# Facilitation of Skills in Geography across School Curriculum

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**Abstract**

*Geography, as a fascinating subject, provides an understanding of people, space, physical environment, etc., and their relationships. Geography learning occupies a significant place at the school level in most of the countries including India. Geography is basically a skill-based subject. Geography learning not only helps the learners to acquire knowledge but also helps them to acquire skills. Skill development in geography encourages for attainment of the competencies relating to exploration, problem solving, decision making, etc., among the learners. In the present day, the attainment of skills in geography among the learners is marginalised at the school level because of many reasons. But, the facilitation of skills in geography should be prioritised at the school level in the context of achieving holistic development of the learners. Therefore, in this paper, attempt has been mainly made for facilitation of skills in geography among learners across school curriculum. More specifically, the paper elaborates the contents based on the themes like geography in school curriculum, geography as a skill-based subject, core skills associated with geography learning, benefits of attainment of skills in geography, skill components in geography curriculum across school stages, pedagogical approaches to skill development in geography, and skill evaluation in geography. The paper has implications for facilitating different types of skills especially in physical geography and human geography among the learners at school stage.*

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## Introduction

Geography, as a fascinating subject, provides an understanding of people, space, physical environment, etc., and their relationships. Geography learning occupies a significant place in our life.

It occupies a significant place in curriculum at the school level in most of the countries. It has specific significance for Indian school education system. Geography learning helps learners to understand the Earth's physical environment and human activities, and their interaction process. The nature and scope of geography learning differ from one stage of school education to another stage of school education as per the nature of the different stages of school education in India. Geography learning helps to explore all activities and changes that have been taking place in the world since the dawn of mankind. Learning geography helps learners to understand today's most challenging issues, such as, population explosion, climate change, scarcity of natural resources, etc. Geography learning develops skills required for understanding and using geographical concepts as effectively as possible. In practice, it is found that geography learning focuses more on accumulating knowledge than developing skills. But, geography learning should substantially focus on skill development as geography is a skill-based subject. So, beyond knowledge acquisition, we must help geography students to acquire skills and attitudes that will help them to cope with the 21st century (Chang and Kidman, 2019). At the school stage, geography learning should help the students to acquire skills in geography. Handoyo, et al. (2017) remarks that skill development in geography is one of the goals of geography education, besides understanding of concepts and attitude development. Skill in geography helps students to understand human and their communities, cultures and economies across the world as well as helps them to recognise the processes and patterns of the natural environment on the Earth's surface. Geography learning helps to develop skills among learners that are not only limited to be used in school but also helpful throughout their daily lives. Skill in geography helps learners to evaluate situations, objects, events and materials that they encounter in their life, and to take insightful decisions accordingly. Geography is a practical-based subject that can exclusively develop skills in geography related concepts and contexts. Skill development in geography is very important at the school level, but it is marginalised in practice. National Council Educational Research and Training (NCERT) (2005) observes that social sciences tend to be considered non-utility subjects and are given less importance than the natural sciences; it is necessary to emphasise that they provide the social, cultural and analytical skills

to adjust to an increasingly inter dependent world and to deal with political and economic realities. So, skill development in social sciences is often neglected at school level. Geography is a core aspect of social sciences at school level, and skill development in geography at the school stage has not been given due weightage in most of the school boards of India. Across the school stages, skill development in geography gets less attention because teaching-learning strategies used for geography teaching in schools are mostly traditional and less activity based. Most teaching methods in geography are teacher-centered, where learners passively receive information. Banerjee (2006) states that in the Indian context, students practice rote learning and memorise concepts of geography, which has very little or no affiliation for developing skills in geography. Geography learning should emphasise skill development through learner-centered activity-based learning methods rather than focusing only on memorising concepts, facts, and statistical data. The purpose of geography education is not to convey the content through activities but to allow students to develop skills in geography by organising different activities in the context of acquisitions (Artvinli, 2010). Students cannot develop skills in geography unless the theoretical knowledge of geography is substantiated by practical activities of geography. In reality, teachers convey the content of geography through traditional teaching methods, and they often neglect the skill development of geography. So, emphasis should be given to facilitate skills in geography across the school stages.

## Geography in School Curriculum

Geography learning has occupied a prominent place in the school curriculum of India. The place of geography is not uniform across schools of India. At the Primary school level, geography learning is integrated into learning of environmental studies, where students learn geographical contents integrated with other subject contents. At the middle school level, geography is one of the instructional areas like history and social and political life under social sciences. At the Secondary school level, geography is one of the compulsory units like history, political science and economics under social sciences subject. At the higher Secondary school level, geography is an independent and elective subject. Alam (2016) remarks that in most of the school boards of India, geography is taught as a compulsory and independent subject in the Upper Primary and Secondary Stages, but it is taught as a part of social sciences. At the Higher Secondary Stage in all Indian school boards, geography is learned as an independent but optional subject. Banerjee (2006) stated that higher secondary level students might get a certain flavour of geography as a subject in detail and consider it valuable to pursue as a subject in higher studies.

In Indian context, the contents of geography learning differ across the school stages. At the Primary school stage, in most school boards in India, geographical contents are integrated into the contents of environmental studies where students learn about environments, surrounding places and natural objects that are located beyond the Earth's atmosphere (i.e., the Sun, the moon and stars), etc. Students learn geography as a content area of social sciences at Upper Primary and Secondary school levels. At the upper Primary school level, the main curricular areas of geography are—Earth in the solar system, inside the Earth, globe and maps, major relief features, conservation and management of resources, human and environment relationship, settlement, transport, communications, etc. At the Secondary school Stage, the geography curriculum comprises India's physical features, drainage, climate, natural vegetation and wildlife, population, agriculture, water resources, minerals and energy resources, resources and development, lifelines of the national economy, etc. In the Higher Secondary School stage, geography is introduced as an elective subject. Most of India's Higher secondary school boards identify broadly two areas of geography, i.e., physical geography and human geography. Within physical geography, the main curricular spheres are theories of origin of the Earth, major events over the geological time scale, interior of the earth, distribution of oceans and continents, minerals and rocks, geomorphic process, landforms and their evolution; climate, vegetation and soil; life on Earth; causes, consequences and management of hazards and disasters; fundamental of maps, etc. Within human geography, dominant curricular areas are people and economy; human activities; international trade, transport and communication; human settlement; resources and development; selected geographical issues and problems; processing of data and thematic mapping; spatial information technology, etc.

Hence, learning areas of geography vary from Primary school education to Higher Secondary school education. In addition, content areas of geography gradually expand in respect of breadth, width and scope from Primary to Higher Secondary level of education. At the Higher Secondary level, geography is treated as an independent and separate discipline under most of the school boards of India. In this stage, geography learning develops a broader and deeper understanding of the subject among the students. The simpler aspects of geography are learnt in the lower classes whereas the difficult aspects of geography are attained in higher classes. While in lower classes the learning of geography is based on common issues of geographical phenomena, in higher classes the learning of the same is based on

specific issues of geographical phenomena. While in lower classes geography is studied through unified or integrated approach, in higher classes geography is studied through specialised approach. In lower classes geography curriculum is more utilitarian in nature, but, in higher classes geography curriculum is more task-based and/or specific goal directed in nature. While in lower classes the learning of geography focuses more on geographical information or knowledge gathering, in higher classes it focuses more on conceptual understanding of geographical issues, problem solving relating to geography, analysis and synthesis of geographical data and so on.

## Geography as a Skill-based Subject

Geography is a prominent school subject that helps students to develop a series of skills. Murphy (2007) explains that geography has employment advantages over other humanities and social sciences because there are specific and clear practical applications for developing basic skills such as map making, terrain and location analysis and environmental management in geography. Geography learning encourages skill development by systematically discovering and explaining geographical phenomena and geographical facts rather than encouraging memorisation of the names of places, rivers, mountains, or other geographical facts.

The map is the most important and essential tool of geography because maps enable students to develop map skill through its reading, analysis, interpretation, drawing, etc. Geography develops geographic skills through various lessons such as reading maps, aerial photographs, reading graphs, field observations and critical thinking in space (Yani and Maryani, 2017). In geography learning, learners find and use geographical information instead of only gathering information that helps to gather knowledge in geography. Geography learning helps to develop inquiry skills through determining the location of the settlements, factors affecting their development, and so on. Geography learning illustrates concepts, theories, and cause-effect relationships in a realistic setting that provides a wide scope to develop skills in geography. The geographic process on Earth causes continuous change, and this concept of change is essential to understand how and why physical and human system evolves. Spatial skill is the most important skill in geography, which helps to understand the constant changes over space. Goodchild (2006) remarks that spatial thinking as a fourth R' where three Rs are reading, writing and arithmetic. Geography learning can equip students with skills to identify patterns and trends of spatial changes and analyse the causes and impact of changes, which help students better respond to live in the changing society (Xiang,

2014). Students can describe and analyse the spatial patterns on the Earth by utilising spatial thinking skill. Spatial thinking skill may be regarded as a concept of space, tool of representation, and process of reasoning (National Research Council, 2006). Spatial thinking skill is effectively developed through the Web-based Geographic Information System (GIS) in the world geography course (Jo et al., 2016). In the present day, GIS and Remote Sensing (RS) are the exclusive computer mapping and analysis techniques in geography learning. These tools allow learners a series of activities such as collecting, storing and analysing aerial photographs and satellite imageries and updating and displaying a large set of geographical data.

Geography learning helps to study the landforms, their evolution and their related processes. Skills in geography are necessary to analyse and understand the landforms, their evolution and their related processes. It encompasses interactive activities, development of models, interpretation and analysis of geographical data, etc. that help learners to develop skills in geography. It helps learners to develop skills through the study of the world and its spatial and cultural elements. It develops skills by involving students in statistical and projection methods to understand the population distribution, population growth, population density, sex ratio, migration patterns, occupational structure, etc. So, theoretical contents of geography require integration of practical-based activities of geography with them that help to develop skills in geography. The development of skills in geography is important in the context of active learning of geography.

## Core Skills Associated with Geography Learning

Learners need to acquire core skills of geography along with acquiring textual knowledge in geography. Core skills associated with geography learning may broadly be divided under two heads, i.e., core skills associated with physical geography and human geography. The core skills associated with geography learning are given below.

**Table 1**
**Core Skills Associated with Geography Learning**
**(Physical Geography and Human Geography)**

| Skills in Physical Geography | Skills in Human Geography |
|---|---|
| Geomorphic inquiry | Geographic inquiry |
| Change and continuity perception skill | Map skill |
| Time perception skill | Data interpretation and visualisation skill |
| Skill of using evidence | Spatial thinking skill |

The descriptions of the core skills associated with physical geography are given below.

**Geomorphic Inquiry**: Geomorphology is one of the major domains of physical geography that studies the origin and evolution of the Earth's topography. At the school level, the central concept of geomorphology is the formation of different types of landforms by geomorphic agents like river, wind, sea wave, etc. Geomorphic inquiry focuses on landforms evolution, theoretical investigation of geomorphologic processes and physical/chemical mechanism underlying these processes. Wilcock et al., (2013) states that emerging perspectives to geomorphic inquiry extend beyond the generalisation of landforms of landscape thinking by providing genuine insights into landscape relationships at a given place. Haschenburger and Souch (2004) suggest geomorphic principles that describe the key aspects of landscape structure and function that are embedded within present day geomorphic inquiry, i.e., (i) the basic building block of the landscape is a landform; (ii) landscapes are organised assemblages of interconnected landforms; (iii) landscapes reflect the interaction between driving forces and resistance forces; (iv) landscapes evolve under particular histories; (v) landscapes respond to exogenic and endogenic perturbations and adjust to internal functioning; (vi) landscapes exhibit aspects of equilibrium, disequilibrium, and non-equilibrium behaviours.

**Change and Continuity Perception Skill:** Change and continuity are closely related to geography learning. Both physical and human phenomena change over time because of their dynamic nature and/or effect of humans. Thus, geography learning should address the changes that occur in our surroundings. By acquiring this skill, learners understand and recognise the changes that are occurring around them. Geography learning is concerned with continuous changes in Earth's physical features, places, events, environment, etc. Change and continuity perception skill helps to understand how places are changing, and why places are changing or not changing, and helps to make a decision based on changes taking place. Change and continuity perception skill follows certain steps, i.e., (i) finding similarities and differences; (ii) perceiving change and continuity; (iii) distinguishing between historical phenomena and interpretations; (iv) defining problems and their causes in the past; and (v) finding alternatives to the solution of a historical problem (Tangülü et al., 2015). Geography involves studies of changes over time and space. Geography studies the temporal change of natural and human processes with the connection of past, present and future. So, basic concepts of geography are time, chronology, change and continuity. Change and continuity skill develops competencies for discovering similarities and differences over time

in the geographical process. Change and continuity skill is important for students to understand the change, continuity and to perceive that everything is in change (Pala, 2021).

**Time Perception Skill**: Time is one of the key concepts of geography learning. To perceive the international time, and standard time of a country or place, time perception skill is required. In geography learning, learners develop the perception of long periods to daily periods. The Ministry of National Education, Turkey (2005) states that time perception skill includes some sub-categories, i.e., geological process; annual, seasonal and daily processes; historical processes; and ecological cycles.

**Skill of using Evidence**: Shreds of evidence in geography learning are required to prove the geographic events, phenomena and facts which can be found from primary source and/or secondary source. Shreds of evidence in geography include rock, mineral, fossil, climate, weather condition, daily, seasonal, or annual event, etc., Unlu (2011) remarks that using proofs in geography contains fossils, stones, tectonics, climate, etc. related to geological processes as evidence of a natural feature, using human features as historical, social, financial, and political events and facts as evidence. When proofs are not considerably and directly used, visual elements such as, photos, models, and videos can be used as evidence.

The descriptions of core skills associated with human geography are given below.

**Geographic Inquiry**: Geographic inquiry is one of the key skills in geography learning at the school stage. Geographic inquiry enables learners to participate more actively in solving physical and human geography related problems ranging from local to global levels. Geographic inquiry involves learners in an individual or collaborative inquiry process that commences with geographical questions, and progresses through the data collection, evaluation, interpretation and analysis of the information to develop the conclusion and proposal for action. Özüdoğru and Demiralp (2021) states that geographical inquiry is the foundation of geography literacy which is about a learner asking geographic questions, interpreting the information by investigating the answers to the questions and revealing their conclusions. Solem (2001) found that human geography lessons support the inquiry process.

**Map Skill**: Map is the database of geography from which one visualises the information to predict the fact. Understanding and visualising the information from the map require map skill. Learners who possess map skills face no difficulty in assuming important roles for themselves and their environment. Map skills stand at the core of geography education (Péter et al., 2019). Map skills are acquired through these activities:

determining the position of a place/region, reading the symbols, determining the scale, measuring distance based on map scale, recognising the map types, drawing maps, collecting information from the map, comparing the two or more maps, using maps for elaborating different information, etc. Map skill includes tasks related to maps such as working with map key, finding a particular place on a map, map orientation, the work with two or more different maps of the same place, discovering spatial relations between places and answering geographical questions and task (Mrázková and Hofmann, 2012). Learners develop map skill by reading, interpreting, and drawing maps that contribute to everyday decision-making. Map skill is one of the basic geographic skills that students can easily employ to solve a wide variety of problems in their daily lives (Gokce, 2015).

**Data Interpretation and Visualisation Skill**: One of the important aspects of geography learning is understanding and using geographical data. Geographical data present the status and/or trend of the geographical fact. Learners should know how to present data through appropriate means for better learning of geography. So, interpretation and visualisation of data are very important for geography learners. Explaining, interpreting and visualising the table or data set in geography require data interpretation and visualisation skill. Data interpretation and visualisation skill in geography includes tabular data explanation in a written form, formulating a table from the written information, visualising a data set through appropriate graphs, formulating a table from the graphs, comparing the two different types of graphs/tables, etc. The Ministry of National Education, Turkey (2005) stated that data interpretation and visualisation skill helps the students to be actively engaged in selecting and classifying suitable data; forming tables, graphs and diagrams according to the data; using related photos and making connections; using tables, graphs, diagrams appropriately; interpreting tables, graphs, diagrams, and making synthesis by comparing them.

**Spatial Thinking Skill**: Spatial thinking skill enables learners to acquire geospatial knowledge. Spatial thinking is the ability to visualise spatial relations, imagine the transformation of space from one scale to another scale, remember images of spaces, create a new viewing angle or perspectives, etc. Spatial thinking underlies a significant amount of geography learning, such as maps, graphs, images, diagrams, models, and visualisations (Bednarz and Bednarz, 2008). Spatial thinking skill includes the geographical skill that helps to analyse and interpret spaces, primarily those in our surroundings (Unlu and Yildirim, 2017). Spatial thinking skill can be developed through Geographic

Information System (GIS), which enables learners to map and analyse changes and patterns of the spatial distribution on Earth.

The Ministry of National Education of Turkey (2005) identified eight core geographic skills derived from geography lessons. The eight core skills are— map skill, observation skill, fieldwork skill, geographic inquiry skill, the skill of preparing and explaining tables, graphics and diagrams, chronology skill, skill of using evidence, skill of perception of change and continuity. National Geography Standards substantially contributed to geography education in the United States of America (USA) and identified five skills that students should possess by completing Grades IV, VIII and XII. These five skills are asking geographic questions, acquiring geographic information, organising geographic information, analysing geographic information, and answering geographic information (Geography Standards Education Project, 1994). Artvinli (2012) remarks that eight skills identified by the Ministry of National Education of Turkey also prepare the students internationally for the five sets of geographical skills identified by the Geography Standard Education Project, 1994.

## Benefits of Attainment of Skills in Geography

Skill in geography provides methods and techniques to think and act geographically. It helps individuals to take a wise decision regarding where to build houses and/or live, how to travel from one place to another, how to conserve energy and resources, etc. It helps to analyse the differences and similarities between two distinct places, explain how these differences and similarities affect human activities, gain information about the interdependency between the physical environment and human processes and so on. It helps learners to explore the physical process, spatial patterns, human process, etc., from local to global level. It helps, to explore spatial information at various scales. It enables learners to collect, compare, analyse and present geographical information. Collecting information, analysing it, drawing a meaningful conclusion, and making an informed decision about possible action are key components of geographic skills (Bednarz and Bednarz, 1995). Geographical skill helps to explain the diversity and interdependence of regions, places, and locations. Effectively and fluently communicating geographical ideas, principles, and theories through action/performance are required skills in geography. It helps learners to recognise patterns, associations, and spatial order of the objects and landscapes.

Geography learning provides a wider scope to develop skills that can be applied to determine and resolve various social and environmental issues. It increases understanding of the physical and cultural aspects of the place. Skill in geography allows students to generate ideas

to solve environmental and social problems. Learners can use several skills in geography to investigate social and environmental issues. Skill in geography provides solutions that cause the least damage to the environment and minimise undesirable side effects. Skill development through geography learning makes the learners highly employable and more relevant to the future workforce. Maps, statistics, geographical information, etc., are properly interpreted by skilled geography students in the problem solving and decision-making of any business or government organisation.

Geographic Information System (GIS) is an important and essential tool in geography learning in present day. Through geography learning, students develop mastery on GIS tools that help them to collect and interpret information of remotely sensed images/ satellite imageries, aerial photographs, etc. Knowledge and skills to use GIS help to develop spatial thinking skill. Spatial thinking skills allow students to recognise and understand relationships in multiple ways and to remember them in both static and dynamic representation (Collins, 2017). GIS helps to effectively present and analyse geographic information within less time and thus, it helps to develop geographic inquiry skill.

## Skill Components in Geography Curriculum across School Stages

Geography curriculum has many practical aspects that provide ample opportunities to develop the subject/content specific skills. The skill components of geography curriculum vary from one stage of school to another. In the primary school stage, geographical contents allow learners to explore their surrounding environment and different plants around them. So, in this stage, learners start enquiring about their surroundings with the help of the teacher and this helps them to develop geographic inquiry skill. In this stage, learners develop geographic skills by understanding the spatial variation of plants, farming, crops, etc. The existence of Pines in Himalayan region, Mangroves in Sundarban delta, and Cactus in Thar desert is an example of spatial variation of plants in India. The presence of intensive subsistence farming of rice in West Bengal and Kerala and extensive agricultural farming practice in Punjab and Haryana is the example of spatial variation in a type of farming in India. The rice production in Odisha, West Bengal and Assam; wheat production in Haryana and Punjab; and sugarcane production in Uttar Pradesh and Maharashtra exemplify the spatial variation of crops in India. Primary school learners develop map skill through activities like distance estimation, map drawing, use of direction between two places, use of symbols and scale of maps, etc.

In the middle school stage, learners develop skills in geography through performing different activities based on the concepts or themes like full moon, new moon, orbital plane,

circle of illumination, elliptical orbit, calculation of leap year, summer solstice, winter solstice, equinox, identification of locational settings of India, uses of weather instrument to measure the temperature or atmospheric pressure, rainfall, direction of wind, etc. In this stage, learners develop geographic inquiry skill through using evidence based on the comprehensive information about the Earth (both inside and outside), facts about the Earth, features of the globe, effects of rotation and revolution of the Earth, etc. Learners in the middle school stage learn about distribution of natural vegetation of the world, world's major seaports, life in tropical/subtropical/ temperate grassland and desert regions, continent wise distribution of minerals and power resources, world distribution of arable land, continent wise population distribution, etc. that can develop map skill and spatial thinking skill in geography among the learners. Time perception skill, and change and continuity perception skill are developed in this stage through the geographical contents like land use changes over time, population growth over time, patterns of population changes, different rates of population growth, etc.

In the secondary school stage, geography is an integrated content of social science along with history, political science and economics. Geography contents in the secondary stage help learners to understand the geographical contents like size and location of India, physical features of India, drainage, climate, natural vegetation, wildlife, population, and resources of contemporary India, etc. Secondary stage learners can acquire map and spatial thinking skills through studying the size and location of India, distribution of different climatic factors in India, major types of forest across India, distribution of natural forest and wild life resources across India, types of farming observed across India, state wise production of minerals in India, distribution of energy resources in India, etc. Geographic inquiry can be developed at this stage through the contents/themes like land degradation and conservation measures, rapid decline of forest and wild life, conservation strategy of forest, water resource management, control of environment degradation, etc. Data interpretation and visualisation skill can be developed through the contents of growth of GDP in major sectors, food grains productions, state wise production of minerals, year wise steal productions, etc. Time perception skill, and change and continuity perception skill can be developed through the contents/ themes like climate changes, population growth and population changes from 1951 to 2011, land use patterns of country (India) over the time, rapid decline of forest and wild life, etc.

Most of India's Higher secondary school boards include two broad areas of geography, i.e., physical geography and human geography in the syllabus. At higher secondary stage, geomorphic

inquiry skill, change and continuity perception skill, time perception skill and skill of using evidence can be developed through studying and exploring physical geography contents/ themes like origin and evolution of the Earth, different geomorphic processes and resultant landforms, climate and global concerns, hydrosphere, biosphere, physiography, the spatial and temporal distribution of climate, vegetation and soil, natural hazard and disaster, etc. At this stage geographic inquiry skill, map skill, data interpretation and visualisation skill and spatial thinking skill can be developed through studying and exploring human geography contents/ themes like population distribution, density and growth of population, primary/secondary/tertiary/quaternary human activities, types of transport, communication and trade, types of human settlement, morphology of cities, resources and their creating factors, utilisation of world resources in terms of forest, fishing, land use pattern, water resources, mineral and power resources, selected industries and their distribution and changing patterns, ideas of sustainable development, etc.

## Pedagogical Approaches to Skill Development in Geography

Pedagogy plays a significant role in transacting the subject knowledge and developing skills in any area of learning at school level. Geography contents across the school stages are in many ways practical oriented and provide great scope to develop geographic skills among the learners. So, it is necessary to adopt comprehensive and efficient pedagogical approaches to develop skills in geography among school learners. The pedagogues or teachers should adopt innovative and learner friendly teaching methods to develop

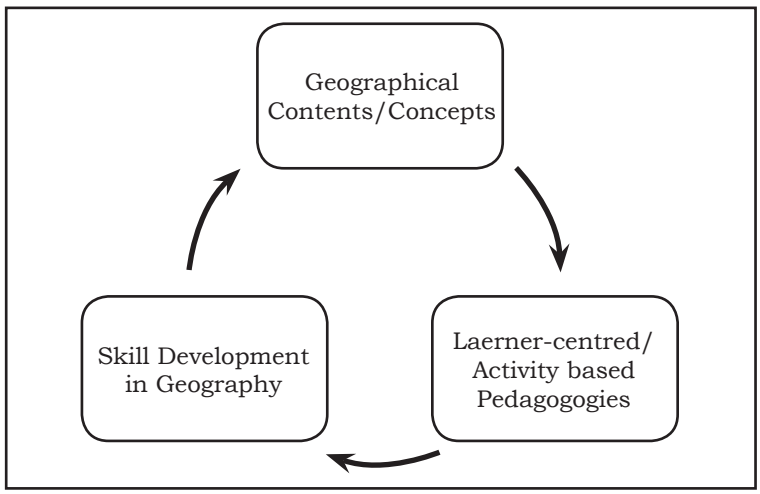



*Fig. 1: Approaches to Skill Development in Geography*

skills in geography among the learners. Activity-based teaching methods are more appropriate to develop skills in geography. Hands-on experiences based on geographical contents provide better scope to the learners to develop their skills in the geography subject. Therefore, for developing skills in geography, the teaching-learning process must focus on practical approaches to teaching-learning geography rather than rote memorisation of concepts of geography. Therefore, the learners should perform individual/ collaborative hands-on activities in geography teaching-learning process. In practice, it is observed in many cases that learners perceive geography as a tedious and rote learning-based course where they recall the facts and memorise the phenomena, names, etc., based on geographical concepts. In order to facilitate learner-centered learning in geography especially for developing geographical skills, Artvinli (2020) remarks that geographic inquiry involves an individual or collaborative process and research that begins with geographical questions, develops activities and proceeds through the collection, evaluation, interpretation and analysis of results.

Practical activities in teaching-learning of geography provide a wide range of scope to develop skills in geography. Laboratory-based activities in geography learning are practical in nature that allow learners to conceptualise abstract geographical concepts through active experiment and observation of phenomena. In laboratory-based learning situations, learners understand content by experimenting, collecting information from primary/secondary sources, processing and visualising that information, etc. Laboratory-based activities in geography provide scope to use maps, weather instruments, rocks, minerals, geography models, etc. to develop skills in geography. French and Russell (2002) state that students are benefited from inquiry based laboratory activities by acquiring effective scientific training. Laboratory-based activities in geography involve students in the interpretation of maps, air photos, other imageries; identification and interpretation of contours; identification and analysis of cross-section of physical and cultural features; interpretation of distributional patterns of various types of vegetation and soil, etc. which help to develop, specific skills of geography such as cartographic skill, topographic map interpretation skill, photographic interpretation skill, etc. Varieties of laboratory activities in geography such as collecting, processing and analysing environmental and spatial information from primary/secondary sources are used in remote sensing, Geographic Information System (GIS), mathematical and statistical modelling of geography and so on.

Geography learning takes place well through field based learning as it provides opportunities for observing of physical changes in environment, experiencing of geographical phenomena in the environment

and others. Fieldwork significantly helps to develop skills in geography through providing adequate scope for understanding geographical features and geography concepts. Learners in field work activities involve themselves in hand-on data collection from primary sources by using technical instruments, questionnaires, interview schedules, etc. Fieldwork provides practical experience in mapping, in Global Positioning System (GPS), etc. Fieldwork activities in geography involve observing and experiencing the geographical phenomena through direct observation; collecting and recording data/experience of people; analysing collected data; preparing the report/drawing the conclusion based on gathered data/information, etc.

Two pedagogical activities based on physical geography and two pedagogical activities based on human geography at senior secondary or higher secondary school level curriculum for skill attainment in geography are exemplified below.

## I. Activities for Skill Attainment in Physical Geography

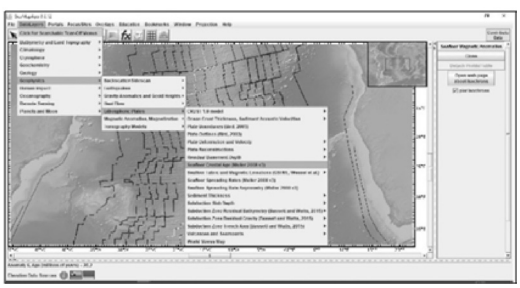
### Activity 1

**Area:** Concept of sea-floor spreading
**Topic:** Sea-floor spreading rate profile
**Broad objective:** To attain time perception skill and skill of using evidence
**Material required:** Computer along with internet connection and GeoMapApp3.6.12, one white A4 sheet for each student, pen or pencil
**Strategy:** Problem solving
**Mode:** Group base

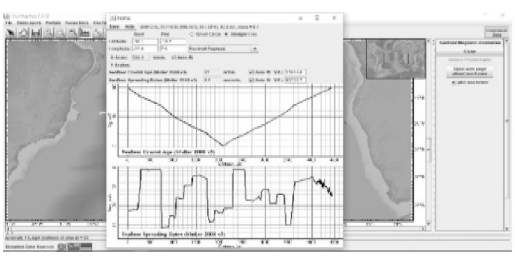
### Activities to be followed

The students of the class would be divided into groups, where each group would include two students. The students will be provided hands-on-experience to create a sea floor spread using 'GeoMapApp3.6.12'. Each group of students would be asked to interpret and present the profile of seafloor spreading based on distance, age and rate of spreading. Students will open the 'GeoMapApp3.6.12', select the 'Mercator map projection', and click on 'agree'. After opening the 'GeoMapApp 3.6.12', they will proceed to the 'Seafloor Crustal Age (Muller 2008)' under the 'Data Layers' tab. Then with the help of 'GeoMapApp 3.6.12', 'seafloor crustal age profile' and 'seafloor spreading rate profile'

***Screenshot 1:*** *GeoMapApp3.6.12*



***Screenshot 2:*** *GeoMapApp3.6.12*



***Source for Screenshot 1 and 2:*** *http://www.geomapapp.org (retrieved on 10 July 2021)*

will be created by them. They will interpret these profiles based on distance, age and rate, and present their findings accordingly.

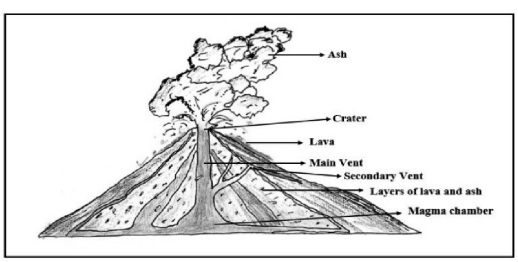
### Activity 2

**Area:** Volcanoes
**Topic:** Causes of volcano and different parts of volcano
**Broad objective:** To attain geomorphic inquiry and change and continuity skill
**Material required:** One model of volcano, safety glasses for each student, baking soda, red colour and vinegar
**Strategy:** Experiment
**Mode:** Whole class

### Activities to be followed

Students would set up the model of the volcano on the table. This would be an empty volcanic model. Students would wear the safety glass for this experiment. Students would put some baking soda (as minerals) and add some red colour (as rock materials) in the empty volcanic model. Students would put vinegar (as a rain or acid rain) in the volcanic model in such a way that the vinegar would spread on it. The rain or acid rain percolates into the volcano. When the rain or acid rain would touch the minerals and materials inside the volcano (baking soda inside the volcano), it would lead to a chemical reaction. Due to the chemical reaction, the vinegar and baking soda will erupt like volcanoes. In this process, students will experience that rain/acid rain is one of the causes of the volcano. After this experiment, the students will be asked to inquire about this volcano model to identify vent, crater, magma, secondary cone, etc.

**Picture 1:** *Volcano*




## II. Activities for Skill Attainment in Human Geography

### Activity 1

**Area:** Land use categories
**Topic:** Land use of the world
**Broad objective:** To attain data interpretation and visualisation skill and map skill
**Material required:** Continent wise land use data, map of world, light tracing instrument
**Strategy:** Data extracting and presentation
**Mode:** Individualised

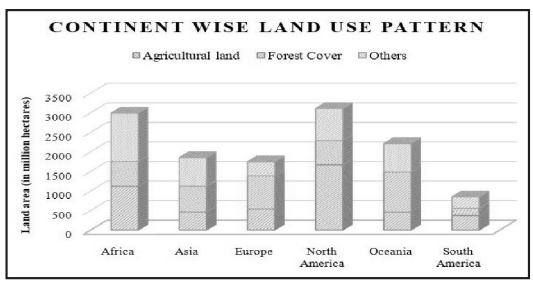
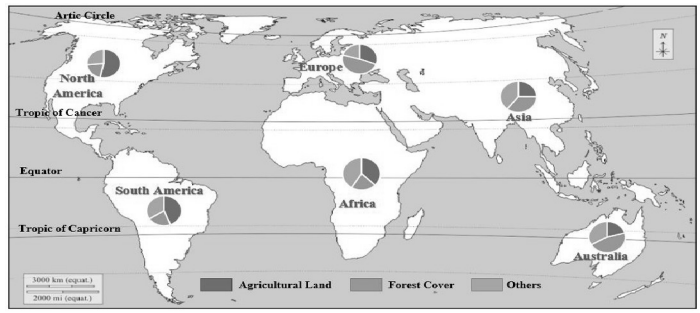



*Fig. 2: continent wise land use pattern*
***Source:*** *https://www.fao.org/ (retrieved on 08th August 2021)*

## Activities to be followed

Students will be provided basic knowledge about the process of data extraction from a graphical representation with the help of scale. The students will be asked to extract the continent wise percentage of land use pattern area from the compound bar graph and represent this continent wise percentage of land use pattern area on a world map. Students will extract the continent wise land use pattern area in a million hectares from the compound bar diagram with the help of the scale of the bar diagram. Then students will convert the area (million hectares) into a percentage. Students will light trace the outline of the world map. Students will draw the pie chart on the outline of world map and label it accordingly. In this way, they will be able to extract the data, convert the data into percentage, and present the data on a map using a diagram.

**Map 1:** *Continent-wise land use pattern*




***Source:*** *https://d-maps.com/ (retrieved on 08 August 2021)*

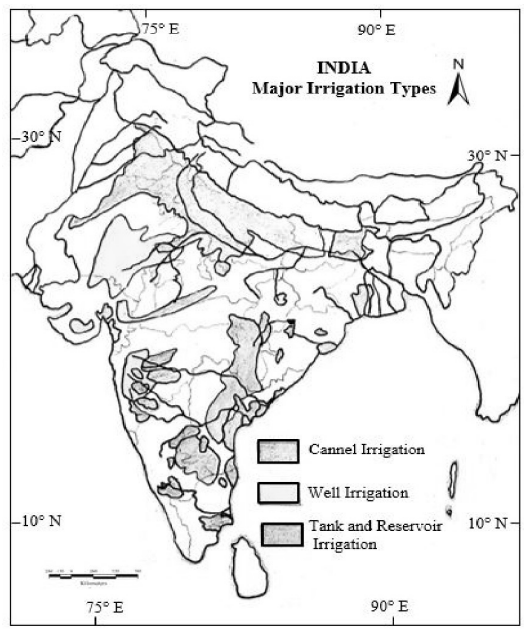
## Activity 2

**Area:** Water resources of India
**Topic:** Irrigation system in India
**Broad objective:** To attain geographical inquiry and spatial thinking skill
**Material required:** Map and atlas
**Strategy:** Inquiry process and spatial association
**Mode:** Individualised

## Activities to be followed

The students would be asked the question—why is tank and reservoir water irrigation more prevalent in south India in comparison to the northern plain? The students will find out the tank and reservoir based

**Map 2***: Major irrigation types of India*




***Source:*** *Oxford School Atlas (33rd edition), New Delhi: Oxford University Press*

irrigation system practiced in south India and canal irrigation and river water use prevalent in the northern plain to answer this question. Students will find out the number of the rivers that exist in south Indian states but those do not provide any canal irrigation. Students will try to find out the causes of this distribution. They will find out that the northern plain is a plain region, and it has perennial rivers whereas south India is a Deccan peninsular region, and the rivers in this region are seasonal. Students will find out that the northern plain is suitable for digging canals and here the perennial rivers supply water throughout the year. Digging canals in south India is expensive because of the peninsular nature. Students would also find out that the southern region is most favourable for tank and reservoir irrigation because here ground water does not percolate easily due to hard rock structure. In this way, students will inquire about the question with the help of atlas and map of India and accordingly find the answer to the question—why are tank and reservoir water irrigation more found in south India than in the northern plain?

## Skill Evaluation in Geography

The present evaluation procedures in geography deal more with the knowledge of geography whereas skill evaluation in geography is given less weightage. Questions and the other evaluation means of geography learning across school stages focus more on assessing the learners' recall power rather than assessing the skills of geography. Mishra (2015) remarks that most test items are short answer types that require recalling factual information rather than allowing learners to demonstrate the application of skills in geography. A small percentage of test items assess higher cognitive skills. The skills evaluation is the major concern in the geography evaluation process. Performance-based assessments test students' skills well in many areas of education. Performance-based assessments need to be given proper weightage in assessment of geography learning. Teachers should know to administer the performance based assessment in geography. Rudner and Boston (1994) remarked that, "to implement performance assessment fully, administrators and teachers must have a clear picture of the skills they want students to master and a coherent plan for how students will master those skills". Chart 1 displays some of the common steps and procedures to implement performance-based assessment in geography (physical geography and human geography).

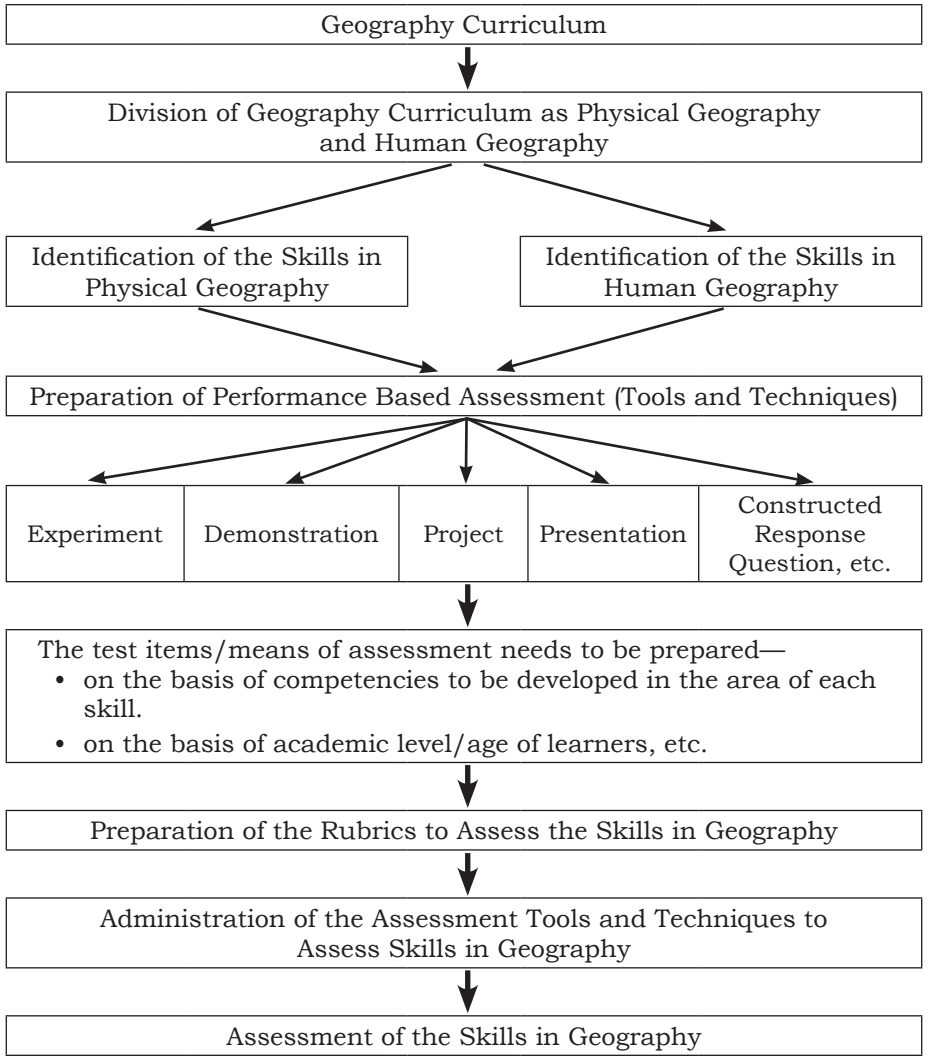



**Chart 1:** *Steps and procedure for performance based assessment for skill assessment in geography*

The examples of the objectives and/or use of some of the performance based assessment tools and techniques are given here. The experiments can be used to evaluate the skills in geography learning. In an experiment, learners

plan and carry out different practical activities by using geographical skills and concepts. In experiments in geography, learners use geographical materials, tools, models, instruments, etc. and handle them. The demonstration allows learners to show their skills in the subject area. Through the demonstration, the competencies in geography like using geographical facts as evidence, determining the position of a place on a map, measuring distance based on map scale, extracting information from the maps, etc. of the learners are assessed. The presentation allows students to present information and data of geography learning. Presentation in geography assesses how students select suitable data to portray the information; formulate tables, diagrams, and graphs; make a meaningful connection with the presentation and so on. Constructed response type questions require a student to present his/her own creativity and complex thinking rather than just describing what he/she knows or his/her factual information. Constructed response type questions in geography learning assess the spatial thinking ability; use of evidence to prove the geographical fact; interpretation of the data, information and diagrams; perception of the time, changes and continuity over the space, etc.

Effective administration and scoring of performance based assessment in respect of assessment of skill in geography require proper rubrics based on the area of assessment of skill in geography. A model rubric is presented in Table 2 that may guide to assess a skill (spatial thinking skill) in a content area of geography through a performance-based assessment technique.

**Table 2**
**Rubrics for Assessment of a Skill (Spatial Thinking Skill) in Geography (through a Performance Based Assessment Tool/Technique)**

| Performances | Percentage of marks to be given to total marks | Grades against total marks |
|---|---|---|
| • Provides all relevant, detailed and accurate information along with all significant points. (e.g., visualises all relevant spatial information about two regions on map, points out all relevant, detail and accurate spatial information about two regions on map, etc.).<br>• Uses all the appropriate tools, evidences, etc. along with all significant points. (e.g., finds out all the appropriate spatial relations between two regions identified on map using appropriate tools, evidences, etc.). | Above 75 marks–100 marks | A |

| | | |
|---|---|---|
| • Provides maximum relevant, detailed and accurate information along with maximum appropriate points. (e.g., visualises maximum relevant spatial information about two regions on map, points out maximum relevant, detail and accurate spatial information about two regions on map, etc).<br>• Uses maximum appropriate tools, evidences, etc. along with maximum appropriate points. (e.g., finds out maximum spatial relations between two regions identified on map using maximum appropriate tools, evidences, etc.). | Above 50 marks–75 marks | B |
| • Provides less relevant, less detailed and less accurate information along with less appropriate points. (e.g., visualises less relevant spatial information about two regions on map, points out less relevant, less detailed and less accurate spatial information about two regions on map, etc).<br>• Uses less appropriate tools, evidences, etc. along with less appropriate points. (e.g., finds out less spatial relations between two regions identified on map using less appropriate tools, evidences, etc.). | Above 25 marks–50 marks | C |
| • Provides least relevant, least detailed and least accurate information, along with least appropriate points. (e.g., visualises least relevant spatial information about two regions on map, points out least relevant, least detailed and least accurate spatial information about two regions on map, etc).<br>• Uses least appropriate tools, evidences, etc. along with appropriate points. (e.g., find out least spatial relations between two regions identified on map using least appropriate tools, evidences, etc.). | Upto 25 marks | D |

## Discussion and Conclusion

Geography is a subject in the school curriculum that helps learners to acquire skills besides knowledge. Some core skills associated with geography learning at school stages are geomorphic inquiry, change and continuity perception skill, time perception skill, skill of using evidence, geographic inquiry, map skill, data interpretation and visualisation skill, spatial thinking skill in addition to many other such skills. Acquisition of skills in geography by the learners helps them to understand well the humans and their environment, communities, cultures, and economies and so on. The attainment of skills in geography is important for the learners for better understanding of their natural and social environments starting from the local level to the global level. Attainment of skills in

geography by the learners helps them to take important decisions for their well-being and happy living. Attainment of skills in geography by the learners help them to resolve complex problems such as social and environmental issues, conflict between religious and ethnic groups, resource scarcity, environmental degradation and so on. But in our school setup, the skill development in geography is mariginalised because of several reasons. The scope of practical related activities or hands-on-activities that facilitate the skill development in geography are less remarkable in Indian school system. Therefore, planned efforts need to be made to include adequate skill component in geography curriculum, use suitable learner-centred and practical pedagogic styles and strategies for skill development in geography teaching learning and adopt appropriate performance based and/or practical oriented assessment strategies for assessment of skill attainment of the learners in geography in the school setup. Facilitation of skills in Geography through school curriculum must be treated as one of the frontline agenda in the present educational policies and practices at the school level. The following strategies may be helpful for facilitating skills in geography.

- Geography should be treated as a practical and skill-oriented subject like sciences across the school stages.
- Skill development in geography through the teaching-learning of the contents of geography/ environmental studies/social sciences should be emphasised at school stage.
- The curriculum at school stage should be redefined in order to infuse adequate geographical skills in the curriculum, and efforts need to be made to facilitate the same skills among the learners.
- The core/basic skills from the contents of geography learning in each level of education should be identified in order to develop the same skills among the target group learners.
- Hands-on-activity based pedagogies like laboratory-based learning, experiential learning, etc. should be used in teaching-learning process for skill development in geography.
- Skill assessment in geography should be an important component of assessment practices in geography.
- Skill development in geography should be emphasised in both pre-service and in-service teacher education systems at different levels of teacher education.
- Trainings/orientation programmes/ induction programmes/workshops should be organised relating to the area of 'skills development in geography'.

- Theoretical contents and practical contents of geography should get equal importance in teaching-learning of geography for developing skills in geography.
- One of the main aims of teaching-learning of practical contents of geography should be to develop the skills in geography.
- Schools and other educational institutions must have adequate resources in respect of skill development in geography and the institutions must utilise the same for developing adequate skills among the learners.

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