Geography

Senior High

Grade 12

Teacher Guide

Standards-Based

Department of Education

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Curriculum Panel (CP), Subject Advisory Committee (SAC) and Board of Studies (BOS) members are acknowledged for consideration and endorsement of the teacher guide.

Acronyms

AAL	Assessment As Learning
AFL	Assessment For Learning
AOL	Assessment Of Learning
BOS	Board of Studies
CDD	Curriculum Development Division
CP	Curriculum Panel
DA	Diagnostic Assessment
IHD	Integral Human Development
GoPNG	Government of Papua New Guinea
KSVA	Knowledge Skills Values and Attitudes
MTDG	Medium Term Development Goals
NDoE	National Department of Education
OBC	Outcomes-Based Curriculum
OBE	Outcomes-Based Education
PNG	Papua New Guinea
SAC	Subject Advisory Committee
SBC	Standards-Based Curriculum
SBE	Standards-Based Education
SCG	Subject Curriculum Group
STEAM	Science, Technology, Engineering, Arts and Mathematics

Secretary's Message

The ultimate aim of Standards-Based Education (SBE) in Papua New Guinea is to prepare students for careers, higher education, and citizenship. SBE will therefore focus on providing students with careers, higher education, and citizenship preparedness knowledge, skills, values and attitudes that they can use to work, study and live in the 21st century.

Standards-Based Curriculum (SBC) in PNG is closely aligned to and is key to achieving this aim and its related operational goals. The curriculum is underpinned by four key pillars:

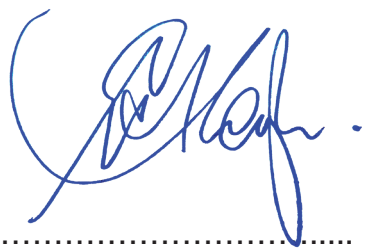
- morals, values and attitudes;
- cognitive, reasoning, decision-making, problem-solving, high level and 21st century skills;
- Science, Technology, Engineering, Arts and Mathematics (STEAM),
- core curriculum.

Social Science is a significant curriculum framework for teaching children and enabling them to progressively develop proficiency on fundamental ideas of Geography, History, Political Science Economics and Environment. This curriculum addresses Social Science skills and processes of geography, civic and cultural literacy, historical and economical literacy and global awareness.

Thus, students will be able to make informed decisions and will be equipped with problem–solving and management knowledge, skills, values and attitudes in Social Science. This enables them to function effectively in the work and higher education environments as productive and useful citizens of a culturally diverse and democratic society in an interdependent world.

Social Science teachers are expected to effectively plan, teach, and assess these knowledge, skills, values, and attitudes. This teacher guide describes what teachers are expected to know and do to enable all their students to effectively learn and demonstrate the expected levels of proficiency in all the grade level Social Science knowledge, skills, values and attitudes, and attain the national content standards.

I commend and approve this Grade 12 Social Science Geography Teacher Guide to be used by teachers in all high schools throughout Papua New Guinea.



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UKE W. KOMBRA, PhD.
Secretary for Education

Introduction

Social Science aims to develop and instill in students the ability to gauge views from all spectrums of life and be able to analyse and make proper judgments and statements to resonate and promote peace and harmony for all people. As individuals, they must be aware of issues of paramount importance affecting their daily lives such as their social groupings and institutions, governance and the natural world surrounding them. Thus, they are able to create and foster great cohesion within their locality which should have an impact on the world and over to sustain and maintain life.

The study of Social Science enhances students' understanding of inter-disciplinary concepts and issues in relation to geography, history, politics, economics and environment within PNG and globally.

Social Science aims to provide a meaningful pedagogical framework for teaching and learning essential and in demand knowledge, skills, values, and attitudes that are required for the preparation of students for careers, higher education and citizenship in the 21st century.

Students should be prepared to gather and understand information, analyse issues critically, learn independently or collaboratively, organize and communicate information, draw and justify conclusions, create new knowledge, and act ethically.

Students' employability will be enhanced through the study and application of STEAM principles. STEAM is an integral component of the core curriculum. All students are expected to study STEAM and use STEAM related skills to solve problems relating to both the natural and the physical environments. The aim of STEAM education is to create a STEAM literate society. It is envisioned that the study of STEAM will motivate students to pursue and take up academic programs and careers in STEAM related fields. STEAM has been embedded in the Social Science curriculum. Equal opportunities should be provided for all students to learn, apply and master STEAM principles and skills.

Social Science is to be timetabled for 240 minutes per week in grade 12.

Structure of the Teacher Guide

This teacher guide comprises of three main sections that provide essential information that all teachers should know and do to effectively implement the Social Science - Geography curriculum.

1. **General Information**
    - Purpose of the teacher guide
    - How to use the teacher guide
    - Syllabus and teacher guide alignment
    - Learning and performance standards
    - Core Curriculum
    - STEAM
    - Curriculum Integration
    - Essential KSVAs

2. **Teaching and Learning**
    - Teaching and Learning Strategies
    - Units and Topics
    - Standards-Based Lesson Planning

3. **Assessment**
    - Performance Assessment
    - Performance Standards

The above components are linked and closely aligned. They should be connected to ensure that the intended learning outcomes and the expected quality of education standards are achieved. The close alignment of planning, instruction and assessment is critical to the attainment of learning standards.

Purpose of the Teacher Guide

This teacher guide describes what all teachers should know and do. The overarching purpose is to help teachers to effectively plan, teach, assess, evaluate, report and monitor students' learning and mastery of national and grade-level expectations. That is, the essential knowledge, skills, values and attitudes (KSVAs) described in the content standards and grade-level benchmarks, and their achievement of the national and grade-level proficiency standards.

Thus, the teacher is expected to:

- understand the significance of aligning all the elements of Standards-Based Curriculum (SBC) as the basis for achieving the expected level of education quality;
- effectively align all the components of SBC when planning, teaching, and assessing students' learning and levels of proficiency;
- effectively translate and align the Social Science syllabi and teacher guide to plan, teach and assess different Social Science units and topics, and the KSVAs described in the grade-level benchmarks;
- understand the Social Science national content standards, grade-level benchmarks, and evidence outcomes;
- effectively make sense of the content (KSVAs) described in the Social Science national content standards and the essential components of the content described in the grade-level benchmarks;
- effectively guide students to progressively learn and demonstrate proficiency on a range of Social Science knowledge, skills, processes, concepts, ideas, principles, practices, values and attitudes;
- confidently interpret, translate and use Social Science content standards and benchmarks to determine the learning objectives and performance standards, and plan appropriately to enable all students to achieve these standards;
- embed the core curriculum in their Social Science lesson planning, instruction, and assessment to permit all students to learn and master the core KSVAs required of all students;
- provide opportunities for all students to understand how STEAM has and continues to shape the social, political, economic, cultural, and the environment contexts and the consequences, and use STEAM principles, skills, processes, ideas and concepts to inquire into and solve problems relating to both the natural and physical (man-made) worlds as well as problems created by STEAM;
- integrate cognitive skills (critical, creative, reasoning, decision-making, and problem-solving skills), high level thinking skills (analysis, synthesis

and evaluation skills), values (personal, social, work, health, peace, relationship, sustaining values), and attitudes in lesson planning, instruction and assessment;

- meaningfully connect what students learn in Social Science with what is learnt in other subjects to add value and enhance students' learning so that they can integrate what they learn and develop in-depth vertical and horizontal understanding of subject content;

- formulate effective SBC lesson plans using learning objectives identified for each of the topics;

- employ SBC assessment approaches to develop performance assessments to assess students' proficiency on a content standard or a component of the content standard described in the grade-level benchmark;

- effectively score and evaluate students' performance in relation to a core set of learning standards or criteria, and make sense of the data to ascertain students' status of progress towards meeting grade-level and nationally expected proficiency standards, and use evidence from the assessment of students' performance to develop effective evidence-based intervention strategies to help students' who are making inadequate or slow progress towards meeting the grade-level and national expectations to improve their learning and performance.

How to use the Teacher Guide

Teacher Guide provides essential information about what the teacher needs to know and do to effectively plan, teach and assess students learning and proficiency on learning and performance standards. The different components of the teacher guide are closely aligned with SBC principles and practice, and all the other components of PNG SBC. It should be read in conjunction with the syllabus in order to understand what is expected of teachers and students to achieve the envisaged quality of education outcomes.

The first thing teachers should do is to read and understand each of the sections of the teacher guide to help them understand the key SBC concepts and ideas, alignment of PNG SBC components, alignment of the syllabus and teacher guide, setting of content standards and grade-level benchmarks, core curriculum, STEAM, curriculum integration, essential knowledge, skills, values and attitudes, strands, units and topics, learning objectives, SBC lesson planning, and SBC assessment. A thorough understanding of these components will help teachers meet the teacher expectations for implementing the SBC curriculum, and therefore the effective implementation of Grade 12 Geography Curriculum. Based on this understanding, teachers should be able to effectively use the teacher guide to do the following:

Determine Learning Objectives and Lesson Topics

Topics and learning objectives have been identified and described in the Teacher Guide. Lesson objectives are derived from topics that are extracted from the grade-level benchmarks. Lesson topics are deduced from the learning objectives. Teachers should familiarise themselves with this process as it is essential for lesson planning, instruction and assessment. However, depending on the context and students' learning abilities, teachers would be required to determine additional learning objectives and lesson topics. Teachers should use the examples provided in this teacher guide to formulate additional learning objectives and lesson topics to meet the educational or learning needs of their students.

Identify and Teach Grade Appropriate Content

Grade appropriate content has been identified and scoped and sequenced using appropriate content organisation principles. The content is sequenced using the spiraling sequence principles. This sequencing of content will enable students to progressively learn the essential knowledge, skills, values and attitudes as they progress further into their schooling. What students learn in previous grades is reinforced and deepens in scope with an increase in the level of complexity and difficulty in the content and learning activities. It is important to understand how the content is organised so that grade appropriate content and learning activities can be selected, if not already embedded in the benchmarks and learning objectives, to not only help students learn and master the content, but ensure that what is taught is rigorous, challenging, and comparable.

Integrate the Core Curriculum in Lesson Planning, Instruction and Assessment

Teachers should use this teacher guide to help them integrate the core curriculum – values, cognitive and high-level skills, 21st century skills, STEAM principles and skills, and reading, writing, and communication skills in their lesson planning, instruction and assessment. All students in all subjects are required to learn and master these skills progressively through the education system.

Integrate Cognitive, High Level, and 21st Century Skills in Lesson Planning, Instruction and Assessment

Teachers should integrate the cognitive, high level and 21st century skills in their annual teaching programs, and give prominence to these skills in their lesson preparation, teaching and learning activities, performance assessment, and performance standards for measuring students' proficiency on these skills. Social Science addresses the skills and processes of geography, civic and cultural literacy, historical and economical literacy and global awareness. Thus, students will be able to make informed decisions, problem–solving and management knowledge, skills, values and attitudes in Social Science. This enables them to function effectively in the work and higher education environments as productive and useful citizens of a culturally diverse and democratic society in an interdependent world.

In addition, it envisages all students attaining expected proficiency levels in these skills and will be ready to pursue careers and higher education academic programs that demand these skills, and use them in their everyday life after they leave school at the end of Grade 12. Teachers should use the teacher guide to help them to effectively embed these skills, particularly in their lesson planning and in the teaching and learning activities as well as in the assessment of students' application of the skills.

Integrate Social Science Values and Attitudes in Lesson Planning, Instruction and Assessment

In Social Science, students are expected to learn, promote and use work, relationship, peace, health, social, personal, family, community, national and global values in the work and study environments as well as in their conduct as community, national and global citizens. Teachers should draw from the information and suggestions provided in the syllabus and teacher guide to integrate values and attitudes in their lesson planning, instruction, and assessment. They should report on students' progression towards internalizing different values and attitudes and provide additional support to students who are yet to reach the internalization stage to make positive progress towards this level.

Integrate Science, Technology, Engineering, Arts and Mathematics (STEAM) Principles and Skills in Lesson Planning, Instruction and Assessment

Teachers should draw from both the syllabus and teacher guide in order to help them integrate STEAM principles and skills, and methodologies in their lesson planning, instruction and assessment. STEAM teaching and learning happens both inside and outside of the classroom. Effective STEAM teaching and

learning requires both the teacher and the student to participate as core investigators and learners, and to work in partnership and collaboration with relevant stakeholders to achieve maximum results. Teachers should use the syllabus, teacher guides and other resources to guide them to plan and implement this and other innovative and creative approaches to STEAM teaching and learning to make STEAM principles and skills learning fun and enjoyable and, at the same time, attain the intended quality of learning outcomes.

Identify and Use Grade and Context Appropriate, Innovative, Differentiated and Creative Teaching and Learning Methodologies

SBC is an eclectic curriculum model. It is an amalgamation of strengths of different curriculum types, including behavioural objectives, outcomes, and competency. Its emphasis is on students attaining clearly defined, measurable, observable and attainable learning standards, i.e., the expected level of education quality. Proficiency (competency) standards are expressed as performance standards/criteria and evidence outcomes, that is, what all students are expected to know (content) and do (application of content in real life or related situations) to indicate that they are meeting, have met or exceeded the learning standards. The selection of grade and contextually appropriate teaching and learning methodologies is critical to enabling all students to achieve the expected standard or quality of education. Teaching and learning methodologies must be aligned to the content, learning objective, and performance standard in order for the teacher to effectively teach and guide students towards meeting the performance standard for the lesson. They should be equitable and socially inclusive, differential, student-centred, and lifelong. They should enable STEAM principles and skills to be effectively taught and learned by students. Teachers should use the teacher guide to help them make informed decisions when selecting the types of teaching and learning methodologies to use in their teaching of the subject content, including STEAM principles and skills.

Plan Standards-Based Lessons

SBC lesson planning is quite difficult to do. However, this will be easier with more practice and experience over time. Effective SBC lesson plans must meet the required standards or criteria so that the learning objectives and performance standards are closely aligned to attain the expected learning outcomes. Teachers should use the guidelines and standards for SBC lesson planning and examples of SBC lesson plans provided in the teacher guide to plan their lessons. When planning lessons, it is important for teachers to ensure that all SBC lesson planning standards or criteria are met. If standards are not met, instruction will not lead to the attainment of intended performance and proficiency standards. Therefore, students will not attain the national content standards and grade-level benchmarks.

Use Standards-Based Assessment

Standards-Based Assessment has a number of components. These components are intertwined and serve to measure evaluate, report, and monitor students' achievement of the national and grade-level expectations, i.e., the essential knowledge, skills, values and attitudes they are expected to master and demonstrate proficiency on. Teachers should use the information

and examples on standards-based assessment to plan, assess, record, evaluate, report and monitor students' performance in relation to the learning standards.

Make Informed Judgments About Students' Learning and Progress Towards Meeting Learning Standards

Teachers should use the teacher guide to effectively evaluate students' performance and use the evidence to help students to continuously improve their learning as well as their classroom practice.

It is important that teachers evaluate the performance of students in relation to the performance standards and progressively the grade-level benchmarks and content standards to make informed judgments and decisions about the quality of their work and their progress towards meeting the content standards or components of the standards. Evaluation should not focus on only one aspect of students' performance. It should aim to provide a complete picture of each student's performance. The context, inputs, processes, including teaching and learning processes, and the outcomes should be evaluated to make an informed judgment about each student's performance, Teachers should identify the causal factors for poor performance, gaps in students learning, gaps in teaching, teaching and learning resource constraints, and general attitude towards learning. Evidence-based decisions can then be made regarding the interventions for closing the gaps to allow students to make the required progress towards meeting grade-level and national expectations.

Prepare Students' Performance Reports

Reporting of students' performance and progress towards the attainment of learning standards is an essential part of SBC assessment. Results of students' performance should be communicated to particularly the students and their parents to keep them informed of students' academic achievements and learning challenges as well as what needs to be done to ensure the students' make positive progress towards meeting the proficiency standards and achieving the desired level of education quality. Teachers should use the information on the reporting of students' assessment results and the templates provided to report the results of students' learning.

Monitor Students' Progress Towards Meeting the National Content Standards and Grade-Level Benchmarks

Monitoring of students' progress towards the attainment of learning standards is an essential component of standards-based assessment. It is an evidence-based process that involves the use of data from students' performance assessments to make informed judgments about students' learning and proficiency on the learning standards or their components, identify gaps in students' learning and the causal factors, set clear learning improvement targets, and develop effective evidence-based strategies (including preplanning and re-teaching of topics), set clear timeframes, and identify measures for measuring students' progress towards achieving the learning targets.

Teachers should use the teacher guide to help them use data from students' performance assessments to identify individual students' learning weaknesses and develop interventions, in collaboration with each student and his/her parents or guardians, to address the weaknesses and monitor their progress towards meeting the agreed learning goals.

Develop Additional Benchmarks

Teachers can develop additional benchmarks using the examples in the teacher guide to meet the learning needs of their students and local communities. However, these benchmarks will not be nationally assessed as these are not comparable. They are not allowed to set their own content standards or manipulate the existing ones. The setting of national content standards is done at the national level to ensure that required learning standards are standardised, maintained and monitored to sustain the required level of education quality.

Avoid Standardisation

The teaching and learning strategies by means of lesson plans, lesson objectives and assessment should not be standardised when implementing the Social Science curriculum. SBC does not mean that the content, lesson objectives, teaching and learning strategies, and assessment are standardised. This is a misconception and any attempt to standardise the components of curriculum without due consideration of the teaching and learning contexts, children's backgrounds and experiences, and different abilities and learning styles of children will be counterproductive. It will hinder students from achieving the expected proficiency standards and hence, high academic standards and the desired level of education quality. That is, they should not be applied across all contexts and with all students, without considering the educational needs and the characteristics of each context. Teachers must use innovative, creative, culturally relevant, and differentiated teaching and learning approaches to teach the curriculum and enable their students to achieve the national content standards and grade-level benchmarks. And enable all students to experience success in learning the curriculum and achieve high academic standards.

The teaching and learning and assessment strategies provided in this teacher guide are not fixed and can be changed. Teachers should use the information and examples provided in the teacher guide to guide them to develop, select, and use grade, context, and learner appropriate content, learning objectives, teaching and learning strategies, and performance assessment and standards. SBC is evidence-based hence decisions about the content, learning outcomes, teaching and learning strategies, students' performance, and learning interventions should be based on evidence. Teaching and learning should be continuously improved and effectively targeted using evidence from students' assessment and other sources.

Syllabus and Teacher Guide Alignment

A teacher guide is a framework that describes how to translate the content standards and benchmarks (learning standards) outlined in the syllabus into units and topics, learning objectives, lesson plans, teaching and learning strategies, performance assessment, and measures for measuring students' performance (performance standards). It expands the content overview and describes how this content identified in the content standards and their components (essential KSVAs) can be translated into meaningful and evidence-based teaching topics and learning objectives for lesson planning, instruction and assessment. It also describes and provides examples of how to evaluate and report on students' attainment of the learning standards, and use evidence from the assessment of students' performance to develop evidence-based interventions to assist students who are making slow progress towards meeting the expected proficiency levels to improve their performance.

Grade 12 Social Science comprises of the Syllabus and Teacher Guide. These two documents are closely aligned, complimentary and mutually beneficial. They are the essential focal points for teaching and learning the essential Social Science knowledge, skills, values and attitudes.

Syllabus and teacher guide alignment	
Syllabus Outlines the ultimate aim and goals, and what to teach and why teach it	**Teacher Guide** Describes how to plan, teach, and assess students' performance
- Overarching and SBC principles - Content overview - Core curriculum - Essential knowledge, skills, values and attitudes - Strands and units - Evidence outcomes - Content standards and grade-level benchmarks - Overview of assessment, evaluation, and reporting	- Determine topics for lesson planning, instruction and assessment - Formulate learning objectives - Plan SBC lesson plans - Select teaching and learning strategies - Implement SBC assessment and evaluation - Implement SBC reporting and monitoring

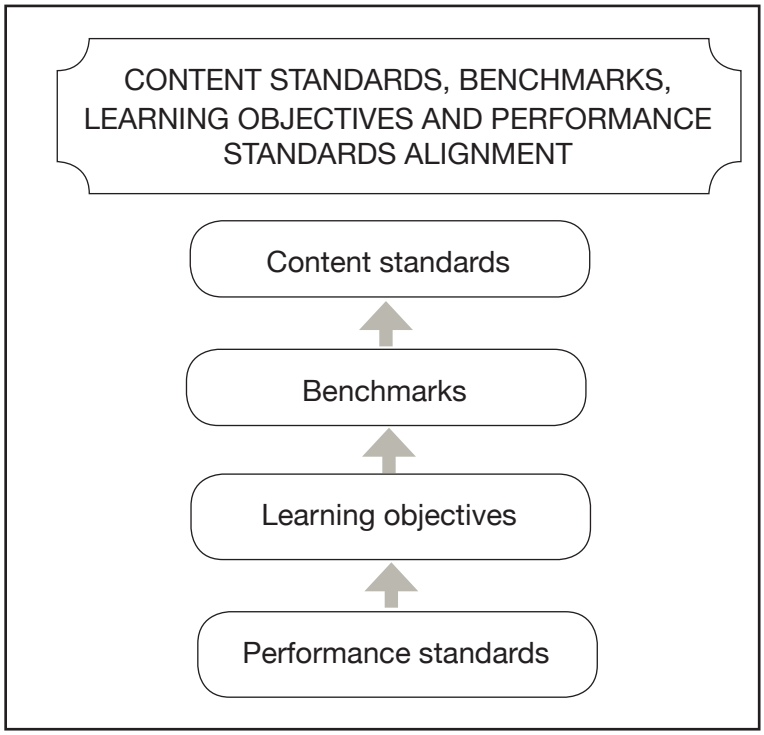
The syllabus outlines the ultimate aim and goals of SBE and SBC, what is to be taught and why it should be learned by students, the underlying principles and articulates the learning and proficiency standards that all students are expected to attain. On the other hand, the teacher guide expands on what is outlined in the syllabus by describing the approaches or the how of planning, teaching, learning, and assessing the content so that the intended learning outcomes are achieved.

This teacher guide should be used in conjunction with the syllabus. Teachers should use these documents when planning, teaching and assessing Grade 12 Social Science content.

Teachers will extract information from the syllabus (e.g., content standards and grade-level benchmarks) for lesson planning, instruction and is for measuring students' attainment of a content standard as well as progress to the next grade of schooling.

Learning and performance standards alignment

Content standards, benchmarks, learning objectives, and performance standards are very closely linked and aligned. There is a close linear relationship between these standards. Students' performance on a significant aspect of a benchmark (KSVA) is measured against a set of performance standards or criteria to determine their level of proficiency using performance assessment. Using the evidence from the performance assessment, individual student's proficiency on the aspect of the benchmark assessed and progression towards meeting the benchmark and hence the content standard are then determined.



Effective alignment of these learning standards and all the other components of PNG SBE and SBC (ultimate aim and goals, overarching, SBC and subject-based principles, core curriculum, STEAM, and cognitive, high level, and 21st century skills) is not only critical but is also key to the achievement of high academic standards by all students and the intended level of education quality. It is essential that teachers know and can do standards alignment when planning, teaching, and assessing students' performance so that they can effectively guide their students towards meeting the grade-level benchmarks (grade expectations) and subsequently the content standards (national expectations).

Learning and Performance Standards

Standards-Based Education (SBE) and Standards-Based Curriculum (SBC) are underpinned by the notion of quality. Standards define the expected level of education quality that all students should achieve at a particular point in their schooling. Students' progression and achievement of education standard(s) are measured using performance standards or criteria to determine their demonstration or performance on significant aspects of the standards and therefore their levels of proficiency or competency. When they are judged to have attained proficiency on a content standard or benchmark or components of these standards, they are then deemed to have met the standard(s). That is, achieved the intend level of education quality.

Content standards, benchmarks, and learning objectives are called learning standards while performance and proficiency standards (evidence outcomes) can be categorised as performance standards. These standards are used to measure students' performance, proficiency, progression and achievement of the desired level of education quality. Teachers are expected to understand and use these standards for lesson planning, instruction and assessment.

Content standards

Content standards are evidence-based, rigorous and comparable regionally and globally. They have been formulated to target critical social, economic, political, cultural, environmental, and employable skills gaps identified from a situational analysis. They were developed using examples and experiences from other countries and best practice, and contextualized to PNG contexts.

Content standards describe what (content - knowledge, skills, values, and attitudes) all students are expected to know and do (how well students must learn and apply what is set out in the content standards) at each grade-level before proceeding to the next grade. These standards are set at the national level and thus cannot be edited or changed by anyone except the National Subject-Based Standards Councils. Content Standards:

- are evidence-based;
- are rigorous and comparable to regional and global standards;
- are set at the national level;
- state or describe the expected levels of quality or achievement;
- are clear, measurable and attainable;
- are linked to and aligned with the ultimate aim and goals of SBE and SBC and overarching and SBC principles;
- delineate what matters, provide clear expectations of what students should progressively learn and achieve in school, and guide lesson planning, instruction, assessment;
- comprise knowledge, skills, values, and attitudes that are the basis for quality education;
- provide teachers a clear basis for planning, teaching, and assessing lessons;

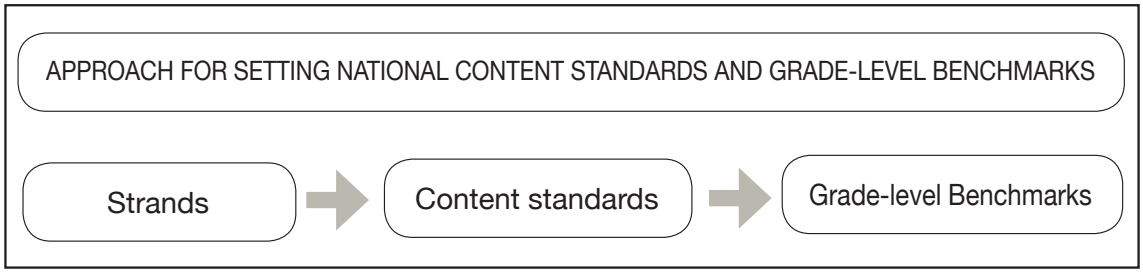
- provide provinces, districts, and schools with a clear focus on how to develop and organise their instruction and assessment programs as well as the content that they will include in their curriculum.

Benchmarks

Benchmarks are derived from the content standards and benchmarked at the grade-level. Benchmarks are specific statements of what students should know (i.e., essential knowledge, skills, values or attitudes) at a specific grade-level or school level. They provide the basis for measuring students' attainment of a content standard as well as progress to the next grade of schooling.

Grade-level benchmarks:

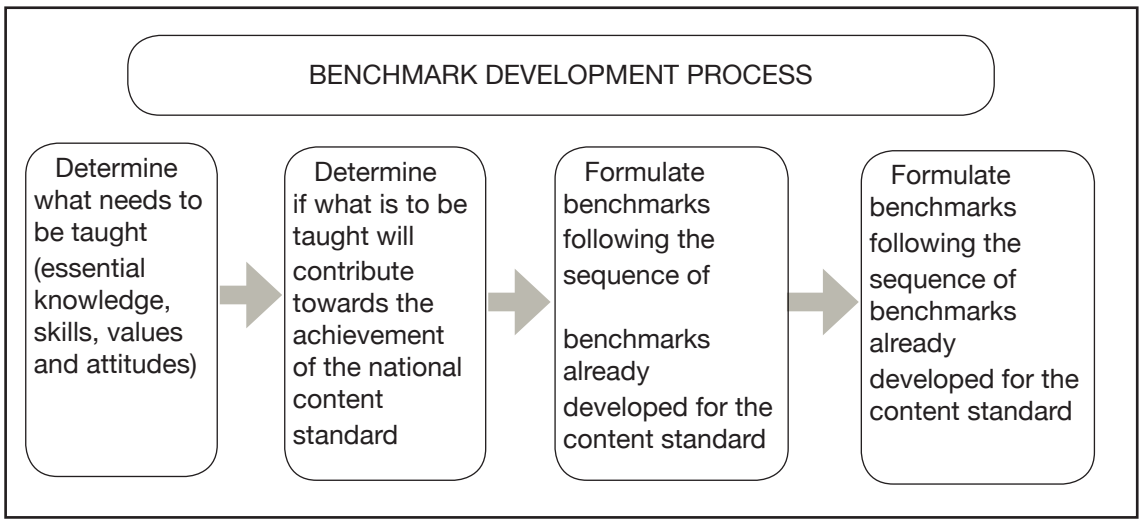
- are evidenced-based;
- are rigorous and comparable to regional and global standards;
- are set at the grade level;
- are linked to the national content standards;
- are clear, measurable, observable and attainable;
- articulate grade level expectations of what students are able to demonstrate to indicate that they are making progress towards attaining the national content standards;
- provide teachers a clear basis for planning, teaching, and assessing lessons;
- state clearly what students should do with what they have learned at the end of each school-level;
- enable students' progress towards the attainment of national content standards to be measured, and
- enable PNG students' performance to be compared with the performance of PNG students with students in other countries.



Development of additional benchmarks

Teachers should develop additional benchmarks to meet the learning needs of their students. They should engage their students to learn about local, provincial, national and global issues that have not been catered for in the grade-level benchmarks but are important and can enhance students' understanding and application of the content. However, it is important to note that these benchmarks will not be nationally examined as they are not comparable. Only the benchmarks developed at the national level will be tested. This does not mean that teachers should not develop additional

benchmarks. An innovative, reflect, creative and reflexive teacher will continuously reflect on his/her classroom practice and use evidence to provide challenging, relevant, and enjoyable learning opportunities for his/her students to build on the national expectations for students. Teachers should follow the following process when developing additional grade-level benchmarks.



Learning objectives

Learning or instructional objectives are precise statements of educational intent. They are formulated using a significant aspect or a topic derived from the benchmark, and is aligned with the educational goals, content standards, benchmarks, and performance standards. Learning objectives are stated in outcomes language that describes the products or behaviours that will be provided by students. They are stated in terms of measurable and observable student behaviour.

For example, students will be able to identify all the main towns of PNG using a map.

Performance standards

Performance Standards are concrete statements of how well students must learn what is set out in the content standards, often called the **"be able to do"** of **"what students should know and be able to do."** Performance standards are the indicators of quality that specify how competent a student's demonstration or performance must be. They are explicit definitions of what students **must do to demonstrate proficiency or competency at a specific level on the content standards.**

Performance standards:

- measure students' performance and proficiency **(using performance indicators)** in the use of a specific knowledge, skill, value, or attitude in real life or related situations
- provide the basis **(performance indicators)** for evaluating, reporting and monitoring students' level of proficiency in use of a specific knowledge, skills, value, or attitude

- are used to plan for individual instruction to help students not yet meeting expectations **(desired level of mastery and proficiency)** to make adequate progress towards the full attainment of benchmarks and content standards
- are used as the basis for measuring students' progress towards meeting grade-level benchmarks and content standards.

Proficiency standards

Proficiency standards describe what all students in a particular grade or school level can do at the end of a strand, or unit. These standards are sometimes called evidence outcomes because they indicate if students can actually apply or use what they have learnt in real life or similar situations. They are also categorized as benchmarks because that is what all students are expected to do before exiting a grade or are deemed ready for the next grade.

Core Curriculum

A core set of common learnings (knowledge, skills, values, and attitudes) are integrated into the content standards and grade-level benchmarks for all subjects. This is to equip all students with the most essential and in-demand knowledge, skills, and dispositions they will need to be successful in modern/ postmodern work places, higher-education programs and to be productive, responsible, considerate, and harmonious citizens. Common set of learnings are spirally sequenced from Preparatory - Grade 12 to deepen the scope and increase the level of difficulty in the learning activities so that what is learned is reinforced at different grade levels.

The core curriculum includes:

- cognitive (thinking) skills (refer to the syllabus for a list of these skills);
- reasoning, decision-making and problem-solving skills
- high level thinking skills (analysis, synthesis and evaluation skills);
- 21st century skills (refer to illustrative list in *Appendix 2*);
- reading, writing and communication skills (literacy skills);
- STEAM principles and skills;
- essential values and attitudes (Core personal and social values, and sustaining values), and
- spiritual values and virtues.

The essential knowledge, skills, values and attitudes comprising the core curriculum are interwoven and provide an essential and holistic framework for preparing all students for careers, higher education and citizenship.

All teachers are expected to include the core learnings in their lesson planning, teaching, and assessment of students in all their lessons. They are expected to foster, promote and model the essential values and attitudes as well as the spiritual values and virtues in their conduct, practice, appearance, and their relationships and in their professional and personal lives. In addition, teachers are expected to mentor, mould and shape each student to evolve and possess the qualities envisioned by society.

Core values and attitudes must not be taught in the classroom only; they must also be demonstrated by students in real life or related situations inside and outside of the classroom, at home, and in everyday life. Likewise, they must be promoted, fostered and modeled by the school community and its stakeholders, especially parents. A whole school approach to values and attitudes teaching, promoting and modeling is critical to students and the whole school community internalising the core values and attitudes and making them habitual in their work and school place, and in everyday life. Be it work values, relationship values, peace values, health values, personal and social values, or religious values, teachers should give equal prominence to all common learnings in their lesson planning, teaching, assessment, and learning interventions. Common learnings must be at the heart of all teaching and extracurricular programs and activities.

Science, Technology, Engineering, Arts and Mathematics

STEAM education is an integrated, multidisciplinary approach to learning that uses science, technology, engineering, arts and mathematics as the basis for inquiring about how STEAM has and continues to change and impact the social, political, economic, cultural and environmental contexts and identifying and solving authentic (real life) natural and physical environmental problems by integrating STEAM-based principles, cognitive, high level and 21st century skills and processes, and values and attitudes.

Social Science is focused on both goals of STEAM rather than just the goal of problem-solving. This is to ensure that all students are provided opportunities to learn, integrate, and demonstrate proficiency on all essential STEAM principles, processes, skills, values and attitudes to prepare them for careers, higher education and citizenship.

Objectives

Students will be able to:

- examine and use evidence to draw conclusions about how STEAM has and continues to change the social, political, economic, cultural and environmental contexts.
- investigate and draw conclusions on the impact of STEAM solutions to problems on the social, political, economic, cultural and environmental contexts.
- identify and solve problems using STEAM principles, skills, concepts, ideas and process.
- identify, analyse and select the best solution to address a problem.
- build prototypes or models of solutions to problems.
- replicate a problem solution by building models and explaining how the problem was or could be solved.
- test and reflect on the best solution chosen to solve a problem.
- collaborate with others on a problem and provide a report on the process of problem-solving used to solve the problem.
- use skills and processes learnt from lessons to work on and complete STEAM projects.
- demonstrate STEAM principles, skills, processes, concepts and ideas through simulation and modelling.
- explain the significance of values and attitudes in problem-solving.

Content overview

STEAM is a multidisciplinary and integrated approach to understanding how science, technology, engineering, arts and mathematics shape and are shaped by our material, intellectual, cultural, economic, social, political and environmental contexts. And for teaching students the essential and in-demand cognitive, high level and 21st century skills, values and attitudes, and empower them to effectively use these skills and predispositions to identify and solve problems relating to the natural and physical environments as well as the impact of STEAM-based solutions on human existence and livelihoods, and on the social, political, economic, cultural, and environmental systems.

STEAM disciplines have and continue to shape the way we perceive knowledge and reality, think and act, our values, attitudes, and behaviours, and the way we relate to each other and the environment. Most of the things we enjoy and consume are developed using STEAM principles, skills, process, concepts and ideas. Things humans used and enjoyed in the past and at present are developed by scientists, technologists, engineers, artists and mathematicians to address particular human needs and wants. Overtime, more needs were identified and more products were developed to meet the ever changing and evolving human needs. What is produced and used is continuously reflected upon, evaluated, redesigned, and improved to make it more advanced, multipurpose, fit for purpose, and targeted towards not only improving the prevailing social, political, economic, cultural and environmental conditions but also to effectively respond to the evolving and changing dynamics of human needs and wants. And, at the same time, solutions to human problems and needs are being investigated and designed to address problems that are yet to be addressed and concurred. This is an evolving and ongoing problem-solving process that integrates cognitive, high level, and 21st century skills, and appropriate values and attitudes.

STEAM is a significant framework and focal point for teaching and guiding students to learn, master and use a broad range of skills and processes required to meet the skills demands of PNG and the 21st century. The skills that students will learn will reflect the demands that will be placed upon them in a complex, competitive, knowledge-based, information-age, technology-driven economy and society. These skills include cognitive (critical, synthetic, creative, reasoning, decision-making, and problem-solving) skills, high level (analysis, synthesis and evaluation) skills and 21st century skills. Knowledge-based information and technology driven economies require knowledgeable workers and not technicians. Knowledge workers are lifelong learners, are problem solvers, innovators, creators, critical and creative thinkers, reflective practitioners, researchers (knowledge producers rather than knowledge consumers), solutions seekers, outcomes oriented, evidence-based decision makers, and enablers of improved and better outcomes for all.

STEAM focuses on the skills and processes of problem-solving. These skills and processes are at the heart of the STEAM movement and approach to not only problem-solving and providing evidence-based solutions but also the development and use of other essential cognitive, high level and 21st century skills. These skills are intertwined and used simultaneously to gain a broader understanding of the problems to enable creative, innovative, contextually

relevant, and best solutions to be developed and implemented to solve the problems and attain the desired outcomes. It is assumed that by teaching students STEAM-based problem-solving skills and providing learning opportunities inside and outside the classroom, more students will be motivated to pursue careers and academic programs in STEAM related fields thus, closing the skills gaps and providing a pool of cadre of workers required by technology, engineering, science, and mathematics-oriented industries.

Although, STEAM focuses on the development and application of skills in authentic (real life) contexts, for example the use of problem-solving skills to identify and solve problems relating to the natural and physical worlds, it does not take into account the significant influence values and attitudes have on the entire process of problem-solving. Values and attitudes are intertwined with knowledge and skills. Knowledge, skills, values and attitudes are inseparable. Decisions about skills and processes of skills development and application are influenced by values and attitudes (mindset) that people hold. In the same light, the use of STEAM principles, processes and skills to solve problems in order to achieve the outcomes envisaged by society are influenced by values and the mindset of those who have identified and investigated the problem as well as those who are affected by the problem and will benefit from the outcome.

STEAM problem-solving methods and approaches

Problem-solving involves the use of problem-solving methods and processes to identify and define a problem, gather information to understand its causes, draw conclusions, and use the evidence to design and implement solutions to address it.

Even though there are many different problem-solving methods and approaches, they share some of the steps of problem-solving, for example:

1. identifying the problem;
2. understanding the problem by collecting data;
3. analysing and interpret the data;
4. drawing conclusions;
5. using data to consider possible solutions;
6. selecting the best solution;
7. testing the effectiveness of the solution by trialling and evaluating it, and
8. reviewing and improve the solution.

STEAM problem-solving processes go from simple and technical to advance and knowledge-based processes. However, regardless of the type of process used, students should be provided opportunities to learn the essential principles and processes of problem-solving and, more significantly, to design and create a product that addresses a real problem and meets a human need.

The following are some of the STEAM problem-solving processes.

Engineering and technology problem-solving methods and approaches

Engineering and technology problem-solving methods are used to identify and solve problems relating to the physical world using the design process. The following are some of the methods and approaches used to solve engineering and technology related problems.

Parts substitution

It is the most basic of the problem-solving methods. It simply requires the parts to be substituted until the problem is solved.

Diagnostics

After identifying a problem, the technician would run tests to pinpoint the fault. The test results would be used either as a guide for further testing or for replacement of a part, which also need to be tested. This process continues until the solution is found and the device is operating properly.

Troubleshooting

Troubleshooting is a form of problem-solving, often applied to repair failed products or processes.

Reverse engineering

Reverse engineering is the process of discovering the technological principles underlying the design of a device by taking the device apart, or carefully tracing its workings or its circuitry. It is useful when students are attempting to build something for which they have no formal drawings or schematics.

Divide and conquer

Divide and conquer is the technique of breaking down a problem into sub-problems, then breaking the sub-problems down even further until each of them is simple enough to be solved. Divide and conquer may be applied to all groups of students to tackle sub-problems of a larger problem, or when a problem is so large that its solution cannot be visualised without breaking it down into smaller components.

Extreme cases

Considering “extreme cases” – envisioning the problem in a greatly exaggerated or greatly simplified form, or testing using extreme condition – can often help to pinpoint a problem. An example of the extreme-case method is purposely inputting an extremely high number to test a computer program.

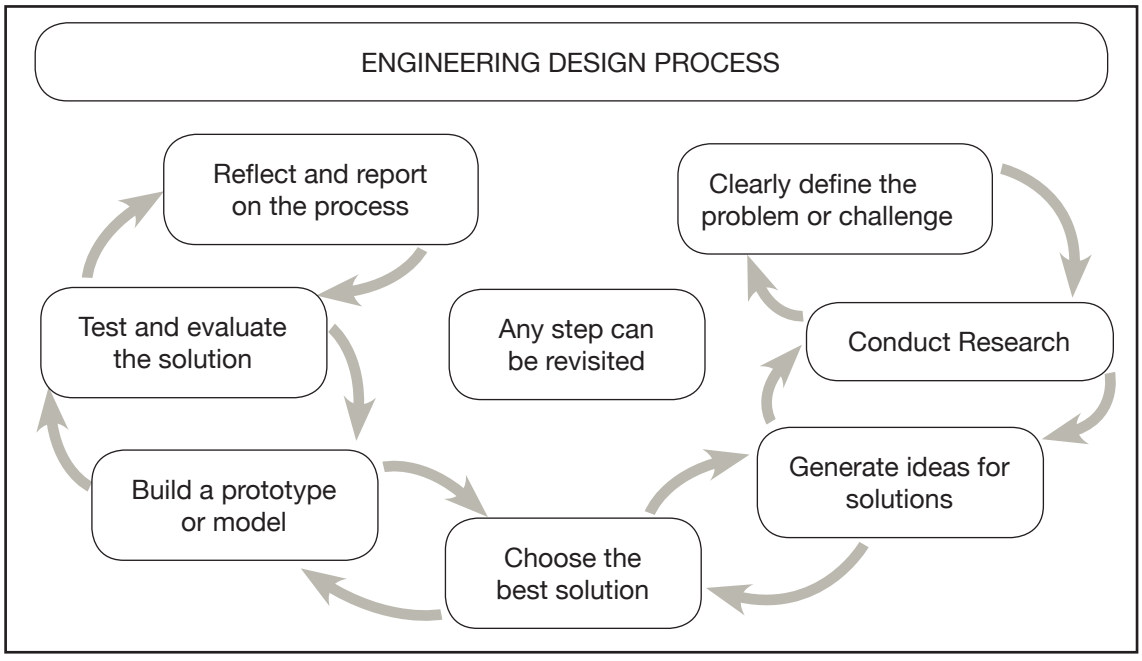
Trial and error

The trial and error method involves trying different approaches until a solution is found. It is often used as a last resort when other methods have been exhausted.

Engineering design process

Technological fields use the engineering design process to identify and define the problem or challenge, investigate the problem, collect and analyse data, and use the data to formulate potential solutions to the problem, analyse each of the solutions in terms of its strengths and weaknesses, and choose the best solution to solve the problem. It is an open-ended problem-solving process that involves the full planning and development of products or services to meet identified needs. It involves a sequence of steps such as the following:

1. Analysing the context and background, and clearly defining the problem.
2. Conducting research to determine design criteria, financial or other constraints, and availability of materials.
3. Generating ideas for potential solutions, using processes such as brainstorming and sketching.
4. Choosing the best solution.
5. Building a prototype or model.
6. Testing and evaluate the solution.
7. Repeating steps as necessary to modify the design or correct faults.
8. Reflecting and report on the process.



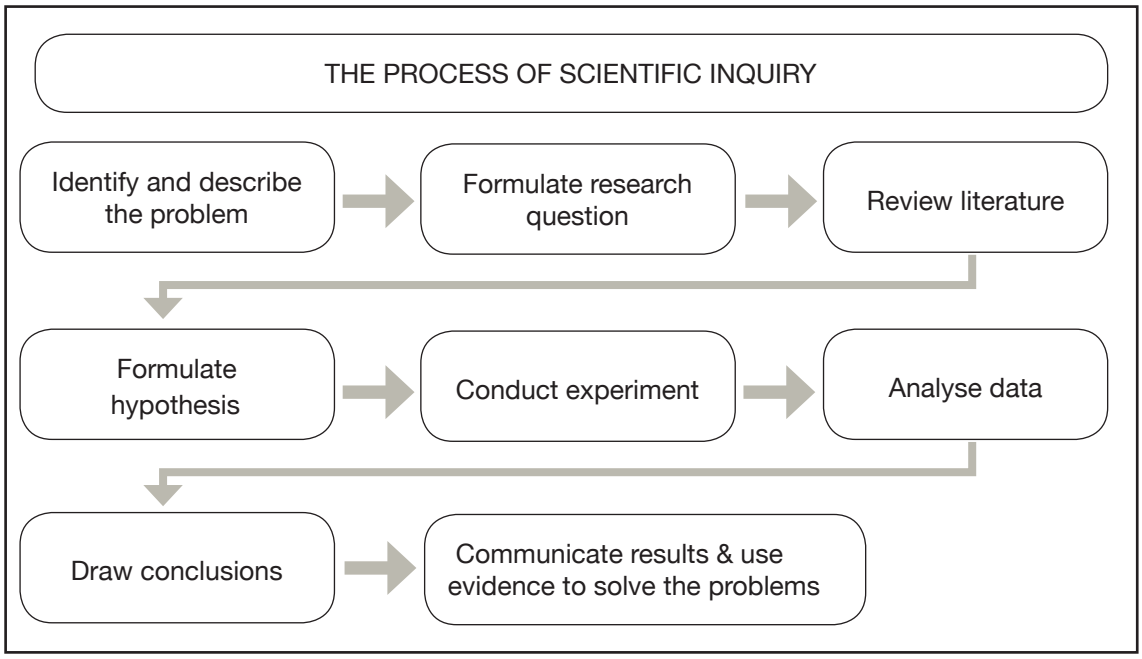
The scientific method and approach to problem-solving

Science uses predominantly the quantitative-scientific inquiry process to investigate, understand, and make informed decisions about problems relating to the natural world. The steps in the process vary, depending on the purpose of the inquiry and the types of questions asked.

There are six basic science process skills:

1. Observation
2. Communication
3. Classification
4. Measurement
5. Inference
6. Prediction

These processes are at the heart of the scientific inquiry and problem-solving process.



The steps above should be taught and demonstrated by students separately and jointly before they implement the inquiry process. Students should be guided through every step of the process so that they can explain it and its importance, and use the steps and the whole process proficiently to identify, investigate and solve problems. A brief explanation and examples of each step are provided below to help teachers plan and teach each step. Students should be provided with opportunities to practice and reflect on each step until they demonstrate the expected level of proficiency before moving on to the next one.

Step 1: Identify and describe the problem

Problems are identified mainly from observations and the use of the five senses – smell, sight, sound, touch and taste. Students should be guided and provided opportunities to identify natural and physical environment problems using their five senses and describe what the problem is and its likely causes.

Example - Observation

i. When I turn on a flashlight using the on/off switch, light comes out of one end.

Step 2: Formulate research question

After the problem is identified and described, the question to be answered is then formulated. This question will guide the scientist in conducting research and experiments.

Example - Question

i. What makes light comes out of a flash light when I turn it on?

Step 3: Review literature

It is more likely that the research problem and question have already been investigated and reported by someone. Therefore, after asking the question, the scientist spends some time reading and reviewing papers and books on past research and discussions to learn more about the problem and the question asked to prepare him/her for his own research. Conducting literature review helps the scientist to better understand his/her research problem, refine the research question and decide on the experiment/research approach before the experiment is conducted,

Example - Literature review

i. The scientist may look at the flashlight's instruction manual for tips or conduct online search on how flashlights work using the manufacturer's or relevant websites. The scientist may even analyse information and past experiments or discoveries regarding the relationship between energy and light.

Step 4: Formulate hypothesis

With a question in mind, the researcher decides on what he/she wants to test (The question may have changed as a result of the literature review). The research will clearly state what he/she wants to find out by carrying out the experiment. He/She will make an educated guess that could answer the question or explain the problem. This statement is called a hypothesis. A hypothesis guides the experiment and must be testable.

Example – Hypothesis

i. The batteries inside a flashlight give it energy to produce light when the flashlight is turned on.

Step 5: Conduct experiment

This step involves the design and conduct of experiment to test the hypothesis. Remember, a hypothesis is only an educated guess (a possible explanation), so it cannot be considered valid until an experiment verifies that it is valid.

Example - Experimental procedure

i. Remove the batteries from the flashlight, and try to turn it on using the on/off switch.
   Result: The flashlight does not produce light

ii. Re-insert the batteries into the flashlight, and try to turn it on using the on/off switch.
   Result: The flashlight does produce light.

iii. Write down these results

In general, it is important to design an experiment to measure only one thing at a time. This way, the researcher knows that his/her results are directly related to the one thing he/she changed. If the experiment is not designed carefully, results may be confusing and will not tell the researcher anything about his/her hypothesis.

Researchers collect data while carrying out their experiments. Data are pieces of information collected before, during, or after an experiment. To collect data, researchers read the measuring instruments carefully. Researchers record their data in notebooks, journals, or on a computer.

Step 6: Analyse data

Once the experiment is completed, the data is then analysed to determine the results. In addition, performing the experiment multiple times can be helpful in determining the credibility of the data.

Example - Analysis

i. Record the results of the experiment in a table.

ii. Review the results that have been written down.

Step 7: Draw conclusions

If the hypothesis was testable and the experiment provided clear data, the scientist can make a statement telling whether or not the hypothesis was correct. This statement is known as a conclusion. Conclusions must always be backed up by data. Therefore, scientists rely heavily on data so they can make an accurate conclusion.

If the data support the hypothesis, then the hypothesis is considered correct or valid. However, if the data do not support the hypothesis, the hypothesis is considered incorrect or invalid.

Example - Valid hypothesis

i. The flashlight did not produce light without batteries. The flashlight did produce light when batteries were inserted. Therefore, the hypothesis that batteries give the flashlight energy to produce light is valid, given that no changes are made to the flashlight during the experiment.

Example - Invalid hypothesis

ii. The flashlight did not produce light when the batteries were inserted. Therefore, the hypothesis that batteries give the flashlight energy to produce light is invalid. In this case, the hypothesis would have to be modified to say something like, “The batteries inside a flashlight give it energy to produce light when the batteries are in the correct order and when the flashlight is turned on.” Then, another experiment would be conducted to test the new hypothesis.

An invalid hypothesis is not a bad thing! Scientists learn something from both valid and invalid hypotheses. If a hypothesis is invalid, it must be rejected or modified. This gives scientists an opportunity to look at the initial observation in a new way. They may start over with a new hypothesis and conduct a new experiment. Doing so is simply the process of scientific inquiry and learning.

Step 8: Communicate findings

Scientists generally tell others what they have learned. Communication is a very important component of scientific progress and problem-solving. It gives other people a chance to learn more and improve their own thinking and experiments. Many scientists' greatest breakthroughs would not have been possible without published communication or results from previous experimentation.

Every experiment yields new findings and conclusions. By documenting both the successes and failures of scientific inquiry in journals, speeches, or other documents, scientists are contributing information that will serve as a basis for future research and for solving problems relating to both the natural and physical worlds. Therefore, communication of investigative findings is an important step in future scientific discovery and in solving social, political, economic, cultural, and environmental problems.

Example - Communication of findings

i. Write your findings in a report or an article and share it with others, or present your findings to a group of people. Your work may guide someone else's research on creating alternative energy sources to generate light, additional uses for battery power, etc.

Artistic design

Science uses predominantly the quantitative-scientific inquiry process to investigate, understand, and make informed decisions about problems. The steps in the process vary, depending on the purpose of the inquiry and the types of questions asked. There are six basic science process skills:

The equipping and enabling of students to become proficient in a broad range of STEAM skills, processes and predispositions can also lead to the attainment of many other societal goals, including national and global development goals and aspirations. These goals include:

- sustainability goals;
- peace related goals;
- work related goals;
- academic goals;
- relationship goals;
- health goals;
- adoption and internalisation of values and attitudes accepted by society, and
- improved social, political, economic outcomes.

Even though the original purpose and the drive of STEAM was to develop a pathway to engage students in learning about, experiencing, and applying STEAM skills in real life situations to motivate and hopefully get them to pursue careers in STEAM related fields and undertake STEAM related higher education programs to meet the demand for STEAM workers, STEAM education can also be used to teach and engage students to study more broadly the impact of STEAM on the social, economic, political, intellectual, cultural and environmental contexts. This line of inquiry is more enriching, exciting, empowering and transformative.

STEAM-based lesson planning

Effective STEAM lesson planning is key to the achievement of expected STEAM outcomes. STEAM skills can be planned and taught using separate STEAM-based lesson plans or integrated into the standards-based lesson plans. To effectively do this, teachers should know how to write effective standards and STEAM-based lesson plans.

Developing STEAM-based lesson plans

Teachers should integrate STEAM content and teaching, learning and assessment strategies into their standards-based lesson plans.

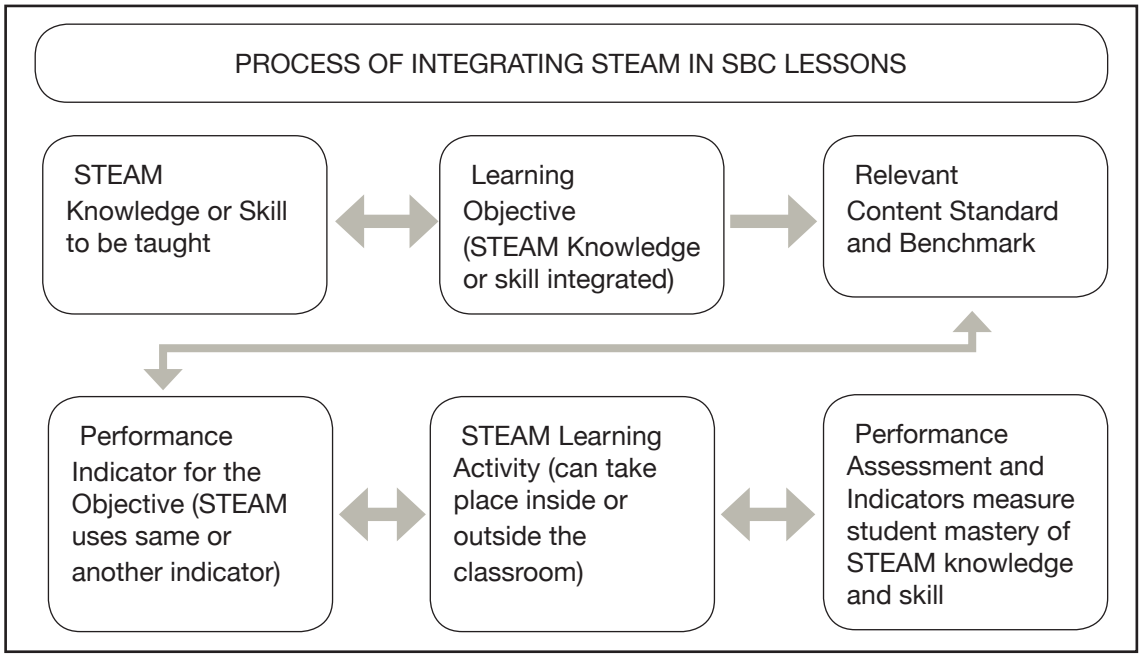
Integration of STEAM problem-solving skills into standards-based lesson plans

Knowing how to integrate STEAM problem-solving skills, principles, values and attitudes as well as STEAM teaching, learning, and assessment strategies into the standards-based lesson plans is essential for achieving the desired STEAM learning outcomes. When integrating STEAM problem-solving skills into the standards-based lesson plans, teachers should ensure that these skills are not only effectively aligned to the learning objective and performance standards, they must also be effectively taught and assessed.

STEAM principles and problem-solving skills are integrated into the content standards and grade-level benchmarks. A list of these skills, including 21st century skills, is provided in the Social Science Grades 11 & 12 Syllabus. Teachers should ensure that these skills are integrated in their standards-based lesson plans, taught and assessed to determine students' level of proficiency on each skill or specific components of the skill. Teachers should use the following process as guide to integrate STEAM principles and problem-solving skills into the standards-based lesson plans.

Teachers are expected to integrate the essential STEAM principles, processes, skills, values and attitudes described in the grade 12 benchmarks when formulating their standards-based lesson plans. Opportunities should be provided inside and outside of the classroom for students to learn, explore, model and apply what they learn in real life or related situations. These learning experiences will enable students to develop a deeper understanding of STEAM principles, processes, skills, values and attitudes and appreciate their application in real life to solve problems.

Process for integrating STEAM principles and problem-solving skills into standards-based lessons



Teachers should follow the steps given below when integrating STEAM problem-solving principles and skills into their standards-based lesson plans.

Step 1: Identify the STEAM knowledge or skill to be taught (From the table of KSVAs for each content standard and benchmark). This could already be captured in the learning objective stated in the standards-based lesson plan.

Step 2: Develop and include a performance standard or indicator for measuring student mastery of the STEAM knowledge or skill (e.g. level of acceptable competency or proficiency) if this is different from the one already stated in the lesson plan.

Step 3: Develop student learning activity (An activity that will provide students the opportunity to apply the STEAM knowledge or skill specified by the learning objective and appropriate statement of the standards). Activity can take place inside or outside of the classroom, and during or after school hours.

Step 4: Develop and use performance descriptors (standards or indicators) to analyse students' STEAM related behaviours and products (results or outcomes), which provide evidence that the student has acquired and mastered the knowledge or skill of the learning objective specified by the indicator(s) of the standard(s).

STEAM teaching strategies

STEAM education takes place in both formal and informal classroom settings. It takes place during and after school hours. It is a continuous process of inquiry, data collection, data analysis, making decisions about interventions, and implementing and monitoring interventions for improvements.

There are a variety of STEAM teaching strategies. However, teaching strategies selected must enable teachers to guide students to use the engineering and artistic design processes to identify and solve natural and physical environmental problems by designing prototypes and testing and refining them to effectively mitigate the problems identified. The following are some of the strategies that could be used to utilise the STEAM approach to solve problems and coming up with technological solutions.

1. Inquiry-Based Learning
2. Problem-Based Learning
3. Project-Based Learning
4. Collaborative Learning

Collaborative learning involves individuals from different STEAM disciplines and expertise in a variety of STEAM problem-solving approaches working together and sharing their expertise and experiences to inquire into and solve a problem.

Teachers should plan to provide students opportunities to work in collaboration and partnership with experts and practitioners engaged in STEAM related careers or disciplines to learn first-hand about how STEAM related skills, processes, concepts, and ideas are applied in real life to solve problems created by the natural and physical environments. Collaborative learning experiences can be provided after school or during school holidays to enable students to work with STEAM experts and practitioners to conduct inquiry and solve problems by developing creative, innovative and sustainable solutions. Providing real life experiences and lessons, e.g., by involving students to actually solve a scientific, technological, engineering, or mathematical, or Arts problem, would probably spark their interest in a STEAM career path.

Developing STEAM partnerships with external stakeholders e.g., higher education institutions, private sector, research and development institutions, and volunteer and community development organizations can enhance students' learning and application of STEAM problem-solving principles and skills.

1. Participatory Learning
2. Group-Based Learning
3. Task Oriented Learning
4. Action Learning
5. Experiential Learning
6. Modeling
7. Simulation

STEAM learning strategies

Teachers should include in their lesson plans STEAM learning activities. These activities should be aligned to principle or a skill planned for students to learn and demonstrate proficiency at the end of the lesson to expose students to STEAM and giving them opportunities to explore STEAM-related concepts, they will develop a passion for it and, hopefully, pursue a job in a STEAM field. Providing real life experiences and lessons, e.g., by involving students to actually solve a scientific, technological, engineering, or mathematical, or arts problem, would probably spark their interest in a STEAM career path. This is the theory behind STEAM education.

STEAM-based assessment

STEAM-based assessment is closely linked to standards-based assessment where assessment is used to assess students' level of competency or proficiency of a specific knowledge, skill, value, or attitude taught using a set of performance standards (indicators or descriptors). The link also includes the main components such as the purpose, the assessment principles and assessment strategies and tools.

In STEAM-based assessment, assessments are designed for what students should know and be able to do. In STEAM learning students are assessed in a variety of ways including portfolios, project/problem-based assessments, backwards design, authentic assessments, or other student-centered approaches.

When planning and designing the assessment, teachers should consider the authenticity of the assessment by designing an assessment that relates to a real world task or discipline specific attributes (such as simulation, role play, placement assessment, live projects, debates) which should make the activity meaningful to the students, and therefore be motivating as well as developing employability skills and discipline specific attributes.

Effective STEAM-based assessment strategies

The following sections describe six assessment tools and strategies shown to impact teaching and learning as well as help teachers foster a 21st century learning environment in their classrooms:

1. Rubrics
2. Performance-Based Assessments (PBAs)
3. Portfolios
4. Student self-assessment
5. Peer-assessment
6. Student Response Systems (SRS).

Although the list does not include all innovative assessment strategies, it includes what we think are the most common strategies, and ones that may be particularly relevant to the educational context of developing countries in this 21st century. Many of the assessment strategies currently in use fit under one or more of the categories discussed. Furthermore, it is important to note that these strategies also connect in a variety of ways.

1. Rubrics

Rubrics are both a tool to measure students' knowledge and ability as well as an assessment strategy. A rubric allows teachers to measure certain skills and abilities not measurable by standardized testing systems that assess discrete knowledge at a fixed moment in time. Rubrics are also frequently used as part of other assessment strategies (portfolios, performances, projects, peer-review and self-assessment). They will be discussed in those sections as well.

2. Performance-Based Assessments

Performance-Based Assessments (PBA), also known as project-based or authentic assessments, are generally used as a summative evaluation strategy to capture not only what students know about a topic, but if they have the skills to apply that knowledge in a "real-world" situation. By asking them to create an end product, PBA pushes students to synthesize their knowledge and apply their skills to a potentially unfamiliar set of circumstances that is likely to occur beyond the confines of a controlled classroom setting.

The implementation of performance-based assessment strategies can also impact other instructional strategies in the classroom.

3. Portfolio Assessment

Portfolios are a collection of student work gathered over time that is primarily used as a summative evaluation method. The most salient characteristic of the portfolio assessment is that rather than being a snapshot of a student's knowledge at one point in time (like a single standardized test), it highlights student effort, development, and achievement over a period of time; portfolios measure a student's ability to apply knowledge rather than simply regurgitate. They are considered both student-centered and authentic assessments of learning.

4. Self-assessment

While the previous assessment tools and strategies listed in this report generally function as summative approaches, self-assessment is generally viewed as a formative strategy, rather than one used to determine a student's final grade. Its main purpose is for students to identify their own strengths and weaknesses and to work to make improvements to meet specific criteria. Self-assessment occurs when students judge their own work to improve performance as they identify discrepancies between current and desired performance. In this way, self-assessment aligns well with standards-based education because it provides clear targets and specific criteria against which students or teachers can measure learning.

Self-assessment is used to promote self-regulation, to help students reflect on their progress and to inform revisions and improvements on a project or paper. In order for self-assessment to be truly effective four conditions must be in place: the self-assessment criteria is negotiated between teachers and students, students are taught how to apply the criteria, students receive feedback on their self-assessments and teachers help students use assessment data to develop an action plan.

5. Peer Assessment

Peer assessment, much like self-assessment, is a formative assessment strategy that gives students a key role in evaluating learning. Peer assessment approaches can vary greatly but, essentially, it is a process for learners to consider and give feedback to other learners about the quality or value of their work. Peer assessments can be used for a variety of products like papers, presentations, projects, or other skilled behaviours. Peer assessment is understood as more than only a grading procedure and is also envisioned as teaching strategy since engaging in the process develops both the assessor and assessee's skills and knowledge.

The primary goal for using peer assessment is to provide feedback to learners. This strategy may be particularly relevant in classrooms with many students per teacher since student time will be more plentiful than teacher time. Although any single student's feedback may not be rich or in-depth as teacher's feedback, the research suggests that peer assessment can improve learning.

6. Student Response System

Student response system(SRS), also known as classroom response system (CRS) or audience response system (ARS) is a general term that refers to a variety of technology-based formative assessment tools that can be used to gather student-level data instantly in the classroom through the combination of hardware, (voice recorders, PC, internet connection, projector and screen) and software.

Teachers can ask students a wide range of questions (both closed and open ended), where students can respond quickly and anonymously, and the teacher can display the data immediately on graphs. The use of technology also includes a use of video which examines how a range of strategies can be used to assess students' understanding.

The value of SRS comes from teachers analyzing information quickly and then devising real-time instructional solutions to maximize student learning. This includes a suggested approach to help teachers and trainers assess learning.

Curriculum Integration

What is Curriculum Integration?

Curriculum integration is making connections in learning across the curriculum. The ultimate aim of curriculum integration is to act as a bridge to increase students' achievement and engage in relevant curriculum *(Susan M. Drake and Rebecca C. Burns 2008).*

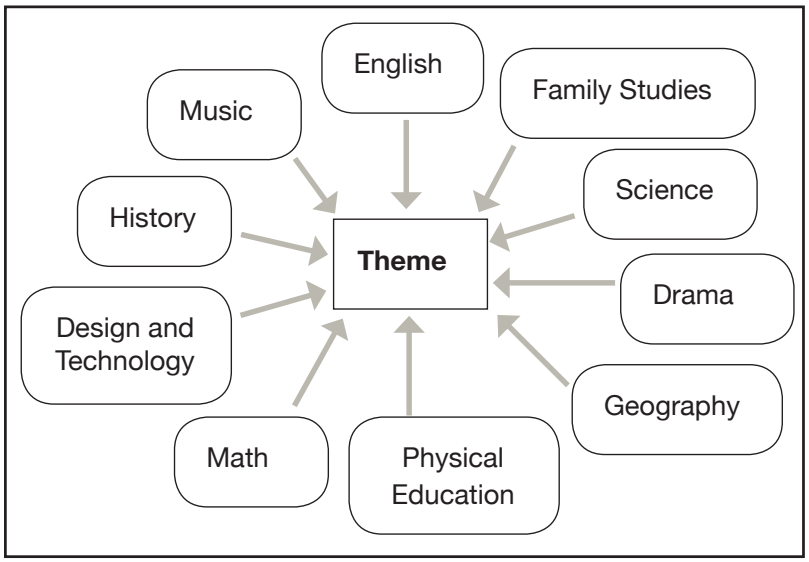
Teachers must develop intriguing curriculum by going beyond the traditional teaching of content based or fragmented teaching to one who is knowledge based and who should be perceived as a 21st century innovative educator. Curriculum integration is a holistic approach to learning thus curriculum integration in PNG SBC will have to equip students with the essential knowledge, skills, values and attitudes that are deemed 21st century.

There are three approaches that PNG SBC will engage to foster conducive learning for all its children whereby they all can demonstrate proficiency at any point of exit. Adapting these approaches will have an immense impact on the lives of these children thus they can be able to see themselves as catalyst of change for a competitive PNG. Not only that but they will be comparable to the world standards and as global citizens.

Engaging these three approaches in our curriculum will surely sharpen the knowledge and ability of each child who will foresee themselves as assets through their achievements and thus contribute meaningfully to their country. They themselves are the agents of change. Integrated learning will bear forth a generation of knowledge based populace who can solve problems and make proper decisions based on evidence. Thus, PNG can achieve its goals like the Medium Term Development Goals (MTDG) and aims such as the Vision 2050 for a happy, healthy and wealthy society whereby, all its citizens should have access to and fair distribution to income, shelter, health, education and general goods and services thus improving the general standard of living for PNG in the long run.

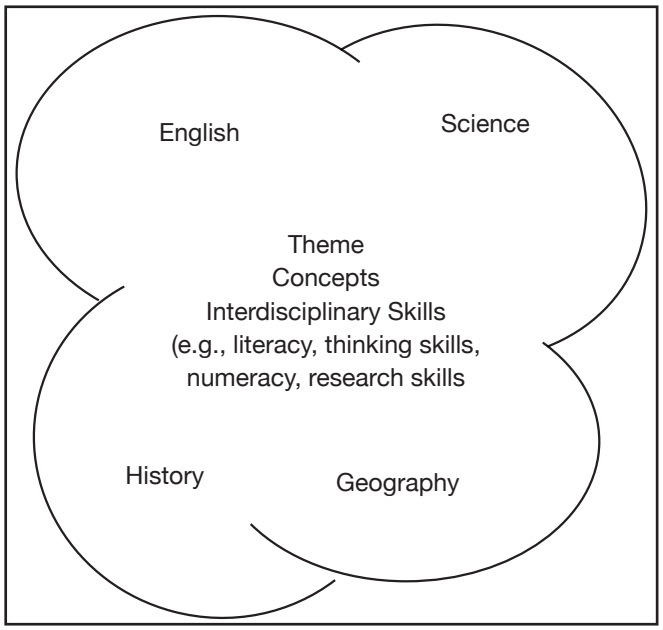
1. Multidisciplinary approach

In this approach, learning involves a theme or concept that will be taught right across all subject areas of study by students. That is, content of a particular theme will be taught right across all subjects as shown in the diagram below. For instance, if the theme is global warming, subject areas create lessons or assessment as per their subjects around this theme. Social Science will address this issue and Science and all other subject will do likewise.



2. Interdisciplinary approach

This approach addresses learning similarly to the multidisciplinary approach of integrated learning whereby learning takes place within the subject area. However, it is termed interdisciplinary in that the core curriculum of learning is interwoven into each subject under study by the students. For instance; in Social Science geography strand, students write essay on internal migration however, apart from addressing the issues of this topic, they are to apply the skill of writing text types in their essay, such as; argumentative, informative, explanatory, descriptive, expository and narrative essay. They must be able to capture the mechanics of English skills such as grammar, punctuation and so forth.



Though these skills are studied under English, they are considered as core skills that cut across all subjects. For example; if Science students were to write about human development in biology, then the application of writing skills has to be captured by the students in their writing. It is not seen as an English skill but a standard essential skill all students must know and do regardless.

Therefore, essential knowledge, skills, values and attitudes comprising the core curriculum are interwoven and provide an essential and holistic framework for preparing all students for careers, higher education and citizenship in this learning.

3. Intra-disciplinary approach

This approach involves teachers integrating sub disciplines within a subject area. For instance, within the subject Social Science, the strands (disciplines) of geography, environment, history and political science will all be captured studying a particular content for Social Science. For example, under global warming, students will study the geographical aspects of global warming, environmental aspect of global warming and likewise for history, political science and economics. Thus, children are well aware of the issues surrounding global warming and can address it confidently at each level of learning.

4. Trans-disciplinary approach

In this approach, learning goes beyond the subject area of study. Learning is organized around students'questions and concerns. That is, where there is a need for change to improve lives, students develop their own curriculum to effect this need.

The trans-disciplinary approach addresses real-life situations thus giving the opportunity to students to attain real life skills. This learning approach is more to do with Project–Based Learning which is also referred to as problem-based learning or place-based learning.

The three steps to planning project based curriculum *(Chard 1998).*

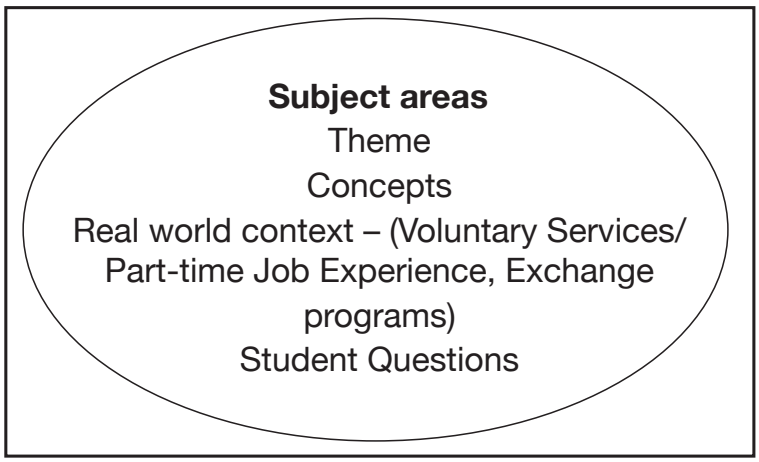
1. Teachers and students select a topic of study based on student interests, curriculum standards, and local resources
2. The teacher finds out what the students already know and helps them generate questions to explore. The teacher also provides resources for students and opportunities to work in the field
3. Students share their work with others in a culminating activity. Students display the results of their exploration and review and evaluate the project.

For instance; students may come up with slogans for school programs such as 'Our culture – clean city for a healthier PNG'. The main aim could be to curb betel nut chewing in public areas especially around bus stops and local markets. Here, students draw up their own instructions and criteria for assessment which is; they have to clean the nearest bus stop or local market once a week throughout the year. They also design and create posters to educate the general public as their program continues. They can also involve the town council and media to assist them especially to carry out awareness.

Studies *(Susan M. Drake and Rebecca C. Burns 2008).* have proven that Project based-programs have led to the following:

- Students go far beyond the minimum effort
- Make connections among different subject areas to answer open-ended questions
- Retain what they have learnt
- Apply learning to real-life problems
- Have fewer discipline problems
- Lower absenteeism *(Curtis, 2002)*

These integrated learning approaches will demand for teaches to be proactive in order to improve students learning and achievements. In order for PNG Standards-Based Curriculum to serve its purpose fully, these three approaches must be engaged for better learning for the children of Papua New Guinea now and in the future.



Essential Knowledge, Skills, Values, and Attitudes

Students' level of proficiency and progression towards the attainment of content standards will depend on their mastery and application of essential knowledge, skills, values, and attitudes in real life or related situations.

Social Science has 5 broad areas (strands) which contain essential knowledge captured in the national content standards and benchmarks. Knowledge is 'what students must know and understand' in Social Science. The fundamental concepts in Social Science are outlined below.
Geography - The examination, description, and explanation of the earth - its variability from place to place, how places and features change over time, and the processes responsible for these variations and changes. - Human geography (population, migration,)
History - Historical roots and how past events have shaped Papua New Guinea and the world. - Reconstructing and interpreting historical events
Political Science - Political ideologies and systems (power, authority, governance and functions of different political systems)
Economics - The concept of scarcity (limited resources & unlimited needs & wants) - Satisfying needs and wants - Decision making
Environment - Physical systems and processes of the environment - Relationship between people and the environment - Impact of the exploitation of the natural environment - Good stewards of the environment

Social Science requires 'inquiry–based learning'. The inquiry–based learning 'is an approach that emphasises the role of the student in the learning process, rather than the teacher telling the students what they need to know. It encourages the students to explore a topic, ask questions and share ideas. Therefore, the skills outlined here are essential for 'inquiry–based learning'.
Research Skills - Access information - Organise information - Evaluate sources - Use information - Align solution with task - Cite all sources accurately
Collaborating Skills Working effectively with peers, listen and share ideas and compromise to create good products - Show independent initiative - Assume shared responsibility - Assist others in their roles - Contribute ideas - Keep an open mind - Apply strategies - Take a variety of roles - Tolerate different view points
Critical Thinking Create products that demonstrate abilities to justify augments, asking questions, analyse complex systems, evaluate evidence, draw conclusions, reflect on learning and explain how to solve problems
Creative and Innovative Skills - Think creatively - Generate ideas - Work creatively with others - Implement innovations
Communicating Skills - Ability to listen, read, write, present, comprehend, share and express ideas and thoughts between different audiences and use multiple forms of media

Thinking is problem-solving. Critical thinking is motivated by a problem. Teachers are advised to raise the level of higher thinking skills for the students.

The 'inquiry-based learning' is a process where students are engaged in;

1. Identify the problem
2. Develop an action plan
3. Research/gather/collect data
4. Analyse/organise data and form conclusions
5. Report the results/presentation

Moreover, Social Science is driven by values. These values and attitudes must be emphasised and reinforced in the teaching and learning process.

Values & Attitudes
• Curiosity • Initiative • Adaptability • Leadership • Collaboration & teamwork • Participation • Passion for exploring & learning • Appreciation of the awesomeness of nature, events, people etc • Being patriotic and responsible • Show consideration • Respect the environment and people • Embrace diversity • Maintain positive values

Teaching and Learning Strategies

Social Science emphasises and embraces the use of cognitive, reasoning, decision-making, problem-solving and higher-level thinking skills to teach to enhance students' understanding of inter-disciplinary concepts and issues in relation to environment, geography, history, politics and economic within PNG and globally. It aims to provide a meaningful pedagogical framework for teaching and learning essential and in-demand knowledge, skills, values, and attitudes that are required for the preparation of students for careers, higher education and citizenship in the 21st century.

Students must be prepared to gather and understand information, analyse issues critically, learn independently or collaboratively, organize and communicate information, draw and justify conclusions, create new knowledge, and act ethically.

These teaching and learning strategies will help teachers to;

- familiarize themselves with different methods of teaching in the classroom
- develop an understanding of the role of a teacher for application of various methods in the classroom

Successful teachers always keep in view that teaching must "be dynamic, challenging and in accordance with the learner's comprehension. He/she does not depend on any single method for making his/her teaching interesting, inspirational and effective".

Please find a list of the different teaching and learning strategies in Appendix 3.

These strategies;

- make learning more engaging
- make learning more effective
- make learning fun
- encourage higher motivational level
- improve attention spans
- develop higher order thinking and reflective skills
- improve communication skills
- develop the spirit of teamwork/collaboration
- develop leadership skills and qualities
- encourage discovery learning

Therefore, teachers are encouraged to utilise the suggested strategies as well as others.

Units and Topics

This section of the teacher guide contains the Social Science - Geography content to be taught in grade 12. It consists of;

- units
- topics

Geography in grade 12 has four (4) units and they are;

1. Geography Skills
2. People and Places
3. People and Resources
4. People and Environment

The table below outlines the units and topics of Geography in grade 12 to be taught in an academic year. This will guide teachers to plan and teach the Geography strand in grade 12.

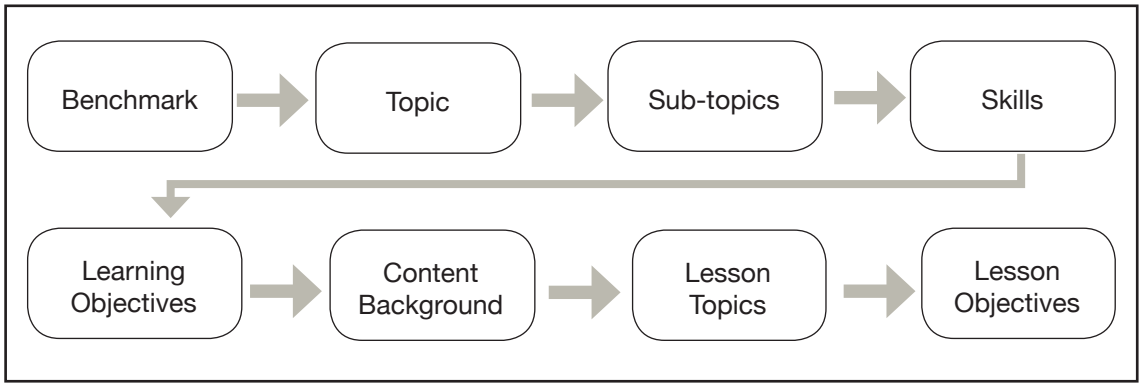
Units	Topics
Geography Skills	Topic 1: Political and religious profiles of regions Topic 2: Political and religious ideologies Topic 3: Changing patterns of religious and political ideologies Topic 4: Presentation of political and religious information
People and Places	Topic 1: Global population distribution, migration and demographics Topic 2: Socio-economic and environmental features of developed and developing countries Topic 3: Characteristics of mega cities
People and Resources	Topic 1: Global migration trends and patterns Topic 2: Factors influencing migration Topic 3: Consequences of migration
People and Environment	Topic 1: The greenhouse effect Topic 2: Global warming and climate change Topic 3: Factors influencing global warming and climate change Topic 4: Impact of climate change Topic 5: Impact of climate change in PNG Topic 6: Addressing climate change Topic 7: Regions affected by climate change

How were the topics developed?

The topics given in the table were derived from the benchmarks. That is, National content standards are benchmarked at each grade level, which allows for essential KSAVs to be reinforced and expanded throughout the grades. Benchmarks show grade level expectations of what students are able to do to demonstrate that they are making progress towards attaining the content standard. These grade-level benchmarks were then unpacked to identify the topics. From the topics, teachers should be able to develop sub-topics and learning objectives and of course the lesson topics and lessons objectives to be achieved per lesson.

When we unpack a benchmark, we are identifying what students will know and be able to do when they have mastered the benchmark.

1. Write out the benchmark.
2. Write the verbs (skills/actions) – Higher order thinking skills.
3. Underline or highlight the big idea (content) in the benchmark. The big idea (content) is the topic derived from the benchmark.
4. Develop sub-topics from the big idea (topic).
5. Write learning objectives according to the sub-topics.
6. Derive lesson topics from the learning objectives.



Unit of work

The unit of work outlines the topics, sub-topics and the learning objectives for each of the four (4) units in Geography, derived from the content standard and the benchmarks. It basically presents what the teacher is expected to teach. Teachers are advised to use the learning objectives to create lesson topics and lesson objectives in preparing lessons. Brief content background of each topic is provided to support teacher's lesson preparation.

Unit 1: Geography Skills

Content Standard 1.1: Students will be able to use geographical tools to collect, analyse and interpret information about people, places and environment.

Benchmark 12.1.1.1: Construct political and religious profiles of various regions using available data.

Topic 1: Political and religious profiles of regions

Sub-topic:
- Political profiles
- Religious profiles

Skills: Creative thinking skills (synthesis)

Learning Objectives: By the end of the topic, students will be able to:

- Construct political profiles of various regions.
- Construct religious profiles of various regions.

Content Background

What is a profile?

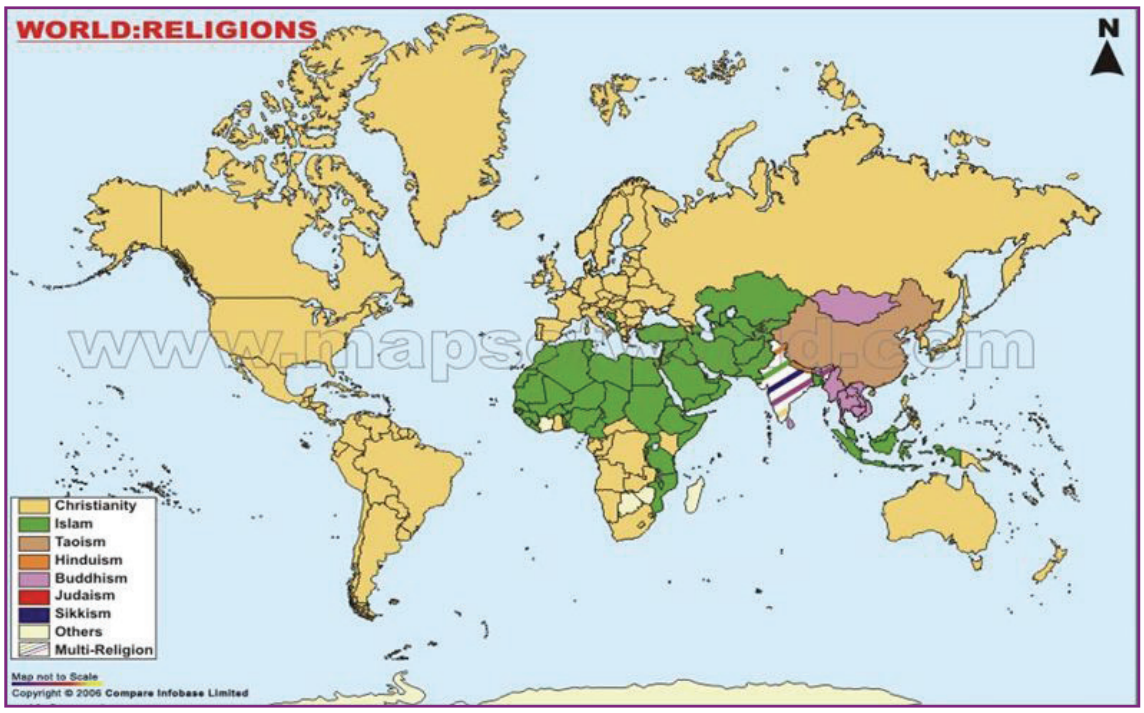
A profile is a short description of a place, country, an organisation or a person? A religious profile is an outline of the different religions practised in a country while a political profile is an account of the political system of a country.

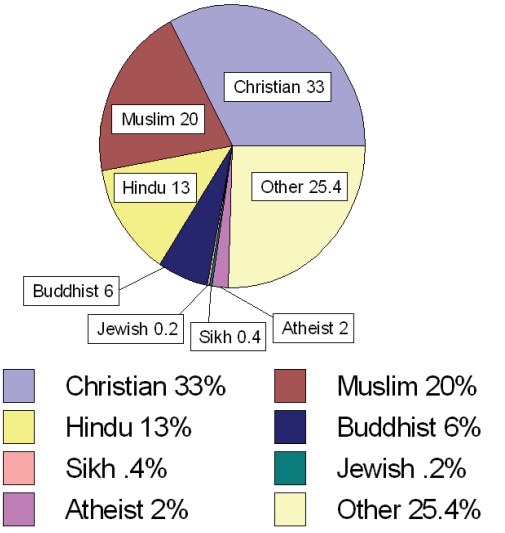
Religion and politics are concepts that designate two different and interdependent subsystems of society. Although the concepts are separated analytically, the relationship between religion and politics is characterized by interdependence. A definition of religion widely accepted among social scientists is provided by Peter Berger (1967, 1999), who defines religion as a “set of beliefs that connects the individual to a community, and in turn to a sense of being or purpose that transcends the individual and the mundane.” The concept of politics denominates the regulative power to make collectively binding decisions, allocate resources, and solve social problems.

Religious profiles

Religion is a social-cultural system of designated behaviours and practices, morals, worldviews, texts, sanctified places, prophecies, ethics, or organisations that relates humanity to supernatural, transcendental, or spiritual elements. However, there is no scholarly consensus over what precisely constitutes a religion. Different religions may or may not contain various elements ranging from the divine, sacred things, faith, a supernatural being or supernatural beings or "some sort of ultimacy and transcendence that will provide norms and power for the rest of life". Religious practices may include rituals, sermons, commemoration or veneration (of deities), sacrifices, festivals, feasts, trances, initiations, funerary services, matrimonial services, meditation, prayer, music, art, dance, public service, or other aspects of human culture. Religions have sacred histories and narratives.

The major religions of the world (Hinduism, Buddhism, Islam, Confucianism, Christianity, Taoism, and Judaism) differ in many respects, including how each religion is organized and the belief system each upholds. Other differences include the nature of belief in a higher power, the history of how the world and the religion began, and the use of sacred texts and objects.





According to the map and the pie graph, Christianity is practiced in many parts of the world which includes Europe, North and South America, the Pacific Island countries, Australia, New Zealand and other countries in Africa and Asia.

The second largest religion is muslim.

Source: https://www.google.com/search?q=World+religions&source

Suggested Resources

Benchmark 12.1.1.2: Use political and religious maps to show the types and distribution of political and religious ideologies across the globe.

Topic 2: Political and religious ideologies

Sub-topics:

- Types of political ideologies
- Distribution of political ideologies
- Types of religious ideologies
- Distribution of religious ideologies

Skills: Critical thinking skills

Learning Objectives: By the end of the topic, students will be able to;

- Identify different types of political ideologies.
- Locate the distribution of political ideologies on global maps.
- Identify different types of religious ideologies.
- Locate the distribution of religious ideologies on global maps.

Content Background

An ideology is a collection of ideas or beliefs shared by a group of people. There are many different kinds of ideologies; social, political, epistemological, ethical, religious and many more. In this topic, we will look at;

1. Political ideologies
2. Religious ideologies

Political ideologies are sets of ideas and principles that explain how the society should work or about how a country should be run and offer the blue print for a certain social order. It largely concerns itself with how to allocate power and to what ends it should be used. For example, Communism (based on the ideas and writings of Karl Marx and Friedrich Engles). Every society has an ideology that forms the basis of the public opinion. Organisations (political organisation) striving for power influence the ideology of a society to become what they want it to be, therefore, that is why people in a society seem to think alike.

Political ideologies have two dimensions:

1. Goals: how society should work (or be arranged).
2. Methods: the most appropriate ways to achieve the ideal arrangement.

Political ideology now, more than ever before, is very closely linked to state power whatever the political system.

Teachers are advised to allow students to research on the different political ideologies and compare their goals and methods/approaches used in running their countries and societies. Integrate this topic with the topics in Political Science (strand 3).

Distribution of political ideologies

Type of political ideology	Countries
Communism	Cuba, Laos, china, North Korea, Vietnam,
Democracy	Australia, New Zealand, Canada, Switzerland, Iceland, Finland, Denmark, Spain, UK,

What is a religious ideology?

A religious ideology is a set of ideas that refer to religious and secular (non-religious) tools and accompany political actions and processes in a sustained and systematic way. Religious ideologies focus on answering the world-view including afterlife and other things that are not in the materialistic world, whereas most ideologies focus on providing a world-view about the materialistic world.

Suggested Resources

1. Heywood, A. *'Introduction: Understanding Ideology',* in A. Heywood, Political Ideologies
2. Vincent, A. *'The Nature of Ideology',* in A. Vincent, Modern Political Ideologies (Blackwell, 1996), pp. 1–21.

Benchmark 12.1.1.3: Interpret political and religious maps and indicate changing patterns in the spread of particular religions or ideologies.

Topic 3: Changing patterns of religious and political ideologies

Sub-topic:

- Factors contributing to the changing patterns of religion and political ideologies

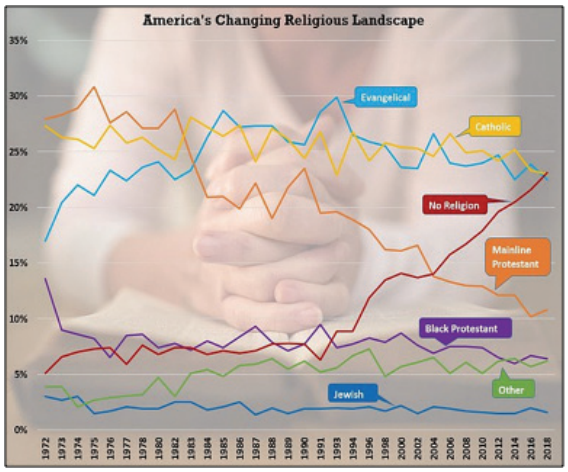
Skill: Critical thinking skills (interpreting)

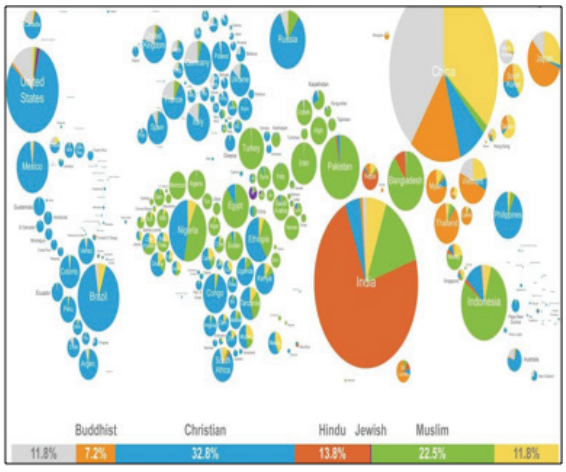
Learning Objectives: By the end of the topic, students will be able to;

- Investigate and explain the changing patterns in the spread of religious and political ideologies.
- Describe the factors that contribute to the spread of certain religion and political ideologies.

Content Background

Religious Change Religious beliefs and rituals can be the catalyst or vehicle of social change. Most religions are syncretic; they borrow practices, beliefs and organizational characteristics from other religions. Sometimes this is done voluntarily and at other times it is done by force. For instance, Catholicism through the practice of forced conversion during the period of European colonialism influenced other religions. Vodoun borrowed heavily from Catholicism. The one god is manifested in Bondye while St. Patrick is symbolized by Vodoun's rainbow serpent deity, Ochumare. Often times special days are adopted by religions. Catholicism adopted Yule, the winter solstice celebration of Pagans, to celebrate the birth of Jesus Christ. The Zuni merged their native religion with Catholicism, incorporating images of Christ into their cloths and jewelry.





Revitalization movements are frequently associated with religion. They often occur in disorganized societies due to warfare, revolutions, etc. They usually call for the destruction of existing social institutions in order to resolve conflict and stabilize the culture through reorganization. Most recorded revitalization movements were an adaptive response to rapidly changing social and economic circumstances brought on by contact with an outside culture.

The cargo cults of Melanesia are one example of movements that make a conscious effort to build an ideology that will be relevant to changing cultural needs. Cargo cults arose in Melanesia and other areas of the world after European contact in response to "…the expropriation of native land, and the relegation of indigenous peoples to roles as menial laborers and second-class citizens" (Bonvillain 2010: 374). Rituals were per-formed in the belief that they would result in increased wealth and prosperity in line with the European idea of material wealth.

Suggested Resources

Benchmark 12.1.1.4: Compile political and religious information of different countries using various geographic tools and data sources.

Topic 4: Presentation of political and religious information

Sub-topics:
- Political information of different countries
- Religious information of different countries

Skills: Creative thinking skills (compiling)

Learning Objectives: By the end of the topic, students will be able to:

- Research and collect political information of various countries.
- Research and collect religious information of various countries.
- Analyse the political and religious information on the selected countries.
- Compile political and religious information of different countries.

Content Background

No simple definition can describe the many religions in the world. Every society has a religion. For many people religion is an organised system of beliefs, rituals (facts and ceremonies) personal practises and worship directed towards a supreme power or deity (god).

There are thousands of religions in the religion. The three religions with the most followers are Christianity, Islam and Hinduism. Other religions include Buddhism, Confucianism, Jainism, Judaism, Shinto and Taoism.

Many characteristics of religions

Most leading religions share certain characteristics. The chief characteristics include;

1. Belief in the deity or in a power beyond the individual
2. Doctrine (accepted teaching) of salvation
3. Code of conduct
4. Use of sacred stories
5. Religious rituals

The essential qualities of a religion are maintained and passed on from generation to generation by sources called authority that the followers accept as sacred.

Religion today

Numerous thinkers severely criticized religion in the west in 1900. They charged that many religious doctrines had become dry and uninspiring and no longer satisfied spiritual needs. For many the rise science cast doubt on older doctrines. Critics also claimed that traditional doctrines failed to deal with current social issues and that they supported outdated moral attitudes

Some religious groups have tried to meet society's needs and problems. For example, most religions have traditionally prohibited women as clergy

throughout the ages relationship between religious and ideologies has provided much material for thought, particularly with connection with the urgent issue of development.

Suggested Resources

Unit 2: People and Places

Content Standard 1.2: Students will be able to investigate and explain how geographic and human characteristics create culture and define places.

Benchmark 12.1.2.1: Interpret the world's population distribution, migration patterns and demographics of developed and developing countries.

Topic 1: Global population distribution, migration and demographics

Sub-topics:

- World population distribution and population densities
- Examine migration patterns
- Factors that contribute to uneven distribution of population between continents

Skills: Examining, analysing data, investigating

Learning Objectives: By the end of the topic, students will be able to:

- Explain world population distribution and population densities.
- Describe the main clusters of population.
- Examine migration patterns and other demographic information of developed and developing countries.
- Investigate the factors that contribute to uneven distribution of population between continents.

Content Background

What is population Distribution? Population distribution describes the way that people are spread out across the Earth's surface. While Population density describes the number of people living in a given area. It is calculated as follows:

$$\text{Population Density} = \frac{\text{Number of people in an area}}{\text{Size of Area}}$$

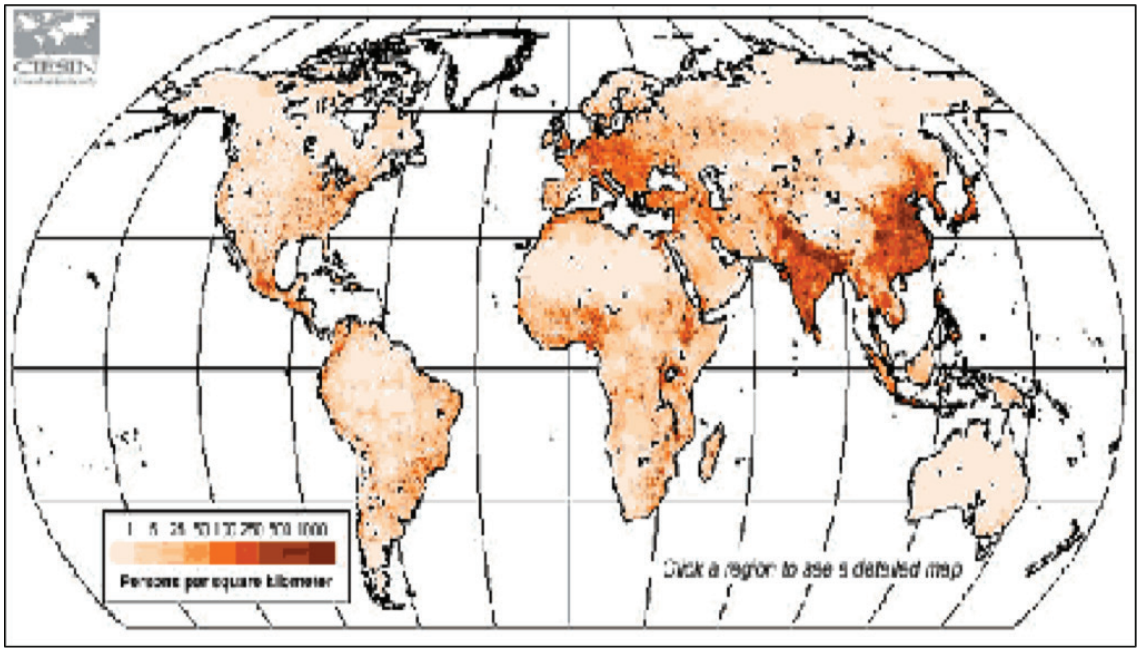
Population Distribution

Population distribution refers to the pattern of where people live. World population distribution is uneven. Places which are sparsely populated contain few people. Places which are densely populated contain many people. Sparsely populated places tend to be difficult places to live. These are usually places with hostile environments e.g. Antarctica. Places which are densely populated are habitable environments e.g. Europe.

Population distributions are often shown by means of a dot map, were each dot represents a given number of people They provide a quick overview of the general characteristics of a distribution as well as indications of areas of high or low density e.g. Nile Valley in Egypt (where 99% of the country's population live on 4% of the total land area). Population density can be displayed on a dot map

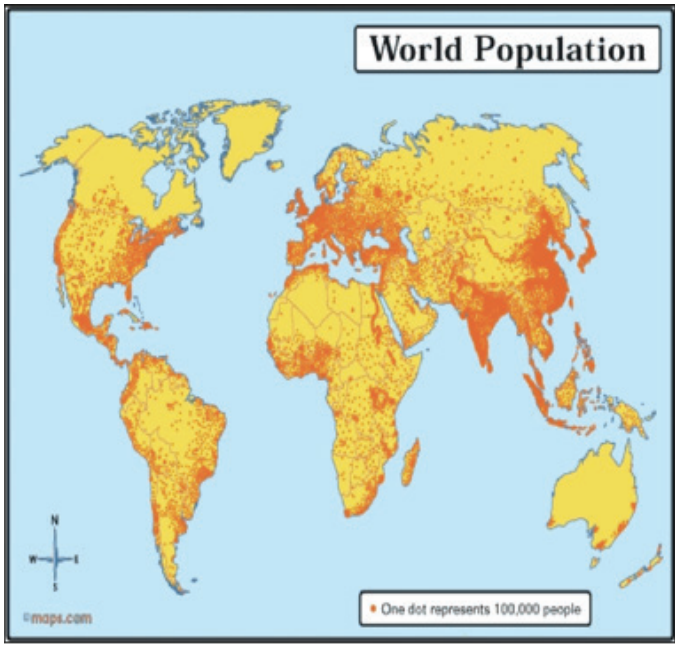
Population Density

Population density is a measurement of the number of people in an area. It is an average number. Population density is calculated by dividing the total number of people living in an area. Population density is usually shown as the number of people per square kilometer. The map below is a choropleth (shading) map showing population density. The darker the colour the greater the population density.



Limitations (disadvantages) of Dot Maps

- If many dots are concentrated in one part of the map then they will overlap making it difficult to identify one symbol from another making comparison of densities more difficult.
- They may suggest (incorrectly) that some areas are totally uninhabited e.g. Areas away from the Nile in Egypt when in fact there are insufficient numbers to warrant a symbol.



Migration

Migration is the movement of people from one permanent home to another. This movement changes the population of a place.

International migration is the movement from one country to another. People who leave their country are said to emigrate. People who move into another country are called immigrants. The movement of people into a country is known as immigration. For instance, every year some people leave the UK and move abroad. At the same time some people will move into the UK. Immigrants add to the total population and emigrants are subtracted from the total. Sometimes people just move from one region to another within the same country.

In many developing countries, large numbers of people have moved from the countryside to the cities in recent years. This is called rural to urban migration. Why do people migrate? Sometimes people have a choice about whether they move, but sometimes they are forced to move. The reasons people leave a place are called the push factors. The reasons people are attracted to new places to live are called the pull factors.

Push factors	Pull factors
Few jobs	Better health care
war	Job opportunities
Famine	Education
Natural disasters	Safety

Advantages and disadvantages of migration

Country losing people

Advantages	Disadvantages
Money sent home by migrants	People of working age move out reducing the size of the country's potential workforce
Decreases pressure on jobs and resources	Gender imbalances are caused as it is typically men who seek to find employment elsewhere. Women and children are left behind
Migrants may return with new skills	'Brain drain' if many skilled workers leave

Factors affecting population density

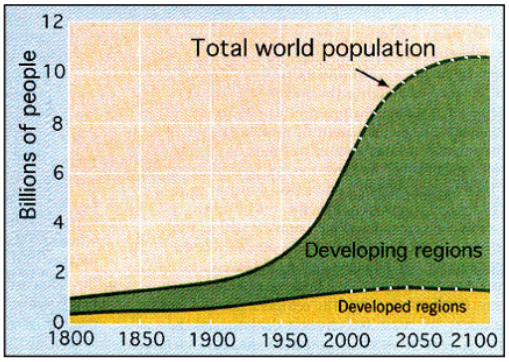
There are a range of human and natural factors that affect population density. The tables below illustrate this.

Physical factors	High density	Low density
Relief (shape and height of land)	Low land which is flat e.g. Ganges Valley in India	High land that is mountainous e.g. Himalayas
Resources	Areas rich in resources (e.g. coal, oil, wood, fishing etc.) tend to densely populated e.g. Western Europe	Areas with few resources tend to be sparsely populated e.g. The Sahel

Climate	Areas with temperate climates tend to be densely populated as there is enough rain and heat to grow crops e.g. UK	Areas with extreme climates of hot and cold tend to be sparsely populated e.g. the Sahara Desert

Population change

Human factors	High density	Low density
Political	Countries with stable governments tend to have a high population density e.g. Singapore	Unstable countries tend to have lower population densities as people migrate e.g. Afghanistan.
Social	Groups of people want to live close to each other for security e.g. USA	Other groups of people prefer to be isolated e.g. Scandinavians
Economic	Good job opportunities encourage high population densities, particularly in large cities in MEDCs and LEDCs around the world.	Limited job opportunities cause some areas to be sparsely populated e.g. Amazon Rainforest



The world's population is growing very rapidly. In 1820 the world's population reached 1 billion. In 1990 it reached 6 billion people.

The major reason for population changes, whether in an individual country or for the whole world, is the change in birth and death rates. The birth rate is the number of live babies born in a year for every 1000 people in the total population. Death rates are number of people dying per 1000 people. When birth rates are higher than death rates the population of an area will increase.

Over the past 150 years improvements in health care and sanitation around the world have led to a drop in the death rate. While birth rates have dropped in MEDCs, birth rates are still high in LEDCs. Therefore the number of people in the world has grown rapidly. This rapid growth in population has been called a population explosion.

Suggested Resources

1. Columbia University's Center for International Earth Science Information Network

Benchmark 12.1.2.2: Investigate the socio-economic and environmental features of developed and developing economies.

Topic 2: Socio-economic and environmental features of developed and developing countries

Sub-topic:

- Socio-economic and environmental features of developed and developing countries.

Skills: Interpreting, investigating, analysing, critiquing.

Learning Objectives: By the end of the topic, students will be able to:

- Identify the main socio economic and environmental features of developed and developing countries.
- Compare and contrast developed and developing countries socio-economic factors.
- Explain the relationship between environmental features of the world and population distribution.
- Describe the main human development Indicators of developed and developing countries.

Content Background

What is socio-economics?

Socio-economics (also known as social economics) is the social science that studies how economic activity affects and is shaped by social processes. In general it analyzes how societies progress, stagnate, or regress because of their local or regional economy, or the global economy. The definition of socioeconomic is relating to both economic and social factors. For example, a person's class in society is based on how much money/wealth he or she has.

Socio-economic status is a broad concept that includes such factors as educational attainment, occupation, income, wealth and deprivation. Socio-economic status profoundly impacts an individual or family's reputation and standing in the community. Socio-economic issues include the ethics, fairness and results of policies, theories and institutions that may result in a different standard of treatment and opportunities based on income and background. Poverty is a major socio-economic issue because lack of money for basic necessities is the source of many other socio-economic concerns.

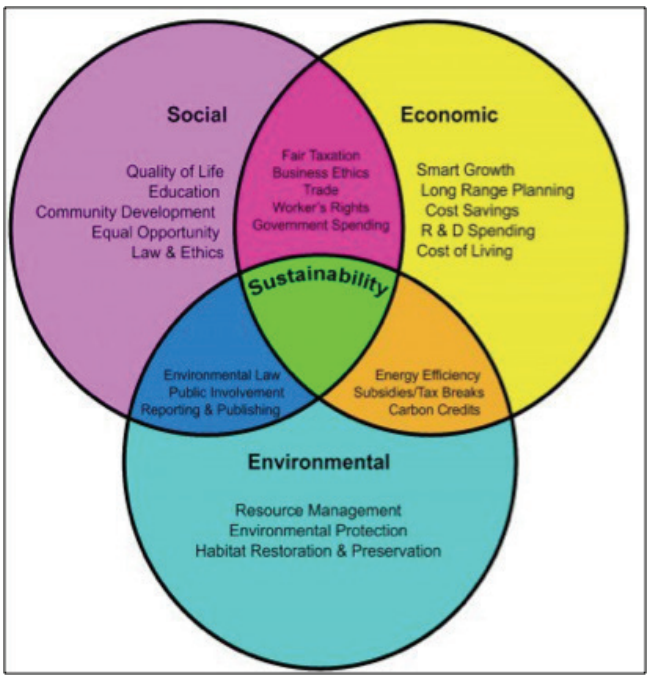
A comparison of socio-economic factors of developing and developed countries

Characteristics	Developing countries	Developed Countries
Per capita real income	Low per capita real income	High per capita income.
Population growth rate/size	High population growth rate/size	Low population growth rate
Rates of unemployment	High rates of unemployment	Low rates of unemployment
Dependence on primary sector	Dependence on primary sector	Depend on secondary and service sectors
Dependence on exports of primary commodities	Dependence on exports of primary commodities	Dependence on exports of manufactured commodities and services

Our 'environment' includes both social and physical determinants of health. Social impacts on health are embedded in the broader environment and shaped by complex relationships between economic systems and social structures. These systems and structures impact the distribution of resources, money and power in a community and around the world. This distribution, known as the socioeconomic environment, shapes how communities and individuals can gain the resources needed to meet their basic human needs.

Economic status is typically measured by income and education, social status measured by power and rank in a group, and work status measured by occupation. Access to resources is largely shaped by access to education, income and power. A person's socio-economic status (SES) is comprised of their economic, social and work status in comparison to their larger community.

Below is a diagram showing the three spheres and how they are related.



Environmental sustainability

In a truly sustainable environment, an ecosystem would maintain populations, biodiversity, and overall functionality over an extended period of time. Ideally, decisions that are made should promote equilibrium within our natural systems and seek to encourage positive growth. Unnecessary disturbances to the environment should be avoided whenever possible.

Economic sustainability

Similar to environmental sustainability, economic sustainability involves creating economic value out of whatever project or decision you are undertaking. Economic sustainability means that decisions are made in the most equitable and fiscally sound way possible while considering the other aspects of sustainability. In most cases, projects and decisions must be made with the long term benefits in mind (rather than just the short term benefits).

Social sustainability

Social sustainability is based on the concept that a decision or project promotes the betterment of society. For many people, the main concern in their lives is their overall wellbeing and quality of life. Think about how this relates to the economy and the environment. In a poor economy, people experience a poor quality of life. The same also holds true for a poor environment. In a poor environment, the impacts on quality of life are not always easily observable. However, it doesn't take a trained individual to see how things such as polluted storm water runoff, over-development of floodplains, and the poor management of our scarce resources can have an effect on our everyday quality of life. The three spheres of sustainability encompass many concepts which explain how decisions and actions can have an impact on the overall sustainability of our world.

Suggested Resources

Benchmark 12.1.2.3: Explore the significant characteristics or features of mega cities

Topic 3: Characteristics of mega cities

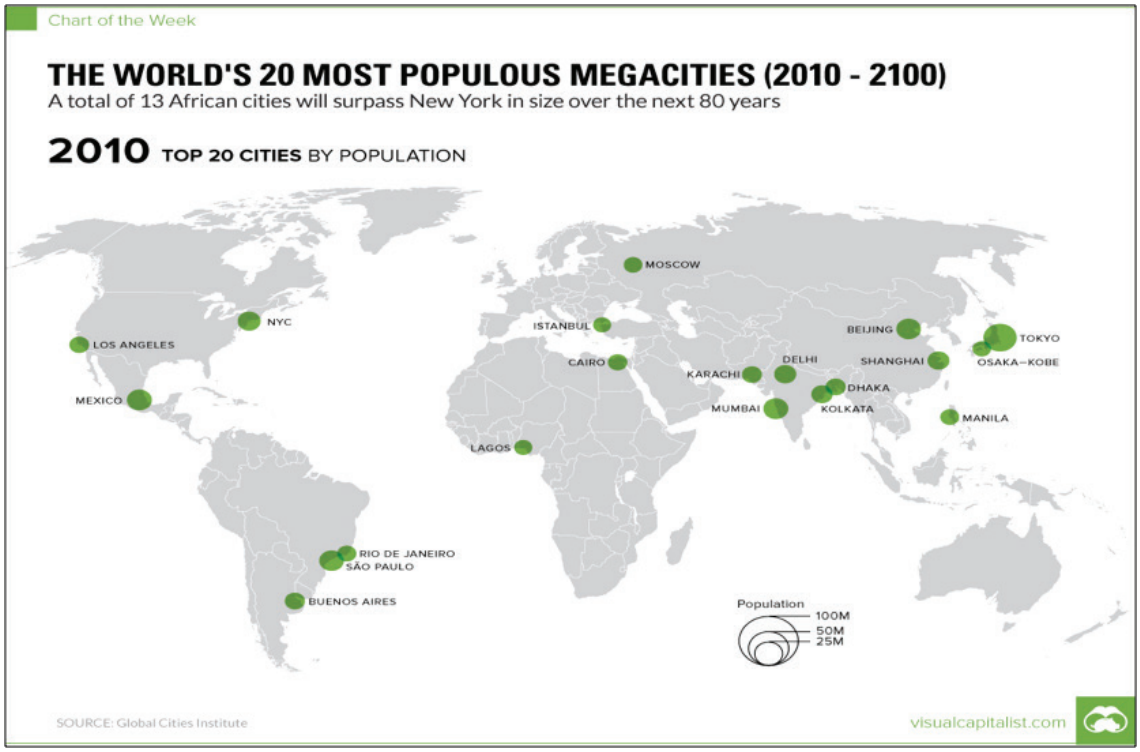
Sub-topic:
- Characteristics of mega cities

Skills: Critical thinking (analysis/explore)

Learning Objectives: By the end of the topic, students will be able to:
- Identify the characteristics of mega cities.
- Examine the characteristics of mega cities.

Content Background

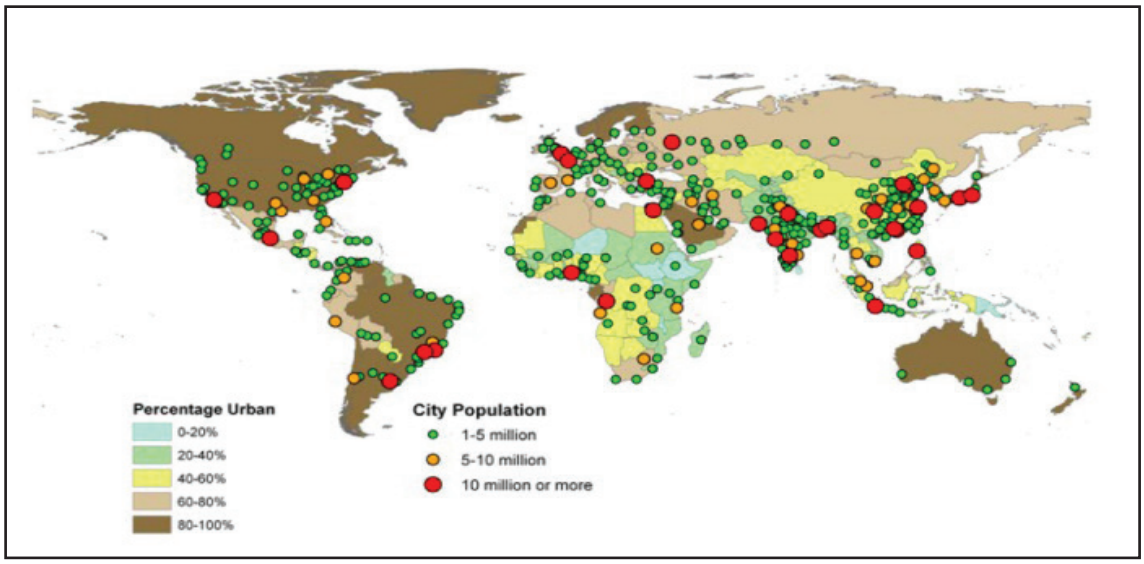
What is a megacity (hyper city/megalopolis)?
A city of at least 20 million people (UN Habitat, 2006)



Global distribution

In January 2015, China's Pearl River Delta conurbation overtook Tokyo as the world's largest city (Van Mead, 2016). However, this depends on how the 'city' is measured – the Pearl River Delta includes the cities of Shenzhen, Guangzhou, Foshan and Dongguan (but not Hong Kong, which is considered a separate territory under its 'Special Administrative Zone' status within China). If these cities were measured separately, Tokyo would likely remain the world's largest city.

Most of the world's megacities are found in Asia, as shown on the map below.



Global patterns of urbanisation, 2015

Characteristics of megacities

Megacities are often agglomerations (clusters/groups), created when two or more towns and cities grow so large that they join together. This is slightly different from a conurbation. A conurbation is an urban area created when two or more large settlements grow so big that they join together.

At the start of the 20th century, only London and New York were considered megacities. At that time, just 2% of the world's population lived in cities. The following years saw an increase in the number and a change in distribution, to now when over 50% of people live in cities producing 80% of the world's economic output. Megacities are now growing faster in the developing world compared to the richest countries.

Problems of megacities

- water supply,
- waste management
- sustainability of the housing stock.

Where are megacities found?

Most megacities are found at locations with;

- an adequate supply of fresh water, usually from a major river
- often coastal which makes it easy for trade, and therefore employment
- a large area of flat land suitable for building
- land that is generally well drained.

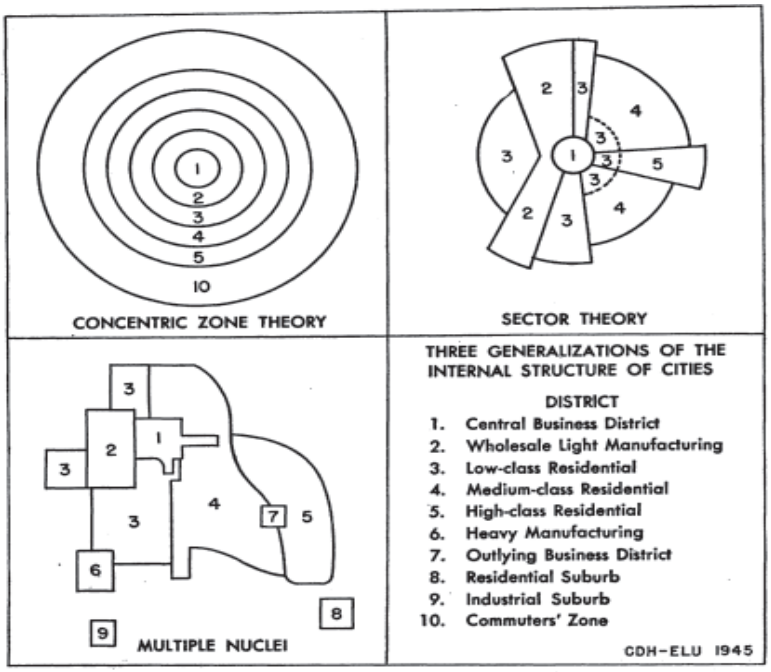
As most megacities are coastal, their situation is generally conducive to trade, and this was the original situational feature that made the city grow in that location. However, recent megacity growth is due to a positive feedback loop between accessibility for migrants, and the development of transport infrastructure. As modern transport networks (especially highways and trains) have developed, they have made it easier for migrants to reach the megacity. The population increases, and with it the size of the economy. More money can be spent on developing transport links to the rest of the country, which then makes it even easier for migrants to reach the city.

The reason that cities grow is usually because of in-migration. People migrate to the city because of the economic and social opportunities there. These opportunities are better because of the situation of the city: it is well situated to take advantage of trade opportunities with other places. This is closely linked to the idea of regional economic growth, and in particular the concept of core-periphery development. John Friedmann's Model of Regional Development (1966) and his related World City Hypothesis (1986) are both strongly linked to the development of large cities including megacities, and are covered elsewhere on this site.

Functions of megacities

All cities have multiple functions, such as industrial, political, residential and commercial. Smaller cities can often be identified as having one main function that stands out more than others (such as Canberra in Australia which has a political function; Oxford in England has an educational function; Chongqing in China has a manufacturing function; Frankfurt has a financial function). Megacities are so large that they usually have multiple functions and it is difficult to identify a single main function. They often have industrial and transport functions, but also act as hubs (centers) of commerce and finance, educational excellence, and as political and administrative headquarters.

The land use of megacities is usually highly varied. Megacities have almost always grown so large that they swallow up the surrounding settlements and result in a land use pattern that has distinct local centers within it but may not have any obvious central business district. This fits closely with the Multiple Nuclei model of urban land use, developed by Ullman and Harris in 1945.



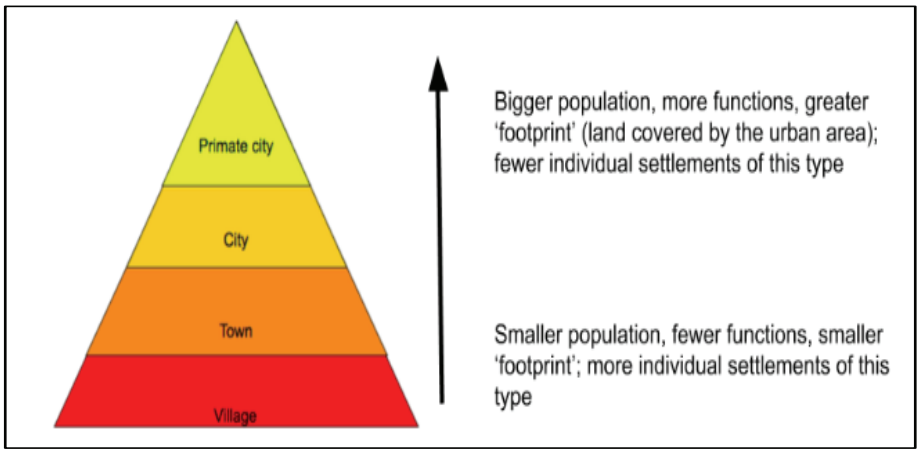
Models of urban land –use

Land use across the city varies in many ways, with no particular pattern, compared to smaller cities which often have clear sectors arranged in particular ways.

Hierarchy of settlement

Megacities are towards the top of the settlement hierarchy, meaning they have a large population but there are very few of them. One example of a settlement hierarchy is shown below. A megacity is often also a 'primate city' (a city twice as big as the next biggest city in the country).

Megacities are at the top of the hierarchy because of their population size (at least 10 million people), land area, variety of functions and their small number. However, other types of city may also appear at the top:



An example of a settlement hierarchy

Growth process of megacities

The growth of megacities is generally unplanned, the city grows due to large amounts of migration from rural areas. For instance, in Bangladesh, migration from rural areas to the capital Dhaka has swelled the city and it is one of the most densely populated cities on Earth. The city authorities have been unable to cope with the intense growth, leading to problems such as flooding, overcrowding, poor quality construction (and associated fires and building collapse) and the development of squatter settlements.

However, Chinese migration in the 1990s (and into the 2000s) was at a massive rate. This migration was planned by the central government in an effort to reduce poverty in China and provide workers for the huge industrial expansion that occurred in the period. The growth of Chinese megacities including Shanghai and the Pearl River Delta region was carefully planned and these cities have strong public transport networks, service provision and economic opportunities for the incoming migrants.

Megacities tend to grow in both the land area and population, and also affect the proportion of people living in rural areas compared to urban areas. Both urban growth and urbanisation happen with many megacities.

Urbanization is the term used to describe an increasing proportion of a population residing in urban areas. The difference between urban growth and urbanization is that urban growth reflects an increase in either the land area or the population size of an urban area. Urbanization is about the relative proportion of people residing in rural or urban areas in a given area (such as a region, country or continent).

Suggested Resources

Unit 3: People and Resources

Content Standard 1.3: Students will be able to analyse and discuss the different ways human factors and the distribution of resources that affect the development of places and the movement of populations.

Benchmark 12.1.3.1: Use migration data to show and analyse migration trends and patterns of various countries and regions using graphs, maps, and other tools.

Topic 1: Global migration trends and patterns

Sub-topic:

- Migration trends and patterns of various countries and regions using graphs and maps, and other tools.

Skills: Creative/critical thinking skills

Learning Objectives: By the end of the topic, students will be able to:

- Use migration data to show migration trends and patterns of various countries and regions using graphs and maps, and other tools.
- Examine and analyse migration trends and patterns of various countries and regions using graphs and maps, and other tools.

Content Background

Global migration trends and patterns

Migration is the movement of people from one place to another with the intent to settle. Global migration is a situation where people leave their countries to go and live in other foreign countries in order to find jobs. Most global migration occurs from developing to developed countries. In 2015, 244billion people, or 3.3 percent of the world's population, lived outside of their country of origin.

According to estimates from the UN 2015 report, in 2013, the United States, Germany and Russia had the largest of immigrants of any country, while Tuvalu and Tokelau had the lowest.

Main causes of global migration

In preindustrial societies, environmental factors, such as the need for resources due to overpopulation, were often the cause of migration.

Current Global Migration: Job opportunities, security and environmental disasters, conflict and war are some of the factors that influence the migration patterns of people to move across land boundaries.

Global migration pattern

Economic motives drive migration both to developed countries and to developing countries with financial opportunities. Migrants typically remain

within their regions of origins, often crossing into adjacent countries. Taken together, these patterns shape the contours of contemporary international migration.

Migration is important for the transfer of manpower and skills and provides the needed knowledge and innovation for global growth. In order to address the issues raised by global migration, it is necessary to improve international coordination - May 19, 2011.

Types of migration

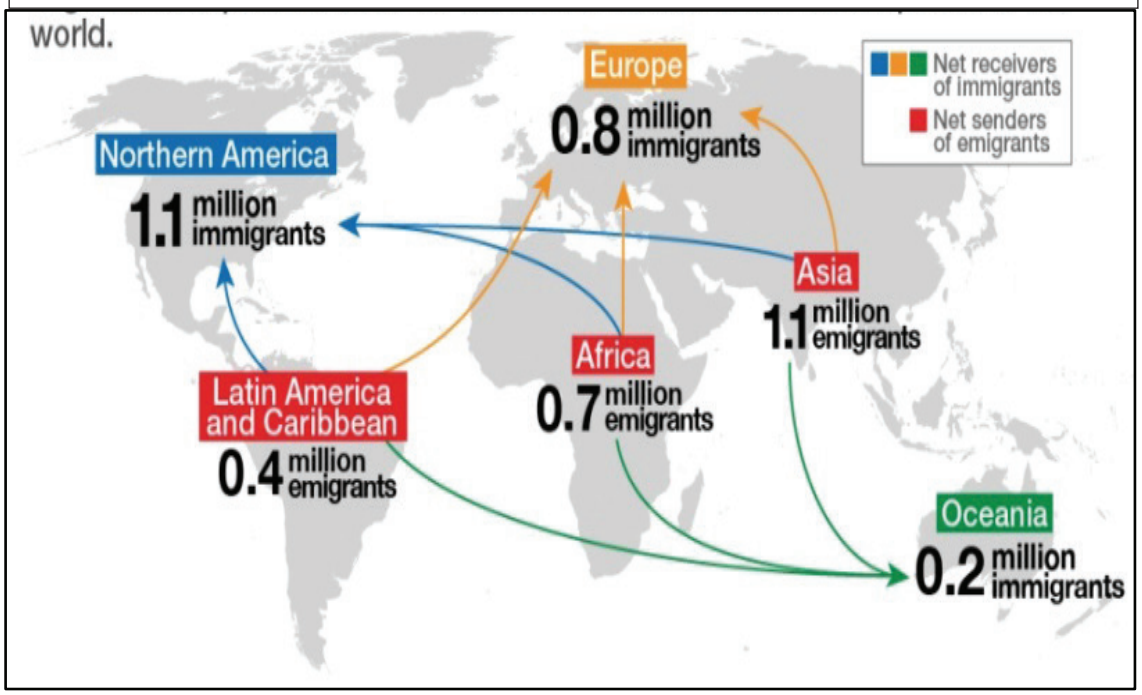
There are four different types of migration:

1. Counter-urbanisation
2. Emigration
3. Immigration and internal migration
4. International migration
5. Rural-urban migration.

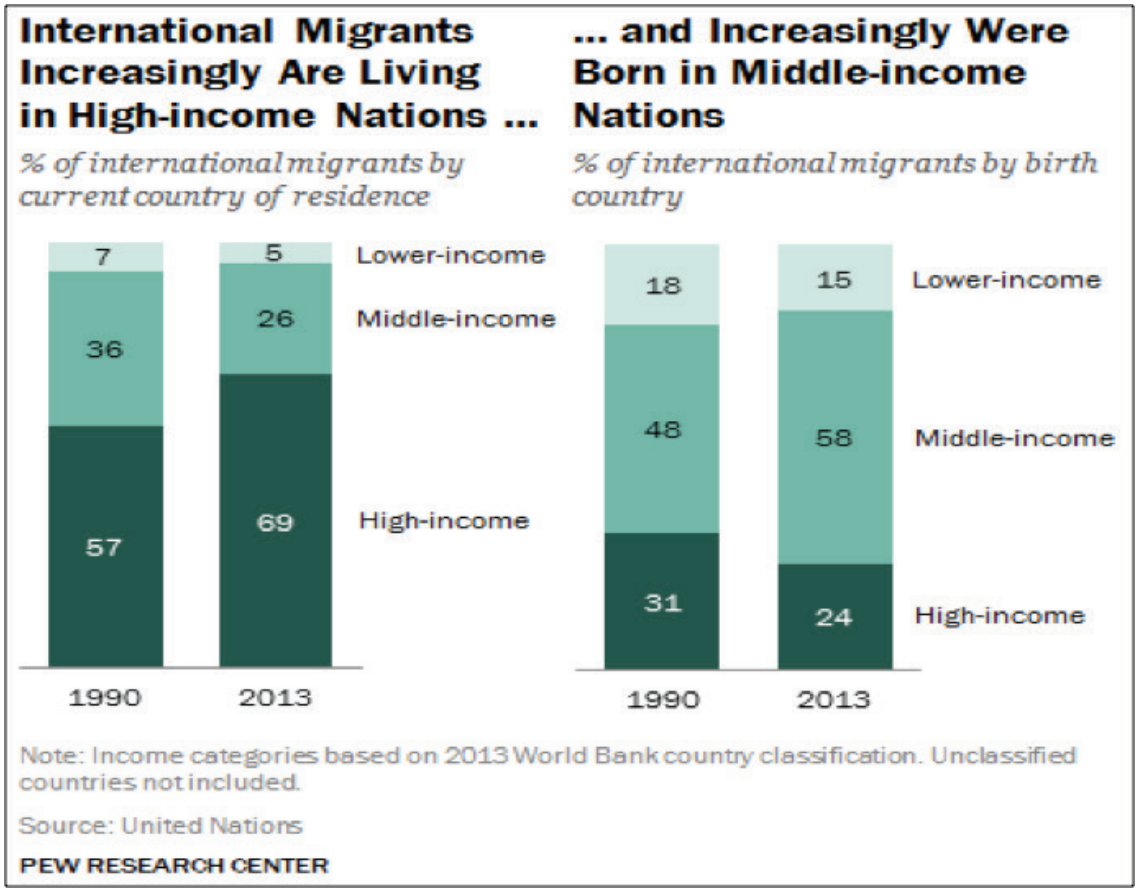
Source: Adapted Abel, G.J.,& Sander, N. (2014)

Global Migration

Between 2010 and 2015, Northern America, Europe and Oceania had a net inflow of over two million immigrants a year. The UN believes international migration is a positive force for the economic and social development of the world.



Retrieved from: https://images.search.yahoo.com/yhs/search?p=Global+Migrations+Patterns+and+Trends+Diagram



Most people migrate for economic reasons compared to cultural and environmental factors.

Suggested Resources

1. Abel, G.J.,& Sander, N. (2014). *Quantifying global international migration flows."*Science, 343.(6178), 1520-1522.
2. Haque, M. S. (2005). *Migration trends and patterns in South Aisa and management approaches and initiatives.* Asia Pacific Population Journal, 20(3), 39.
3. Kritz, M, M., Keely, C. B., & Tomasi, S. M. (1987). *The global picture of contemporary immigration patterns.*
4. Kritz, M, M., Keely, C. B., & Tomasi, S. M. (1981). *Global trends in migration: theory and re-search on international population movements.*
5. *https://images.search.yahoo.com/yhs/search?p=Global+Migrations+Patterns+and+Trends+Diagram&fr=yhs-Lkry-*

Benchmark 12.1.3.2: Examine the factors that influence people to migrate

Topic 2: Factors influencing migration

Sub-topics:
- Pull factors
- Push factors

Skills: Critical thinking skills

Learning Objectives: By the end of the topic, students will be able to:

- Conduct a mini research on the factors that influence people to migrate.
- Analyse the data collected from the mini research.
- Categorise the information into push and pull factors of migration.
- Present the data on tables and graphs.
- Propose ways to control migration especially (migration into towns & cities).

Content Background

This topic may be given as a project for students to conduct a mini research. Teacher should guide the students with an analytical rubric (detailed expectations). The learning objectives should help to set out the criteria.

In geography, the term push and pull factors are used to describe why people migrate from one area to another. The opportunity of employment is a major pull factor.

Factors influencing migration	
Push Factors	**Pull Factors**
Not enough jobs	Availability of better job opportunities
Few job opportunities	Better living conditions
Primitive Conditions	Political and/or religious freedom
Desertification	Education
Famine and Droughts	Better medical care
Political fear or persecution	Attractive climates
Slavery or forced labour	Security
Poor medical care	Family links
Loss of wealth	Industry
Natural Disasters	Better chances of marrying
Death threats	Fertile land
Lack of political or religious freedom.	Environmental safety
Pollution	Education
Poor housing conditions	Better medical care
Land lord tenant issues	Attractive climates
Bullying	Security
Discrimination	
Poor chances of marrying	
War and famine	

Push and pull factors are interconnected. One factor pushes people to migrate looking for better of that factor when it is offered somewhere else.

Factors influencing migration	
Push Factors	**Pull Factors**
Persecution Violence War	→ Safety and stability Freedom
Poor wages Lack of jobs	→ Higher wages Job prospects
Crop failure and famine Pollution Natural disaster	→ Food availability (fertile land) Better environment
Limited opportunities Lack of services Family separation	→ Family reunification Better quality of life Availability of services

Suggested Resources

1. Awumbila, M. (2017). *Drivers of migration and urbanisation in Africa: Key trends and issues."* International Migration, 7, 8.
2. Hare, D. (1999). *'Push' versus 'pull' factors in migration outflows and returns: Determinants of migration status and spell duration among China's rural population.* The Journal of Development Studies, 35 (3), 45-72.
3. https://www.theguardian.com/world/2015/sep/04/10-ways-to-manage-the-migration-crisis
4. Parkins, N. C. (2010). *Push and pull factors of migration. American Review of Political Economy, 8(2), 6.*
5. Schoorl, J., Heering, L., Esveldt, I., Groenewold, G., & Van der Erf, R. (2000). *Push and pull factors of international migration: a comparative report.*
6. Quiang, L. (2003). *An Analysis of Push and Pull Factors in the Migration of Rural Workers in China*

How to access and search for scholarly resources

1. Click on Google Chrome search engine on your phone
2. Type in “Google Scholar”
3. Click on google scholar on your search engine (google chrome).
4. Type in the topic you want to search and click search (enter).
5. Click on the article or book on the relevant topic you are teaching and READ.
6. Download if PDFversion is available.

Repeat same steps for any topics you want to read to enhance your teaching.

Benchmark 12.1.3.3: Analyse the consequences of migration

Topic 3: Consequences of migration

Sub-topics:
- Economic effects of migration
- Social effects of migration
- Environmental effects of migration

Skills: Critical thinking skills

Learning Objectives: By the end of the topic, students will be able to:

- Investigate the economic effects of migration.
- Examine the social effects of migration.
- List and explain the environmental effects of migration.

Content Background

Economic effects of migration

The economic effects of migration for both sending and receiving countries may also vary depending on who is moving, specifically with respect to migrant workers' skill levels. If there are no jobs, the consequences are segregation, housing problems and divided cities" (Traynor, 2010).

At the same time, developing countries can suffer from "brain drain"—the loss of trained and educated individuals to emigration. For example, there are currently more African scientists and engineers working in the U.S. than there are in all of Africa, according to the International Organization for Migration (IOM).

Migration boosts the working-age population. Migrants arrive with skills and contribute to human capi-tal development of receiving countries. Migrants also contribute to technological progress.

Social effects of migration

Native residents are largely unfriendly to newcomers, because they associate them with increased stress in the labor market, larger loads on the social infrastructure, a rise in crime and ethnocultural conflicts, and overall deterioration in living and working conditions of the native population. Meanwhile, in many developed countries that face an intensive inflow of foreigners, life satisfaction, which reflects the perception of social processes is sufficiently high and has demonstrated positive dynamics in re-cent years.

Environmental effects of migration

Receiving countries have increased population which leads to an increase in global emissions. Migration appears to have damaging effects on the environmental conditions in the region to where migration takes place. Possible causes of the negative effects are the initial deforestation and more intensive land use that directly results from the establishment of more farms, but also the inadequate technologies that used by the migrants who are not so familiar with the region's soil and climatic conditions.

Suggested Resources

1. Conway, D., & Cohen, J.H. (1998). Consequences of migration and remittances for Mexican transnational communities. *Economic geography 74* (1), 26-44.
2. De Jong, G. F., Chamratrithirong, A., & Tran, Q. G. (2002). For Better, For Worse: Life Satisfaction Consequences of Migration 1. *International Migration Review, 36*(3), 838-863.
3. Keane, D. (2003). The environmental causes and consequences of migration: a search for the meaning of environmental refugees.*Geo.Int'l Envtl. L. Rev. 16, 209.*
4. Liang, Z., & Chen, Y. P. (2010). The educational consequences of migration for children in China. In *Investing in Human Capital for Economic Development in China* (pp.159-179).
5. Zachariah, K. C., Mathew, E. T., & Rajan, S. I (2001). Social, economic and demographic con-sequences of migration on Kerala. *International migration 39*(2), 43-71.

Unit 4: People and Environment

Content Standard 1.4: Students will be able to evaluate how geographic processes and human actions modify the environment and how the modified environment affects humans.

Benchmark 12.1.4.1: Explain the concept of greenhouse effect

Topic 1: The greenhouse effect

Sub-topic:

- Greenhouse and enhanced greenhouse effect

Skills: Critical thinking (analysis)

Learning Objectives: By the end of the topic, students will be able to:

- Explain the concept of greenhouse effect.
- Differentiate between greenhouse and enhanced greenhouse effect.
- Construct diagrams to illustrate greenhouse effect.
- Read and collect newspaper articles on global warming and climate change.
- Engage in debates and class discussions.

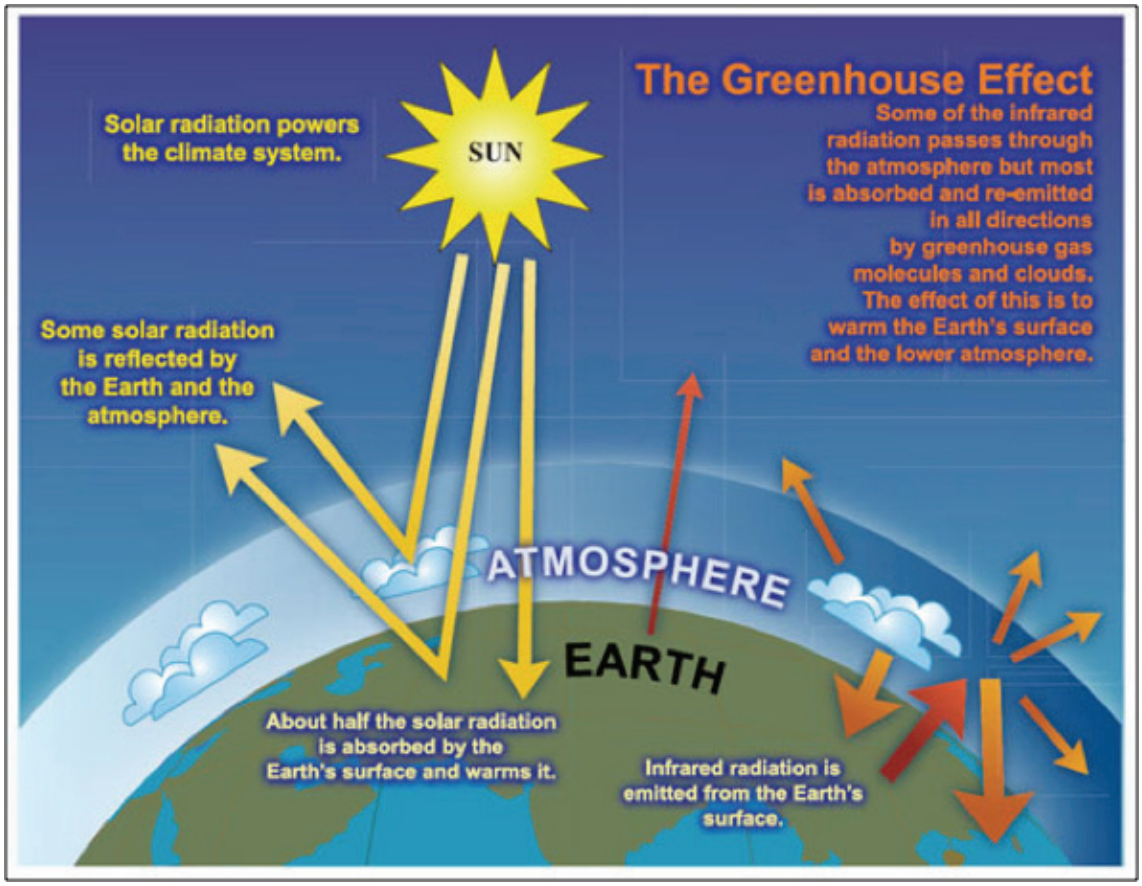
Content Background

Concept of greenhouse effect

A greenhouse is designed to trap heat from the sun's rays inside and acts to keep the plants inside warm, even when it is cold outside. The molecules in our atmosphere are called greenhouse gases because they absorb heat.

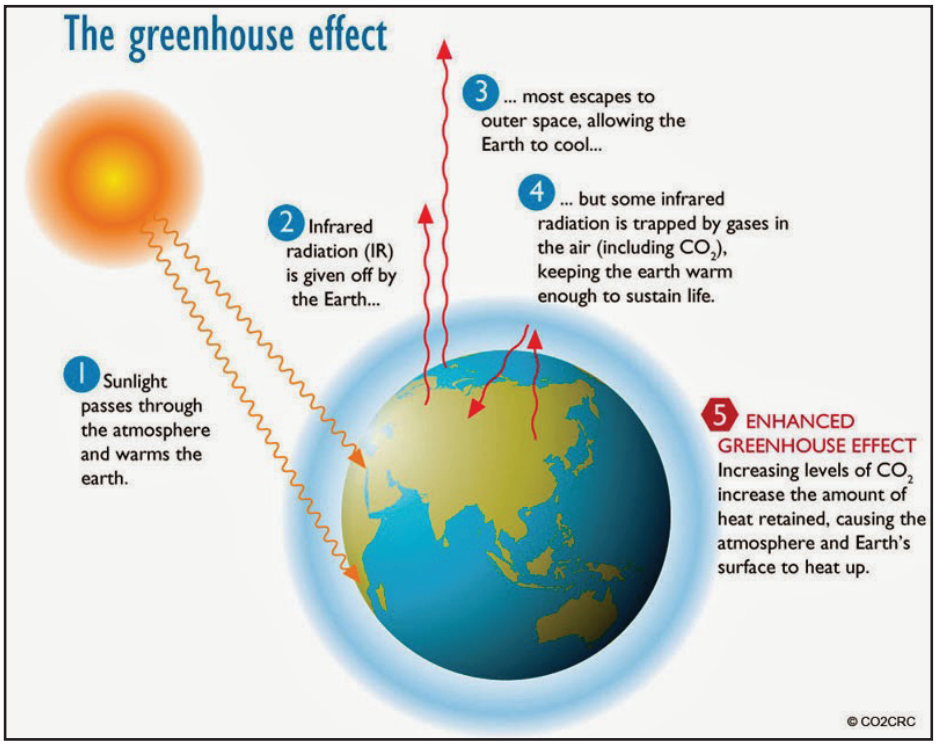
What is greenhouse effect?

The greenhouse effect is a natural process that occurs when gases in earth's atmosphere trap the Sun's heat that warms the earth's surface. When the sun's energy reaches the earth's atmosphere, some of it is reflected back to space and the rest is absorbed and reradiated by greenhouse gases.



Source: https://images.app.goo.gl/ZCnfpe1cKNuZcgVp9.

Difference between greenhouse and enhanced greenhouse effect
The greenhouse effect is a natural process by which the earth traps enough heat to sustain life. It is the trapping of heat under the atmosphere, which is a natural effect caused by greenhouse gases. However, when greenhouse gas concentrations are too high, they trap too much heat and increase the temperature on earth, causing the enhanced greenhouse effect which is now a problem leading to what we call "global warming".



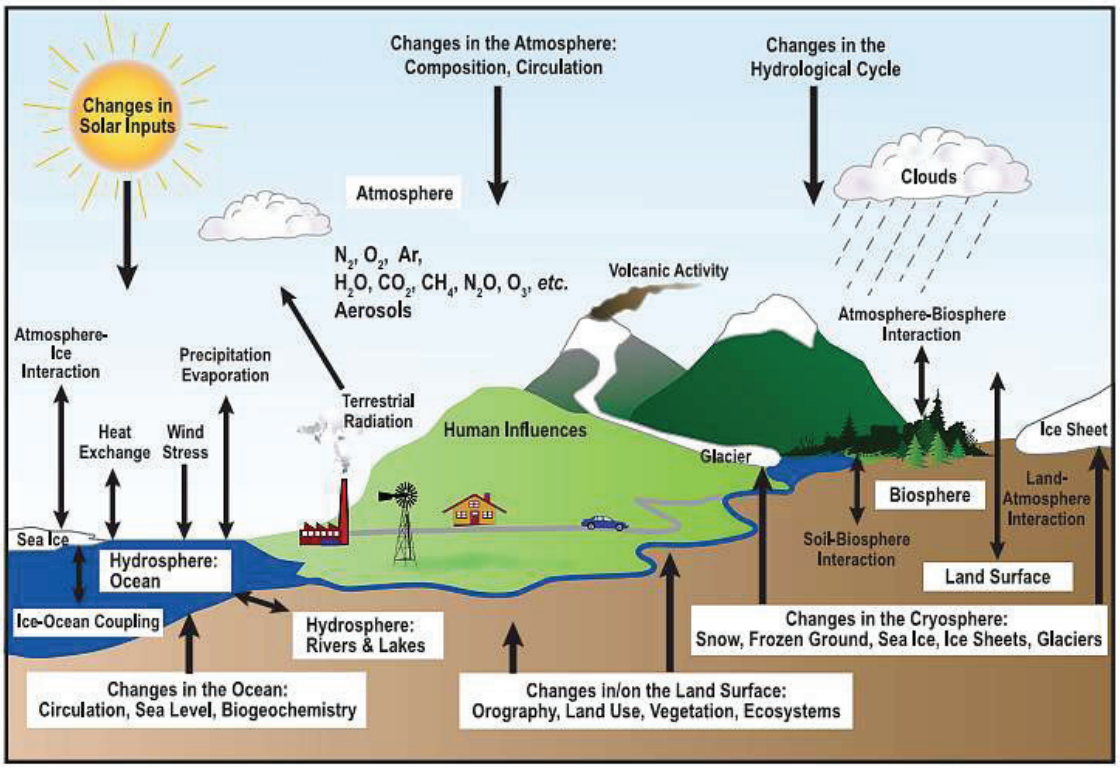
According to World Meteorological Organisation, the warming of long-lived greenhouse gases on our planet has increased by 41% since 1990. Refer to diagram below.

Enhanced Greenhouse effect sometimes referred to as climate change or global warming is caused by human's activities and is the impact on the climate from the additional heat, retained due to the increased amounts of carbon dioxide into the earth's atmosphere since the industrial revolution (human activities).

Ozone depletion is a different environmental problem from the enhanced greenhouse effect. However, ozone depletion is also caused by changes to the atmosphere caused by humans. Both the greenhouse effect and ozone depletion are due to chemicals released into the air by people's activities. For example, production of more air conditioner releases more of the CFC gases that chemically react with ozone gases and depletes the ozone layer slowly causing large holes.

This then causes more direct radiation from the sun's heat to reach the earth which then contributes to more heating up leading to enhanced greenhouse effect. The more the earth becomes warmer due to enhanced greenhouse effect, then it becomes a problem and is now called 'global warming'.

Diagrams illustrating greenhouse effect



Source: https://images.app.goo.gl/ZCnfpe1cKNuZcgVp9.

Suggested Resources

1. Boyes, E., & Stanisstreet, M. (1997). Children's models of understanding of two major global environmental issues (ozone layer and greenhouse effect). *Research in Science & Technological Education, 15*(1), 19-28.
2. Dove, J. (1996). Student teacher understanding of the greenhouse effect, ozone layer depletion and acid rain. *Environmental education research, 2*(1), 89-100.
3. Koulaidis, V., & Christidou, V. (1999). Models of students' thinking concerning the greenhouse effect and teaching implications." *Science Education, 83*(5), 559-576.
4. Mitchell, J. F. (1989). The "greenhouse" effect and climate change. *Reviews of Geophysics, 27*(1), 115-139.

Benchmark 12.1.4.2: Examine the process of global warming and climate change.

Topic 2: Global warming and climate change

Sub-topic:
- Process of global warming and climate change

Skills: Analytical thinking, interpreting

Learning Objectives: By the end of the topic, students will be able to:

- Explain why global warming and climate change is such a hot topic.
- Examine the process of global warming and climate change.
- Use available data and examine the scientific predictions of global warming and climate change.
- Read and collect newspaper articles on global warming and climate change.
- View documentaries and engage in debates and class discussions.

Content Background

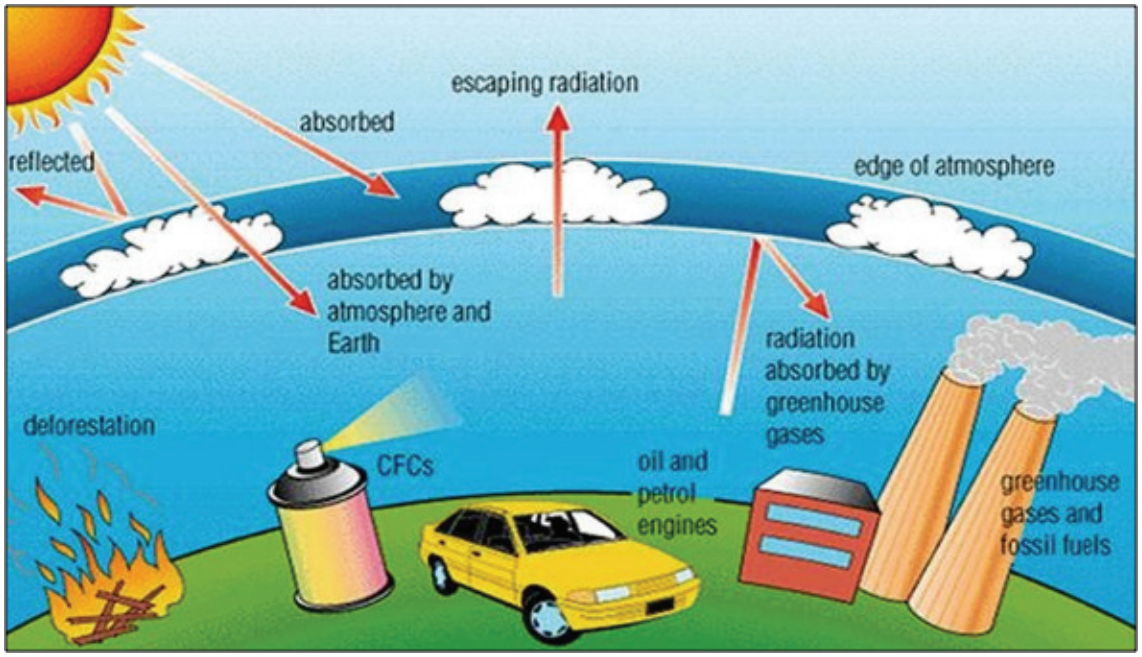
What is global warming?

Global warming and climate change has become a hot issue globally because of the fact that the globe is heating up. Global warming is the rise in the average temperature of the earth's atmosphere and oceans since the late 19th century and is projected continuation. This happens when there is an increase in the production of gases like carbondioxide, water vapour, nitrous oxide, methane which are known as greenhouse gases. These greenhouse gases trap heat and light from the sun in the earth's atmosphere and this in turn increases the temperatures and cause global warming.

Why is global warming and climate change such an issue?
- There is a great increase in the global temperature today than it was in the 1880.
- Both land and oceans are warmer now than the first time it was recorded in 1880, and temperature are still ticking up.
- According to the National Oceanic and Atmospheric Administration (NOAA): Average surface temperature rose a total of 1.71 degrees Fahrenheit (0.95 degrees Celsius) between 1880 and 2016.
  Source: https://www.livescience.com/37003-global-warming.html

Causes of global warming

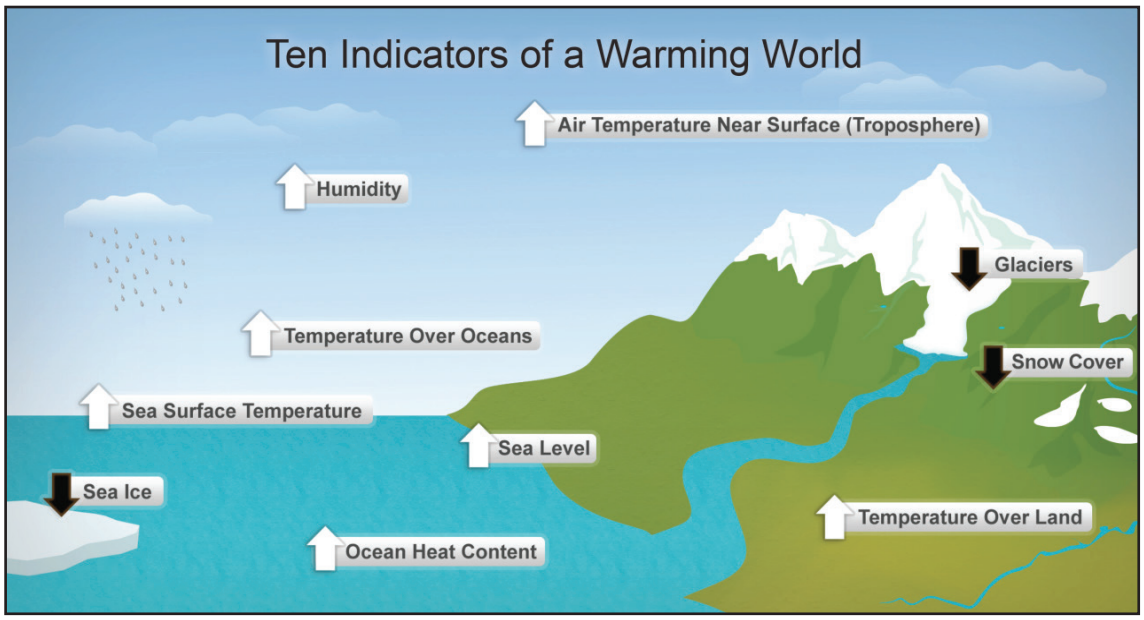
The main cause of global warming today is the *burning of fossil fuels* by large industries around the world. Most of this hydrocarbon heats up the planet through the greenhouse effect (natural process of heating and cooling of the earth between the earth's atmosphere and the direct sun's radiation).



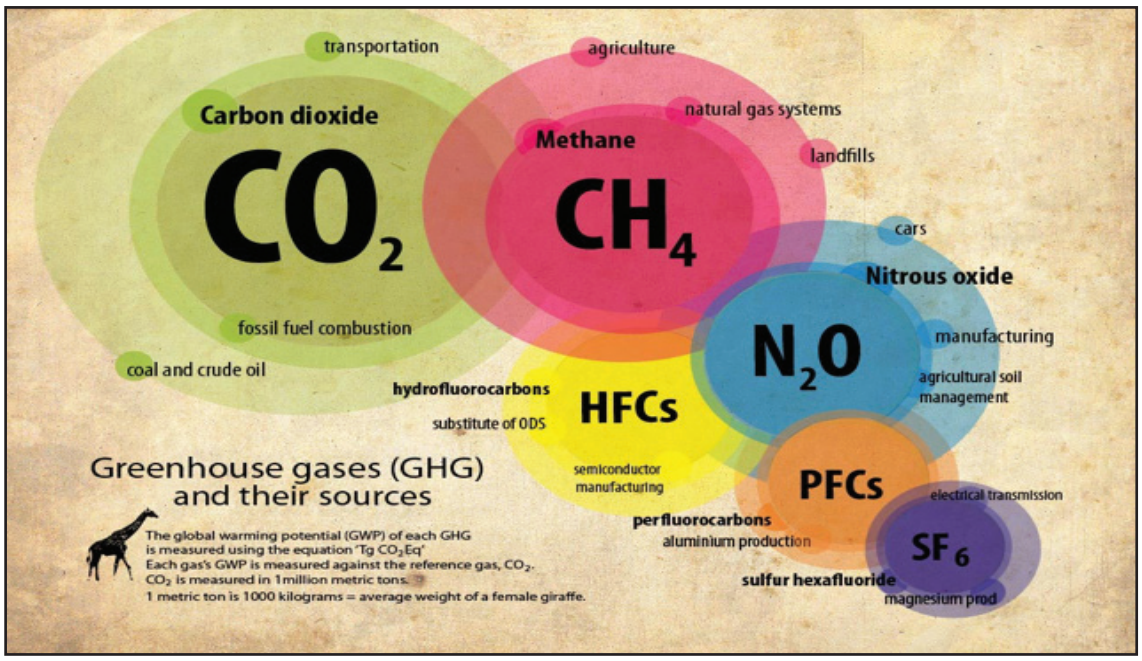
Source: https://images.app.goo.gl/ZCnfpe1cKNuZcgVp9.

- The greenhouse gases are a blanket that controls the amount of heat passing through the earth through the earth's atmosphere and the sun's radiation.
- The greenhouse effect occurs when the solar radiation heats the surface of the earth and then bounce back toward the atmosphere. Gasses in the atmosphere trap this heat, preventing it from escaping into the void space and sustain life on the planet. It is a natural cycle that helps in sustaining life on earth. But when there is too much of one thing, then there will be problems.
- Global warming occurs when there is an imbalance in the amount of radiation, i.e. more radiation coming in than going out. When more radiation is trapped, it increases the normal global temperature. This gradual increase in the planet's temperature results is increase warming of the globe which is referred to as global warming.

Diagram below shows ten indicators of a warming world



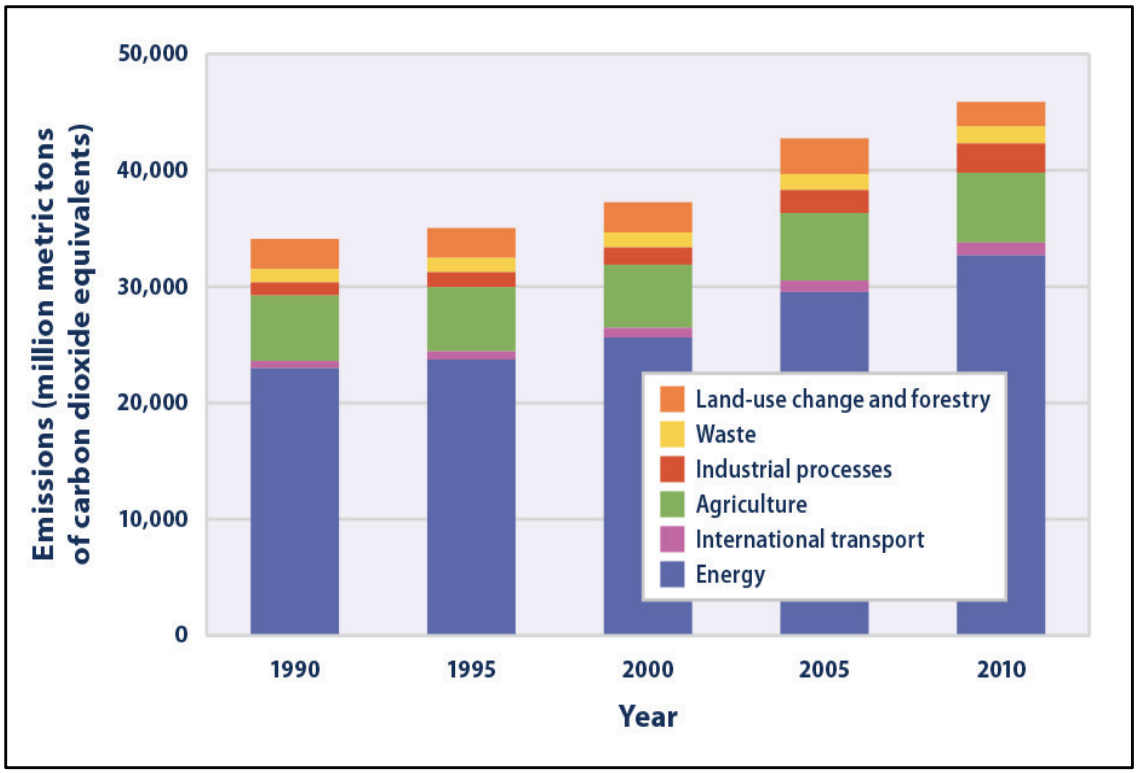
Where did the Greenhouse Gases come from?



Source: https://images.app.goo.gl/ZCnfpe1cKNuZcgVp9.

Where does emission come from?

Most emission come from energy sectors around the world.



Suggested Resources

1. *https://worldat1c.org/top-diagrams-to-explain-climate-change-10c5a016b6e9.*
2. *https://images.app.goo.gl/ZCnfpe1cKNuZcgVp9.*
3. Liverman, D. M., & O'Brien, K.L. (1991). Global warming and climate change in Mexico. *Global Environmental Change 1*(5), 351-364.
4. Schuldt, Johnathon P., Konrath, S.H., & Schwarz, N. (2011). "Global warming" or "climate change"? Whether the planet is warming depends on question wording. *Public Opinion Quarterly, 75* (1), 115-124.

Benchmark 12.1.4.3: Identify and analyse the factors contributing to global warming and climate change.

Topic 3: Factors influencing global warming and climate change

Sub-topics:
- Human factors contributing to global warming and climate change
- Natural factors contributing to global warming and climate change

Skills: Analysis (identify, explain)

Learning Objectives: By the end of the topic, students will be able to:

- Examine the human activities contributing to global warming and climate change.
- Investigate natural cycles contributing to global warming and climate change.

Content Background

How do human activities contribute to global warming and climate change? Human activity is driving climate change, including global temperature rise. Human activities contribute to climate change by causing changes in earth's atmosphere in the amounts of greenhouse gases, aerosols (small particles), and cloudiness. The largest known contribution comes from the burning of fossil fuels, which releases carbon dioxide gas to the atmosphere.

There is no doubt humans have been the main part of the problem. Here are the 10 biggest human causes of global warming.

Activity	Explanation
Travel and Transportation	The vast majority of vehicles on the road (and in the air and water) are powered via fossil fuels, such as gasoline. As they burn this fuel to power their engines, these vehicles release carbon and other pollutants, affecting both air and water quality.
Industrialization	The transition of economies from primarily farming-based to primarily industrial is likely to have been the earliest cause of the rampant global warming we see today. Research suggests global warming was kicked off partly by the Industrial Revolution in the U.S. and other countries, which occurred in the mid-19th century.
Deforestation	Millions of acres of forest are cleared every year, whether to harvest wood for making lumber or paper, to clear land for farming and ranching or to make way for residential and industrial areas. Forests store enormous amounts of carbon, essentially removing it from the air and preventing it from being absorbed into the atmosphere, and this is especially true of rainforests, which are even more endangered than other areas. In addition to losing the natural air-scrubbing function of trees, deforestation decreases biodiversity, which can cause ripple effects throughout entire ecosystems, putting whole species at risk.
Livestock Production	Ranching contributes to climate change in a few ways. In addition to clearing trees to make room for large areas adequate for the care and feeding of animals for food, these animals create a huge amount of waste, which produces methane, a very harmful greenhouse gas.

Factory Farming	The industrialization of agriculture takes the potential negative effects of livestock production and amplifies them. While organic farming can have a positive impact on global warming by reducing carbon through the growth of crops, large-scale, industrialized farming negates the positive impact of organic food and animal production.
Consumerism	Our need to have the latest gadget and get it delivered right now, in addition to a culture where disposability is seen as a positive, is a major contributor to global warming. This bent toward consumerism has ripple effects around the world. The products used by humans contribute to more than 60 percent of greenhouse gas emissions and as much as 80 percent of total land, water and material use. In addition to the energy it takes to produce all the stuff we buy, keeping it going and using it to its fullest requires even more energy
Overuse of Electricity	The gasoline your car burns was made using fossil fuels, which is how most people get their electricity as well. In the U.S., electricity generation is tied as the biggest greenhouse gas contributor.
Overfishing	Hundreds of millions of jobs around the world center on fishing, and about 3 billion people depend on fish as their main source of protein from food. But just as with most industries, humans have created too much of a good thing, and overfishing is putting the oceans at risk. Human population growth and resulting overfishing are depleting natural marine stocks, which impacts the health and biodiversity of the entire ocean.
Use of Aerosols	Though some forms of aerosols have been banned in many countries, other forms of them still are in wide use. These products are loaded with greenhouse gases, including CO_2 and methane, as well as chlorofluorocarbons, which erode the ozone layer.
Inability to Change	Even if we addressed every single other issue on this list today, the impact of human-caused global warming will remain for decades, if not centuries. The magnitude of the issue is, quite simply, too difficult for many of us to comprehend. So, many of us think, if we can't truly fix this issue, what's the point of even trying? After all, it's our very inaction that has caused or worsened many of these issues.

Retrieved from: https://www.reusethisbag.com/articles/10-human-causes-of-global-warming/

Natural factors contributing to global warming and climate change

The earth's climate can be affected by natural factors that are external to the climate system, such as changes in volcanic activity (aerosols), dust, and salt spray; natural carbon cycle processes like termite mounds in Africa that emit methane, or tiny organisms in the ocean surface that take up carbon dioxide; and variation in snow and ice cover that change how much the earth's surface reflects the sun's energy back into space (referred to as albedo).solar output, and the earth's orbit around the sun.

Of these, the two factors relevant on timescales of contemporary climate change are changes in volcanic activity and changes in solar radiation. In terms of the earth's energy balance, these factors primarily influence the amount of incoming energy. Volcanic eruptions are episodic and have relatively short-term effects on climate. Changes in solar irradiance have contributed to climate trends over the past century but since the Industrial Revolution, the effect of additions of greenhouse gases to the atmosphere has been over 50 times that of changes in the Sun's output.

Suggested Resources

1. *https://www.vedantu.com/chemistry/effects-of-burning-fossil-fuels*
2. Hoyos, C.D., Agudelo, P. A., Webster, P.J., & Curry, J.A. (2006). Deconvolution of the factors contributing to the increase in global hurricane intensity. *Science, 312*(5770), 94-97.
3. Lin, I. I., Pun, I. F., & Lien, C.C. (2014). "Category-6" supertyphoon Haiyan in global warming haitus: Contribution from subsurface ocean warming. *Geophysical Research Letters, 41*(23), 8547-8553.
4. Stone, D., & Weaver, A. (2003). Factors contributing to diurnal temperature range trends in twentieth and twenty-first century simulations of the CCCma coupled model. *Climate Dynamics, 20*(5), 435-445.
5. Watanabe, C. (1995). Mitigating global warming by substituting technology for energy: MITI's efforts and new approach. *Energy Policy, 23* (4-5), 447-461.

Benchmark 12.1.4.4: Investigate the impact of climate change on the environment and the people from different perspectives.

Topic 4: Impact of climate change

Sub-topic:
- Impact of climate change on the environment and the people

Skills: Analysis (investigate/identify, explain)

Learning Objectives: By the end of the topic, students will be able to:
- Investigate the impact of climate change on the environment and the people from different perspectives.
- Read and collect newspaper articles on global warming ad climate change.
- View documentaries and engage in debates and class discussions.

Content Background

Impact of climate change on the environment

As the climate warms, it changes the nature of global rainfall, evaporation, snow, stream flow and other factors that effects water supply and water temperatures affect water supply and quality. Specific impacts include: warmer water temperature affect water quality and accelerate water pollution.

Sea level rise causes the weather to change, look at the Gulf of Mexico for example - the warmer the earth gets, the warmer the oceans get. Hurricanes basically 'feed' off of warm water. So as the earth heats up and the oceans heat up, larger and more destructive hurricanes will form. (Think of hurricane Katrina...that is only a precursor to what that area may see as the surrounding ocean continues to heat up).

A warmer climate creates an atmosphere that collects more water, changing weather patterns in such a way that wet areas become wetter and dry areas become drier.

Experience more extreme weather such as floods, storms, heat waves, droughts are expected to become more common.

Impacts of climate change on people

The diagram below shows some of the impact of climate change on people's health:
For example; severe weather leads to injuries, fatalities, mental health impacts. Air pollution contributes to asthma, cardiovascular diseases etc.

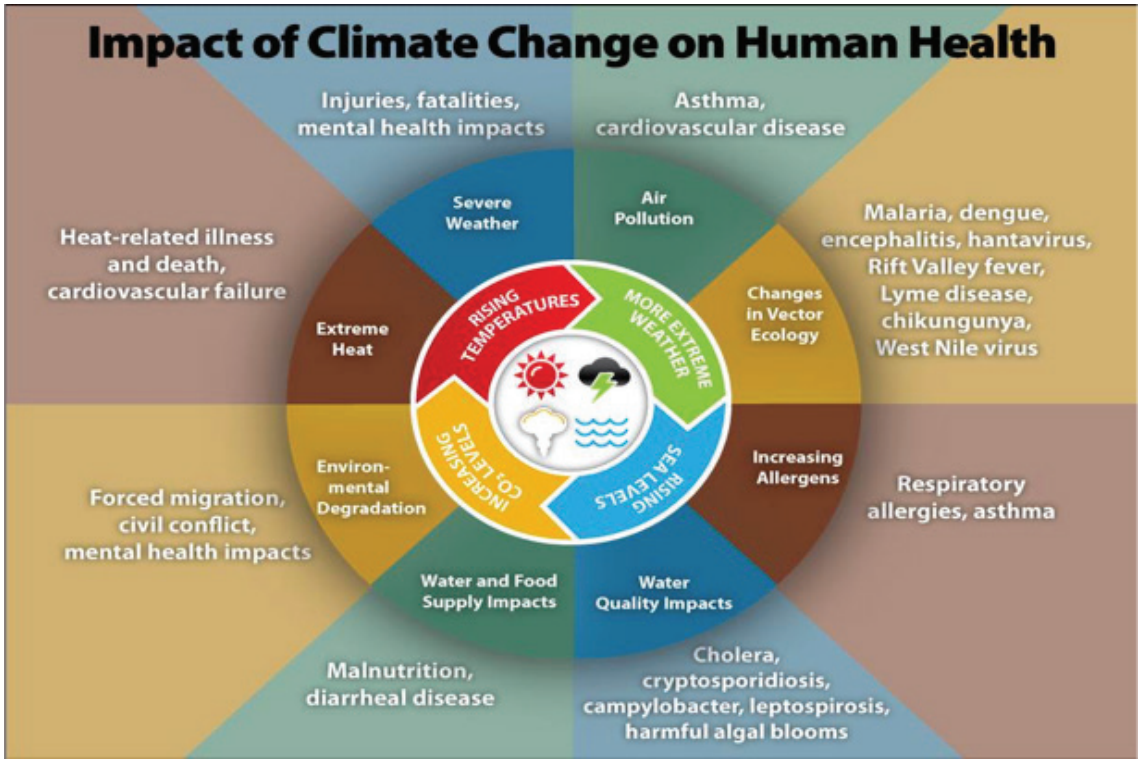


Photo Credit: Centre for Disease Control and Prevention

Suggested Resources

1. Arnell, N. W., van Vuuren, D. P., & Isaac, M. (2011). The implications of climate policy for the impacts of climate change on global water resources. *Global Environmental Change 21*(2), 592-603.
2. Berry, H. L., Bowen, K., & Kjellstrom, T. (2010). Climate change and mental health: a causal pathways framework." *International journal of public health, 552),* 123-132.
3. Change, G. C. (2007). Impacts and Adaptation. *Nature Conservancy, 434,* 951-0569.
4. Jones, H. P., Hole, D. G., & Zavaleta, E.S. (2012). Harnessing nature to help people adapt to climate change. *Nature Climate Change, 2*(7), 504.
5. Rosenweig, C., & Parry, M. L. (1994). Potential impact of climate change on world food supply. *Nature, 367*(6459), 133.

Benchmark 12.1.4.5: Use research skills to investigate and document cases of social, economic, political, and environmental impact of climate change in Papua New Guinea and elsewhere.

Topic 5: Impact of climate change in PNG (Case studies)

Sub-topics:
- Social impact of climate change in PNG
- Economic impact of climate change in PNG
- Political impact of climate change in PNG
- Environmental impact of climate change in PNG

Skills: Creative thinking skills

Learning Objectives: By the end of the topic, students will be able to:

- Investigate and gather information on the impacts of climate change in PNG.
- Analyse and catergorise the impacts of climate change in PNG. (environmental, social, economic, political).
- Use various tools to present data collected on the impacts of climate change.
- Explain how environmental impacts of climate change can affect other areas.
- Investigate cases such as Carteret Islands in PNG and Pacific atolls/ islands.
- Read and collect newspaper articles on global warming and climate change.
- View documentaries and engage in debates and class discussions.

Content Background

Climate change is one of the most complex issues facing us today. It involves many dimensions; science, economics, society, politics and moral and ethical questions – and is a global problem, felt on local scales, that will be around for decades and centuries to come.

Impact of climate change in PNG

Source: Catalyst- Pastoral & Socio-Cultural Journal for Melanesia,Vol. 42, No. 1, 2012 – pp. 69-83 Re-trieved from: https://sedosmission.org/article/social-and-economic-impact-of-climate-change-in-papua-new-guinea/

Climate change discussions in Papua New Guinea have taken on new heights in the last three years. While many in the developed world are talking about the impacts, many third world countries, including Papua New Guinea, are already experiencing these impacts. Discussions have however, moved from impacts to now finding ways to ease this situation.

Climate change is a complex issue and cuts across many other sectors. It is not just an environmental matter. Most discussions currently in PNG are focused on one of the solutions. This could pose problems for the country if we choose to ignore the calls and focus our attention on this one solution. If we have not made it a priority to understand the causes and effects then we should start right now. We cannot be ignorant. The price of ignorance can be

very dear. Climate change is here and it is real. Warnings have gone out and debates are continuing everywhere and we must take heed and start moving. Many Papua New Guineans continue to live as if this is the chosen land and we are the chosen people. From the world over we have learnt that climate change impacts do not discriminate and will take whoever and whatever it wants to take.

Environmental impacts of climate change

In the media we get reports of landslides in Simbu, floods in Western highlands, Madang and Oro provinces and sinking islands in Bouganville. In 1997, PNG went through a long dry period as a result of the El Nino. Just to refresh us, here are some news clips:

March 2004 – Floodwaters have destroyed homes and food gardens and forced the evacuation of more than 10,000 people in … Western Highlands Province". (Radio New Zealand International, 9 March 2004).

March 2006 – Since December 2005, Papua New Guinea has been wracked with heavy rains, plunging four of its regions into floods that have caused much destruction to its vulnerable communities.

November 2007 – The death toll from floods in PNG s Oro Province has passed 150 and could rise further as reports come in from remote areas. (Australian Associated Press, 21 November, 2007).

April 2008 – The provincial government in Papua New Guineas Simbu Province has declared Gera village near Kundiawa a disaster zone after a massive landslide. The slide crushed a number of houses, four church buildings, food gardens, livestock areas and displaced over 2,000 people". (Radio New Zealand International, 14 April, 2008).

June 2008 – The 1,500 residents of Carteret Island, an atoll of the Autonomous Region of Bougainville, PNG are fast becoming the world's first climate change refugees. … Food gardens and coconut groves have been destroyed and children are going to school hungry. (Integrated Regional Information Network, Port Moresby, June 11, 2008).

What stands out in these reports is the number of people displaced, and the number of houses and food gardens destroyed. These figures continue to rise as we hear more reports of floods and landslips all over the country.

These reports tell us of unprecedented heavy rainfalls and continuous floods. They are warnings or lessons we can learn from. But should we continue to ignore these warnings and lessons? Should we continue to live as if human life has no meaning? Papua New Guinea has a population of more than 7 million people. Already it is not able to deal with its many social problems. How is it that it will be able to deal with a climate change phenomena? One thing, Papua New Guineans can be sure of is that its people have the security of their land. On this land we, the people, will find ways to deal with the climate change problems already here. On this land we will continue to grow our food but they must find ways to do this so that we do not harm the land and the environment that will continue to provide for us.

Dealing with reality

The reality is that there will be more displaced people, more evacuations, more deaths, costs will go up and there will be widespread food shortages. The 1997 drought and the 1998 Aitape tsunami left lessons yet to this day there are no real plans at the national level to take care of natural disaster related emergencies except the set-up of disaster offices. These offices have become clearing houses for emergency supplies and miss the important role of continuous monitoring and issuance of early warnings. For example, tsunami scares in Madang in 2006 and 2007 sent groups of people racing for higher grounds. Was this necessary? Would they have prepared better if they had known? Although let us not confuse natural disasters with climate change but take lessons from them.

What would become of the populations, especially women and children who will be caught in these situations? What would become of school children? In 2008 through the media we hear of rice shortages in the Western and Southern Highlands Provinces because the roads have been carried away in the Simbu landslide. Are we all dependent on rice? Papua New Guinea has a unique system where we support each other which although worked out well in the past, it is a different story today. Today land has become scarce for many communities that while on one hand we are happy to play host and will allow groups of displaced people to take shelter on our land and grow food for their survival, on the other hand we will not allow these groups to grow cash crops.

Economic impacts of climate change

On the other hand, in today's terms money determines what we eat, what we wear, whether we send our children to school or not and whether we can get medical attention. Most families own small plantations of coffee, coconuts, cocoa, vanilla as well as fresh produce as sources for their economic base. Yet these crops are also at risk. In the case of the Western Highlands floods, smallholder coffee plantations were washed away. A family's investment probably for the last 10 years was washed away in less than one day. Their financial security gone. The number of families affected will have to start again from scratch and they will have to do this alone. Outside help will be minimum.

While much of our focus is on outside acts, PNG also needs to take some responsibility for some of the emissions that go on today. Family sizes are large and this requires many large gardens to feed the number of people in a given family. In order to make these gardens many trees are taken down annually.

Learning from the Carterets

We have many cases here in PNG but in terms of climate change the Carterets case has many lessons for us. The Carterets is really an atoll just off Bougainville. The atoll is just over one meter above sea level and has a land area of less than one square kilometer. The horseshoe atoll stretches 30 km and is made up of mainly six small islands. This atoll is home to about 1,500 people. As a result of global warming one of the islands has been split into two and the rest of the Carterets is sinking fast and the population is being relocated.

The relocation sounds easy enough to just move the population elsewhere but the issues associated with this are complicated. The land acquisition, the integration into a new community, the transition from island sea lifestyle to mainland farming lifestyle and more, will take a lot of time, energy and money. It will call for all players, not just the affected communities, not just the churches but all including the Civil Society Organisations, provincial and national governments.

According to Bougainville administrator Raymond Masono at that time, they were still negotiating with landowners for land which they would resettle the islanders… This exercise said Mr. Masono would cost the Autonomous Region of Bougainville and the PNG government millions of kina starting 2009 … (Solomon Times Online, 25 November 2008).

Negotiations for land to resettle these people have been going since 1997 when the first warnings went out.

Culture and adaptation

Island communities usually have strong observances of their culture. One of the main cultural practice that will be impacted is how they gather food. If they are resettled in their new communities, as they set about their chores to bring in food they must be careful they do not take what belongs to others already living there. Their housing styles and preferences will also be affected. Island communities with limited building materials prefer low houses on the sand. In their new homes building new houses will depend on the availability and the accessibility of building materials. The resettlement exercise if not done properly can also cause breakup in family ties, and create unnecessary conflict among different clan groups as well as host communities. So this must be thought through carefully. Current village existence is based on relations built over many hundreds of years that outsiders will never understand. Emergencies always force assisting groups to just move people without worrying about these relationships. This is understandable, but with prior preparations this can be avoided. “Working on the land lifestyle” is a complete opposite for these sea people. This will call for continued support from outside. On the Carterets people live simple island life using manual energy to bring in food, to maintain family links and to just be, while in the west people go to work in cars, run electricity everywhere and burn huge amounts of gases in order to continue production for the masses. The people of Carterets and everywhere else in PNG have managed without cars and electricity for many years and are still living without it today. The people of Carterets have not seen huge factories to understand how the work of millions of huge factories can affect them. Nor have they seen huge bush fires and vast areas of deforestation to understand. Papua New Guineans simply do not understand why these people have been displaced. We hear stories about how huge chunks of ice are melting away in the north and we wonder why the water levels are rising in our seas but we do not understand why we must pay the price. So while the educated and the leaders debate the issues the Carterets Islands’ need is rather an urgent matter.

Suggested Resources

1. https://sedosmission.org/article/social-and-economic-impact-of-climate-change-in-papua-new-guinea/
2. *Some more ideas concerning the impact of climate change around the world can be taken from the following articles;
3. Arnell, N. W., van Vuuren, D. P., & Isaac, M. (2011). The implications of climate policy for the impacts of climate change on global water resources. *Global Environmental Change 21*(2), 592-603.
4. Berry, H. L., Bowen, K., & Kjellstrom, T. (2010). Climate change and mental health: a causal pathways framework." *International journal of public health, 552),* 123-132.
5. Change, G. C. (2007). Impacts and Adaptation. *Nature Conservancy, 434,* 951-0569.
6. Jones, H. P., Hole, D. G., & Zavaleta, E.S. (2012). Harnessing nature to help people adapt to climate change. *Nature Climate Change, 2*(7), 504.
7. Rosenweig, C., & Parry, M. L. (1994). Potential impact of climate change on world food supply. *Nature, 367*(6459), 133.

Benchmark 12.1.4.6: Evaluate and critique various national and global strategies, agenda, and actions for addressing climate change.

Topic 6: Addressing climate change

Sub-topic:
- National and global strategies, agenda, and actions for addressing climate change

Skills: Critical thinking (evaluate)

Learning Objectives: By the end of the topic, students will be able to:
- Identify and critique various national and global strategies, agenda, and actions for addressing climate change.
- Assess various national and global strategies, agenda, and actions for managing climate change.
- Discuss the difficulties faced by world leaders in committing to reduce greenhouse gas emissions.
- Read and collect newspaper articles on global warming and climate change.
- View documentaries and engage in debates and class discussions.

Content Background

Responding to climate change involves two possible approaches:
1. Mitigation (reducing and stabilizing the levels of heat-trapping greenhouse gases in the atmosphere)
2. Adaptation (adapting to the climate change already in the pipeline.

Global strategies and agendas
- The Earth Summits
  - United Nations Earth Summit held in Rio de Janeiro in June, 1992 (1st Meeting)
  - United Nations Earth Summit held in New York in June, 1997 (2nd Meeting)
- Kyoto Protocol
  - Climate Change Convention Conference held in Kyoto in Japan in December, 1997
- Conference of the Parties (COP)
- Intergovernmental Panel on Climate Change (IPCC)

Papua New Guinea's strategies and agendas

Port Moresby, March 29, 2017 – Stakeholders from across civil society and private sector have participated in a workshop to agree on a national plan to help address climate change through the management, conservation and sustainable use of PNG's forests at a workshop today.

Hosted by the Government of Papua New Guinea (PNG), the workshop focused on representatives from multiple sectors agreeing on the final version of PNGs National REDD+ Strategy 2017-2027.

The Government of PNG, with the support of the United Nations Development Authority (UNDP), has been developing the PNG National REDD+ Strategy since 2015, under the United Nations Framework Convention on Climate Change (UNFCCC).

REDD+ is an important part of PNG's plan to take action against climate change and PNG was one of the countries that supported its inclusion in the Paris Climate Change Agreement. Implementing REDD+ under the UNFCCC provides PNG with an opportunity to have its contribution to the global fight against climate change internationally recognised and financially supported.

Given below are some of the actions taken to address climate change

The world has until 2030 to drastically cut our emissions. Where do we begin? Several fundamental aspects of climate change make clear both the need for education and the opportunity it offers. First, addressing climate change will require action at all levels of society, including individuals, organizations, businesses, local, state, and national governments, and international bodies. It cannot be addressed by a few individuals with privileged access to information, but rather requires transfer of knowledge, both intellectually and affectively, to decision-makers and their constituents at all levels.

Second, education is needed because, in the case of climate change, learning from experience is learning too late. The delay between decisions that cause climate change and their full societal impact can range from decades to millennia. As a result, learning from education, rather than experience, is necessary to avoid those impacts.

- Global warming and climate change integrated in school curriculums (Social Science)
  - Climate change literacy can be improved through sustained, active learning activities using integrated, cross-discipline curricula.
  - Active learning should be connected to local problem solving.
  - While climate change education should inform students about the scientific concepts and implications of climate change, it is also important to cultivate problem solving and critical thinking skills through framing messages to emphasize an individual's capacity to achieve positive outcomes.
  - Problem-solving-based education can increase the degree to which students behave in a sustainable manner if learners are presented with information and behavior change options whereby concrete gains can be made to reduce individual footprints.
  - It is important therefore to include measurement tools, such as carbon and ecological footprint calculators, with climate change education so that learners can track the changes they can make/are making/will make over time.
  - Narrative techniques, visual imagery (such as photographs) and persuasive texts are powerful tools.
  - Teacher education is essential for providing quality climate change education

- Climate change education and public awareness programmers and policies

Education, including skills development and awareness-raising, plays an essential role in enhancing the capacities of Member States to mitigate climate change and cope with its adverse impacts. Education enables people to understand the causes and consequences of climate change, to make informed decisions and take appropriate actions to address them, and to acquire the necessary skills to support the transition to green economies and sustainable, climate resilient societies.

Adaptation strategies

The adaptation strategies provided on this site are intended to inform and assist communities in identifying potential alternatives. They are illustrative and are presented to help communities consider possible ways to address anticipated current and future threats resulting from the changing climate. In particular, it is important to note:

- The strategies presented are NOT a comprehensive or exhaustive list of resiliency or adaptation actions that may be relevant.
- None of the provided alternatives are likely to be appropriate in all circumstances; the appropriateness of each alternative should be considered in the local context for which it is being considered.
- The potential strategies are largely drawn from EPA and other federal resources. Before adopting any particular strategy, it should be considered in the context provided by the primary source document from which it originated. Source document(s) are indicated.
- The presented strategies should not be relied on exclusively in conducting risk assessments, developing response plans, or making adaptation decisions.
- This information is not a substitute for the professional advice of an environmental or climate change professional or attorney.

Source: All information in this table is retrieved from: https://www.epa.gov/arc-x/strategies-climate-change-adaptation. Teachers are encouraged to look within this strategies and assist students identify strategies they can adopt to suit PNG context.

Suggested Resources

1. Betsill, M. M. (2001). Mitigating climate change in US cities:opportunities and obstacles.*Local environment, 6*(4), 393-406.
2. Brown, M. A., & Southworth, F. (2008). Mitigating climate change through green buildings and smart growth. *Environment and Planning A, 40*(3), 653-675.
3. Haines, A., Smith, K. R., Anderson, D., Epstein, P.R., McMichael, A. J., Roberts, I.,..& Woods, J. (2007). Policies for accelerating access to clean energy, improving health, advancing devel-opment, and mitigating climate change. *The Lanchet, 370* (9594), 1264-1281.
4. https://www.epa.gov/arc-x/strategies-climate-change-adaptation.
5. Watanabe, C. (1995). Mitigating global warming by substituting technology for energy: MITI's efforts and new approach. *Energy Policy, 23* (4-5), 447-461.

6. Weinhofer, G., & Hoffman, V.H. (2010). Mitigating climate change - how do corporate strategies differ?. *Business Strategies and the Environment, 19*(2), 77-89.

Benchmark 12.1.4.7: Show places being affected by climate change on maps and develop and present their profiles to advocate for the reduction of the contributing factors.

Topic 7: Regions affected by climate change

Sub-topic:
- Regions affected by climate change

Skills: Creative thinking skills

Learning Objectives: By the end of the topic, students will be able to:

- Show places being affected by climate change on maps and develop and present their profiles to advocate for the reduction of the contributing factors.
- Outline and explain the specific problems faced by the people who live in these areas.
- Read and collect newspaper articles on global warming and climate change.
- Engage in debates and class discussions.

Content Background

Due to global warming, ice caps in the polar regions having melting and bus fires have rage the world like never before and it is happening at a much faster rate.

Regions affected by climate change

- Artic
- Africa
- Small Island States and Islands
- Asian Megadeltas

} areas that will be terribly affected now and in the future.

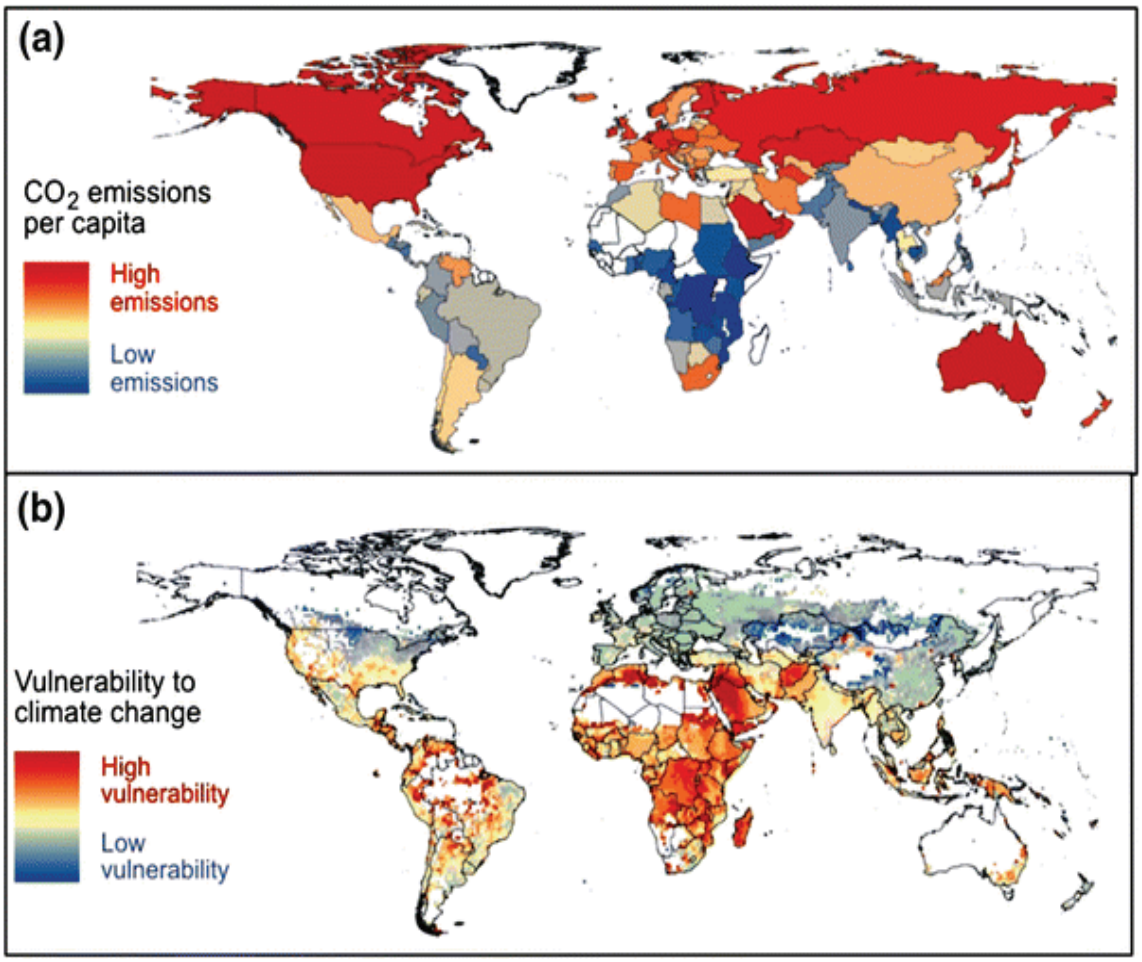
People mostly affected are poor, young children and elderly.

Some of the places most affected by climate change

The effects of global warming have also affected prime travel destinations and putting lives at risks while some are facing the risk of extinction. Below are some places worth visiting before they disappear.

1. The Great Barrier Reef – coral bleaching as ocean temperatures much warmer.
2. Venice, Italy – due to its beautiful river canals, it has become prone to constant flooding and is viewed as the sinking city.
3. Glacier National Park, Montana – as global temperatures rise, the glaciers are melting leading to the loss of pristine ecosystem that is home to hundreds of species of plants and animals are dying out.
4. The Dead Sea- with one-third of body of water being lost, Dead Sea is evaporating with dams and storage reservoirs, it is estimated to dry up by year 2050.

5. The Amazon – The world's largest rainforest is currently facing extreme drought due to long drier months and logging activities risking the forests to increase temperatures and forest fires.
6. Yamal Peninsula, Russia – As temperatures increase the permafrost northern regions are melting which causes reindeer to migrate or event die in search of colder winters. This affects the Nenets people's lifestyle as they depend so much on reindeers.
7. Maldives: Clustered in the Indian Ocean, the series of atolls makes up the lowest- lying country in the world has its people displaced as the sea levels continue to rise. It is at the risk of vanishing completely.
8. Key West, Florida – This place is prone to Hurricane Irma and continuously faces environmental challenges. Continual flooding has put Florida's budget under strain to undergo rebuilding and repairing of the place.
9. The Rhone Valley, France – It is one of the winemaking regions of France, however the continuous increase of temperatures mean that vine growth is affected and winemakers are leaving the region affecting the economy of that region.
10. Mumbai, India - Due to sea level rise, and frequent flooding may leave the city underwater.



Suggested Resources

1. Arnell, N. W., van Vuuren, D. P., & Isaac, M. (2011). The implications of climate policy for the impacts of climate change on global water resources. *Global Environmental Change 21*(2), 592-603.
2. Berry, H. L., Bowen, K., & Kjellstrom, T. (2010). Climate change and mental health: a causal pathways framework." *International journal of public health, 552)*, 123-132.
3. Change, G. C. (2007). Impacts and Adaptation. *Nature Conservancy, 434,* 951-0569.
4. Jones, H. P., Hole, D. G., & Zavaleta, E.S. (2012). Harnessing nature to help people adapt to climate change. *Nature Climate Change, 2*(7), 504.
5. Rosenweig, C., & Parry, M. L. (1994). Potential impact of climate change on world food supply. *Nature, 367*(6459), 133.

Standards-Based Lesson Planning

What are Standards-Based Lessons?

In a Standards-Based Lesson, the most important or key distinction is that, a student is expected to meet a defined standard for proficiency. When planning a lesson, the teacher ensures that the content and the methods of teaching the content enable students to learn both the skills and the concepts defined in the standard for that grade level and to demonstrate evidence of their learning.

Planning lessons that are built on standards and creating aligned assessments that measure student progress towards standards is the first step teacher must take to help their students reach success. A lesson plan is a step-by-step guide that provides a structure for an essential learning.

When planning a standards-based lesson, teacher instructions are very crucial for your lessons. How teachers instruct the students is what really points out an innovative teacher to an ordinary teacher. Teacher must engage and prepare motivating instructional activities that will provide the students with opportunities to demonstrate the benchmarks. For instance, teacher should at least identify 3-5 teaching strategies in a lesson; teacher lectures, ask questions, put students into groups for discussion and role play what was discussed.

Why is Standards-Based Lesson Planning Important?

There are many important benefits of having a clear and organized set of lesson plans. Good planning allows for more effective teaching and learning. The lesson plan is a guide and map for organizing the materials and the teacher for the purpose of helping the students achieve the standards. Lesson plans also provide a record that allows good, reflective teachers to go back, analyze their own teaching (what went well, what didn't), and then improve on it in the future.

Standards-based lesson planning is vital because the content standards and benchmarks must be comparable, rigorous, measurable and of course evidence based and be applicable in real life that we expect students to achieve. Therefore, teachers must plan effective lessons to teach students to meet these standards. As schools implement new standards, there will be much more evidence that teachers will use to support student learning to help them reach the highest levels of cognitive complexity. That is, students will be developing high-level cognitive skills.

Components of a Standards-Based Lesson Plan

An effective lesson plan has three basic components;

- aims and objectives of the course;
- teaching and learning activities;
- assessments to check student understanding of the topic.

Effective teaching demonstrates deep subject knowledge, including key concepts, current and relevant research, methodologies, tools and techniques, and meaningful applications.

Planning for under-achievers

Who are underachieving students?
Under achievers are students who fail or do not perform as expected. Underachievement may be caused by emotions (low self-esteem) and the environment (cultural influences, unsupportive family)

How can we help underachievement?
Underachievement varies between students. Not all students are in the same category of underachievement.

Given below a suggested strategies teachers may adopt to assist underachievers in the classroom.

- Examine the Problem Individually
  It is important that underachieving students are addressed individually by focusing on the student's strengths.
- Create a Teacher-Parent Collaboration
  Teachers and parents need to work together and pool their information and experience regarding the child. Teachers and parents begin by asking questions such as;
  - In what areas has the child shown exceptional ability?
  - What are the child's preferred learning styles?
  - What insights do parents and teachers have about the child's strengths and problem areas?

- Help student to plan every activity in the classroom
- Help students set realistic expectations
- Encourage and promote the student's interests and passions.
- Help children set short and long-term academic goals
- Talk with them about possible goals.
- Ensure that all students are challenged (but not frustrated) by classroom activities
- Always reinforce students.

Sample of Standards-Based Lesson Planning

To help teachers plan effective Standards-Based lesson plans, a sample lesson is provided here. Teachers are encouraged to study the layout of the different components of this lesson and follow this design in their preparation and teaching of each lesson. Planning a good lesson helps the teacher to focus on the essential knowledge, skills, values and attitudes that students are expected to learn and master at the end of the lesson.

NOTE FOR TEACHER

GIVEN BELOW IS A GRADE 9 SBC LESSON PLAN. USE THIS TO HELP YOU DESIGN YOUR LESSON PLANS FOR GRADE 11 GEOGRAPHY

Strand 1: Geography

Unit 1: Geography Skills

Content Standard 1.1: Student will be able to use geographical tools to locate and interpret information about people, places and environment.

Benchmark 9.1.1.1: Identify and explain the use of weather instruments and unit of measurements used in measuring weather.

Topic 1: Weather Instruments

Lesson topic: Weather instruments and elements of weather

Grade: 9

Length of Lesson: 40 minutes

Essential knowledge, skills, values and attitudes:
Knowledge:

- Weather instruments
- Elements of weather

Skill(s): Critical thinking skills of identifying weather instruments from other instruments.

Values: Caring for weather instruments

Attitudes: Being responsible when handling weather instruments

Performance indicator: Identify weather instruments and the elements of weather measured.

Materials: pictures of weathers instruments plus other instruments, cardboards with names of weather instruments written on each of them, list of names of weather instruments on A4 size paper, pictures of elements of weather, charts, butcher papers etc.

Instructional (lesson) Objective(s): By the end of the lesson, students will be able to;

- List the weather instruments.
- Distinguish weather instruments from other instruments.
- Relate each weather instrument to the elements of weather measured.

Essential Questions:

- What is weather?
- What are the elements of weather?
- How do scientists measure weather?

Lesson Procedure

<table>
<tr><th>Teacher Activities</th><th>Student Activities</th></tr>
<tr><td colspan="2">Introduction (time in minutes)</td></tr>
<tr><td>Ask questions in relation to the lesson topic.
Do you like the weather today?
Why do you like or dislike the weather today?

Build on the answers given by students to ask more relating questions about whether instruments.

Explain the importance of learning about weather and weather instruments used for measuring weather.</td><td>Listen carefully and answer questions (possible answers)
Yes I do because it is a sunny day today,
Yes I do because it is warm
No I do not because it rained last night and the place is wet
No I do not because it is windy.</td></tr>
<tr><td colspan="2">Body (time in minutes)</td></tr>
<tr><td colspan="2">Modeling</td></tr>
<tr><td>Name an element of weather and identify the instrument used to measure it.</td><td>Listen and respond when questions are asked</td></tr>
<tr><td colspan="2">Guided Practice</td></tr>
<tr><td>Give students a copy of the handout showing pictures/ illustrations of different types of instruments.

Ask students to name one weather instrument

Ask students to stop and give one weather instrument and the element of weather it measures (this is to see if students understood the instructions and what is expected of them)</td><td>Look at the pictures/illustrations and name a weather instrument

Give one weather instrument and the weather element it measures</td></tr>
<tr><td colspan="2">Independent Practice</td></tr>
<tr><td>Ask students to use the handout to identify and write the names of the weather instruments and the elements of weather.

Ask students to fill in this table(in groups of 5))
<table><tr><th>Name of weather instrument</th><th>Picture of weather instrument</th><th>Element of weather measured</th></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table></td><td>Look at the handout and identify the weather instruments

Match the pictures with the names
Identify the element of weather measured</td></tr>
<tr><td colspan="2">Conclusion (time in minutes)</td></tr>
<tr><td>Ask students to say in one sentence what they have learnt in the lesson?</td><td>Listen carefully

In one sentence, say what they have learned in the lesson.</td></tr>
</table>

Assessments, Reporting and Monitoring

What is Standards-Based Assessment (SBA)?

Standards-Based Assessment is an on-going and a systematic process of **assessing, evaluating, reporting** and **monitoring** students' performance and progression towards meeting grade and national level expectations. It is the measurement of students' proficiency on a learning objective or a specific component of a content standard and progression towards the attainment of a benchmark and content standard.

Purpose of Standards-Based Assessment

Standards-Based Assessment (SBA) serves different purposes. These include instruction and learning purposes. The primary purpose of SBA is to improve student learning so that all students can attain the expected level of proficiency or quality of learning.

Enabling purposes of SBA is to:

- measure students' proficiency on well-defined content standards, benchmarks and learning objectives
- ascertain students' attainment or progress towards the attainment of specific component of a content standard
- ascertain what each student knows and can do and what each student needs to learn to reach the expected level of proficiency
- enable teachers to make informed decisions and plans about how and what they would do to assist weak students to make adequate progress towards meeting the expected level of proficiency
- enable students to know what they can do and help them to develop and implement strategies to improve their learning and proficiency level
- communicate to parents, guardians, and relevant stakeholders the per formance and progress towards the attainment of content standards or its components
- compare students' performances and the performances of other students

Principles of Standards-Based Assessment

The principle of SBA is for assessment to be;

- emphasising on tasks that should encourage deeper learning
- be an integral component of a course, unit or topic and not something to add on afterwards
- a good assessment requires clarity of purpose, goals, standards and criteria
- of practices that should use a range of measures allowing students to demonstrate what they know and can do
- based on an understanding of how students learn
- of practices that promote deeper understanding of learning processes by developing students' capacity for self-assessment
- improving performance that involves feedback and reflection
- on-going rather than episodic

- given the required attention to outcomes and processes
- be closely aligned and linked to learning objectives, benchmarks and content standards.

Standards-Based Assessment Types

In standards-Based Assessment, there are three broad assessments types.

1. Formative Assessment

Formative assessment includes 'assessment *for* and *as*' and is conducted during the teaching and learning of activities of a topic.

Purposes of Assessment For Learning

- On-going assessment that allows teachers to monitor students on a day-to-day basis.
- Provide continuous feedback and evidence to the teachers that should enable them to identify gaps and issues with their teaching, and improve their classroom teaching practice.
- Helps students to continuously evaluate, reflect on, and improve their learning.
- Help teachers to make inferences about student learning to inform their teaching.
- Provide continuous feedback to both students and teachers which enables them to monitor progress, identify and address gaps and errors in learning.

Purposes of Assessment As Learning

- Occurs when students reflect on and monitor their progress to inform their future learning goals.
- Helps students to continuously evaluate, reflect, and improve their own learning.
- Helps students to understand the purpose of their learning and clarify learning goals.

2. Summative Assessment

Summative assessment focuses on 'assessment of learning' and is conducted after or at the conclusion of teaching and learning of activities or a topic.

Purposes of Assessment Of Learning

- Help teachers to determine what each student has achieved and how much progress he/she has made towards meeting national and grade-level expectations.
- Help teachers to determine what each student has achieved at the end of a learning sequence or a unit.
- Enable teachers to ascertain each student's development against the unit or topic objectives and to set future directions for learning.
- Help students to evaluate, reflect on, and prepare for next stage of learning.

3. Authentic Assessment

- Is performed in a real life context that approximates as much as possible, the use of a skill or concept in the real world.
- Is based on the development of a meaningful product, performance or process.
- Students develop and demonstrate the application of their knowledge, skills, values and attitudes in real life situations which promote and support the development of deeper levels of understanding.

Authentic Assessment Criteria

Authentic assessment refers to assessment that:

- Looks at students actively engaged in completing a task that represents the achievement of a learning objective or standard.
- Takes place in real life situations.
- Asks students to apply their knowledge, skills, values and attitudes in real life situations.
- Students are given the criteria against which they are being assessed.

Performance Assessment

Performance assessment is a form of testing that requires students to perform a task rather than select an answer from a ready-made list. For example, a student may be asked to explain historical events, generate scientific hypotheses, solve math problems, converse in a foreign language, or conduct research on an assigned topic. Teachers, then judge the quality of the student's work based on an agreed-upon set of criteria. It is an assessment which requires students to demonstrate that they have mastered specific skills and competencies by performing or producing something.

Types of performance assessment;

i. Products

This refers to concrete tangible items that students create through either the visual, written or auditory media such as;

- Creating a health/physical activity poster
- Video a class game or performance and write a broadcast commentary
- Write a speech to be given at a school council meeting advocating for increased time for health and physical education in the curriculum
- Write the skill cues for a series of skill photo's
- Create a brochure to be handed out to parents during education week
- Develop an interview for a favorite sportsperson
- Write a review of a dance performance
- Essays
- Projects

ii. Process Focused Tasks

It shows the thinking processes and learning strategies students use as they work such as;

- Survival scenarios
- Problem-solving initiative/adventure/activities
- Decision making such as scenario's related to health issues
- Event tasks such as creating a game, choreographing a dance/ gymnastics routine, creating an obstacle course
- Game play analysis

- Peer assessment of skills or performances
- Self-assessment activities
- Goal setting, deciding a strategy and monitoring progress towards achievement

iii. Portfolio
This refers to a collection of student work and additional information gathered over a period of time that demonstrates learning progress.

iv. Performances
It deals with observable affective or psycho-motor behaviours put into action such as;

- Skills check during game play
- Role plays
- Officiating a game
- Debates
- Performing dance/gymnastics routines
- Teaching a skill/game/dance to peers

Performance Standards

Performance Standards are concrete statements of how well students must learn what is set out in the content standards, often called the "be able to do" of "what students should know and be able to do." Performance standards are the indicators of quality that specify how competent a students' demonstration or performance must be. They include explanations of how well students must demonstrate the content, explaining how good is good enough.

Performance standards:

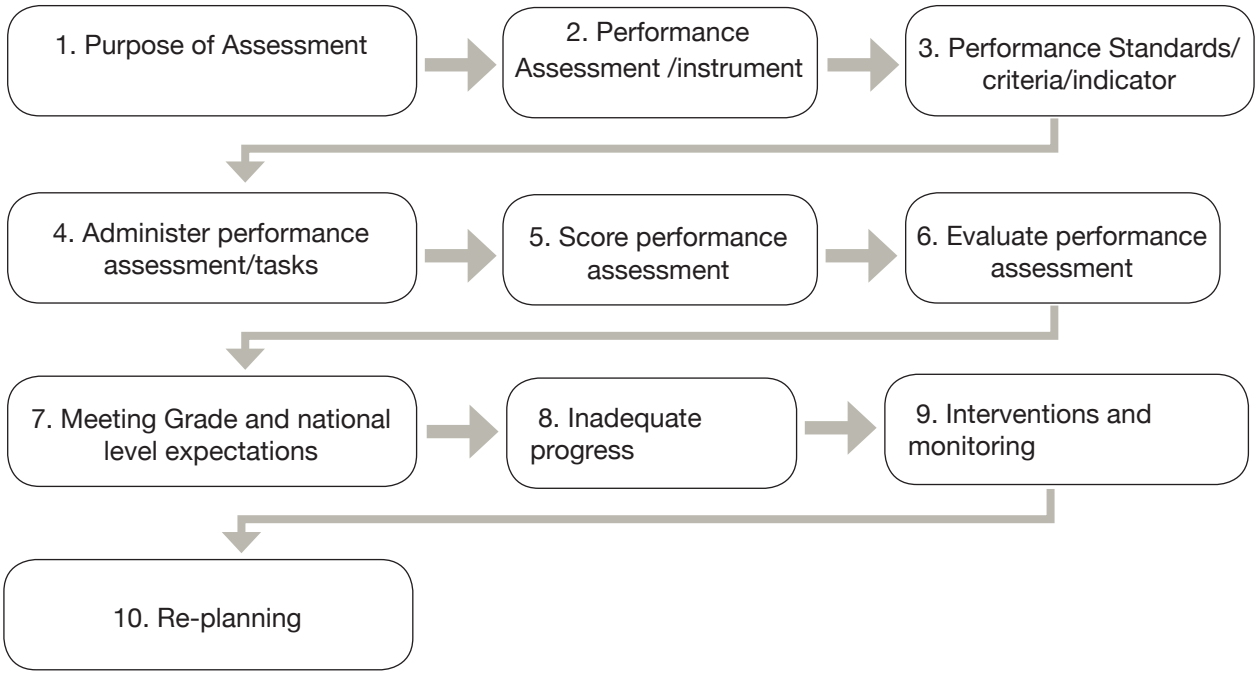
- measure students' performance and proficiency (using performance indicators) in the use of a specific knowledge, skill, value, or attitude in real life or related situations
- provide the basis (performance indicators) for evaluating, reporting and
- monitoring students' level of proficiency in use of a specific knowledge, skills, value, or attitude
- are used to plan for individual instruction to help students not yet meeting expectations (desired level of mastery and proficiency) to make adequate progress towards the full attainment of benchmarks and content standards
- are used as the basis for measuring students' progress towards meeting grade-level benchmarks and content standards.

Assessment Strategies

It is important for teachers to know that, assessment is administered in different ways. Assessment does not mean a test only. There are many different ways to find out about student's strengths and weaknesses. Relying on only one method of assessing will not reflect student's achievement. Provided in the appendices is a list of suggested strategies you can use to assess student's performances. These strategies are applicable in all the standards-based assessment types.
Please refer to Appendix 5 to see the suggested strategies.

There are different performance assessment methods and assessment strategies for assessing students' learning and performance on significant components of content standards.

Standards-Based Assessment Process



Scoring Students' Assessment

Assessment scoring methods describe how students' assessment tasks will be scored.

The most commonly used methods of scoring students' assessment are:

i. Checklists
ii. Rating Scales
iii. Rubrics

Students' performance is assessed and scored using:

i. a set of well-defined criteria
ii. performance standards or indicators,

Checklists, rating scales and rubrics are tools that state specific criteria and allow teachers and students to gather information and to make judgements about what students know and can do in relation to the standards. They offer systematic ways of collecting data about specific behaviours, knowledge and skills.

The quality of information acquired through the use of checklists, rating scales and rubrics is highly dependent on the quality of the descriptors chosen for assessment.

Checklists usually offer a yes/no format in relation to student demonstration of specific criteria. This is similar to a light switch; the light is either on or off. They may be used to record observations of an individual, a group or a whole class.

Rating Scales allow teachers to indicate the degree or frequency of the behaviours, skills and strategies displayed by the learner. Rating scales state the criteria and provide three or four response selections to describe the quality or frequency of student work.

Teachers can use rating scales to record observations and students can use them as self-assessment tools. Teaching students to use descriptive words, such as **always, usually, sometimes** and **never** helps them pinpoint specific strengths and needs. Rating scales also give students information for setting goals and improving performance. In a rating scale, the descriptive word is more important than the related number. The more precise and descriptive the words for each scale point, the more reliable the tool.

Effective rating scales use descriptors with clearly understood measures, such as frequency. Scales that rely on subjective descriptors of quality, such as fair, good or excellent, are less effective because the single adjective does not contain enough information on what criteria are indicated at each of these points on the scale.

Rubrics use a set of criteria to evaluate a student's performance. They consist of a fixed measurement scale and detailed description of the characteristics for each level of performance. These descriptions focus on the quality of the product or performance and not the quantity; e.g., not number of paragraphs, examples to support an idea, spelling errors. Rubrics are commonly used to evaluate student performance with the intention of including the result in a grade for reporting purposes. Rubrics can increase the consistency and reliability of scoring.

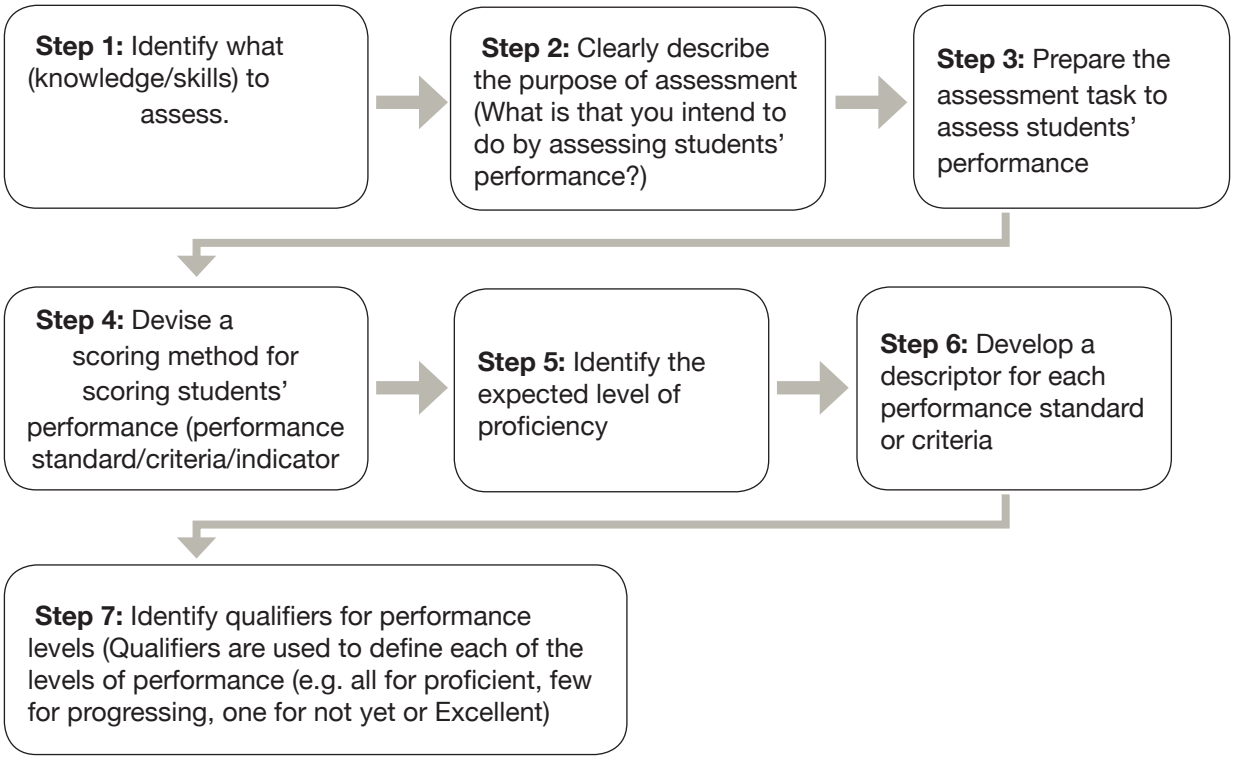
Rubrics use a set of specific criteria to evaluate student performance. They may be used to assess individuals or groups and, as with rating scales, may be compared over time.

Rubrics are recognized as a way to effectively assess student learning and communicate expectations directly, clearly and concisely to students. The inclusion of rubrics in a teaching resource provides opportunities to consider what demonstrations of learning look like, and to describe stages in the development and growth of knowledge, understandings and skills. To be most effective, rubrics should allow students to see the progression of mastery in the development of understandings and skills.

However, regardless of which method is used, students' performance, proficiency, and quality of learning should be meaningfully and effectively measured. This will help ascertain if students are meeting grade-level expectations and progressing towards meeting the content standard.

Assessment Samples

Teachers are required to use the steps outlined below when planning assessment. These steps will guide you to develop effective assessments to improve student's learning as well as evaluating their progress towards meeting national and grade –level expectations.



There are three (3) assessment samples provided here to guide teachers when preparing assessment for students. There is a/an;

i. formative assessment sample
ii. summative assessment sample
iii. authentic assessment sample

All these samples are based on one topic;

Teachers are encouraged to give a variety of assessments using different strategies on one topic to test the understanding and achievement of a content standard and a benchmark by individual students.

NOTE FOR TEACHER

THESE ARE GRADE 9 ASSESSMENT SAMPLES. USE THESE TO DEVELOP GRADE 12 GEOGRAPHY ASSESSMENTS

Formative Assessment

This assessment is given during the lesson.

Benchmark 9.1.1.1: Identify and explain the use of weather instruments and unit of measurements used in measuring weather.

Topic 1: Weather instruments

Lesson Topic: Weather instruments and elements of weather

What are you assessing?
Identification of weather instruments and relate to the elements of weather.

Performance Task
Identify weather instruments and the elements measured. Students will complete this table.

Name of weather instrument	Picture of weather instrument	Element of weather measured

What is the purpose of this assessment?
To monitor students understanding of the weather instruments and the elements measured.

Assessment Scoring

Checklist **Date:** 7th August, 2020		
Performance criteria/standard	**Yes**	**No**
Identifies weather instruments and the elements measured.		

Summative Assessment

Strand 1: Geography

Unit 1: Geography Skills

Content Standard 1.1: Student will be able to use geographical tools to locate and interpret information about people, places and environment.

Benchmark 9.1.1.1: Identify and explain the use of weather instruments and unit of measurements used in measuring weather.

Topic 1: Weather instruments

Learning Objectives: By the end of the topic, students will able to;

- Identify weather instruments.
- Explain the uses of weather instruments.
- Identify the units of measurements used in weather instruments.

Purpose of the assessment
The purpose of this assessment is to measure student's achievement of the benchmark, i.e. if students have used analytical skills to identify different weather instruments and their units of measurements and explain what each weather instrument is used for and how it is used. Also to find out if the students can work independently and have confidence in their abilities and evaluate the effectiveness of their research.

Expected level of proficiency
1. Explain the uses of weather instruments
2. Identify the units of measurements used in weather instruments

Performance Task
Create a booklet on weather instruments. This will include; carrying out a research on the uses and units of measurements of weather instruments, explanations on the uses of weather instruments, illustrations of the different weather instruments, general layout of the booklet (cover, content, references,)

Assessment Strategy
Project to assess the quality of end product

Scoring Rubric

Rubric					
Date: 20th August, 2020					
Performance standard/ criteria	**Proficiency Levels**				**Score**
	Excellent (4)	**Good (3)**	**Fair (2)**	**Needs to improve (1)**	
Research (Work independently)	Research is complete including descriptions and facts from different sources	Research is mostly there with descriptions and facts from only two sources	Research is missing some descriptions and facts and used only one source	Research is lacking some crucial parts making it incomplete	
Identify units of measurements used in each weather instrument	Identify units of measurements used in all the weather instruments	Identify units of measurements used in most of the weather instruments	Identify units of measurements used in some of the weather instruments	Identify units of measurements used in few weather instruments	
Explain the use of each weather instruments	Clear explanations on the uses of all-weather instruments	Explain the uses of most of the weather instruments	Explain the uses of some weather instruments only	Explain the use of only a few weather instruments	
Design, layout and organization of the booklet	Content is well organized with headings and sub-headings. Text and illustrations are neatly organized and making it easy to read	Content is organized with headings and sub-headings. Text and illustrations are placed to make it easy to read	Most of the sections are organized, however, the placement of the text and graphics sometimes make it difficult to read	There was no clear structure. Text and illustrations are randomly placed making it hard to read.	

Strand 2: History

Unit 3: Culture and Society

Content Standard 2.3: Students will be able to investigate the different ways of transmitting culture and critically think about the reasons culture and cultural diffusion affects the development and maintenance of societies.

Benchmark 9.2.3.1: Examine the methods by which societies of PNG transmit culture across time, such as storytelling, songs, religious services, food, clothing, rituals, holidays, etc.

Topic 1: Culture transmission

Lesson topics:

- Methods used to transmit culture in PNG
- Transmission of culture through oral traditions in PNG
- Transmission of culture through art, music and customs in PNG
- Transmission of culture PNG food, clothing and religious rituals in PNG

Learning objectives: By the end of the topic, students will be able to:

- Examine the different methods used to transmit cultures in PNG.
- Discuss how PNG's cultures are transmitted through oral tradition.
- Examine how PNG cultures are transmitted through language, art, music and customs.
- Observe and critique how PNG cultures are transmitted through food, clothing and religious rituals.
- *Use video recording gadgets to record a video and create a portfolio on one method of transmitting cultures in PNG (Authentic Assessment).*

Purpose of this assessment
To find out if students can be able to use the skills of analyzing to examine the methods by which societies of PNG transmit culture across time.

Note: Assessment should be linked to the performance indicator indicated in the learning objectives

Expected Level of Proficiency
All students are expected to:

- identify the methods used to transmit culture in PNG
- analyse how these methods have been used to transmit culture over time

Performance Task
Students will write a test out of 20 marks. You can use other assessment tools (assignment, projects etc) assess student's proficiency on this benchmark.

Assessment Strategy
A test will be used to measure student's proficiency.

Sample test

Grade 9 Social Science
Test No: 01

Name: _____Class: _____ Date: _____Total: __/10 Marks

There are two parts to this test.

Part A: Multiple Choice (4 marks)
Circle the correct answer to the questions given.

QUESTION 1
Culture is defined as

A. A group of people.
B. People's way of life.
C. Daily lives of people.
D. The food and clothes people wear.

QUESTION 2
'The methods used by people to pass on their cultures from one generation to the next is referred to as

A. Culture.
B. Cultural heritage.
C. Cultural transfusion.
D. Cultural transmission.

QUESTION 3
Which example shows a native PNG culture?

A. Easter Worship
B. Chewing of betel
C. Bride price ceremony
D. Regional sports gathering

QUESTION 4
Which of these is a foreign culture introduced to Papua New Guinea culture?

A. Dances
B. Christmas
C. Gardening
D. Bride price

Part B: Short Answers (6 marks)
Write your answers clearly

QUESTION 1
Name the three common ways culture has been transmitted in Papua New Guinea. (3 marks)

(i) Oral *(ii) Practices* *(iii) Experiences*

QUESTION 2
Choose one of the three ways and explain how it has helped transmit culture overtime. (2 marks)

(i) Oral transmission has helped culture to be passed onto the next generation through use of the word of mouth by storytelling.

(ii) Practices has transmitted culture through time, by children being shown the practices through actions of traditional songs and dances, how to perform ceremonies like bride price and funerals and rituals like initiations.

(iii) Experience has transmitted culture through time by children been born into that culture where they are part of that activity or they observe till they are allowed to take part.

QUESTION 3

State a reason why we should maintain our culture? (1 mark)

We should maintain our culture because it is our identity, other people are able to tell where we come from and also to keep it from dying out.

End of test

Assessment Scoring

Rubrics must be developed to articulate the real proficiency of the child. This is an analytical rubrics used to assess the child's learning through the assessment tool a test.

Performance standards/criteria	Advance 5	Proficient 4	Progressing 3	Not Yet 2	Score ___/10
Define culture and cultural transmission (4 marks)	Correctly distinguish culture from cultural transmission and shows clear understanding of their connections	Correctly distinguish culture from cultural transmission	Satisfactorily distinguish culture from cultural transmission	Cannot distinguish between culture and cultural transmission	
Identify the different methods used to transmit cultures in PNG (3 marks)	Identifies all the methods of transmitting culture and writes it correctly	Identifies all the methods of transmitting culture	Identifies two of the methods of transmitting culture	Identifies only one method of transmitting culture	
Analyze these methods to transmit cultures in PNG	Clearly explains how culture is transmitted and maintained and with more than two supporting examples.	Explain how culture is transmitted and maintained and with a supporting examples	Satisfactorily explains how culture is transmitted and maintained but no examples given	Poor explanation of how culture is transmitted and no examples given	

Authentic Assessment

Strand 1: Geography

Unit 1: Geography Skills

Content Standard 1.1: Students will be able to evaluate and elaborate on the roles and responsibilities, and the rights of citizens in different government systems.

Benchmark 9.1.1.4: Record daily maximum and minimum temperature over two weeks and construct a temperature graph and calculate the average daily temperature over two weeks as well as the average maximum and average daily temperature.

Topic 4: Temperature

Learning Objectives: By the end of this topic, students will be able to:

- Record daily maximum and minimum temperature over two weeks.
- Construct temperature line graph.
- Calculate the average daily temperature over two weeks.
- Calculate average maximum and average minimum temperature.

Purpose
The purpose of this assessment is to test students understanding of how temperature is measured using ther-mometers. To see if students can apply what they have learnt in theory into practice in real life and of course motivate them to become meteorologists in future.

Expected level of proficiency
- Observe and take measurements of the temperature
- Record temperature on a temperature chart
- Construct temperature graph

Performance Task
Observing and Recording Temperature Data
Students will observe the temperature each day with the thermometer. They will record the temperature each day for 5 days. (They can use thermometers provided by the school or use the ones they have created in the STEAM Activity).

Assessment strategy
Students will do a project (project-based learning) to demonstrate their proficiency of the benchmark. Refer to the performance task.

Materials needed
- Thermometer, pencil, paper to record temperature, temperature chart for one week
- Teacher to communicate with necessary school personnel to let them know that students will be measuring temperatures around the building.

Instructions

- Go outside and observe the temperature at 10:00am, 12:00pm, 2:00pm, each day (Monday-Friday)
- Record the temperature reading on the paper
- Enter the data for the 5 days on the temperature chart
- Calculate the daily average temperature
- Construct average temperature graph (line, bar or column)

Assessment Scoring

Date: 30th August, 2019					
Performance standard/ criteria	**Exceeds expectations (5)**	**Meets expectations (4)**	**Needs improvement (3)**	**Inadequate (2)**	**Score**
Observe and take measurements of the temperature	Observations and measurements are accurate. Measurements are taken at the same time each day. Displays careful and correct handling of the thermometer	Accurate measurements taken at the same time each day	Some measurements are not accurate	Observations and measurements at different times each day. Most of the measurements are not accurate	
Record temperature on a temperature chart	Chart has a title Chart captures the time Chart captures the daily temperature recordings at different times Chart captures the daily average temperatures Highlights the minimum & maximum daily temperatures	Chart has a title Chart captures the time Chart captures the daily temperature recordings at different times Chart captures the daily average temperatures	Chart has a title Chart captures the time Chart captures the daily temperature recordings at different times	Chart captures only the daily temperature recordings at different times	
Construct a temperature graph	Graph has a title Axis labeled correctly Graph has accurate intervals Clear and easy to read	Graph has a title Axis labeled correctly Clear and easy to read	Graph has a title Axis labeled incorrectly Easy to read	Has a graph without a title and axis not labled making it difficult to read	

Strand 2: History

Unit 3: Culture and Society

Content Standard 2.3: Students will be able to investigate the different ways of transmitting culture and critically think about the reasons culture and cultural diffusion affects the development and maintenance of societies

Benchmark 9.2.3.1: Examine the methods by which societies of PNG transmit culture across time, such as storytelling, songs, religious services, food, clothing, rituals, holidays, etc.

Topic 1: Culture transmission

Lesson topics:

- Methods used to transmit culture in PNG
- Transmission of culture through oral traditions in PNG
- Transmission of culture through art, music and customs in PNG
- Transmission of culture PNG food, clothing and religious rituals in PNG

Learning objectives: By the end of the topic, students will be able to:

- Examine the different methods used to transmit cultures in PNG.
- Discuss how PNG's cultures are transmitted through oral tradition.
- Examine how PNG cultures are transmitted through language, art, music and customs.
- Observe and critique how PNG cultures are transmitted through food, clothing and religious rituals.
- *Use video recording gadgets to record a video and create a portfolio on one method of transmitting cultures in PNG (Authentic Assessment).*

What is to be assessed?
Content of the topic which is transmission of PNG's cultures

Purpose
The purpose of this assessment is for the students to understand how cultures of Papua New Guinea have been transmitted overtime and also to enable them to become aware of their dying cultures which must be pre-served through recording and archiving as such the activity that they are doing. They foresee the importance of preserving culture thus is empowered to promote and maintain it.

Expected level of proficiency
Students can;

- Identify the methods of transmitting cultures in PNG
- Analyse the methods used to transmit cultures in PNG

Performance task
'Video Recordings and Portfolio on Methods of Transmitting Cultures in PNG'
Use video recording gadgets (portable cameras/ mobile phone cameras) to record a video and create a portfo-lio of the snap shots of one method used to transmitting culture in PNG. Students will work in groups of 4 to 5 to produce a video and portfolio on the methods of transmitting cultures in PNG. This activity will take up to a month (4 weeks).

Assessment strategy
Students will do a project (project-based learning) to demonstrate their proficiency of the benchmark. Refer to the performance task.

Materials needed
Mobile, camera, biros, papers and questionnaire, (If the required technology is not available at all then, docu-ment information through questionnaires)

Instructions
- Students to work in groups of four or five
- Carry out the project according to the criteria
- A period or two of lesson times for Social Science should be made avail able for students to continue work on this. (Organise trip to museum as refresher as they continue with their assessment tasks)
- Present video and portfolio of the snap shots of the assessment task after the due date.

Assessment scoring
Rubrics must be developed to articulate the real proficiency of the child. This is an analytical rubrics used to assess the child's learning through the assess-ment tool a project.

'Video recordings and portfolio on methods of transmitting cultures in PNG'

Performance standards/criteria	Advance 11	Proficient 10	Progressing 9-5	Not Yet 4-1	Score ___/ 30
Identify the methods of transmitting culture in PNG (10 marks)	Correct video recordings and snap shots of the whole range of methods of transmitting and with voice recording as well	Correct video recordings and snap shots of one method of transmitting culture	Fair recordings and snap shots of one method of transmitting culture	Inappropriate recordings and snap shots of one method of transmitting	
Analyze the methods used to transmit culture in PNG (10 marks)	Exceptional title Well explained video recordings and clearly written analysis of snap shots of all the methods of transmitting culture	Very good title Good explanation of video recordings and sound written analysis of the snap shots of one method of transmitting culture	Sound title Fair explanation of video recordings and fair written analysis of the snap shot of one method of transmitting culture	Fair title Poor explanation of the video recordings and poor written analysis of the snap shots of one method of transmitting culture	
Archive of video record and portfolio of the snap shots (10 marks)	Outstanding video records and portfolio of snap shots for archiving	Very good video record and portfolio of snap shots for archiving	Fair video record and portfolio of snap shots for archiving	Poor video record and portfolio of snap shots therefore cannot be archived	

Steam Assessment (creating/replicating)

Strand 2: History

Unit 4: Development and Sustainability of Societies

Content Standard 2.4: Students will be able to explain and analyse the roles of individuals and groups within a society as promoters of change or guardians of status quo.

Benchmark 9.2.4.4: Identify individuals and groups in PNG who have made important contributions to-wards promoting change or sustainability and evaluate the nature of their contribution.

Topic 4: Agents of change in PNG

Learning Objectives: By the end of this topic, students will be able to;

- Identify individuals and groups who have made important contributions to PNG.
- Evaluate the nature of these contributions.
- *Research on important figures in PNG's history and create monuments in honour of their contribu-tions to developing our nations.*

What is to be assessed?
Content of benchmark which is individuals and groups in PNG who have made important contributions towards promoting change or sustainability and evaluate the nature of their contribution

Purpose
The purpose of this assessment is for the students to appreciate history of and show respect for important persons who have greatly contributed to the development of PNG.

Expected level of proficiency
Students can;

1. Identify individuals and groups who have made important contributions to PNG
2. Evaluate the nature of these contributions

Performance task
'Restoration of PNG's Agents of Change'
Students will work in groups of 5 to 6 to research and create monuments for important persons who have contributed to develop PNG. This assessment should be done in collaboration with other subjects such as Technology and Industrial Arts (TIA), English/L&L, Maths, Science and Business Studies. Why these subjects? TIA will assist students draw faces of this important persons and create their sculptures. English to assist write biographies of these figures and also write proper captions to their monuments and Business Studies will capitalize on the idea of making money from these monuments for the school through school fares and other ways. Math on the correct size and measurement of the sculptures and Science on the advice of how much of the

content of certain chemicals to maintain lasting effects etc.

Assessment strategy
Students will do a steam project to demonstrate their proficiency of the benchmark. Refer to the performance task.

Materials needed
Biros, pencils, erasers, ruler, tape measures, metals, sculpturing tools, safety gears such as masks, hand cloves, overalls and helmet, calculators, diaries and journals.

Assessment scoring
Rubrics must be developed to articulate the real proficiency of the child. This is an analytical rubrics used to assess the child's learning through the assessment tool a STEAM project.

'Restoration of PNG's Agents of Change'

Performance standards/criteria	Advance 11	Proficient 10	Progressing 9-5	Not Yet 4-1	Score ___/30
Identify individuals and groups who have made important contributions to PNG (10 marks)	Identified all the prominent figures and produced biography for each of them	Identified some prominent figures with their biographies	Identified less than 3 prominent figures with their biographies	Identified only one prominent with his/her biography	
Evaluate the nature of these contributions (10 marks)	- Exceptional title - Well and detailed explanation of all these persons contributions to development of PNG	- Very good title - Good explanation of all these persons contributions to development of PNG	- Sound title - Fair explanation of these persons contributions to development of PNG	- Fair title - Poor explanation of these persons contributions to development of PNG	
Monuments/sculptures of the important persons who contributes to the development of PNG (10 marks)	Excellent sculpture with all details of the person as presented in the photograph and correct caption embedded onto the sculpture	Very good sculpture with all details as presented in the photograph	Good sculpture but a few details missing according to the photograph	Fair sculpture with a lot of details missing as it is not according to the photograph	

Glossary

Terms	Definitions
Assessment	Activities teachers use to help students learn and to measure and monitor their progress towards the attainment of expected levels of proficiency.
Assessment As Learning	Assessment is used to help students understand and reflect on what they have learnt or are having difficulties with, identify areas of strengths and weaknesses, and set clear, measurable, and attainable personal goals to improve their own learning.
Assessment For Learning	A common form of assessment. It is an ongoing assessment process that arises out of the interaction between teaching and learning. Also referred to as formative assessment.
Assessment Of Learning	Provides a summary of students learning over a given period of time and is generally carried out at the end of a course of study. Also referred to as summative assessment.
Assessment Strategies	Different ways or approaches of assessing students work.
Authentic Assessment	A type of broad assessment that involves students actively engaged in completing a task that represents the achievement of a learning objective or standard. Authentic assessment takes place in real life situations.
Benchmarks	Benchmarks are more detailed descriptions of a specific level of performance expected of students at particular ages, grades, school levels or levels of development. They are the specific components of the knowledge, process, skill, concept, principle, or idea identified by a content standard.
Content Standards	Content Standards are broadly stated expectations of what (content) students should know. They describe the knowledge, skills, values, and attitudes that students should attain.
Curriculum Integration	Curriculum integration in teaching and learning refers to an approach or methodology that cuts across and draws on multiple subject areas to focus on a topic or theme.
Diagnostic Assessment	An assessment given to identify child's strengths and learning needs for improvement.
Evaluation	Assessment information used to assess the effectiveness of teaching and learning and to make improvements to teaching practices in order to improve students learning.
Formative Assessment	A form of assessment used throughout a unit of study in teaching and learning to measure student's understanding and progress.
Monitoring	General supervision over the teaching and learning of the standards.
Performance Assessment	A form of assessment that is focused on measuring students' mastery of knowledge, skills, values and attitudes taught and learnt in each lesson.
Performance Standards	Performance standards are the indicators of quality that specify how competent a students' demonstration or performance must be.
Proficiency	Mastery of the essential knowledge, skills, values and attitudes in the content standards and benchmarks.

Rubrics	It is a scoring guide used to assess the quality of students responses in an assessment often presented in a table with evaluative criteria at certain levels of achievement.
Self–Assessment	A judgment for official purposes for teachers to make about their abilities, principles or decisions.
Standard	A standard is a level of quality or achievement, especially a level that is thought to be acceptable. It is something used to measure or estimate the quality or degree of something, for example, how good a piece of work is.
Standards-Based Curriculum	Describes **what** all students should know and be able to **do** at the end of a grade or school level. The main idea behind standards-based curriculum is **standards.**
Standards-Based Education	An academic program in which clearly defined academic content and benchmarks are aligned. It spells out what schools and communities need to do to ensure achievement of expectations. The main idea behind standards-based education is **standards.**
Standards-Based Assessment	A systematic and ongoing process of collecting and interpreting information about students' achievements.
STEAM Education	The teaching and learning in the fields of Science, Technology, Engineering, Arts, and Mathematics in both formal and informal classroom settings.
Summative Assessment	A form of assessment used after completing a unit or topic or at a specific point in time in teaching and learning to measure student's mastery of the content standards and benchmarks.
21st Century Skills	Refers to a broad set of knowledge, skills, work habits, and character traits that are believed by educators, school reformers, college professors, employers, and others to be critically important to success in today's world, particularly in collegiate programs and contemporary careers and workplaces.

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Appendices

Appendix 1: Bloom's Taxonomy

Level of Understanding	Key Verbs
Creating Can the student create a new product or point of view?	Construct, design, and develop, generate, hypothesize, invent, plan, produce, compose, create, make, perform, plan, produce, assemble, formulate,
Evaluating Can the student justify a stand or decision?	Appraise, argue, assess, choose, conclude, critique, decide, defend, evaluate, judge, justify, predict, prioritize, provoke, rank, rate, select, support, monitor,
Analyzing Can the student distinguish between the different parts?	Analyzing, characterize, classify, compare, contrast, debate, criticise, deconstruct, deduce, differentiate, discriminate, distinguish, examine, organize, outline, relate, research, separate, experiment, question, test,
Applying Can the student use the information in a new way?	Apply, change, choose, compute, dramatize, implement, interview, prepare, produce, role play, select, show, transfer, use, demonstrate, illustrate, interpret, operate, sketch, solve, write,
Understanding Can the student comprehend ideas or concepts?	Classify, compare, exemplify, conclude, demonstrate, discuss, explain, identify, illustrate, interpret, paraphrase, predict, report, translate, describe, classify,
Remembering Can the student recall or remember the information?	Define, describe, draw, find, identify, label, list, match, name, quote, recall, recite, tell, write, duplicate, memorise, recall, repeat, reproduce, state,

Appendix 2: 21st Century Skills

Ways of Thinking	**Creativity and innovation** • Think creatively • Work creatively with others • Implement innovations **Critical thinking, problem-solving and decision making** • Reason effectively and evaluate evidence • Solve problems • Articulate findings **Learning to learn and meta-cognition** • Self-motivation • Positive appreciation of learning • Adaptability and flexibility
Ways of Working	**Communication** • Competency in written and oral language • Open minded and preparedness to listen • Sensitivity to cultural differences **Collaboration and teamwork** • Interact effectively with others • Work effectively in diverse teams • Prioritise, plan and manage projects
Tools for Working	**Information literacy** • Access and evaluate information • Use and manage information • Apply technology effectively **ICT literacy** • Open to new ideas, information, tools and ways of thinking • Use ICT accurately, creatively, ethically and legally • Be aware of cultural and social differences • Apply technology appropriately and effectively
Living in the World	**Citizenship – global and local** • Awareness and understanding of rights and responsibilities as a global citizen • Preparedness to participate in community activities • Respect the values and privacy of others **Personal and social responsibility** • Communicate constructively in different social situations • Understand different viewpoints and perspectives **Life and career** • Adapt to change • Manage goals and time • Be a self-directed learner • Interact effectively with others

Appendix 3: Teaching and Learning Strategies

Strategy	Teacher	Students
Case study Used to extend students' understanding of real life issues	Provide students with case studies related to the topic of the lesson and allow them to analyse and evaluate.	Study the case study and identify the problem addressed. They analyse the problem and suggest solutions supported by conceptual justifications and make presentations. This enriches the students' existing knowledge of the topic.
Debate A method used to increase students' interest, involvement and participation	Provide the topic or question of debate on current issues affecting a bigger population, clearly outlining the expectations of the debate. Explain the steps involved in debating and set a criteria/ standard to be achieved.	Conduct researches to gather supporting evidence about the selected topic and summarising the points. They are engaged in collaborative learning by delegating and sharing tasks to group members. When debating, they improve their communication skills.
Discussion The purpose of discussion is to educate students about the process of group thinking and collective decision.	The teacher opens a discussion on certain topic by asking essential questions. During the discussion, the teacher reinforces and emphasises on important points from students responses. Teacher guide the direction to motivate students to explore the topic in greater depth and the topic in more detail. Use how and why follow-up questions to guide the discussion toward the objective of helping students understand the subject and summarise main ideas.	Students ponder over the question and answer by providing ideas, experiences and examples. Students participate in the discussion by exchanging ideas with others.
Games and simulations Encourages motivation and creates a spirit of competition and challenge to enhance learning.	Being creative and select appropriate games for the topic of the lesson. Give clear instructions and guidelines. The game selected must be fun and build a competitive spirit to score more than their peers to win small prices.	Go into groups and organize. Follow the instructions and play to win

Observation Method used to allow students to work independently to discover why and how things happen as the way they are. It builds curiosity.	Give instructions and monitor every activity students do	Students possess instinct of curiosity and are curious to see the things for themselves and particularly those things which exist around them. A thing observed and a fact discovered by the child for himself becomes a part of mental life of the child. It is certainly more valuable to him than the same fact or facts learnt from the teacher or a book. Students • Observe and ask essential questions • Record • Interpret
Peer teaching and learning *(power point presentations, pair learning)* Students teach each other using different ways to learn from each other. It encourages; team work, develops confidence, feel free to ask questions, improves communication skills and most importantly develop the spirit of inquiry.	Distribute topics to groups to research and teach others in the classroom. Go through the basics of how to present their peer teaching.	Go into their established working groups. Develop a plan for the topic. Each group member is allocated a task to work on. Research and collect information about the topic allocated to the group. Outline the important points from the research and present their findings in class.
Performance-related tasks (dramatization, song/lyrics, wall magazines) Encourages creativity and take on the overarching ideas of the topic and are able to recall them at a later date	Students are given the opportunity to perform the using the main ideas of a topic. Provide the guidelines, expectations and the set criteria	Go into their established working groups. Being creative and create dramas, songs/lyrics or wall magazines in line with the topic.
Project (individual/group) Helps students complete tasks individually or collectively	Teacher outline the steps and procedures of how to do and the criteria	Students are involved in investigations and finding solutions to problems to real life experiences. They carry out researches to analyse the causes and effects of problems to provide achievable solutions. Students carefully utilise the problem-solving approach to complete projects.
Use media and technology to teach and generate engagement depending on the age of the students	Show a full movie, an animated one, a few episodes form documentaries, you tube movies and others depending on the lesson. Provide questions for students to answer before viewing	Viewing can provoke questions, debates, critical thinking, emotion and reaction. After viewing, students engage in critical thinking and debate

Appendix 4: Lesson Plan Template

Strand: ……

Unit: ……..

Content Standard: .....

Benchmark: ……..

Topic 1: ……..

Lesson Topic: ……

Grade: ……

Length of Lesson: ……

Essential KSAVs

Knowledge: ……

Skill(s): ……

Values: ……..

Attitudes: ……

Performance Indicator:

Materials:

Instructional (lesson) Objective(s): By the end of the lesson, students will be able to:

- ……
- ……
- ……

Essential Questions:

- ……
- ……

Lesson Procedure

Teacher Activities	Student Activities
Introduction (time in minutes)	
Body (time in minutes)	
Modeling	
Guided Practice	
Independent Practice	
Conclusion (time in minutes)	

Appendix 5: Assessment Strategies

Strategy	Description
Analogies	Students create an analogy between something they are familiar with and the new information they have learned. When asking students to explain the analogy, it will show the depth of their understanding of a topic.
Classroom presentations	A classroom presentation is an assessment strategy that requires students to verbalize their knowledge, select and present samples of finished work, and organize their thoughts about a topic in order to present a summary of their learning. It may provide the basis for assessment upon completion of a student's project or essay.
Conferences	A conference is a formal or informal meeting between the teacher and a student for the purpose of exchanging information or sharing ideas. A conference might be held to explore the student's thinking and suggest next steps; assess the student's level of understanding of a particular concept or procedure; and review, clarify, and extend what the student has already completed.
Discussions	Having a class discussion on a unit of study provides teachers with valuable information about what the students know about the subject. Focus the discussions on higher level thinking skills and allow students to reflect their learning before the discussion commences.
Essays	An essay is a writing sample in which a student constructs a response to a question, topic, or brief statement, and supplies supporting details or arguments. The essay allows the teacher to assess the student's understanding and/or ability to analyse and synthesize information.
Exhibitions/ demonstrations	An exhibition/demonstration is a performance in a public setting, during which a student explains and applies a process, procedure, etc., in concrete ways to show individual achievement of specific skills and knowledge.
Interviews	An interview is a face-to-face conversation in which teacher and student use inquiry to share their knowledge and understanding of a topic or problem, and can be used by the teacher to explore the student's thinking; assess the student's level of understanding of a concept or procedure and gather information, obtain clarification, determine positions, and probe for motivations.
Learning logs	A learning log is an ongoing, visible record kept by a student and recording what he or she is doing or thinking while working on a particular task or assignment. It can be used to assess student progress and growth over time.
Observation	Observation is a process of systematically viewing and recording students while they work, for the purpose of making programming and instruction decisions. Observation can take place at any time and in any setting. It provides information on students' strengths and weaknesses, learning styles, interests, and attitudes.
Peer assessment	Assessment by peers is a powerful way to gather information about students and their understanding. Students can use set criteria to assess the work of their classmates.

Performance tasks	During a performance task, students create, produce, perform, or present works on "real world" issues. The performance task may be used to assess a skill or proficiency, and provides useful information on the process as well as the product.
Portfolios	A portfolio is a collection of samples of a student's work, and is focused, selective, reflective, and collaborative. It offers a visual demonstration of a student's achievement, capabilities, strengths, weaknesses, knowledge, and specific skills, over time and in a variety of contexts.
Questions and answers (oral)	In the question–and-answer strategy, the teacher poses a question and the student answers verbally, rather than in writing. This strategy helps the teacher to determine whether students understand what is being, or has been, presented, and helps students to extend their thinking, generate ideas, or solve problems.
Quizzes, tests, examinations	A quiz, test, or examination requires students to respond to prompts in order to demonstrate their knowledge (orally or in writing) or their skills (e.g., through performance). Quizzes are usually short; examinations are usually longer. Quizzes, tests, or examinations can be adapted for exceptional students and for re-teaching and retesting.
Questionnaires	Questionnaires can be used for a variety of purposes. When used as a formative assessment strategy, they provide teachers with information on student learning that they can use to plan further instruction.
Response journals	A response journal is a student's personal record containing written, reflective responses to material he or she is reading, viewing, listening to, or discussing. The response journal can be used as an assessment tool in all subject areas.
Selected responses	Strictly speaking a part of quizzes, tests, and examinations, selected responses require students to identify the one correct answer. The strategy can take the form of multiple-choice or true/false formats. Selected response is a commonly used formal procedure for gathering objective evidence about student learning, specifically in memory, recall, and comprehension.
Student self-assessments	Self-assessment is a process by which the student gathers information about, and reflects on, his or her own learning. It is the student's own assessment of personal progress in terms of knowledge, skills, processes, or attitudes. Self-assessment leads students to a greater awareness and understanding of themselves as learners.
Posters	
Video analysis	
Reflective writing	
Projects	
Observation reports	