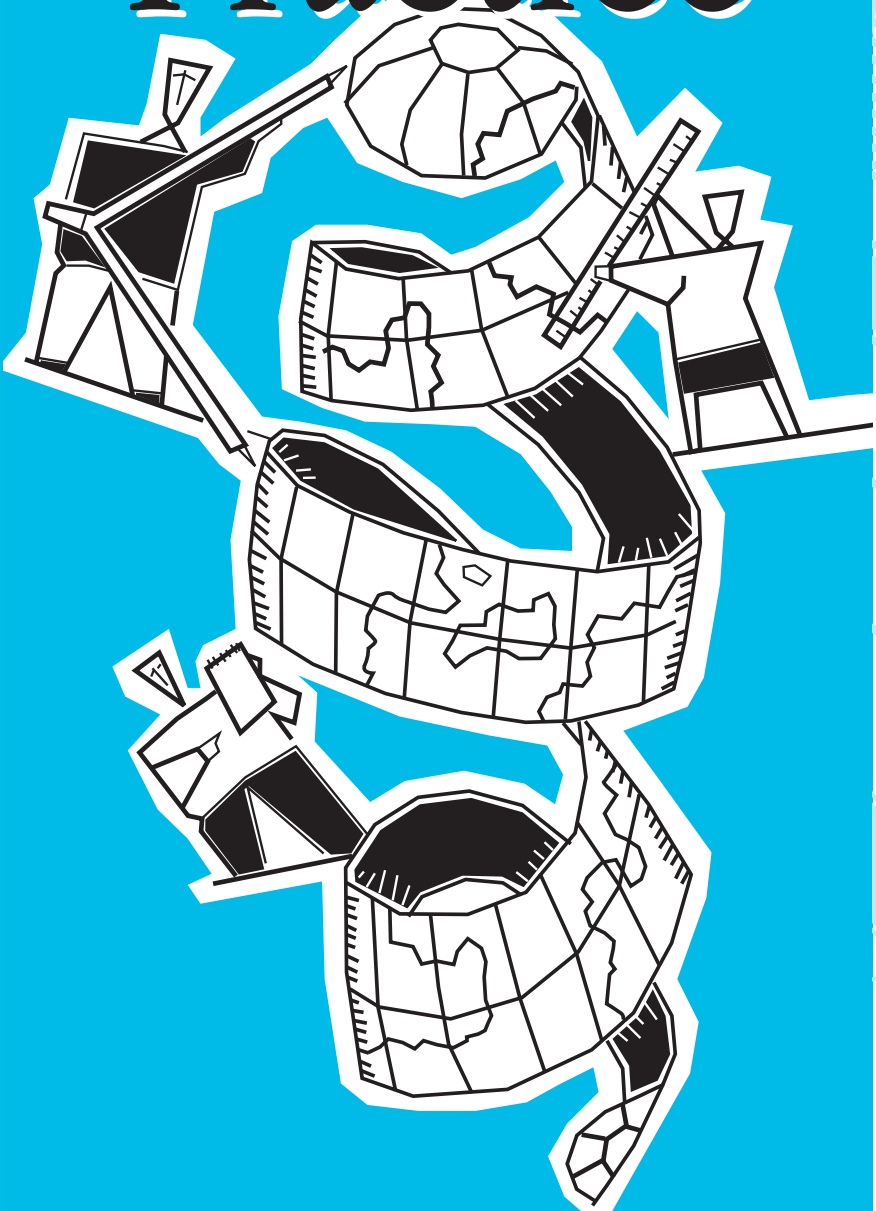
Theory INTO Practice



PROFESSIONAL DEVELOPMENT
FOR GEOGRAPHY TEACHERS

Series editors: Mary Biddulph and Graham Butt

Maps with Latitude

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Contents

Introduction

Our globe - our only planet - is, arguably, the most important topic in geography. We are privileged to live on this beautiful, varied planet - and to learn and teach about it. But in geography lessons we are so busy with studying bits of the world, and specific aspects of geography, that we are in danger of losing the global vision.

This book focuses on the globe as a whole - an ideal theme for geography in the new millennium. Using an accessible and comprehensible research approach, I consider:

1. evidence that globes and world maps are neglected and misunderstood;
2. how and why we have reached this situation - understanding the present by way of the past;
3. the 'seasons diagram', arguing that it is central to much geography, but also still confuses people;
4. 'going 3D', with a research-based approach that is accessible to all teachers and to all students: by focusing on the globe we solve many of the conceptual problems;
5. de-mystifying world map projections;
6. the international context - wisdom from elsewhere - and 'moral and spiritual' dimensions;
7. ten 'key concepts' about our globe.

This book challenges the perspectives and the stereotypes held by many people, and questions some of the values implicit in this area of the curriculum. The topic involves all ages: there are ideas here that apply to pre-school children, next to ideas that are unfamiliar even to learned professors. Furthermore, the topic is relevant to all countries. As far as possible, therefore, the book is written in a way that makes sense in relation to all countries, avoiding detailed references to the national curriculum of any single country.

5: The great world map muddle

5

If we can keep the sphere central to our thinking - with the simple 30° x 30° shapes from the previous chapter - then the projections used to create world maps become easy and straightforward to understand. So why all the confusion and all the misleading claims?

The plan of campaign

This chapter is intended to help with the selection of appropriate flat world maps for different classroom contexts, and also to help to develop sound classroom discussion of the qualities and weaknesses of certain well-known world maps. By the end of this chapter, the whole topic should be reasonably clear. But first, a quick look back may be helpful to set the topic in its historical context and - perhaps - explain why even the experts are confused.

'Map projections' was a topic in some geography A-level courses and in most geography degrees until the mid-1960s. The topic was always tackled in a complex, abstract, mathematical manner - and entirely in 'two-dimensions'. To add to the problem, all the words used were long and complex, of Latin or Greek origin, and most geographers did not have enough Latin or Greek to understand them easily. Thus, instead of 'equal-area' one met 'orthographic'. Worse still, most of the applications and significance of different map projections were ignored.

No wonder 'new brooms' swept all this away in the late 1960s and early 1970s! So we now have a situation where even the 'curriculum experts' have little understanding of the topic. The topic made a small comeback in the GA *Geography Teachers' Handbook* (Bailey and Fox, 1997), but that is only the first step. The topic needs to be tackled in a new way if it is to receive the attention it deserves.

Equal-area maps

The ideal is an 'equal-area' world map. There is a long history of professional bodies recommending equal-area world maps for schools. For example, in a 1908 edition of *The Geographical Teacher*, the Geographical Association recommended that world maps in school atlases should be equal-area (Wise, 1997).

More than 90 years later, there is strong and ever-increasing pressure for world maps to be equal-area. But so often those who lobby do not understand that a flat map that is fair to area cannot be fair to shape. The Development Education lobby has been particularly vociferous in wanting equal-area maps - and rightly so. There can surely be no justification today for schools to use a world map that shows one part of the world bigger than another area of the same size. Variation of size within one map is both confusing to students (and teachers) and 'unfair' to some parts of the world. Many teachers and many publishers would welcome clear guidance on this question.

If the case for using equal-area world maps in schools is accepted, this immediately simplifies the discussion. But there are still questions about which equal-area maps are most helpful. There are several to choose from (see pages 35-36).

Should we always use equal-area world maps?

This question can be raised in the classroom: what do your students feel about it? Perhaps the answer should be 'almost always'. For example, it may be useful, occasionally, to print a 'globe look-alike' map (i.e. 3D appearance on a 2D sheet of paper) provided lines of latitude and longitude are clearly visible. They help students to see that a globe is being represented, and help us to adjust to the idea that size is unreliable and measurements should not be made on this map. These are 'oblique zenithal' world maps. They cannot show the whole world, but they are good at showing 'the world as centred on ...' whether London or Tokyo or Sydney. For example, a Sydney-centred map helps us to see that our 'Far East' is Australia's 'Near North'.

There is also a need to warn students about misleading world maps they may still encounter. So there is a case for keeping a 'rogues gallery' of world maps that are not equal-area.

Most of the beautiful world maps based on satellite imagery are - unfortunately – not equal-area maps. Students may need help to realise that a satellite image of the world still has to distort shape or size or both. Until there are equal-area maps in this style, many schools may decide that the advantages of these maps outweigh the serious disadvantage of their varied scale.

The ideal outcome is a school with students who question any world map they see, and who are able to recognise the main qualities and limitations of any world map.

Where is the 'centre'?

There is a simple answer to this question: anywhere we choose. Students can be invited to make the case for different places as the centre of a world map.

It is also helpful for students to realise that any map projection can be centred anywhere: this must be the case, because a sphere has no top or bottom or sides. Yet this simple fact is missing from almost all treatments of map projections, and is not a part of many geographers' perception of the world. (There has been confusion between this simple basic principle, and the problems of mathematical expression of the principle.)

In practice there are few points which can be usefully made for and against various centres. (As far as is known, this is an original list: teachers may like to evaluate it and add their own observations.) Students could be invited to draw up their own lists, when shown contrasting world maps. If different groups of students were allocated a country or region to represent (e.g. Australia, UK, USA, Antarctica, Russia), there would be important disagreements - and the value of the globe would be re-emphasised.

World map centred on	**Advantages**	**Disadvantages**
Greenwich Meridian	Makes most sense to Europeans. Longitude west of Greenwich is on west of map. Longitude east of Greenwich is on east of map. Distortions at extremes can be 'lost' in Pacific.	Can confirm prejudices rather than challenge them. Encourages Eurocentric view of the world.
Pacific	Welcome 'alternative' view	Longitude west of Greenwich on east of map. Longitude east of Greenwich on west of map (confusing to students). Most land is at edge of map, therefore shapes badly distorted (on 'uninterrupted' world maps).
North Pole (e.g. as map on United Nations flag – see page 30)	'Fair' treatment of northern hemisphere lands. Distinctive and challenging view of world. Emphasises proximity of Canada and Russia.	Bad treatment of southern hemisphere. Disastrous for Antarctica.
South Pole (very rare)	Interesting challenge to conventional viewpoint. Reaffirms that there is no 'right way up' for world.	Most continents very distorted. Likely to confuse students.

Table 1: Choosing an equal-area map.

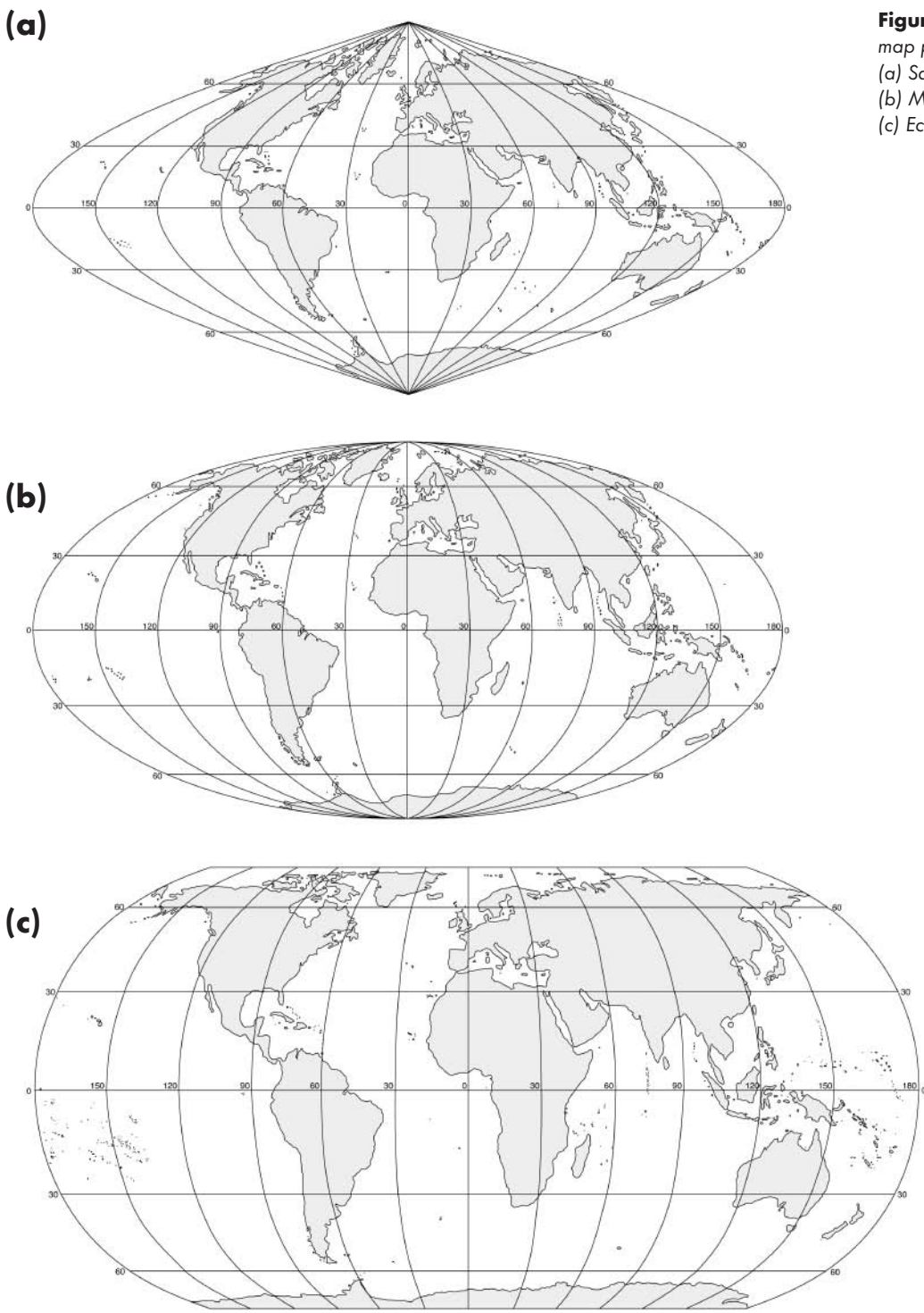
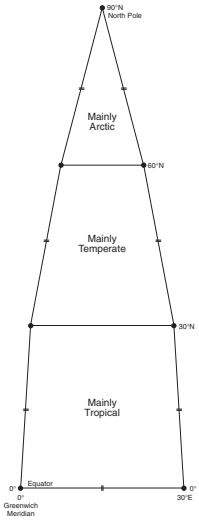


Figure 9: *Equal-area map projections: (a) Sanson-Flamsteed, (b) Mollweide, and (c) Eckert IV.*



Choosing an equal-area map

If the choice of an 'equal-area' map projection has been made, the next (but less important) question is which equal-area map projection is best? Again, students can be invited to express their opinions and to evaluate various maps (Figure 9).

The answers can again come from comparing the shapes on these maps with our 'three sectors' diagram: each map projection can be judged against it. Look at the edges as well as at the centre: on most maps the edges are where the distortion is greatest. Often-used equal-area map projections include Sanson-Flamsteed, Peters, Mollweide and Eckert IV, - all named after their originators.

The Peters map

This map has received much publicity in recent years. Unfortunately, many people have wrongly assumed that the Peters projection is the only equal-area world map - this is yet more evidence that the topic is not understood. Peters does deserve credit for pressing the case for 'equal-area' world maps, and for challenging the stuffiness and remoteness of the whole topic of map projections. But his map has huge distortions of shape. Students can identify these distortions if they are invited to compare this map with the accurate globe. For example, Peters Africa looks as long and thin as South America really is.

Some of the claims Peters made for his map are wrong. His rhetoric ignores the other equal-area map projections. An expert evaluation of the Peters map concluded (among several other damning statements):

> *'The Peters map conveys a distorted view of the world ... Developing countries near the Equator are totally deformed ... The Peters map is totally unsuitable for representing the countries of the Third World' (Pape, 1985, p. 109-10).*

Despite this wholesale condemnation, the Peters map continues to be popular with people who do not compare it with the globe, and who do not realise that there are other equal-area maps available.

Mollweide and Sanson-Flamsteed

This can be summed up as 'good at the centre; too distorted at the extremes', which is clear from comparison with our diagram (Figure 7). It is, however, arguably better than Eckert IV in that the 'bending' is obvious - the 'stretching' in Eckert IV is not so obvious. Ask students what New Zealanders might think of these map projections if they are centred on the Greenwich Meridian: the answers may be unprintable.

Eckert IV

This was the 'surprise choice' for the 1995 National Curriculum (DFEE, 1995). Eckert IV is also too long and thin in the Tropics. The distortion is not as extreme as Peters, but Africa still looks too much like Latin America, which could confuse some students. Eckert himself did not like this projection much: he preferred his Eckert VI. Eckert IV lay in well-deserved obscurity for many years; one day the mystery of its surprise resurrection will perhaps be revealed.

Fortunately there is a simple solution to the problem of distorted shapes.

'Interrupted' map projections

This chapter discusses only equal-area map projections, for reasons already outlined. An 'interrupted' equal-area map is arguably the ideal solution to the problem of the 'round world on a flat piece of paper' problem. By making cuts in the oceans, these maps are the nearest one can get to a flat map which is correct in size and shape. They are the most similar to our three 'sectors' and should be used much more. Children have no major conceptual problems in handling such maps once they have 'unpeeled the orange' and see why there are gaps.

Interrupted maps can help to clarify an important point that few people seem to have registered: every world map is already 'cut' at the edges. All we are doing is adding a few more cuts. There is a case for recommending the use of 'interrupted' equal-area map projections - probably 'Interrupted Mollweide' (Figure 10). Should national curriculum maps - for all countries - use a map of this type? This is a question worth discussing with students as well as colleagues - there are points for and against. Are the students happy with 'interrupted' maps? Why/why not?

An objection sometimes made about interrupted world maps is that it is hard to measure long distances accurately on this type of map. True - but this is also true for almost all such measuring on almost all world maps. Most of these measurements inevitably produce wrong answers. It is far better to use a globe.

If 'interrupted' projections are used, the question arises: Where should the cuts be made? This is a worthwhile discussion point that can involve students as well as teachers.

Top of the pops, the most common choice, is to have a map centred on the Greenwich Meridian (for reasons outlined earlier), with the 'edge-cut' through the Pacific (180°) and three smaller cuts through the North Atlantic; South Atlantic and Indian Oceans.

Extra cuts? That 'top choice' leaves east Asia distorted. Sometimes an extra cut is made in remote Siberia, to compensate for this. Occasionally, an extra cut is made in the Pacific (New Zealanders may welcome this).

Pacific-centred? This is rare, but not impossible. Fiji issued a postage stamp that put itself in the centre of the world on such a projection.

North Pole centred? This produces an exciting and effective 'star-shaped' world map: there is no 'right way up'. It might be seen as an improvement on the UN flag. In practice, it is rarely seen.

South Pole centred? An idea to puzzle your students: what would it look like?

Cuts in the land-masses These maps are rare - but they are useful for showing ocean currents, and for emphasising that more than 70 per cent of the earth's surface is water. Recent editions of *Philip's Modern School Atlas* include small maps of this type to show plates, volcanoes and earthquakes.

The question of where to cut becomes less important once the idea is accepted that most

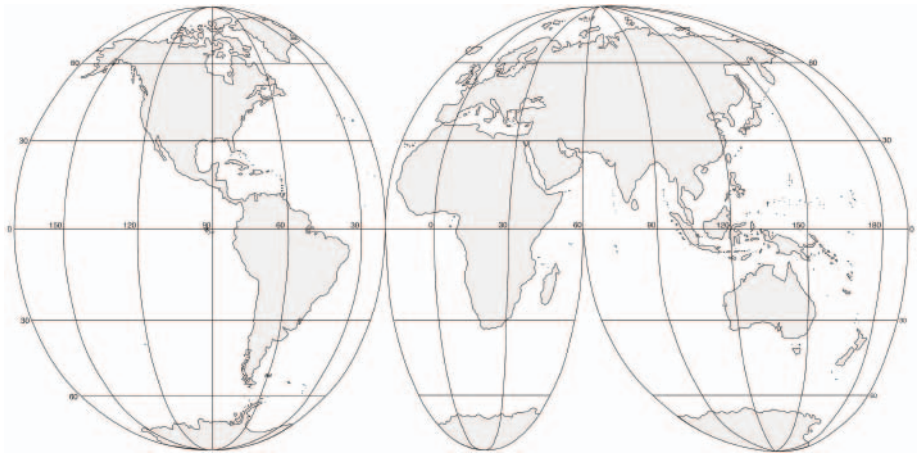


Figure 10:
Interrupted Mollweide.

world maps should have cuts in them. It can be argued that variety is helpful - provided it does not leave students confused. Teachers can respond to this problem by ensuring that globes are used as much as possible - and are the reference point for studying all world maps.

Maps of single continents

Never use part of a world-map projection for a map of one continent. This is a fundamental error which hardly ever occurred until recently.

If our point of reference is the globe, it immediately becomes clear that it is very confusing and very misleading to print part of any flat world map as a separate map of one continent – this imports distortions that do not need to be there, and students will be misled. Any one continent can be transferred from the globe to a flat map with very little distortion of size or shape.

The choice of map projection for continent or country maps need not concern teachers. There are several suitable map projections for the experts to choose from. However, the centre of the map projection must be at or near the centre of the atlas page. It is alarming to find that some respected publishers and authors have recently used part of Gall or Eckert IV for a continent map. This either shows cartographic illiteracy, or shows an unquestioning acceptance of the national curriculum - even to the extent of going beyond what the national curriculum says. Or is it just a false economy - to print one world map then reproduce parts of it on other pages? The worst example is *The Peters Atlas*, which has pages of maps of small parts of the world which are ridiculously and unnecessarily distorted. But there are other examples, widely used in schools.

Whatever the reason, such maps must be rejected. They are bad cartography, bad geography and bad education. No map should have unnecessary distortions, because the result will be the miseducation of students, who will grow up with their own distorted view of the world. The only argument in their defence that I have heard is not a valid one: these maps are said to link well with the world maps at the start of the book. But two wrongs do not make a right, and the link should be made with the globe, not with a world map.

Theory INTO Practice

The aim of *Theory into Practice* is to take aspects of current research into geographical education and deliver them directly to the classroom practitioner. Geography teachers from across the professional spectrum will be able to access research findings on particular issues which they can relate to their own particular context; thus students will benefit from new and well-informed approaches in the classroom, whilst teachers will keep their own professional development fresh and up-to-date.

A key element in the series is to encourage teachers to reconsider their thinking about teaching and learning in geography; we hope to reinvigorate the debate about how to teach geography and give teachers the support they need to revisit essential questions like:

- Why am I teaching this topic?
- Why am I teaching it this way?
- Is there a more enjoyable/challenging/interesting/successful way to teach it?
- What, how and why are the students learning?

The books in the series will provide a framework both for challenging current assumptions about the nature of the subject in schools, and for answering these questions in new and well-informed ways.

Each book in the series has been contributed by acknowledged experts in their particular fields.

Maps with Latitude

DAVID R WRIGHT

Our globe is the key to geography: no globe = no geography!
Yet the globe is often misunderstood, and sometimes simply forgotten.
This book discusses new approaches to studying our globe,
and to selecting and using world maps.

Geographical Association