning Indicator: *Demonstrate appropriate food handling, storage and hygiene practices to minimise contamination and ensure food safety.*

FOCAL AREA: APPROPRIATE FOOD HANDLING, STORAGE, AND HYGIENIC FOOD PRACTICE

Handling and storing food commodities properly is crucial to maintaining their quality, safety, and shelf-life of food. The general guidelines for storing dry goods, canned foods, Perishables, or frozen items must be followed.

These steps and guidelines will help ensure that the food stays fresh and safe for consumption.

a. Inspect and Sort

- i. Before storing, check for damaged packaging, signs of pests, or expiration dates. Discard any compromised items.
- ii. Sort items by type and date of purchase to facilitate easy access and use.

b. Choose the Right Storage Area

- i. Select a cool, dry, and well-ventilated storage area away from direct sunlight, heat sources, and humidity.
- ii. Consider using a pantry, cupboard, basement, or dedicated storage room.

c. Consider space for storage: A pantry, cupboard, basement, or dedicated storage room.

d. Use Appropriate and clean Containers

- i. Transfer dry goods like grains, flour, and sugar into airtight containers to prevent moisture, pests, and contamination.
- ii. Use clear containers for easy visibility and label them with the contents and date of storage.

e. Handle Raw Foods Safely

- i. Store raw meat, poultry, and seafood separately from ready-to-eat foods or cooked foods.
- ii. Use sealed containers or bags to prevent extracts from leaking onto other foods in the refrigerator.

f. Follow the First-In, First-Out (FIFO) Rule

- i. Arrange items in a way that allows you to use the oldest items first.
- ii. Label and date all stored foods. This prevents items from expiring before they're used.

g. Maintain Proper Temperature

- i. Keep Perishable Foods like fruits, vegetables, dairy, and meat in the refrigerator at temperatures below 40°F (4°C) to slow bacterial growth.
- ii. Freezers should be set to 0°F (-18°C) or lower for storing frozen foods.

h. Prevent Cross-Contamination: Store raw meat, poultry, and seafood on lower shelves or in separate containers to prevent drips and contamination of other foods

Demonstration on how to store some food commodities

Fish

- a. Refrigerate or Freeze: Store fish in the refrigerator at a temperature below 40°F (4°C) or freeze at 0°F (-18°C) or below.
- a. Use Airtight Containers: Store fish in airtight containers or zip-top bags to prevent juices from dripping into other foods and other flavours from affecting the fish.
- b. Keep it Cold: Place fish on ice or in a cold storage container if transferring or transporting it.
- c. Consume Fresh Fish quickly within two days or freeze it for longer storage.

Onion

- a. Cool, Dry Place: Store onions in a cool, dry place with good ventilation (like a mesh bag or basket), away from direct sunlight to prevent them from rotting.
- a. Avoid Moisture: Keep onions away from moisture, as it can cause them to rot quickly.
- b. Check onions regularly for signs of spoilage, such as mould or sprouting.

Mango

- a. Room Temperature: Store unripe mangoes at room temperature, not under direct sun till it is ripe.
- a. Refrigerate Ripe Mangoes: To prolong the life span or freshness of ripe mangoes, store them in the refrigerator.
- b. Check for Ripeness often by touching firmly.

Fresh Tomatoes

- a. Room Temperature: Store fresh tomatoes at room temperature, far from direct sunlight, until they're ripe. Store cooked tomatoes in airtight containers in the freezer (use freezer-free containers or zip lock bags) or refrigerator, depending on time of usage.
- a. Stem Side Down: To prevent moisture from getting into the fruit and causing spoilage, Store tomatoes stem side down. To maintain freshness, use within a few days after purchase.
- b. Don't Refrigerate Unripe Tomatoes: Avoid refrigerating unripe tomatoes, as the cold temperature can affect the ripening process and affect the flavour and texture.



Figure 2.1: Fish in freezer



Figure 2.2: Onions in basket



Figure 2.3: Cereals in Airtight containers

Learning Tasks

1. Discuss guidelines for storing foods such as fish, onion, mango, banana, beans, and rice.
2. Identify the challenges individuals, families, and society face in storing food appropriately.
3. Practical activities to demonstrate storing food commodities.

Pedagogical Exemplars

Review storage guidelines with the whole class. Teachers may reinforce teaching by inviting learners to watch a demonstration/video on how to store food commodities. In mixed groups, teachers assign roles to group members, learners will discuss the basic guidelines for storing food and the challenges faced by individuals, families, and society in storing food appropriately. Learners may share their experiences of food storage from their own home and community as part of these discussions. Each group should produce a group presentation based on their discussions and shared experiences. In their groups, using a range of food samples, learners will simulate or demonstrate how to store food commodities.

Engage learning to develop some guidelines for hands-on activities to promote teamwork and collaboration. This practical task will require teachers to provide a range of resources, including food samples, appropriate storage containers, materials for labelling food to be stored and, where possible, access to storage areas and/or fridges/freezers. Teachers may need to provide practical guidance and demonstrations for this activity. Encourage learners to ask questions and provide feedback on each group's work. Learners will also be encouraged to undertake a project

to investigate local/modern ways people store food commodities in the community and produce a report.

1. Experiential /Group Work

- a. Learners watch a demonstration/video on how to store food commodities.
- b. In mixed groups, discuss the basic guidelines for storing foods and challenges faced by individuals, families, and society in storing food appropriately. Each group will prepare a presentation on the guidelines for storing food
- c. In small groups using food samples from the list below, simulate or demonstrate how to store food commodities.

E.g.,

- Fish
- Onion
- Mango
- Banana
- Beans
- Rice, etc.

The teacher goes around to guide learners.

- d. Display stored food commodities in various groups for the gallery walk and appraisal

Key Assessment

The teacher should focus on formative assessments, choosing from the following exemplars or create their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

In groups, produce a presentation showing **three** basic guidelines for storing food.

2. DoK Level 3: Strategic reasoning

Explain the challenges faced by individuals, families, and society in storing food appropriately.

Hint



The recommended mode of assessment for Week 12 is **End of semester examination**. Refer to **Appendix G** at the end of Section 2 for further information on how to go about this assessment mode.

Section 2 Review

The Food for Healthy Living section in the Year 1 curriculum addresses the unique cultural context of Ghana, emphasising traditional dietary practices, while incorporating contemporary nutritional guidelines that combines the theoretical knowledge with practical skills on Basic Concepts in Foods and Nutrition, Food Commodities and their Classification, Effect of heat on food nutrient, Basic Food Nutrients and their Functions in the body to enhance Healthy Growth and Development. Food habits/lifestyle that influence the choice of food, Concepts of Food Security and Its Implications, Factors Influencing Food Security, Concept and Principles of Food Storage and Appropriate food handling, storage and Hygienic food Practice. The learner will be well informed to talk and share ideas confidently among their peers and assess the factors that influence the personal and family food habits/lifestyle practices. The interactive and innovative approaches, as well as assessment strategies prescribed will equip learners with the relevant skills of making informed dietary choices, promoting a lifelong commitment to health and well-being. Core skills of making informed food and dietary choices. Ability to confidently explain and share ideas on basic concepts of Foods and Nutrition, select and use Food Commodities effectively and demonstrate respect for individual and cultural differences in the utilization and preservation of food.



APPENDIX F: Research Work

Conduct simple research on the topic “Causes of food spoilage and its implication for food safety.”

Assessment Objective

Learners will conduct a small-scale research project to:

- Identify and describe the **main causes of food spoilage**
- Explore how these causes affect food **safety**, health, and the environment
- Provide real-life examples from their homes, markets, or community
- Suggest **preventive or safety practices** to reduce spoilage

Instructions to Learners (Can Be Given in Class)

You are to conduct a **simple research project** on **food spoilage** by:

1. Interviewing people (household members, food vendors, shopkeepers)
2. Observing food storage and spoilage practices in your home or local area
3. Reading from textbooks or printed handouts

After your research, you should write a short report that includes:

- The main causes of food spoilage (e.g., bacteria, mould, poor storage, time, pests)
- The effects or dangers of spoilage on food safety (e.g., food poisoning, loss of nutrition)
- 2 or more examples of spoilage in real life (e.g., mouldy bread, sour milk, rotting tomatoes)
- 2 or more ways to **prevent or reduce** spoilage (e.g., proper refrigeration, drying, salting)

Suggested Low-/No-Cost Research Materials

Resource	Purpose
Parents, food vendors, market sellers	Interview about spoilage experiences
Spoilt food in the home or community	Observation and photography
Textbooks, printed notes, teacher handouts	Background information
Phone camera (optional)	Documenting observed examples
Notebook or paper	Jotting notes and writing the report

Structure of Research Report (Max 2–3 pages)

1. **Title**
E.g., “Research on Food Spoilage and Its Impact on Food Safety”
2. **Introduction:**
What is food spoilage? Why is it important to study it?
3. **Main Content**

- List and explain **at least 3 causes** of food spoilage
- Discuss **2–3 effects** of spoilage on food safety and health
- Give **2 real-life examples** from your home or community
- Suggest **2 practical ways to reduce spoilage**

4. Conclusion

Summarize your findings

5. Acknowledgements or Sources

Where you got your information (e.g., “Interview with my grandmother”)

Assessment Rubric (Total: 20 Marks)

Criteria	Excellent (5 marks)	Good (4 marks)	Satisfactory (3 marks)	Needs Improvement (1–2 marks)
Identification of Spoilage Causes	Accurately identifies and explains at least 3 key causes with clarity and detail	Identifies 2–3 causes with mostly accurate explanation	Identifies 1–2 causes with limited detail	Causes are unclear, inaccurate, or missing
Understanding of Food Safety Implications	Thoroughly explains how spoilage affects food safety, with examples (e.g., illness, waste)	Gives basic explanation with some examples	Mentions effects but lacks clarity or depth	No clear understanding or inaccurate statements
Use of Real-Life Examples	Uses 2 or more detailed examples (e.g., rotting tomato from market); clearly described	Gives at least one valid example from home/community	Example is vague or weakly connected	No example or irrelevant examples used
Presentation & Organisation	Report is clear, well-organised, neat, and includes headings	Mostly well-organised with a few formatting issues	Somewhat organised but hard to follow in parts	Poorly structured and difficult to understand



APPENDIX G: Sample Table of Specification for End of Semester 1 Examination

STRUCTURE OF THE EXAMS

PART 1- OBJECTIVES 40 MARKS. 1 MARK EACH

PART 2 – 6 ESSAY QUESTIONS. ANSWER 3 FOR 60 MARKS, 20 MARKS EACH.

TOTAL – 100 MARKS

WEEK	FOCAL AREA	TYPE OF QUESTIONS	DOK LEVELS				TOTAL
			1	2	3	4	
1	Basic concepts in Food and Nutrition	Multiple choice	1	1			2
		Essay	-	-	-	-	-
2	Food Commodities	Multiple choice	1	1	1	-	3
		Essay	-	1	-	-	1
		Practical					
3	Convenience foods	Multiple Choice	1	1	1	-	3
		Essay	-		-	-	-
		Practical	-	-	-	-	-
4	Effects of heat on food nutrients	Multiple	1	1	1	-	3
		Essay	-	-	-	-	-
		Practical	-	-	-	-	-
5	Food Nutrients and their effects on growth	Multiple choice	1	2	1		4
		Essay	-	-	-	-	-
6	Food Habit and its implications on nutritional status.	Multiple choice	2	1	1		4
		Essay	-	-	1	-	1
		Practical	-	-	-	-	-
7	Factors that influence food habits/ lifestyle	Multiple choice	2	1	1		4
		Essay	-	1	-	-	1
		Practical	-	-	-	-	-
8	The concepts of Food Security and Its Implications	Multiple choice	-	2	2	-	4
		Essay	-	-	1	-	1
		Practical	-	-	-	-	-
9	Factors Influencing Food Security	Multiple Choice	2	1	1		4
		Essay	-	1	-	-	1
		Practical	-	-	-	-	

10	Concept and Principles of Food Storage	Multiple choice	1	1	2		4
		Essay	-	1	-		1
11	Causes of Food Spoilage and Implications for Food Safety	Multiple choice	-	2			2
		Essay					
		Practical					
12	Appropriate food handling, storage and Hygienic food Practice	Multiple Choice	1	-	1		2
		Essay	1				1
		Practical					
			14	18	14		46

Total Number of Questions

Multiple Choice questions	40
Essay	6

SECTION 3: FOOD LABORATORY AND HYGIENE

Strand: Food Production

Sub-Strand: Food Production Technology

Learning Outcomes

1. Assess the types, functions and layout of food laboratories used in food production and their role in ensuring efficiency and safety.
2. Plan and design food laboratory layouts to promote safety and the effective use of food laboratory equipment and tools.

Content Standards

1. Demonstrate knowledge and understanding of the types, functions and layout of food laboratories used in food production.
2. Demonstrate knowledge and understanding in innovative ways of planning and using food laboratories.

Hint



Assign **Individual Project** for the semester by Week 14. The project should be submitted by Week 17. See **Appendix H** at the end of Section 3 and Teacher Assessment Manual and Toolkit pages 27 and 126 for more information on how to organise individual project.

INTRODUCTION AND SUMMARY SECTION

This section is targeted to provide learners with a comprehensive understanding of the interplay between food production technology to promote the development of the individual, the family and society in the aspect of hygiene and food laboratories. The thematic areas to be covered under Food Production Technology include the following: comparison of various food laboratories, evaluation of the factors that affect the planning of food laboratories, ways of redesigning food laboratories, and ways of ensuring hygiene in food laboratories.

The weeks covered by the section are:

Week 13: *Concept of food laboratory*

Week 14: *Types of kitchen laboratories layout*

Week 15: *Factors that affect food laboratory planning and layout*

Week 16: *Ways of re-designing/renovation/refurbishment of a food laboratory*

Week 17: *Hygiene in the food laboratory*

SUMMARY OF PEDAGOGICAL EXEMPLARS

Food habits, production technologies, and the effects of heat on nutrients are all influenced by various factors such as geography, culture, technology, religion, education, and economic status. Heat plays a vital role in cooking, affecting food texture, nutrient retention, safety, flavour, moisture content, and even enzyme activity. While convenience foods undergo diverse processing methods—freezing, canning, dehydration, pasteurization, and precooking—they serve essential roles in meal preparation, offering quick and accessible options. Effective teaching in food production technology should incorporate collaborative learning, experiential education, and interactive teaching materials such as food samples, posters, and digital tools. Students benefit from structured discussions, problem-solving activities, and project-based assignments that deepen their understanding of food hygiene and technological advancements. Furthermore, lessons should integrate Gender Equality and Social Inclusion (GESI), Special Educational Needs (SEN), Social and Emotional Learning (SEL), ICT applications, and 21st Century Skills to create a student-centred, inclusive, and engaging learning experience.

ASSESSMENT SUMMARY

The teacher is expected to use varied assessment strategies and tasks to assess learners' levels of achievement in relation to the Depth of Knowledge (DoK). It is equally noteworthy to align the assessment activities with the learning indicators as well as the pedagogical exemplars, to create linkages between the learning indicators, the pedagogical exemplars, and the assessment strategies. Teachers are entreated to administer these assessments and record them for onward submission into the Student Transcript Portal (STP). The following assessment would be conducted and recorded for each learner:

Week 13: *Individual Class Exercise*

Week 16: *Group Case Study*

Week 14: *Group Discussion*

Week 17: *Group Discussion and Presentation*

Week 15: *Case Study*

WEEK 13: CONCEPTS OF FOOD LABORATORIES

Learning Indicator: Discuss the concept of food laboratories and their functions in food production.

FOCAL AREA: CONCEPT OF FOOD LABORATORIES AND THEIR FUNCTIONS IN FOOD PRODUCTION

A food laboratory is a combined facility that serves both as a laboratory for food testing and analysis and as a kitchen for food preparation and cooking. This type of facility is commonly found in research institutions, food manufacturing companies, culinary schools and other establishments where there is a need for both food analysis and food preparation activities. They are a place where food is stored, prepared, cooked and served, cleaning is done, and equipment is stored. They are also the most important area in the home.

1. The functions of a food laboratory

The food laboratory serves essential functions related to the following:

- a. **Food safety:** This ensures that the food products meet safety standards and are safe for consumption
- b. **Quality control:** This practice takes into consideration of the nutritional content, taste, texture, colour and aroma to ensure that the food meets specific quality standards and customer expectations.
- c. **Product development and research:** This involves the development of new food products or the improvement of existing ones. They research ingredients, formulations and cooking techniques to create innovative and appealing food items.
- d. **Sensory evaluation:** Food laboratories conduct sensory evaluations to assess the taste, texture, appearance and overall sensory experience of food products. This information helps in refining recipes and understanding consumer preferences.
- e. **Shelf-life determination:** This involves monitoring the product's quality over time to ensure it remains safe and retains its desired attributes during storage.

1. Types of food laboratories

- a. **Kitchen laboratory:** A kitchen laboratory is a place where food is prepared, cooked, served, tested or eaten. It is often used for product development and recipe testing. It is mostly found at research institutions, food manufacturing factories, Schools and Colleges etc. the available equipment are oven, stove, refrigerator, utensils, crockeries etc.
- b. **Microbiological laboratories:** These laboratories are designed to study microorganisms, such as bacteria, viruses and yeast that can affect food safety and quality and development of control measures against food contaminants. The equipment used in these laboratories are microscopes, incubators, and autoclaves to culture and analyse microorganisms.
- c. **Chemical analysis laboratories** are used to analyse the chemical composition of food, including nutrients, contaminants and Food additives. These laboratories are equipped

with specialized equipment such as chromatographs, spectrophotometers and mass spectrometers to detect and quantify chemical compounds.

- d. **Nutritional analysis laboratories:** These are used to determine the nutrients in foods including macronutrients and micronutrients. Spectrophotometers and chromatographs are the equipment used to find the nutritional content of foods which are needed to develop nutritional labels as well.
- e. **Sensory evaluation laboratories:** They are used to assess taste, smell, texture, and appearance which are the sensory properties of food. The design of these laboratories is to minimize distractions and biases, with controlled lighting, temperature, and humidity during new product development and testing.

Learning Tasks

1. Explain the concept of a food laboratory and the types of food laboratory (orally or written).
2. List the functions of food laboratories.

Pedagogical Exemplars

Put learners in mixed groups and ask them to discuss the concept of food laboratories. Provide learners with appropriate learning materials. Groups should share their findings with their classmates. Promote peer tutoring and encourage tolerance of diverse opinions during presentations and discussions. To ensure that learners have understood the concept, teachers should guide learners in their discussions of the subject. Learners who are not actively participating should receive direct instruction and probing questions to evaluate their comprehension. Those who demonstrate a high level of understanding should be tasked with comparing different types of food laboratories.

1. **Group Work:** In small groups or the whole class, brainstorm the concept of food laboratories.
2. **Structured Talk for Learning:** With the aid of videos and pictures, discuss the functions of food laboratories.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

DoK Level 2: Skills of conceptual understanding

1. Explain the meaning of food laboratories.
2. Describe at least **three** functions of a food laboratory.

WEEK 14: TYPES OF KITCHEN LABORATORIES LAYOUT.

Learning Indicator: Discuss the types of kitchen laboratory layouts and their implication in food production.

FOCAL AREA: TYPES OF KITCHEN LABORATORIES LAYOUT AND THEIR IMPLICATION IN FOOD PRODUCTION



Traditional food laboratory

Modern food laboratory

Figure 3.1: Shows a traditional kitchen with a fire and a modern kitchen with cabinets

1. Kitchen/food laboratories

A kitchen is a dedicated space or room in a home, restaurants, hotels or other food establishments where food is prepared, cooked and often served. It is a central part of any place that deals with food and plays a crucial role in food preparation and service. It is a central part of any place that deals with food and plays a crucial role in food preparation and service. Kitchen laboratories vary in size, layout and equipment based on their purpose and the scale of food operations. The major zones in the kitchens are:

- a. **Food preparation area:** This is where ingredients are washed, chopped, sliced and prepared before cooking. They typically include work surfaces, cutting boards and sinks for food handling.
- a. **Cooking area:** This is where the actual cooking of food takes place. It consists of stoves, ovens, grills, fryers and other cooking appliances required to prepare different types of dishes.
- b. **Refrigeration and storage:** They have refrigerators and freezers to store perishable ingredients and finished food products. They also have shelves, cabinets and pantries for dry storage of non-perishable items and kitchen utensils.

- c. **Utensils and tools:** They are equipped with a variety of utensils and tools, including pots, pans, knives, cutting boards, measuring cups and mixing bowls, essential for cooking and food preparation.
- d. **Ventilation system:** They typically have a ventilation system to remove smoke, odours and heat generated during cooking. This ensures a comfortable and safe working environment for kitchen staff.
- e. **Dishwashing area:** They have a designated area for washing and sanitising dishes, utensils and cooking equipment.

2. Types of kitchen laboratory

- a. Family kitchen laboratory
- b. Educational kitchen laboratory
- c. Research and development kitchen laboratory
- d. Commercial kitchen laboratory
- e. Experimental/test kitchen laboratory
- f. Hospital and clinical kitchen laboratory
- g. Food processing and preservation laboratory

3. Functions of the family kitchen laboratory

- a. Foods are cooked and served in the kitchen laboratory.
- b. Visitors are received and sometimes entertained in the kitchen laboratory.
- c. Storage area for food tools and equipment.
- d. Family meetings may be held in the kitchen laboratory.
- e. Laundering activities can go on in the kitchen laboratory, etc.

4. Kitchen laboratory layouts

There are several types of kitchen laboratory layouts, each of which is designed to suit specific needs and space availability, such as:

- a. Single-Line (Straight-Line) Layout
- b. L-Shaped Layout
- c. U-Shaped Layout
- d. Island Layout
- e. Parallel (Galley) Layout

Implications of kitchen layouts on food production

- Workflow and Efficiency
- Safety and Hygiene
- Space Utilisation
- Collaboration and Teaching

5. Traditional and Modern Food Laboratories

The transition from traditional to modern kitchen laboratories in Ghana and globally reflects advancements in technology, food safety and environmental sustainability. While traditional kitchens maintain cultural significance and resourcefulness, modern kitchens emphasise efficiency, safety and innovation:

- a. Infrastructure and design
- b. Cooking equipment and technology
- c. Safety and hygiene standards
- d. Accessibility and affordability
- e. Application in institutions, etc.

Table 3.1: Similarities and differences between traditional and modern kitchens

Similarities between traditional and modern kitchens	Differences between traditional and modern kitchens
Use fuel	Modern food laboratories are well organised.
Use tools and equipment	Modern food laboratories use sophisticated equipment.

Table 3.2: Traditional kitchen laboratory

Advantages	Disadvantages
Simple to construct	Inadequate storage space
Easy to purchase the tools and equipment	Poor ventilation
	Walls become dirty due to smoke

Table 3.3: Modern kitchen laboratory

Advantages	Disadvantages
Use advanced equipment and tools	Expensive to buy tools and equipment
Well-organised equipment	Complexity in the maintenance of tools and equipment

6. Fuel used in the Kitchen/Food laboratory

In kitchens and food laboratories, different types of fuels are used for cooking and heating. The choice of fuel depends on factors such as cost, availability, environmental impact, efficiency, and safety. Below are common types of fuels used:

a. LPG (Liquefied Petroleum Gas) – Gas

Description: LPG is a flammable mixture of hydrocarbon gases, primarily propane and butane. It is stored in pressurised cylinders and widely used in both domestic and commercial kitchens.

<i>Advantages</i>	<i>Disadvantages</i>
Clean-burning with minimal smoke and soot.	Flammable and requires careful handling.
Quick and efficient heating.	Can be expensive in some regions.
Easy to control the temperature with the burners.	Supply may be limited in rural areas.
Widely available in urban areas.	

Safety Tips:

- Always check for gas leaks.
- Turn off the gas cylinder when not in use.
- Ensure good ventilation in the cooking area.

b. Kerosene

Description: Kerosene is a liquid fossil fuel commonly used in wick stoves and pressure stoves, especially in areas without access to gas or electricity.

<i>Advantages</i>	<i>Disadvantages</i>
Relatively affordable and available in many areas.	Produces smoke and unpleasant odours.
Portable and easy to store.	Can cause indoor air pollution.
Useful in off-grid or emergencies.	Stoves can be difficult to operate and clean.

Safety Tips:

- Store kerosene away from flames and sunlight.
- Use only in well-ventilated areas.
- Do not refill a hot stove.

c. Charcoal

Description: Charcoal is a traditional solid fuel made by burning wood in the absence of oxygen. It is often used in coal pots or open grills.

<i>Advantages</i>	<i>Disadvantages</i>
Affordable and widely available.	Produces carbon monoxide – dangerous in enclosed spaces.
Suitable for outdoor cooking.	Contributes to deforestation and air pollution.
Provides strong, even heat for grilling and roasting.	Time-consuming to light and maintain.

Safety Tips

- Use outdoors or in open, well-ventilated spaces.
- Never use charcoal indoors without proper ventilation.
- Keep children away from hot coal pots.

d. Electricity

Description: Electricity powers a range of kitchen appliances, including ovens, induction cookers, hotplates, and microwaves.

<i>Advantages</i>	<i>Disadvantages</i>
Clean, with no smoke or combustion.	Dependent on availability and stable power supply.
Precise temperature control.	The cost of electricity may be high.
Safer when used correctly.	Not usable during power outages unless backed by generators.

Safety Tips:

- Avoid using damaged cords or sockets.
- Keep water away from electrical appliances.
- Switch off appliances when not in use.

Learning Tasks

1. Describe the zones/layout of a kitchen laboratory of your choice.
2. Surf the internet and other sources for further information on the types of kitchen laboratories and classify them using tables, charts, concept maps and albums.

Pedagogical Exemplars

Put learners in groups and ask them to discuss the kitchen laboratory's layout and the types of food laboratories observed in their environment. Provide learners with appropriate learning materials. Groups should share their findings with their classmates. Promote peer tutoring and encourage tolerance of diverse opinions during presentations and discussions. To ensure that learners have understood the concept, teachers should guide learners in their discussions of the subject. Learners who are not actively participating should receive direct instruction and probing questions to evaluate their comprehension. Those who demonstrate a high level of understanding should be tasked with comparing different types of food laboratories.

1. **Group Work:** In small groups or the whole class, brainstorm the differences and similarities of kitchen laboratories.
2. **Structured talk for learning:** With the aid of videos and pictures, compare the types of kitchen laboratories, bringing out the similarities, differences, advantages and disadvantages of each.
3. **Structured talk for learning:** With the aid of videos and pictures, discuss the types of kitchen laboratories and their functions.
4. **Collaborative Learning and Group Work:** In random/mixed cultural groups, use the "build on what others say" or the debating strategy to compare modern and traditional kitchen laboratories that are available to individuals, families and institutions in the Ghanaian and global context. Present a report at the plenary.
5. **Group Work:** Use think-pair-share, explore the types of fuel used in the food laboratory.
E.g.,

- a. LPG - GAS
- b. Kerosene
- c. Charcoal
- d. Electricity

Present findings in groups for discussion.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 1: Recall

- a. State the types of kitchen laboratories in food production.

2. DoK Level 2: Skills of conceptual understanding

- b. Describe at least three zones/layouts in a kitchen laboratory.
- c. Discuss the fuel and equipment used in the various types of kitchen laboratories.

3. DoK Level 3: Strategic reasoning

- a. Make an album of traditional and modern kitchen laboratories of your choice.
- b. Within your album, explain the advantages and disadvantages of each food laboratory.

WEEK 15: FACTORS THAT AFFECT THE PLANNING AND LAYOUT OF FOOD LABORATORIES

Learning Indicator: Evaluate the factors that affect the planning and layout of food laboratories.

FOCAL AREA: FACTORS THAT AFFECT THE PLANNING AND LAYOUT OF FOOD LABORATORIES

1. The planning of a food laboratory is a complex process that requires careful consideration of various factors to ensure its efficiency, functionality and compliance with industry standards. Some factors that can significantly inform the planning of a food laboratory include:
 - a. **Purpose and scope:** The intended purpose and scope of the food laboratory will drive its design and layout. Whether it is focused on food preparation and cooking, food safety testing, quality control, research and development, or a combination of functions, this will influence the selection of equipment and space requirements.
 - b. **Building infrastructure:** The physical infrastructure of the building or space where the food laboratory will be housed is essential. It must have the necessary utilities, such as water, electricity, ventilation and waste disposal systems, to support the laboratory's operations.
 - c. **Space and layout:** The size and layout of the laboratory space will impact workflow efficiency and safety. Factors such as the arrangement of workstations, equipment placement and the flow of samples through the laboratory need careful consideration.
 - d. **Equipment selection:** Choosing appropriate laboratory equipment is critical. The selection should be based on the specific testing and analysis requirements, as well as budget constraints. Proper equipment maintenance and calibration should also be factored in.
 - e. **Safety and security:** Ensuring the safety of laboratory personnel and maintaining the security of the laboratory and its data are top priorities. Safety measures, such as fume hoods, emergency eyewash stations and safety training, should be incorporated into the laboratory plan.

2. Factors to consider when planning food laboratories for family use

Socio-Cultural Factors	Economic Factors
Family needs	Family budget
Fuel	Size and shape of the food laboratory
Position of doors and windows	Equipment and tools
Functions of the food laboratory	Care and maintenance of the food laboratory
Environment	

Learning Task

Discussions and presentations on the factors that affect food laboratory planning

Pedagogical Exemplars

Organise learners into groups to discuss the factors that affect food laboratory planning, using the provided learning materials. Each group should present their findings to the class, fostering peer tutoring and encouraging respect for different viewpoints during presentations and discussions. Teachers should guide the discussions to confirm understanding among learners. Learners who do not actively participate should be given direct instruction and probing questions to assess their understanding, while those with a higher grasp should be given challenging tasks.

1. **Group Work:** In pairs, discuss the factors that affect food laboratory planning and factors to consider when planning food laboratories for family use.
2. **Group Work/Collaboration:** In groups, evaluate the factors that affect food laboratory planning and present reports for feedback.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

Outline at least three factors that affect food laboratory planning.

2. DoK Level 4: Extended critical thinking and reasoning

Case study scenario

The owner of a new modern restaurant with seating for 20 people is planning the kitchen/food laboratory. What factors would be most important for him to consider when choosing and planning the kitchen/food laboratory?

Please rank the following factors from most important (1) to least important (5) and give justification for your ranking:

- a. Location and accessibility
- b. Equipment and technology available
- c. Size and layout of the laboratory
- d. Safety and hygiene standards
- e. Budget and funding availability

Hint



The recommended mode of assessment for Week 15 is **Case Study**. Refer to **Appendix I** at the end of Section 3 and the teacher assessment manual and toolkit pages 25 and 150 for further information on how to go about this assessment mode.

WEEK 16: WAYS OF RE-DESIGNING/ RENOVATION/REFURBISHMENT OF A FOOD LABORATORY

Learning Indicator: *Suggest ways of re-designing/ renovation/refurbishment of a food laboratory to enhance the functions of various areas within the laboratory.*

FOCAL AREA: REDESIGNING A FOOD LABORATORY

1. Redesigning/renovation/refurbishment of a food laboratory

Renovating/refurbishing an existing food laboratory can be complex and rewarding. The goal is to create a modern, efficient and safe space that complies with industry standards and regulations. The steps include:

- a. **Changing layout and flow:** Optimise the layout and workflow to maximise efficiency. Consider the proximity of different workstations, sample handling areas and storage spaces to minimise unnecessary movement and potential cross-contamination
- b. **Budgeting and planning:** Develop a comprehensive budget that includes not only construction costs but also equipment, furniture and other essential elements. Plan the renovation timeline carefully, considering any potential disruptions to laboratory operations.
- c. **Flooring and walls:** Select materials for the flooring and walls that are easy to clean and sanitise to maintain a hygienic environment. Seamless and non-porous surfaces are ideal for food laboratories.
- d. **Lighting:** Proper lighting is crucial in a laboratory setting. Use adequate and suitable lighting to ensure accuracy in testing and minimise eye strain for laboratory staff.

1. Reasons for re-designing the food laboratory

Re-designing a food laboratory allows for improvements in various aspects. It is essential to carefully plan and execute the re-design process to achieve the desired outcomes, including:

- a. Promote safety and hygiene
- b. Promote efficiency and productivity
- c. Ensure compliance and adaptability to changing needs.
- d. Promote comfort of use
- e. Easy care and maintenance

Pedagogical Exemplars

Arrange learners into mixed groups and have them observe pictures or videos of different food laboratories and suggest ways of re-designing local food laboratories to make them user-friendly. Each group should share their insights with the class, promoting peer learning and encouraging acceptance of various perspectives during presentations and discussions. Teachers should facilitate these discussions to ensure understanding among all learners. Learners who

are less engaged should receive personalised instruction and targeted questions to evaluate their understanding, while those who demonstrate advanced knowledge should be assigned more complex tasks.

1. **Group Work/Collaboration:** In mixed groups, suggest ways of redesigning local kitchen laboratories to make them user-friendly.
2. **Group Work:** In groups, design your dream or ideal food laboratory to enhance the functionality and safety of the zones and layout in the kitchen laboratory.
3. **Experiential/Collaborative Learning:** Undertake a field trip in the community to observe the layout and describe the importance of maintaining cleanliness and order in different food laboratories and report.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities. Reflecting on the presentation and discussion made in class:

1. DoK Level 3: Strategic reasoning

Reflect on the presentation on the proposed re-design of a food laboratory and explain why it is necessary to ensure a high-efficiency ventilation system.

2. DoK Level 4: Extended critical thinking and reasoning

Scenario

Imagine that your school has recently received a grant or money to redesign its food laboratory. The current lab is outdated, lacking both modern equipment and an efficient layout, which hampers the learning experience. As a part of the redesign project, your group has been invited to participate in a planning committee alongside teachers and administrators. The goal is to create a more functional and inspiring environment for culinary education.

Questions:

Based on the scenario above, which of the following would be the most effective approach to ensure the redesigned food laboratory meets educational and functional needs? Justify the reasons for your choice.

1. Survey students and teachers to identify the most frequently used equipment and design the layout to improve accessibility and workflow.
2. Focus on acquiring the latest technology in food preparation and preservation to ensure students are trained on modern and industry-standard equipment.
3. Implement an eco-friendly design that utilises sustainable materials and energy-efficient appliances to promote environmental responsibility.
4. Design the lab exclusively based on the feedback from culinary arts teachers, ensuring that it is tailored to the specific needs of the curriculum they teach.

Hint



The recommended mode of assessment for Week 16 is **Group Case Study**. Refer to **Appendix J** at the end of Section 3 and the teacher assessment manual and toolkit pages 25 and 150 for further information on how to go about this assessment mode.

WEEK 17: HYGIENE IN THE FOOD LABORATORY

Learning Indicator: Discuss ways of ensuring hygiene in the food laboratory.

FOCAL AREA: PERSONAL, FOOD AND ENVIRONMENTAL HYGIENE IN THE FOOD LABORATORY

Maintaining proper hygiene in a food laboratory is essential to ensure the safety and quality of food products, prevent cross-contamination, and create a healthy work environment. These are important hygiene practices to follow in a food laboratory.

1. Personal Hygiene

Personal hygiene is extremely important for food laboratory workers. They must wear clean, protective clothing. Effective and regular handwashing is important to help prevent harmful bacteria from spreading from people's hands. Bath regularly, trim fingers and toenails, brush teeth twice daily



Figure 3.2: Hand washing under running water

2. Food Hygiene in the Food Laboratory

Food hygiene includes the use of clean food commodities, proper cooking of food and proper storage of food. Cover foods, wash hands before touching foods, and use clean tools and equipment for cooking.



Figure 3.3: A fruit seller handles fruits with clean hands

3. Environmental Hygiene in the Food Laboratory

Environmental hygiene in the food laboratory includes cleaning the working area thoroughly, proper disposal of garbage and regular washing of utensils. Clean the sink thoroughly, regularly empty the dustbins, and regularly clean work surfaces



Figure 3.4: Shows a woman cleaning a wooden surface with detergent

Learning Task

Organise a hygiene campaign advocacy to educate your peers on personal, food and environmental hygiene in promoting food safety and healthy living.

Pedagogical Exemplars

Engage learners to brain-write and share their knowledge on food hygiene. Teachers should ensure that they explain hygiene in food laboratories. Encourage learners to share ideas with a review lesson on food hygiene learnt in JHS- Career Technology and share. There is a range of tasks within this section, and learners who are not actively participating (AP) may need additional guidance in the form of direct instructions, modelling, targeted questions and the provision of information sources. Learners who exhibit a clear understanding and the ability to perform tasks independently (P) and (HP) should rise to the challenge of researching, analysing information and producing charts/diagrams, projects and presentations.

1. **Talk for Learning:** In pairs, brain-write/through questions and answer/talking points, review lessons on food hygiene learnt in JHS-Career Technology and share.
2. **Structured Talk for Learning:** In pairs/smaller groups/whole class, explain hygiene in food laboratories and present in class.
3. **Group work:** In mixed groups, discuss how to maintain good hygiene in food laboratories.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities. Reflecting on the presentation and discussion made in class:

DoK Level 3: Strategic reasoning

1. Analyse the importance of proper hand hygiene in a food laboratory. How can hand washing practices affect food safety?

2. Develop a plan for managing both solid and liquid waste disposal in a food laboratory to prevent contamination and maintain a clean environment.
3. A food establishment has experienced an outbreak of foodborne illness linked to contaminated foods from the food laboratory. Analyse the potential sources of contamination. and draw a plan to prevent similar cases in the future.

Hint



The recommended mode of assessment for week 17 is **Discussion and presentation**. Refer to **Appendix O** for a detailed outline rubric for their Discussion and presentation assessment. See the *Teachers Assessment Manual and Toolkit* pages (52–54) for more information on how to organise a discussion as an assessment mode.

SECTION 3 REVIEW

To conclude, the focus of Food Production Technology is to equip learners with a deep understanding of the critical links between food production, nutritional science and health outcomes of food laboratories and hygiene. By addressing local contexts and integrating practical applications, learners will be prepared to make informed choices that contribute to individual and community well-being within the Ghanaian culture of food laboratories.



APPENDIX H: Individual Project Work

Project Title “Redesigning Our School Food Laboratory: A Hygiene-Conscious and Efficient Space”

Project Overview

Your school food lab is outdated and no longer meets the standards for modern, safe, and efficient food preparation. You are to **develop a redesign plan for the food laboratory**, taking into account:

- The most suitable layout type for a school setting
- Factors that influence design decisions (e.g., space, safety, workflow)
- Hygiene practices to promote food safety
- A sketch or model to demonstrate your redesign idea

You will present your **redesign plan** as a report with a **layout sketch or 3D model**.

Project Duration: 3 Weeks

Week	Activity
1	Conduct research: Types of kitchen layouts and factors affecting lab design. Interview your teacher or kitchen staff if possible.
2	Begin writing your report. Create a sketch or model of your redesign (hand-drawn or using available materials). Highlight hygiene considerations in your new layout.
3	Finalise your project. Check spelling, neatness, and complete your write-up. Submit your report with a sketch/model.

Project Components (What Learners Should Submit)

1. **Title Page** (Name, class, project title)
2. **Introduction**
 - Why is lab design important for food safety and learning?
3. **Types of Kitchen Lab Layouts**
 - Describe at least **3 types** (e.g., island, galley, L-shaped)
 - Briefly explain **how each affects food production**
4. **Factors Affecting Lab Design**
 - Discuss **at least 4 factors**: space, ventilation, lighting, workflow, equipment, safety
5. **Redesign Plan**
 - Describe your proposed layout
 - Explain how it improves hygiene, workflow, and safety
 - Include your **hand-drawn sketch or 3D model**
6. **Hygiene Measures**

- Identify at least **3 hygiene practices** in the new lab: e.g., handwashing station location, waste disposal, floor material, etc.

7. Conclusion and Reflection

- What did you learn from this project?

Suggested Low-/No-Cost Materials (For Sketch or Model)

Material	Use
Old cartons or boxes	Base for model layout
Bottle caps, clay, paper rolls	Represent stoves, sinks, or workstations
Pencil, crayons, markers	Drawing/sketching
A4 paper or cardboard	Drawing/sketch background
Ruler and glue/tape	Neat sketching and joining model parts
Printed/handwritten labels	Labeling zones (e.g., washing, cooking, storage)

Assessment Rubric (Total: 20 Marks)

Criteria	Excellent (5 marks)	Good (4 marks)	Satisfactory (3 marks)	Needs Improvement (1–2 marks)
Understanding of Layout Types and Implications	Accurately describes 3+ layout types and clearly explains their pros and cons in food production	Describes 2–3 layout types with mostly correct implications	Describes layouts but with vague or partial explanations	Descriptions are incorrect or missing
Factors Affecting Food Lab Design	Discusses 4+ factors with strong, practical explanations	Explains at least 3 relevant factors	Mentions 2 or more factors but with limited detail	Few or no relevant factors discussed
Creativity and Suitability of Redesign	Layout/model is realistic, creative, clearly improves hygiene and workflow	Layout is good and addresses most needs with some creativity	Layout is basic with minor improvements shown	Layout lacks detail or is unrealistic
Incorporation of Hygiene Principles	Clearly integrates hygiene measures (e.g., handwashing, waste zones) into design with justification	Mentions hygiene principles and includes some in layout	Mentions hygiene briefly but not linked to design	Hygiene is not considered in redesign

Presentation and Clarity	Report is well-organised, neat, with clear sketch/model and labels	Mostly clear and neat; sketch is understandable	Presentation has issues with neatness or clarity	Unclear writing or missing visuals/model
---------------------------------	--	---	--	--

Tips for Teachers

- Allow learners to submit either **sketches or simple models** depending on available materials.
- You can display outstanding redesigns on the **classroom board** or use them for class discussion on improving your actual food lab.



APPENDIX I: Case Study

Case Scenario The owner of a new modern restaurant that can seat 20 customers is planning the kitchen/food laboratory. He wants to ensure the kitchen is safe, functional, and efficient for food preparation.

As a student of Food and Nutrition, the owner has asked you to advise on the most important factors to consider when choosing and planning the kitchen or food laboratory.

You are to rank the following factors from most important (1) to least important (5) and justify your ranking:

- a. Location and accessibility
- b. Equipment and technology available
- c. Size and layout of the laboratory
- d. Safety and hygiene standards
- e. Budget and funding availability

Assessment Task for Learners

Write a **case study analysis** based on the above scenario. Your task is to:

1. **Rank** the five factors (1 = most important, 5 = least important)
2. **Justify** your ranking with practical reasons
3. Discuss how each factor can **positively or negatively affect** food preparation and service
4. Make **recommendations** to the restaurant owner on how to plan for each factor

Suggested Structure of Learner Response

Title

“Case Study Analysis: Planning a Kitchen/Food Lab for a Modern Restaurant”

1. Introduction

Briefly explain what a kitchen/food laboratory is and why proper planning is essential in a food business.

2. Factor Ranking Table (example)

Factor	Ranking (1–5)
Safety and hygiene standards	1
Equipment and technology available	2
Size and layout of the laboratory	3
Budget and funding availability	4
Location and accessibility	5

4. Justification for Each Ranking

- Explain why each factor was placed in its rank
- Give practical examples (e.g., “Safety is ranked 1 because without it, the restaurant could face closure from health inspectors.”)

5. Recommendations

Suggest actions the owner should take for the top 2–3 factors (e.g., ensure proper ventilation, invest in basic but efficient equipment)

6. Conclusion

Summarise the importance of proper kitchen planning in food safety and business success.

Assessment Rubric (Total: 20 Marks)

Criteria	Excellent (5 marks)	Good (4 marks)	Satisfactory (3 marks)	Needs Improvement (1–2 marks)
Accurate Ranking with Reasoning	All 5 factors are ranked logically with clear, well-reasoned justifications	All factors ranked with mostly logical reasons	Some factors ranked; justification is partial or unclear	Ranking is missing or poorly justified
Understanding of Each Factor	Shows strong understanding of how each factor affects kitchen planning and food safety	Shows general understanding with minor gaps	Limited understanding; explains only some factors	Lacks understanding; vague or incorrect descriptions
Use of Examples and Recommendations	Gives realistic examples and useful recommendations for top-ranked factors	Gives at least one example and basic recommendations	Examples and suggestions are generic or unclear	No useful examples or suggestions given
Presentation and Organisation	Response is well-organised, neat, and follows structure; easy to follow	Mostly organised with minor formatting issues	Somewhat disorganised or missing some parts	Disorganised or hard to follow; lacks structure



APPENDIX J: Group Case Study

Scenario

Imagine that your school has recently received a grant or money to redesign its food laboratory. The current lab is outdated, lacking both modern equipment and an efficient layout, which hampers the learning experience. As a part of the redesign project, your group has been invited to participate in a planning committee alongside teachers and administrators. The goal is to create a more functional and inspiring environment for culinary education.

Questions

Based on the scenario above, which of the following would be the most effective approach to ensure the redesigned food laboratory meets educational and functional needs? Justify the reasons for your choice.

1. Survey students and teachers to identify the most frequently used equipment and design the layout to improve accessibility and workflow.
2. Focus on acquiring the latest technology in food preparation and preservation to ensure students are trained on modern and industry-standard equipment.
3. Implement an eco-friendly design that utilises sustainable materials and energy-efficient appliances to promote environmental responsibility.
4. Design the lab exclusively based on the feedback from culinary arts teachers, ensuring that it is tailored to the specific needs of the curriculum they teach.

Rubric for Case-Based Assessment (Total: 20 Marks)

Criteria	Excellent (5 marks)	Good (4 marks)	Satisfactory (3 marks)	Needs Improvement (1–2 marks)
1. Justification of Selected Option	Clearly and strongly justifies one selected approach with multiple compelling reasons that reflect real-world needs in culinary education	Gives clear justification with one or two valid reasons; reasoning is mostly sound	Gives a basic justification; reasoning is general or somewhat vague	Justification is weak, unclear, or missing
2. Consideration of Educational Needs	Shows deep understanding of what learners and teachers need in a food lab (e.g., space use, accessibility, common equipment, safety)	Shows good understanding of at least one key educational need in the lab redesign	Mentions educational needs, but with limited depth or detail	Lacks understanding of how the redesign supports teaching/learning

3. Quality of Supporting Examples or Reasoning	Uses specific and realistic examples(e.g., “students often crowd around the only working stove”; “teachers say they waste time due to poor layout”) to support ideas	Gives at least one practical example or reference, but may lack detail	Provides general reasoning without examples or specificity	Gives no examples or uses irrelevant ideas
4. Clarity, Organisation, and Communication	Response is well-organised, logical, and clearly communicates the selected idea; grammar and structure enhance understanding	Mostly well-organised; communication is clear with minor issues in structure or flow	Organisation is basic but understandable; some ideas are scattered or unclear	Disorganised or poorly communicated; difficult to understand

SECTION 4: BEVERAGES

Strand: Food production

Sub–Strand: Food processing techniques

Learning Outcomes

1. Apply scientific principles in food processing techniques to produce nutritious beverages.
2. Apply knowledge of nutrition to enrich and fortify beverages for improved health benefits.

Content Standards

1. Demonstrate knowledge, understanding, and skills in applying scientific principles to beverage production.
2. Demonstrate knowledge and understanding of the principles of nutrition and apply them to produce, enrich and fortify beverages to meet the diverse needs of individuals, families and society.

INTRODUCTION AND SUMMARY SECTION

This section of the Teacher Manual covers Food Production Technology and the sub-strand of food processing techniques. This section is targeted to provide learners with a comprehensive understanding of types of beverages and their uses, analysis on enriching and fortifying beverages and experimentation with beverage production.

The weeks covered by the section are:

Week 18: *Types of Beverages*

Week 19: *Scientific principles in selection, processing and preservation of beverages*

Week 20: *Enrichment and Fortification of Beverages (1)*

Week 21: *Enrichment and Fortification of Beverages (2)*

Week 22: *Experiment on Non – Alcoholic Beverages (1)*

Week 23: *Experiment on Non – Alcoholic Beverages (2)*

Week 24: *Scientific principles in alcoholic beverages*

SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher is encouraged to adopt group work (mixed-ability and mixed-gender), structured talk for learning and problem-based learning approaches, which consider the use of samples, charts, videos, posters, etc., on Food Production Technology. The focus of these activities should be on food production, nutritional science and human health, to promote healthy growth

and development of the individual, family and society. The adoption of experiential learning approaches, where students are assigned to do projects and present their findings in class, could also be considered. Last but not least, the teacher should incorporate GESI, SEN, SEL, the 21st Century skills, National Core Values and ICT in the lesson delivery to make the lesson learner-centred.

ASSESSMENT SUMMARY

Teachers are encouraged to employ a range of assessment methods and tasks to evaluate learners' achievement levels in relation to the Depth of Knowledge (DoK). It is important that these assessment activities are aligned with the learning indicators and the pedagogical exemplars to ensure coherence between what is taught, how it is taught, and how learning is assessed. Teachers are also required to carry out these assessments, document the results, and submit them through the Student Transcript Portal (STP). Each learner will be assessed and recorded based on the following:

<i>Week 18: Mid – semester examination</i>	<i>Week 22: Practical</i>
<i>Week 19: Report Writing</i>	<i>Week 23: Practical</i>
<i>Week 20: Poster Presentation</i>	<i>Week 24: End of semester examination</i>
<i>Week 21: Group Discussion and Presentation</i>	

WEEK 18: TYPES OF BEVERAGES

Learning Indicators

Discuss the types of beverages and their uses.

FOCAL AREA: TYPES OF BEVERAGES AND THEIR USES

1. The concept of beverages

Beverages are liquid substances that are consumed to quench thirst/ hydration or for pleasure/ enjoyment. Or Beverage is a flavoured drink that is either refreshing, nourishing or stimulating. It can be sweetened or unsweetened. They come in a wide variety of types, catering to different tastes and preferences. The beverages are classified under the following types:

- a. **Alcoholic Beverages:** These beverages are drinks that contain ethanol (alcohol) as the primary psychoactive ingredient. They are produced through the fermentation and/or distillation of grains, fruits or other natural ingredients. Alcoholic beverages are popular for social, cultural and recreational purposes, but they should be consumed responsibly due to their potential for intoxication and negative health effects when consumed in excess. They include soft and hard liquor such as beer, wine and spirits.



Figure 4.1: Alcoholic beverages (Alcoholic beverages, n.d.)

- b. **Non-alcoholic Beverages:** These beverages are drinks that do not contain alcohol or have very low alcohol content or stimulants. These beverages are popular for hydration, refreshment, stimulation, and nourishment. They include water, juices, soft drinks, coffee, smoothies and milk. Types of non–alcoholic beverages include:
 - i. **Stimulating beverages:** They are beverages that increase alertness, energy and attention, but when consumed frequently and too much, can elevate blood pressure, heart rate and respiration because some of them contain caffeine. E.g., tea, coffee, ginger drink.

- ii. **Refreshing beverages:** They are beverages that refresh and are good for vitality. E.g., Carbonated drinks, fruit drinks, vegetable drinks, etc.
- iii. **Nourishing beverages:** They nourish the body and have health benefits, such as improving digestion processes and encouraging peristaltic waves. They may have electrolytes that improve body functions (Fluid balance, nerve function, and muscle function. E.g., cereal, local drinks – millet drink (Zonkom), milk drink/shake, cocoa drink, coconut drink, etc.



Figure 4.2: Non-alcoholic beverage (Non-alcoholic beverages, n.d.)

2. Uses of beverages

Beverages serve various purposes and are used for a wide range of reasons. The uses of beverages depend on their types and properties. Here are some common uses of beverages:

- a. **Hydration:** One of the primary uses of beverages is to hydrate the body. Water and other hydrating beverages help maintain the body's fluid balance and prevent dehydration.
- b. **Quenching thirst:** Beverages, especially cold and refreshing ones such as water, juice, lemonade and iced tea, are used to quench thirst and provide relief on hot days.
- c. **Nutrition:** Many beverages, such as milk, fruit juices and smoothies, provide essential nutrients, including vitamins, minerals and antioxidants, which contribute to overall nutrition.
- d. **Energy boost:** Beverages containing caffeine, such as coffee and energy drinks, are used to provide a quick energy boost and increase alertness.
- e. **Social enjoyment:** Beverages, including coffee, tea, soft drinks and cocktails, are often enjoyed in social settings, such as gatherings, parties and celebrations.

3. Factors to consider when selecting beverages

These factors may vary depending on individual preferences, dietary needs and health goals. These are some important factors to consider when choosing beverages:

- a. **Nutritional content:** Check the nutritional information on the label to assess the calories, sugar content, vitamins, minerals and other nutrients present in the beverage.
- b. **Sugar content:** Be mindful of the sugar content in beverages, especially in soft drinks, fruit juices and flavoured beverages.
- c. **Health conditions:** Consider any health conditions or medical considerations.
- d. **Environmental impact:** Consider the environmental impact of the beverage's packaging and production.

Learning Tasks

1. Develop concept maps and discussions on types of beverages.
2. Discuss the functions and uses of beverages.
3. Explanations of the factors to consider when selecting beverages.
4. Surf the internet and other sources for further information on the types of beverages, beverage production and beverage service.

Pedagogical Exemplars

Arrange learners into mixed groups by ability, gender, culture or ethnicity and have them brainstorm on the meaning of beverages. Guide learners in their groups to surf the internet or read text to identify the types, functions and uses of beverages. Each group should share their insights with the class, promoting peer learning and encouraging acceptance of various perspectives during presentations and discussions. Teachers should facilitate these discussions to ensure understanding among all learners. Learners who are less engaged should receive personalised instruction and targeted questions to evaluate their understanding, while those who demonstrate advanced knowledge should be assigned more complex tasks

1. Group work/Collaborative Learning

- a. In friendship/mixed ability/buzz groups, brainstorm the meaning of beverages.
- b. Surf the internet for information on types of beverages.

2. Group work

- a. With a pyramid group/concept map/spider web, discuss the types of beverages and their uses.
- a. Share the group report in a plenary session for peer review.

3. Talk for Learning Approach: In a whole-class discussion, use the snowball strategy to discuss factors that influence the selection and use of beverages for healthy living.

- a. Nutritional content
- b. Health condition
- c. Sugar content
- d. Environmental impact

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 1: Recall

- a. Outline at least **three** types of beverages and their functions.
- b. State at least **three** uses of beverages in meal service.

2. DoK Level 3: Strategic reasoning

Discuss at least **two** beverages that can be used for any of the following functions and explain why they are considered suitable for that specific function.

- a. Wedding
- a. Funeral
- b. Outdoor events
- c. Annual family reunion

Hint



The recommended mode of assessment for Week 18 is **Mid-semester examination**. Refer to **Appendix K** at the end of Section 4 for further information on how to go about this assessment mode.

WEEK 19: SCIENTIFIC PRINCIPLES IN SELECTION, PROCESSING AND PRESERVATION OF BEVERAGES

Learning Indicator: *Explain the scientific principles involved in the selection, processing, and preservation of beverages*

FOCAL AREA: SCIENTIFIC PRINCIPLES INVOLVED IN THE SELECTION, PROCESSING, AND PRESERVATION OF BEVERAGES

This content explores the scientific principles guiding the production, selection, processing, and preservation of beverages. Understanding these principles ensures that beverages are safe, nutritious, and of high quality while also promoting best practices in food science and technology.

1. General Principles of Beverage Production

To achieve consistent, safe, and high-quality beverages, the following general principles must be followed:

- a. **Quality Ingredients:** Use fresh and high-quality raw materials (e.g., fresh fruits, clean water, fresh dairy or plant-based ingredients) to ensure safety, flavour, and nutritional value.
- a. **Cleanliness:** Maintain hygiene throughout the preparation process. Clean utensils, equipment, and work surfaces prevent contamination and spoilage.
- b. **Safety:** Follow standard food safety guidelines such as hand washing, sanitising equipment, and avoiding cross-contamination.
- c. **Measurement:** Accurate measurement of ingredients ensures consistency in taste, texture, and nutritional content across batches.
- d. **Temperature Control:** Monitor and maintain appropriate temperatures during preparation, storage, and processing to preserve flavour and avoid spoilage.

2. Specific Principles for Making Different Beverages

Different types of beverages require specific scientific principles to ensure the best flavour, safety, and nutritional retention:

- a. **Tea:** The goal is to extract flavour compounds while minimising tannin extraction, which can cause bitterness. Use water at an optimal temperature (around 85–90°C) and avoid over-steeping.
- a. **Coffee:** The principle is to extract the maximum amount of caffeine and flavour compounds while minimising bitterness from tannins. Water should be heated to about 90–96°C for best results.
- b. **Cocoa:** Cocoa contains starch, which requires cooking (boiling) to break down. This improves texture and digestibility while developing flavour.

- c. **Fruit-Based Beverages:** The aim is to retain water-soluble vitamins, especially vitamin C. Cold processing and minimal exposure to heat and light help maintain nutrient content.

3. Selection of Beverages

The selection of ingredients and finished beverages must consider quality, origin, and regulatory standards:

- a. **Quality Control:** Evaluate beverages for taste, texture, appearance, freshness, and nutritional content. Poor quality ingredients negatively impact the final product.
- a. **Source and Origin:** The origin of ingredients influences their flavour profile and quality. Locally-sourced ingredients may be fresher, while imported options may offer variety but with different quality levels.
- b. **Regulatory Compliance:** Ensure that beverages meet food safety regulations, including labelling, permitted ingredients, and shelf-life standards set by local or international agencies.

4. Processing of Beverages

Processing techniques help enhance safety, improve shelf life, and optimise product quality:

- a. **Filtration:** Removes solids, impurities, and unwanted particles from liquids to improve clarity, taste, and hygiene.
- a. **Pasteurisation:** A mild heat treatment that kills harmful microorganisms without significantly altering taste or nutrition. Common in milk, fruit juices, and some non-alcoholic drinks.
- b. **Carbonation:** Carbon dioxide gas is added to drinks like soda to enhance mouthfeel and taste. It also acts as a mild preservative.
- c. **Homogenisation:** Breaks down particles in a liquid to ensure uniform consistency and prevent separation (e.g., in dairy-based or fruit beverages).

5. Preservation of Beverages

Preservation methods extend the shelf life of beverages and maintain safety:

- a. **Sterilisation:** Involves high-temperature treatment to completely destroy microorganisms, ensuring longer shelf life, especially in canned or bottled beverages.
- a. **Packaging:** Proper packaging (e.g., glass bottles, plastic containers, tetra packs) prevents contamination and exposure to air, light, or microbes.
- b. **Refrigeration:** Slows microbial growth and enzymatic activity. Essential for perishable beverages like fruit juice, milk-based drinks, and fresh teas.
- c. **Preservatives:** Chemical preservatives (e.g., benzoates, sorbates) are added in controlled amounts to inhibit microbial growth and spoilage.

Learning Tasks

1. Explain the general principles of beverage production
2. Discuss the selection, processing and preservation of beverages.
3. Surf the internet for more information on the scientific principles of beverages

Pedagogical Exemplars

Put learners into mixed groups to brainstorm on the scientific principles of beverage production. Guide learners in their groups to surf the internet or read text to identify the specific principles for beverage production. Each group should share their insights with the class, promoting peer learning and encouraging acceptance of various perspectives during presentations and discussions. Teachers should facilitate these discussions to ensure understanding among all learners. Learners who are less engaged should receive personalised instruction and targeted questions to evaluate their understanding, while those who demonstrate advanced knowledge should be assigned more complex tasks

Experiential Learning/Collaborative Learning

- a. In mixed groups, explain the scientific principles involved in the selection, processing, and preservation of beverages.

Creativity and innovation: Ability to exhibit new ideas on the principles of beverage production.

- a. Guide learners in their groups to surf the internet or read text to identify the specific principles for beverage production
- b. Each group should share their insights with the class, promoting peer learning and encouraging acceptance of various perspectives during presentations and discussions.

Key Assessment

1. DoK Level 2 Skills of conceptual understanding

Explain the scientific principles in the selection, processing, and preservation of beverages.

Hint



- The recommended Mode of Assessment for week 19 is **Report writing**. The outline indicating a detailed scope and rubrics for learners on project-based assessment has been provided in **Appendix Q**. See the Teacher Assessment Manual and Toolkit page (74-75) for more information on how to organise report writing as an assessment mode.
- Teachers are expected to give Homework to learners in week 19. Learners are expected to submit work in week 20 for scoring.

WEEK 20: ENRICHMENT AND FORTIFICATION OF BEVERAGES (1)

Learning Indicator: Analyse how to enrich or fortify beverages to meet the food, nutrition and social needs of individuals, families and society.

FOCAL AREA: ENRICH OR FORTIFY BEVERAGES

2. Beverage production, enrichment and fortification

Beverage production, enrichment and fortification are processes aimed at creating or enhancing the nutritional value, taste and overall quality of beverages. These processes involve the addition of various ingredients to improve the product's health benefits, flavour, texture and shelf life.

- a. **Beverage production:** Beverage production involves the creation of various types of drinks, starting from raw materials to the finished product. The production process may vary depending on the type of beverage being made, such as soft drinks, fruit juices, tea, coffee, dairy-based beverages and alcoholic beverages.
- a. **Enrichment:** This refers to the addition of specific nutrients or substances to a beverage to increase its nutritional value. This is particularly common in juices, milk and certain health drinks. E.g., fruit juices may be enriched with added vitamins (such as vitamin C or vitamin D) to enhance their nutritional profile. Milk may be enriched with vitamins A and D or calcium to improve its health benefits.
- b. **Fortification:** Fortification is a process in which essential vitamins, minerals, or other bioactive compounds are added to beverages to address specific nutrient deficiencies in the population.

3. Food substances used for beverage enrichment and fortification

The substances used for enrichment and fortification can vary based on the specific nutrients targeted and the type of beverage. These are some common food substances used for beverage enrichment and fortification:

- a. **Vitamins:** Various water-soluble and fat-soluble vitamins can be added to beverages. Vitamin C (ascorbic acid) is commonly added to fruit juices and drinks due to its antioxidant properties. Vitamin D is often added to milk and plant-based milk alternatives to support bone health. B-complex vitamins, such as thiamine, riboflavin, niacin, vitamin B6 and vitamin B12, may also be added to energy drinks and fortified beverages.
- a. **Minerals:** Minerals like calcium, iron, zinc, magnesium and potassium are frequently used for fortification. Calcium may be added to certain fruit juices or beverages to promote bone health. Iron is commonly added to some fortified drinks to address iron deficiency. Magnesium and potassium are minerals that may be added to sports and energy drinks to support electrolyte balance.
- b. **Proteins:** Protein-enriched beverages are popular among athletes and individuals looking to increase their protein intake. Proteins from sources like whey, casein, soy,

or plant-based protein isolates can be added to smoothies, shakes and nutritional beverages.

- c. **Fibre:** Fibre can be added to certain beverages, such as fruit juices and smoothies, to increase their dietary fibre content. Soluble fibre from sources like psyllium husk or inulin is commonly used.
- d. **Omega-3 Fatty Acids:** Some fortified beverages, especially milk and milk alternatives, may contain added omega-3 fatty acids, such as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which are essential for brain health.
- e. **Plant Extracts:** Certain beverages may be enriched with plant extracts like green tea extract, ginseng, or echinacea for their potential health benefits.

3. Benefits of beverage fortification and enrichment to individuals, families and society.

Individual Benefits

- a. **Improved nutrition:** Fortified and enriched beverages support overall health and well-being by providing essential vitamins, minerals, and other nutrients.
- b. **Addressing deficiencies:** Targeted fortification addresses issues of specific micronutrient deficiencies, such as iron or vitamin D deficiency.
- c. **Enhanced cognitive function:** Fortified or enriched beverages, with omega-3 fatty acids, support brain health and cognitive function, especially in children.

Family Benefits

- a. **Convenient nutrition:** Fortified and enriched beverages can be a convenient way to ensure family members, especially children, receive essential nutrients.
- b. **Supporting healthy habits:** Enriched or fortified beverages can be a good alternative for sugary or fizzy drinks.
- c. **Reducing healthcare costs:** Fortified and enriched beverages can help reduce healthcare costs for families by addressing nutritional deficiencies.

Societal Benefits

- a. **Public health improvement:** In places where there are high rates of micronutrient deficiencies, the adoption of fortified and enriched beverages can help to improve public health.
- b. **Economic benefits:** By promoting healthy habits and reducing healthcare costs, fortified and enriched beverages can have a positive impact on the economy.
- c. **Food security:** Fortification and enrichment can help by providing essential nutrients to populations with less access to food

Learning Tasks

1. Discussions on beverage production, enrichment and fortification.
2. Identification of food substances used for beverage enrichment, fortification and their functions.

Pedagogical Exemplars

Arrange learners into mixed groups to discuss the enrichment and fortification of beverages and the reasons. Guide learners in their groups to surf the internet or read text. Each group should share their insights with the class, promoting peer learning and encouraging acceptance of various perspectives during presentations and discussions. Teachers should facilitate these discussions to ensure understanding among all learners. Learners who are less engaged should receive personalised instruction and targeted questions to evaluate their understanding, while those who demonstrate advanced knowledge should be assigned more complex tasks.

1. **Group Work/Collaborative Learning:** In friendship groups/gender-based groups/random grouping, explain beverage enrichment/fortification, functions and present in class.
2. **Experiential Learning:** Watch videos/surf the internet/talk to friends on beverage enrichment or fortification.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

Explain the concept of beverage enrichment and fortification and give at least **two** reasons for beverage enrichment/fortification.

2. DoK Level 3: Strategic reasoning

Analyse at least **two** ways beverages can be enriched or fortified to meet the nutritional needs of a specific group of people. E.g. the elderly, children

Hint



*The recommended Mode of Assessment for week 20 is **Poster Presentation**. The outline indicating a detailed scope and rubrics for learners on project-based assessment has been provided in **Appendix F** of Section 1. See Teacher Assessment Manual and Toolkit pages (76–78) for more information on how to organise a poster assessment.*

WEEK 21: ENRICHMENT AND FORTIFICATION OF BEVERAGES (2)

Learning Indicator: Analyse how to enrich or fortify beverages to meet the food, nutrition and social needs of individuals, families and society.

FOCAL AREA: FUNCTIONS, NUTRITIONAL AND FOOD SAFETY, BEVERAGE ENRICHMENT AND FORTIFICATION

Functions of beverage enrichment and fortification

- 1. Nutrition and flavour enhancement:** Flavour enhancement involves the addition of natural or artificial flavours to beverages to improve taste and appeal to consumers.
- 2. Texture and mouth-feel improvement:** Certain additives, such as stabilisers and emulsifiers, are used in beverage production to improve texture and mouth-feel.
- 3. Shelf-life extension:** Preservatives and other additives may be used to extend the shelf life of beverages, ensuring that they remain safe and enjoyable for consumers over an extended period.
- 4. Health benefits:** Fortified beverages can help address micronutrient deficiencies, support immune function, or promote overall health.
- 5. Targeted nutrition:** Fortification can be specific to a particular section of the population, e.g. children, pregnant women, or athletes, to meet their unique nutritional needs.
- 6. Functional benefits:** Helps with hydration issues, energy giving, and cognitive support.
- 7. Product differentiation:** Enrichment can help beverages stand out in a competitive market by offering special features or benefits.

Nutritional and food safety implications of beverage enrichment and fortification

Consumers should be aware of the potential benefits and risks associated with fortified beverages and make informed decisions based on their individual dietary needs and health conditions.

Table 4.1: Benefits and risks associated with fortified beverages

Nutritional implications	Food safety implications
Addressing nutrient deficiencies	Overconsumption
Improved nutritional profile	Quality control and stability
Promoting health benefits	Potential interactions
Convenient and handy	Allergies and sensitivities
Accessibility	Adverse effects

Learning Task

Discussions on the nutritional and food safety implications of beverage enrichment and fortification.

Pedagogical Exemplars

Arrange learners into mixed groups to discuss the functions of enrichment and fortification of beverages. Guide learners in their groups to surf the internet or read text. Each group should share their insights with the class, promoting peer learning and encouraging acceptance of various perspectives during presentations and discussions. Teachers should facilitate these discussions to ensure understanding among all learners. Learners who are less engaged should receive personalised instruction and targeted questions to evaluate their understanding, while those who demonstrate advanced knowledge should be assigned more complex tasks.

Group work: In pairs/mixed ability groups, discuss the nutritional/ safety implications for healthy living. Groups present their reports for the whole class discussion.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

Discuss the functions of beverage enrichment, fortification.

2. DoK Level 3: Strategic reasoning

Discuss at least **two** nutritional and food safety implications of beverage enrichment and fortification.

Hint



The recommended Mode of Assessment for week 21 is **Group Discussion and Presentation**. The outline indicating a detailed scope and rubrics for learners on project-based assessment has been provided in **Appendix O of Section 3**. See Teacher Assessment Manual and Toolkit page 27 for more information on how to organise project-based assessment.

WEEK 22: EXPERIMENT ON NON – ALCOHOLIC BEVERAGES (1)

Learning Indicator: *Conduct experiments to produce non-alcoholic beverages using local food commodities that meet the needs of individuals, families and society.*

FOCAL AREA: EXPERIMENTS TO PRODUCE NON-ALCOHOLIC BEVERAGES

The main steps in beverage production

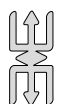
1. **Pre-preparation activities**
 - a. Ingredients sourcing
 - b. Cleaning and processing of raw materials
2. **Preparation activities**
 - a. Mixing or blending
 - b. Squeezing
 - c. Pasteurisation or sterilisation (if necessary)
 - d. Filtration
3. **Post preparation activities**
 - a. Packaging
 - b. Cleaning and tidying up

Producing, enriching and fortifying non-alcoholic beverages

This involves a series of steps to create beverages that are flavourful, nutritious and meet specific consumer preferences. The steps and processes involved in producing enriched and fortified non-alcoholic beverages include:

- a. **Selection of base ingredients:** Choose the main ingredients for the non-alcoholic beverage such as water, fruit juices or botanical extracts.
- b. **Processing and preparation:** Prepare the ingredients by cleaning, peeling and cutting fruit or vegetables.
- c. **Extraction:** Extract juices, pulps or concentrates from the chosen ingredients.
- d. **Blending and mixing:** Combine the extracted juices, pulps, concentrates and other ingredients in the desired proportions. Mix the ingredients thoroughly to create a uniform blend.
- e. **Sweetening and flavouring:** Add sweeteners such as sugar, honey or alternative sweeteners based on the desired level of sweetness. Incorporate natural or artificial flavours to enhance the taste profile of the beverage.

- f. **Enrichment and fortification:** Identify the nutritional elements to be added to the beverage such as vitamins, minerals, amino acids or antioxidants. Measure and add the desired nutrients to the beverage mixture.
- g. **Filtration and clarification:** Pass the beverage through filters to remove any solids, particles or impurities. Clarify the beverage to achieve a clear and
- h. visually appealing appearance.
- i. **Carbonation (for carbonated beverages):** Introduce carbon dioxide gas into the beverage to create carbonation and bubbles. Adjust the level of carbonation according to the desired effervescence.



Note

Enrichment may involve adding vitamins, minerals or nutrients to improve the beverage's nutritional content. Fortification may include adding additional flavours or ingredients for functional benefits.



Figure 4.3: Select fruits (oranges)



Figure 4.4: Squeeze oranges



Figure 4.5: Bottle orange juice

Learning Tasks

1. Interview selected families in your community to find out what local beverage resources are available to individuals, families and societies.
2. Produce a work plan for preparing and enriching a local beverage.
3. Conduct experiments to prepare, enrich/fortify and package local beverages.

Pedagogical Exemplars

- Learners will observe the teacher or watch a video on how to prepare, enrich or fortify beverages using local ingredients.
- Put learners into groups. The teacher will assign a local beverage to each group to produce and demonstrate how to enrich or fortify the beverage using local ingredients.
- Teachers should provide each group with the necessary instructions, raw ingredients and resource materials, e.g., mixing jugs, stirrers and display glasses to produce and package the beverage.

- Teachers should monitor the experiment to provide support when necessary. Learners will prepare the beverage and write down the procedures they followed.
- Guide learners to package their alcoholic beverages appropriately and display them for appraisal.
- The groups should prepare a presentation for the whole class and explain the experiment, including the ingredients required and the procedures they followed to produce the beverage.

1. Experiential Learning: Observe/watch a video on how to prepare, enrich or fortify beverages using local ingredients.

E.g. using sobolo leaves/ Hibiscus flower, prekese, turkey berry to enrich beverages, etc.

2. Group work

- In smaller groups/ task groups/Jigsaw with cross grouping/mixed ability groups, experiment and produce enriched/fortified local beverages (non – alcoholic)
- Learners display work for appraisal.

3. Group Work

- Reflect and write a report on beverage enrichment and fortification
- Encourage groups to choose different ways of presenting their work, e.g., videos, PowerPoint, charts or written, etc.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

- Write the recipe, the ingredients and their quantities, method, tools and equipment needed to prepare a local non-alcoholic beverage of your choice.
- Produce a work plan to prepare and enrich/fortify a beverage of your choice using local food commodities.

2. DoK Level 3: Strategic reasoning

Practical activities: Follow your work plan to prepare and package your selected local beverage for appraisal.

3. DoK Level 4: Extended critical thinking and reasoning

Reflect on the experiment conducted and write a report on the process of beverage enrichment and fortification.

Hint



The recommended mode of assessment for Week 22 is **Practical**. Refer to **Appendix L** at the end of Section 4 and the teacher assessment manual and toolkit pages 37 and 128 for further information on how to go about this assessment mode.

WEEK 23: EXPERIMENT ON NON – ALCOHOLIC BEVERAGES (2)

Learning Indicator: Conduct experiments to produce non-alcoholic beverages using local food commodities that meet the needs of individuals, families and society.

FOCAL AREA: EXPERIMENTS TO PRODUCE NON-ALCOHOLIC BEVERAGES (2)



Figure 4.6: Local fortified beverage

1. Prepare, enrich or fortify beverages using local ingredients

E.g., using sobolo leaves/ Hibiscus flower, prekese, turkey berry to enrich beverages, etc.

Experiment 1: Ginger and Turmeric Infused Water

Ingredients

- Fresh ginger
- Fresh turmeric
- Water
- Honey or lemon (optional)

Method

- a. Slice ginger and turmeric.
- b. Infuse in water for 30 minutes to 1 hour.
- c. Strain and add honey or lemon as desired.

Benefits

- a. Anti-inflammatory properties
- b. Supports digestive health and immune function

Experiment 2: Coconut Water with Pineapple and Mint

Ingredients

- Fresh coconuts
- Pineapple chunks
- Fresh mint leaves
- Ice

Method

- a. Extract coconut water.
- b. Blend with pineapple and mint.
- c. Serve chilled.

Benefits

- a. Rich in electrolytes and potassium.
- b. Supports hydration and digestive health.

Experiment 3: Sorghum-Based Fermented Beverage

Ingredients

- Sorghum grains
- Water
- Starter culture (optional)

Method

- a. Soak and cook sorghum grains.
- b. Ferment with starter culture or natural yeast.
- c. Filter and bottle.

Benefits

- a. Rich in probiotics and fibre.
- b. Supports gut health and immune function.

Experiment 4: Hibiscus Flower / Sobolo Tea

Ingredients

- Dried hibiscus flowers
- Water
- Honey or lemon (optional)

Method

- a. Steep hibiscus flowers in hot water.
- b. Strain and add honey or lemon as desired.

Benefits

- a. Rich in vitamins and minerals.
- b. Supports heart health and antioxidant function.

Learning Tasks

1. Produce a work plan for preparing and enriching local beverages.
2. Conduct experiments to prepare, enrich/fortify and package local beverages.

Pedagogical Exemplars

- Learners will observe the teacher or watch a video on how to prepare, enrich or fortify beverages using local ingredients
- Put learners into groups. The teacher will assign a local beverage to each group to produce and demonstrate how to enrich or fortify the beverage using local ingredients.
- Teachers should provide each group with the necessary instructions, raw ingredients and resource materials, e.g., mixing jugs, stirrers and display glasses to produce and package the beverage.
- Teachers should monitor the experiment to provide support when necessary. Learners will prepare the beverage and write down the procedures they followed.
- Guide learners to package their alcoholic beverages appropriately and display them for appraisal.
- The groups should prepare a presentation for the whole class and explain the experiment, including the ingredients required and the procedures they followed to produce the beverage.

1. **Experiential Learning:** Observe/watch a video on how to prepare, enrich or fortify beverages using local ingredients.

E.g., using sobolo leaves/ Hibiscus flower, prekese, turkey berry to enrich beverages, etc.

2. **Experiential Learning/Group work:** In smaller groups/ task groups/Jigsaw with cross grouping/mixed ability groups, experiment and produce enriched/fortified local beverages (non - alcoholic). Learners display work for appraisal.

3. Group Work

- a. Reflect and write a report on beverage enrichment and fortification
- b. Encourage groups to choose different ways of presenting their work, e.g., videos, PowerPoint, charts or written, etc.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

- a. Write the recipe, the ingredients and their quantities, method, tools and equipment needed to prepare a local non-alcoholic beverage of your choice.
- b. Produce a work plan to prepare and enrich/fortify a beverage of your choice using local food commodities.

2. DoK Level 3: Strategic reasoning

Practical activities: Follow your work plan to prepare and package your selected local beverage for appraisal.

3. DoK Level 4: Extended critical thinking and reasoning

Reflect on the experiment conducted and write a report on the process of beverage enrichment and fortification.

Hint



The recommended Mode of Assessment for week 23 is **Practical**. A sample outline indicating a detailed scope and rubrics for learners on Practical assessment has been provided in **Appendix R**. See the Teacher Assessment Manual and Toolkit page (37 –39) for more information on how to organise Practical as a mode of assessment.

WEEK 24: SCIENTIFIC PRINCIPLES IN ALCOHOLIC BEVERAGES

Learning Indicator: Evaluate how scientific principles influence alcoholic beverage production using local food commodities.

FOCAL AREA: ALCOHOLIC BEVERAGE PRODUCTION



Figure 4.7: Local drink Pito production. (Pito production, n.d.)

1. Producing, enriching and fortifying alcoholic beverages

Producing, enriching, and fortifying alcoholic beverages involves several steps and processes to create products that meet desired quality, flavour and nutritional standards.

The steps involved in producing enriched and fortified alcoholic beverages:

Step 1: Selection of Raw Materials

- a. Choose local food commodities rich in fermentable sugars or starches, such as:
- b. Cereal grains (sorghum, millet, maize, rice)
- c. Tubers (cassava, yam, sweet potatoes)
- d. Fruits (pineapple, banana, palm sap, grapes)
- e. Sugar-rich sources (honey, sugarcane, molasses)

Step 2: Preparation of Raw Materials

- a. Starchy grains and tubers
- b. Clean and crush/mash to expose starches.
- c. Malting (if applicable)
- d. Cooking/Boiling
- e. Add enzymes (e.g., amylase)

Step 3: Fermentation (Alcohol Formation)

- a. Add yeast (e.g., *Saccharomyces cerevisiae*) to the prepared sugar-rich mixture.
- b. Control fermentation conditions:
 - i. Temperature: Maintain an optimal range (25-35°C) for yeast activity.
 - ii. Oxygen restriction: Seal the fermentation vessel to promote anaerobic conditions, necessary for alcohol production.

- iii. Duration: Allow fermentation for 3–14 days, depending on the beverage type.
- iv. Chemical Reaction: Yeast converts sugars into ethanol and carbon dioxide.

Step 4: Filtration and Clarification

- a. After fermentation, filter the liquid to remove solid residues.
- b. Let it settle or use filtration techniques to achieve a clear beverage.

Step 5: Distillation (For Spirits and Strong Alcoholic Beverages)

- a. Heat the fermented liquid in a distillation apparatus.
- b. Collect ethanol vapours at around 78.37°C and condense them into liquid form.
- c. Repeat distillation if a higher alcohol concentration is required.

Step 6: Maturation and Ageing (If required)

- a. Store the beverage in barrels, clay pots, or glass containers to enhance flavour and aroma.
- b. Duration varies:
 - i. Local palm wines are consumed fresh.
 - ii. Spirits and some wines require months to years of ageing.

Step 7: Packaging and Preservation

- a. Bottle or store the beverage in sterilised containers.
- b. Use preservatives (e.g., natural herbs or chemical stabilisers) if necessary.
- c. Seal properly to prevent contamination.

Step 8: Quality Testing and Serving

- a. Check for alcohol content using a hydrometer or alcohol meter.
- b. Taste and adjust the beverage as needed before serving.

Processes of Enrichment

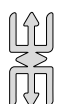
- a. Addition of natural ingredients
- b. Ageing and maturation
- c. Fermentation control, etc.

Process of fortification

- a. Vitamin and mineral addition
- b. Functional ingredient fortification
- c. Incorporation of antioxidants from natural extracts to boost health benefits
- d. Alcohol content adjustment
- e. Use of herbal infusions, etc.

2. Scientific Production in Alcoholic Beverage Production

- a. Fermentation (Biochemical Principle)
 - i. Microbial Activity
 - ii. Raw Materials
 - iii. Enzymatic Action
- b. Distillation (Physical and Chemical Principles)
 - i. Boiling Point Differences
 - ii. Fractional Distillation
- c. Quality and Safety Control (Microbiological & Chemical Principles)
 - i. Pasteurisation or Filtration
 - ii. Ethanol Concentration Measurement
 - iii. Toxin Reduction
- d. Flavour and Aroma Development (Biochemical and Sensory Science)
 - i. Esters and Phenolics
 - ii. Ageing and Maturation
- e. Preservation and Shelf Life (Food Chemistry)
 - i. pH Control
 - ii. Natural Preservatives



Note

Enrichment may involve adding vitamins, minerals or nutrients to improve the beverage's nutritional content. Fortification may include adding additional alcohol, flavours or ingredients for functional benefits.

Learning Tasks

1. Search for further information on alcoholic beverages and conduct personal experiments to prepare, enrich and fortify different types of beverages.
2. Produce a work plan for preparing and enriching a local beverage
3. Conduct experiments to prepare, enrich/fortify and package local alcoholic beverages

Pedagogical Exemplars

- Learners will observe the teacher or watch a video showing steps and processes of how to prepare, enrich or fortify alcoholic beverages using local ingredients.
- Put learners into groups in terms of their ability, gender, culture and ethnicity. The teacher will assign an alcoholic beverage to each group to produce and demonstrate how to enrich or fortify the beverage using local ingredients.

- Teachers should provide each group with the necessary instructions, raw ingredients and resource materials, e.g., mixing jugs, stirrers and display glasses to produce and package the beverage.
 - Teachers should monitor the experiment to provide support when necessary. Learners will prepare the alcoholic beverage and write down the procedures they followed. Guide learners to package their alcoholic beverages appropriately and display them for appraisal.
 - The groups should prepare a presentation for the whole class and explain the experiment, including the ingredients required and the procedures they followed to produce the beverage.
1. **Experiential Learning:** Observe/watch a video on how to prepare, enrich or fortify beverages using local ingredients. Surf the internet and other sources to identify the scientific principles that guide alcoholic beverage production.
 2. **Experiential Learning/Group work**
 - a. In smaller groups/ task groups/Jigsaw with cross grouping/mixed ability groups, apply the scientific principles to conduct experiments and produce enriched/fortified local alcoholic beverages.
 - b. Display your alcoholic beverages for appraisal.

Key Assessment

The teacher should focus on formative assessments by choosing from the following exemplars or creating their own formative assessment activities.

1. DoK Level 2: Skills of conceptual understanding

- a. Write the recipe, the ingredients and their quantities, method, tools and equipment needed to prepare a local alcoholic beverage of your choice.
- b. Produce a work plan to prepare and enrich/fortify a beverage of your choice using local food commodities.

2. DoK Level 3: Strategic reasoning

Practical activities: follow your work plan to prepare and package your selected local beverage for appraisal. Write reports for class presentations and appraisals.

3. DoK Level 4: Extended critical thinking and reasoning

Reflect on the experiment conducted and write a report on the process of beverage enrichment and fortification.

Hint



The recommended mode of assessment for Week 24 is **End of 2nd semester examination**. Refer to **Appendix M** at the end of Section 4 for further information on how to go about this assessment mode.

SECTION 4 REVIEW

To conclude, the focus of Food Processing technique is to equip learners with a deep understanding of beverages, their scientific principles, enrichment and fortification, and then integrating practical applications on beverage production, both alcoholic and non – alcoholic. This prepares learners for adult life and the world of work.



APPENDIX K: Sample Table of Specification for Mid-Semester Examination

STRUCTURE OF THE EXAMS

PART 1- OBJECTIVES 40 MARKS. 1 MARK EACH

PART 2 – 6 ESSAY QUESTIONS. ANSWER 3 FOR 60 MARKS, 20 MARKS EACH

TOTAL – 100 MARKS

WEEK	FOCAL AREA	TYPE OF QUESTIONS	DOK LEVELS				TOTAL
			1	2	3	4	
13	Concept of food laboratories and their functions in food production	Multiple choice	1	2	1		4
		Essay		1	1		2
14	Types of kitchen laboratories lay-out and their implication in food production	Multiple choice	1	1	2		4
15	Factors that affect the planning and layout of food laboratories	Multiple Choice	2	1	1	-	4
		Essay	1	-	-		1
		Practical	-	-	-	-	-
16	Redesigning a Food Laboratory	Multiple	1	2	1	-	4
		Essay	-	1	-	-	1
		Practical	-	-	-	-	-
17	Personal, food and environmental hygiene in the food laboratory	Multiple choice	1	2	1		4
		Essay	-		1	-	1
Total			7	10	8		25

Total Number of Questions

Multiple choice question	20
Essay	5



APPENDIX L: Practical Assessment

Practical Assessment Task: Preparing and Packaging a Local Beverage

Task Description:

Follow your pre-written work plan to:

- **Prepare** a selected local beverage (e.g., *sobolo*, *asaana*, *lamugin*, etc.)
- **Package** it appropriately for consumer use or appraisal

You must:

- Apply principles of hygiene and food safety
- Choose and justify appropriate packaging for your beverage
- Ensure that your beverage is appealing, properly sealed, and ready for storage or sale

Scoring Rubric for Practical Assessment (Total: 15 Marks)

Criteria	Excellent (5 points)	Good (4 points)	Satisfactory (3 points)	Needs Improvement (2 points or below)
1. Beverage Preparation Process	Demonstrates full mastery of beverage preparation: proper hygiene, accurate measurements, efficient workflow; follows work plan with no errors.	Shows good preparation with few errors; maintains hygiene; mostly follows plan.	Preparation is adequate but lacks flow; may skip a step or be unhygienic in parts.	Poor preparation process; unhygienic, disorganised, or deviates from work plan.
2. Packaging and Suitability	Uses a clean, safe, and suitable container (e.g., plastic bottle, sealed sachet, glass jar); package matches beverage type and volume; sealed and labelled.	Uses a fairly appropriate package, but minor mismatch in volume, seal, or labelling.	Packaging is used but may lack seal, hygiene, or fit for product.	Packaging is not suitable or safe (e.g., used bottle, dirty, leaking, wrong size).
3. Creativity and Presentation	Highly appealing design (e.g., neat label, brand name, uniform filling); demonstrates creativity and some innovation; follows scientific food handling methods.	Generally presentable and attractive; makes effort at branding or hygiene techniques.	Basic presentation; labelling and appearance are plain or not well finished.	Little to no creativity; poorly presented; beverage unattractive or unlabelled.

Teacher Observation Checklist (During Practical Session)

Use this checklist to guide your scoring and feedback:

Assessment Item	Yes (✓)	No (✗)	Comment (if needed)
Student followed their work plan step-by-step			
Ingredients measured properly and hygiene observed (e.g., clean utensils, apron used)			
Beverage was properly cooked/brewed or mixed			
Package/container was clean and appropriate for beverage type			
Container was sealed correctly (airtight cap, tied bag, corked bottle, etc.)			
Label included product name, date, or basic instructions			
Scientific principles mentioned/applied (e.g., boiling, pasteurization, sterilization)			
Beverage appearance is attractive and neatly packaged			
Learner observed safety (no spillage, handled hot items carefully, etc.)			

Teacher Notes

- Examples of acceptable containers:
 - Clean reused PET bottles
 - Sachets sealed with heat or string
 - Glass bottles with corks or screw caps
- Encourage learners to add simple **branding** or **labeling**: name of beverage, best before date, or even a slogan



APPENDIX M: Sample Table of Specification for End of Semester 2 Examination

WEEK	FOCAL AREA	TYPE OF QUESTIONS	DOK LEVELS				TOTAL
			1	2	3	4	
13	Concept of food laboratories and their functions in food production	Multiple choice	1	1			2
		Essay	-	-	-	-	-
14	Types of kitchen laboratories layout and their implication in food production	Multiple choice	1	1	1	-	3
		Essay	-	1	-	-	1
		Practical					
15	Factors that affect the planning and layout of food laboratories	Multiple Choice	1	1	1	-	3
		Essay	-		-	-	-
		Practical	-	-	-	-	-
16	Redesigning a Food Laboratory	Multiple	1	1	1	-	3
		Essay	-	-	-	-	-
		Practical	-	-	-	-	-
17	Personal, food and environmental hygiene in the food laboratory	Multiple choice	1	2	1		4
		Essay	-	-	-	-	-
18	Types of beverages and their uses	Multiple choice	2	1	1		4
		Essay	-	-	1	-	1
		Practical	-	-	-	-	-
19	Scientific principles involved in the selection, processing, and preservation of beverages	Multiple choice	2	1	1		4
		Essay	-	1	-	-	1
		Practical	-	-	-	-	-
20	Enrich or fortify beverages	Multiple choice	-	2	2	-	4
		Essay	-	-	1	-	1
		Practical	-	-	-	-	-
21	Functions, nutritional and food safety, beverage enrichment and fortification	Multiple Choice	2	1	1		4
		Essay	-	1	-	-	1
		Practical	-	-	-	-	
22&23	Experiments to produce non-alcoholic beverages	Multiple choice	1	1	2		4
		Essay	-	1	-		1
		Multiple choice	-	2			2

24	Alcoholic beverage production	Multiple Choice	1	-	1		2
		Essay	1				1
		Practical					
			14	18	14		46

Total Number of Questions

Multiple Choice questions	40
Essay	6

References

1. Adigo, E. C., & Maddah, C. K. (2011). *Food and nutrition*. Kwadwoan Publishing: Accra.
2. *Alcoholic beverages*. (n.d.). Retrieved from <https://bellaellahotel.com/gallery/>
3. *Banana vendor*. (n.d.). Freepik. Retrieved from <https://www.freepik.com/photos/banana-vendors>
4. *Fish in freezer*. (n.d.). Retrieved from <https://dianesrestaurant.com/how-long-does-fresh-seafood-last-in-the-fridge/>
5. *Food Pyramid*. (n.d.). Pinterest. Retrieved from <https://www.pinterest.com/pin/102808803978626766/>
6. *Food storage containers*. (n.d.). Amazon. Retrieved from <https://www.amazon.com/Airtight-Containers-PantryStar-Organization>
7. *Hand washing*. (n.d.). Bioxsoap. Retrieved from <https://www.bioxsoap.co.tz/the-importance-of-hand-washing>
8. Leonardo Ai Image generator.
9. Ministry of Education. (2010). *Teaching Syllabus for Food and Nutrition*. CRDD.
10. Ministry of Education. (2010). *Teaching Syllabus for Management in Living*. Press, Accra.
11. *Non-alcoholic beverages*. (n.d.). iStockphoto. Retrieved from <https://www.istockphoto.com/photo/coca-cola-fanta-and-sprite-gm476209536-66435987>

