Developing Topographic Map Study Skills in Advanced-Level Geography Students: A Teacher's Experiences

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ABSTRACT

Map work is a core component of the geography curriculum, but it presents unique challenges for both students and teachers. Students must have a high level of cognitive and conceptual development to read and interpret a map. Teachers, too, often find it difficult to instill the necessary skills for graphic literacy. The unique challenges associated with topographic map study skills are highly relevant to the choice of this subject. The primary goal of this study was to help advanced-level geography students improve their topographic map study skills. For this study, the action research method was used as a research method. Following the pre-test, four students with lower grades were chosen as a sample. Thematic analysis is performed on the data. This research found that most of the students in year 12 felt that they had some issues with incorrect topography identification based on map observation, incorrect recognition of standard symbols from map observation, incorrectly calculating the area of a map, difficulties comprehending the relationship between physical and cultural landscapes, and difficulties with reading and analysing a map. The research then revealed that students require fundamental knowledge of drawing, reading, and interpreting maps. It is also critical to teach map work in as practical a manner as possible. Teachers can use models as teaching aids and the group discussion method as a teaching method to help students develop these skills. Teachers' peer intervention, individual attention, and discussion with friends all help to increase knowledge of basic topographic map concepts. It contends that the sophistication and complexity of the skills required to interpret topographical maps should not be underestimated. Teachers must be made aware of how students acquire map reading skills and the difficulties they face during this process so that teaching programmes that correspond to students' levels of cognitive development can be developed. The study's findings and recommendations have implications for geography teachers, textbook authors, and educational authorities, particularly those involved in curriculum and syllabus development.

Key Word: topographic map study skills, advanced-level geography students, teacher experiences

INTRODUCTION

Maps are, to some extent, the language of geography. Maps represent geographical information using cartography techniques, using points, lines, colours, and shapes. Topographic maps provide detailed information about physical features and landscapes, using couture lines for elevations, and are similar to general reference maps (Geography Encyclopaedia, Studying Geography, 2022). A graphical or visual representation is generally more effective than a textual account (LaSpina, 1998). Therefore, geographical competencies include knowing how to draw and understand maps and plans. This includes instructing students on how to read and draw tomographic maps. Students use these skills to supplement their understanding of environmental, physical, and human systems, as well as to develop a sense of place. However, it is necessary to teach students how to interpret resources such as aerial photography, satellite imagery, and digital mapping. Teachers must consider not only the technical or procedural knowledge required by students but also their ability to apply that knowledge. As a result, integrating this aspect with other aspects of geography is critical.

Plans for a high-quality geography curriculum that introduces students to various types of mapping, such as topological and thematic mapping, are critical in secondary school. Geography is a compulsory subject in the formal curriculum implemented by Sri Lankan school education from grade 6 to grade 9. Geography is a new subject that students must study from the third primary stage to the junior secondary stage. For grades 10 and 11, students should select one subject from group number one that piques their interest. Currently, educational authorities are working to expand the opportunity for a large number of students to choose geography as a subject for the General Certificate of Studies at higher levels 12 and 13.

Despite the fact that students have more opportunities to study geography at the advanced level, the number of students who choose to study geography has decreased due to the irrational fear that studying maps is a difficult task. Even students studying geography at school had a low achievement level in the previous period due to weaknesses in the study of topographical maps.

A topographic map depicts man-made and natural features on the ground, such as roads, railways, power transmission lines, contours, elevations, rivers, lakes, and geographical names. Contour lines on topographic maps show how the elevation of the landscape changes. Contour lines are imaginary lines on the Earth's surface that connect points at the same elevation above sea level. Contour lines connect points that have the same elevation; where they are close together, elevation changes quickly and the terrain is steep. Elevation changes slowly where contour lines are spaced widely apart, indicating a gentle slope.

https://study.com/learn/lesson/topography-topographic-maps.html

Map work, on the other hand, is an established part of the geography curriculum, but it poses unique challenges for both students and teachers. Maps are part of a complex system of graphic communication; the conceptual abstraction involved in map reading and interpretation necessitates a high level of cognitive and perceptual development on the part of students; teachers, too, frequently struggle to impart the skills required for graphic literacy. The peculiar difficulties associated with map reading, as well as students' poor performance in this area, have unfortunately encouraged an attitude that dismisses map work as irrelevant or unnecessary in geographical education. However, graphic literacy is essential not only in geography learning but also in the overall cognitive development of the child and thus cannot be excluded from the curriculum (Ndlwana, 1991).

LITERATURE REVIEW

Jean Piaget's work significantly influences psychological studies on children's spatial conceptual development, with seven Piagetian spatial exercises directly related to perceptual tasks like map comprehension (Muir, 1985). Piaget proposed that children develop spatial reasoning during middle childhood. The ability to understand and reason (to draw conclusions) using cues in the environment that convey information about distance or direction is referred to as spatial reasoning. During middle childhood, children learn to distinguish between objects that are close and those that are far away based on their apparent size. They learn that objects farther away appear smaller than objects closer to them.

Younger children who lack spatial reasoning skills often fail to appreciate the seemingly obvious perceptual rule. Younger children, on the other hand, are more likely to believe that distant objects are actually small. They recognise that objects closer and farther away differ in size, but they fail to recognise that the size difference is only apparent, a perceptual illusion caused by distance and the nature of vision. (https://www.mentalhelp.net/cognitive-development/piaget-part-iii/, 20.07.2023) When dealing with school students, it is critical for the teacher to be aware of their physical, mental, and emotional development. Development is a process that occurs from conception to death and can be measured in terms of both quality and sufficiency. Adolescence is the age at which a child gradually enters the maturity stage, and it can be

described as a new awakening in the child's life. Children's external actions, according to Piaget, cause internal changes in their mental structures. The process of intelligence development refers to the process by which the mental structure is constantly growing and revising.

According to the thinking skills activities by Nichols and Kinninent (2001), students must not only recall information from memory but also 'think through' the geographical information shown on the map or image to help explain or redraw it for their peers. It is an excellent retrieval practice activity. Students work through the three processes or steps required to interpret and create maps in the map activity. They must:

- recognise what the symbols represent;
- identify the component parts (identify the symbolic representation).
- Explain the spatial distribution and its significance.

When presented with a map, an experienced geographer is likely to complete all three stages instinctively and probably simultaneously. Students will be forced to consider each stage, and some may become stuck along the way. These three stages will help diagnose where students are getting stuck and put scaffolding in place to support them, such as through informal questioning.

According to Hanus and Hvelkov (2019), a good geography curriculum should allow students to practice deciphering data from maps, creating (or encoding) maps, distribution and relationship analysis, and route-finding. Providing opportunities for students to practice these skills helps students develop fluency and automaticity. For example, once students become familiar with the symbols on an Ordnance Survey 1:50,000 scale map, they won't need to consult the key as frequently. This expedites their map reading while also freeing up working memory space for more efficient information processing. Of course, much of today's mapping is digital, and the same principles apply (Booth, 2019).

Aims of the study

1. To find out the weaknesses of the students in the study of topographical maps.
2. Developing a strategy to address identified weaknesses
3. Implementation of the programme
4. To find out if the programme has improved the level of student achievement

METHODOLOGY

Action research is a method of conducting educational research that is widely used by educators and professionals to examine, and ultimately improve, their pedagogy and practice. In this sense, action research is an extension of the reflection and critical self-reflection that educators practice on a daily basis in the classroom. When students are actively engaged in learning, the classroom can become dynamic and uncertain, necessitating the educator's constant attention. Given these pressures, educators are frequently only able to engage in brief reflection for the purposes of accommodation, modification, or formative assessment. Action research is one approach to more deliberate, substantial, and critical reflection that can be documented and analysed to help educators improve their practice. (https://kstatelibraries.pressbooks.pub/gradactionresearch/chapter/chapt1/12/08/2023). As a result, the research methodology was based on a basic action research model. Figure 1 shows the basic action research cycle used for the current research.

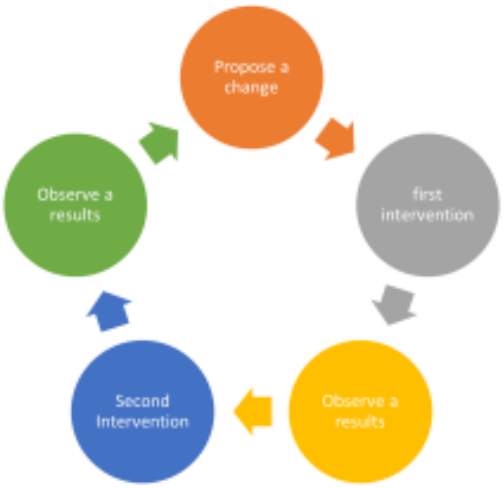

Figure 1: Basic action research cycle used for the current research

Step 1 – Pre-Test (Identifies students' unique weaknesses in topographic maps through a pre-test)

Step 2 – Create a treatment plan to address the identified deficiencies.

Step 3 – Post Test (Assess the treatment plan's effectiveness)

Step 4 – Identify the weaknesses in the treatment programme based on the students' scores and re-implement the programme.

Sample

The results of a pre-test with 12th grade geography students were analysed to determine the weaknesses of female students in the study of topographical maps. The number of female students who took the pre-test was seven. According to the data analysis obtained from the results, two of the seven female students have exceeded the 65-point limit, and one student is close to the 75-point limit. There were four students who received the lowest grades. They had not reached the 50-point mark, it was revealed.

Data Analysis

There were five common weaknesses identified through the pre-test. Those weaknesses are listed below.

- Incorrect topography identification based on map observation
- Incorrect recognition of standard symbols from map observation
- Incorrectly calculating the area of a map
- Difficulties comprehending the relationship between physical and cultural landscapes
- Difficulties with reading and analysing a map

In the first intervention, the basic concepts required for studying topographic maps were primarily introduced. Students were given topographical maps and instructed to use them to provide understanding of standard colour symbols, identify coastal landforms, provide understanding of topographic features, and create cross-sections of the land as part of this intervention. In the second exercise, a researcher determined that it would be more appropriate to focus on the weaknesses demonstrated by all four students and direct them to identify structural characteristics. Given the opportunity to observe the maps in each direction, existing knowledge of standard symbols was tested by asking oral questions. A good understanding of physical features is critical for students studying maps. The model of topographical feature creation was done to provide hands-on experience in creating physical features in space. For this activity, the physical environment of the classroom was prepared by providing the necessary physical resources. The design was

done experimentally with as much active participation from the students as possible. Under this activity, students made all physical features such as ridges, cliffs, residual hills, plains, and valleys. Topographic modelling training enabled students to easily identify topographical features in cartographic studies. Table 1 shows the first intervention test scores below.

Table 1: The first intervention test scores

Symbols represented the students	Marks (out of 15)
A	10
B	12
C	13
D	09

Table 1 shows that the three students scored more than 10 marks out of 15 on their evaluation test of the first intervention.

Taking the weaknesses of the first intervention into account, the students were referred to the second intervention with the goal of overcoming the weaknesses that emerged during the map study. The discussion method was used in this case. The topographic features model was used to demonstrate to the students how to recognise the shape of contour lines in a very simple way. A good understanding of background knowledge among students studying maps is one of the reasons for raising the level of achievement. When creating a map, students should focus on the fundamental characteristics of its location, volume, and direction. For easy comprehension of the map, familiarity with indexes and understanding of the use of alphabetic and colour symbols in the representation of cultural features on the map are required. Teaching activities were carried out with the goal of properly guiding the female students. All four students were well prepared to understand the fundamental concepts required to interpret maps by studying map peripheral information and using maps to study physical and cultural features.

The amount of benefit gained from reading a map is determined by the amount of knowledge the person has gained about the use of that map. Students should identify the information provided by the lines, colours, characters, symbols, and numbers on the map while reading it. The relationship between physical and cultural characteristics should be identified through map interpretation. This intervention focused on the physical and cultural characteristics of the area, as well as the relationship between the physical and cultural characteristics. This step was completed using the discussion method.

Table 2: The second intervention test scores

Symbols represented the students	Marks (out of 25)
A	18
B	22
C	22
D	19

Table 2 shows that two students received more than 20 marks, while the other two received nearly 20 marks.

DISCUSSION AND CONCLUSION

This research find out that most of the students in the year 12 felt that they have some issues with incorrect topography identification based on map observation, incorrect recognition of standard symbols from map

observation, incorrectly calculating the area of a map, difficulties comprehending the relationship between physical and cultural landscapes and difficulties with reading and analysing a map. The GA's Secondary Handbook (2006), in Fred Martin's opinion, also explained that map drawing in schools can give geography a bad name. At worst, it may be nothing more than a tedious colouring activity. Individual perceptions of neatness and aesthetics may be used to assess the quality of a student's map, rather than criteria that identify the student's level of competence to produce a map that is both accurate and technically proficient.'

The research then revealed that students require fundamental knowledge of drawing, reading, and interpreting maps. Teachers can use models as teaching aids and the group discussion method as a teaching method to help students develop these skills. Teachers' peer intervention, individual attention, and discussion with friends all help to increase knowledge of basic topographic map concepts.

Topographic map activities are simple if the student understands basic symbols. It aids in the selection and processing of data for display on the map. Some students take their time developing these skills. To develop these skills, the teacher should devise individual teaching methods for each student. However, the sophistication and complexity of the skills required to interpret topographical maps should not be underestimated. Teachers must be made aware of how students acquire map reading skills and the difficulties they face during this process so that teaching programmes that correspond to students' levels of cognitive development can be developed.

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