GEOGRAPHICAL EDUCATION

Volume 28, 2015

Complementary Geographies

Invitation for Papers and Notes for Contributors

An Invitation to Share

- *Geographical Education* is a refereed journal. Articles submitted to *Geographical Education* for consideration in the Refereed Articles section are reviewed anonymously by a minimum of two referees. Articles are selected by the Editor based on the outcome of the anonymous reviews and ratified by the editor. Authors of accepted articles are sent guidelines for their final submission. Contributions to other sections such as Book Reviews and Reports are not refereed. The ISSN for *Geographical Education* is ISSN 2204-0242.
- We invite your participation in producing this journal. *Geographical Education* encourages school and university teachers and all others interested in geography to share their ideas and experiences in order to promote sound practice, innovative strategies, modern developments and reflection in geographical education.
- Contributions of varying length are invited, with a maximum of 5000 words for major articles and research reports. Shorter articles of 2000 words, featuring classroom strategies, reflections on particular issues and practices in geography teaching, in-service education workshops and comments on previous articles are especially welcome.
- Lesson plans, teaching units and how-to-do-it advice on classroom and field skills are also invited as long as they have relevance for a broad range of teachers across Australia.

Presenting your Article

Email: Please submit your article for review to the Editor (address below). Please send as a Rich Text file or Microsoft Word document.

Word processing: Manuscripts should be word processed and double spaced, with margins of 2.5 cm on all sides, using 12 point size of Times New Roman (or CG Times) font.

Title Page: The title of the article, the name, work position, address and email of the author, and an abstract of no more than 150 words should be provided on a title page.

Headings: Major and minor sub-headings should be used to guide the reader and to break up the text.

Paragraphs: Paragraphs should start without indentation and should be separated by blank lines. All text should be left justified.

Quotations: These should be kept to a minimum and where over 40 words should be indented. These must be appropriately referenced.

End/footnotes: These should be avoided if possible.

References: Authors are requested to use the APA (American Psychological Association) style as shown in the exemplar at http://www.apastyle.org/index.aspx. All references, including internet sources, should be provided in alphabetical order on a separate sheet. The titles of journals should not be abbreviated.

Tables and Figures: All tables and figures should be submitted on a separate sheet of paper but with their position indicated on the text by leaving a 3 cm space above and inserting words such as “Take in Figure X” or “Take in table Y”. All tables and figures (including maps and diagrams) should be submitted with captions clearly numbered, typed and left-justified below the diagram.

Reproduction: Illustrations will be reproduced in black and white. Photographs and illustrations should be black and white. Electronic media such as jpeg and gif files should be emailed to the Editor.

Copyright: Copyright of all material published in the journal, *Geographical Education*, including digital publication in any form is held by AGTA Ltd. AGTA Ltd may determine to make any or all material available to a third party for purposes that AGTA Ltd determines appropriate (such as online distribution of the journal). Authors are responsible for the accuracy of their papers and for obtaining permission to reproduce any material(s) from other publications. Authors may have a self-archived copy of their paper in an electronic repository. That copy should have a copyright notice including full publication details and a link to the url for *Geographical Education* (http://agta.asn.au/Resources/GeographicalEducation/index.php).

Submitting your Article

- *Geographical Education* is published annually. As at least six months are needed for reviewing, editing, design, typesetting and printing, articles should reach the Editor by 30 July.
- The manuscript should be submitted to the Editor by email.
- Manuscripts for possible publication and all correspondence relating to articles should be sent to: Nick Hutchinson, Editor, *Geographical Education*, c/o GTA NSW, PO Box 577, Leichhardt NSW 2040, Australia. Email: nhut1001@bigpond.net.au
- Reviews of books, kits, electronic and other media requested by the Reviews Editor should be sent to:
  Mr Geoffrey Paterson, Reviews Editor, *Geographical Education*, c/- Geography Teachers’ Association of Victoria, PO Box 2066, Camberwell West, Victoria 3124. Email: gkp@netspace.net.au

Advice to Advertisers

Geographical Education welcomes advertisements for quality publications and services relevant to geography teaching.
The page sizes and rates are:

Full Page	180 mm horizontal x 260 mm vertical	A$540 plus GST
Half page	90 mm horizontal x 260 mm vertical or 180 mm horizontal x 130 mm vertical	A$285 plus GST
Quarter Page	90 mm horizontal x 130 mm vertical or 180 mm horizontal x 65 mm vertical	A$195 plus GST
Insert	Any size up to A4	A$340 plus GST

Please note: Advertising and insert prices are ex-GST and are subject to change without notice. Camera-ready artwork should be delivered by 30 July of the year of publication to the Editor.
For further information please visit the AGTA Website: www.agta.asn.au

Contents

Geographical Education **is published annually and is distributed to all members of the state and territory associations affiliated with the Australian Geography Teachers' Association Limited.**

The aims of the journal are to:

- encourage school, college and university teachers and all others interested in Geography to share their ideas and experiences;
- promote sound practice and encourage the developments of innovative strategies for teaching Geography in the classroom and the field;
- provide a forum for discussion between teachers on issues and direction of Geographical education;
- encourage reflection on the scope and purpose of Geography and its role as a medium for the education of young people;
- promote the diffusion of developments in Geography and examples of ways they may be introduced into Geography teaching;
- examine educational issues and trends in the light of their relevance for Geography teaching; and
- disseminate news of AGTA activities and information of national interest from state affiliates.

Review

Geographical Education is a refereed journal. Articles submitted to *Geographical Education* for consideration are reviewed anonymously by a minimum of two reviewers from the list below. Articles are selected by the editor based on the outcome of the anonymous reviews and ratified by the Journal Advisory Committee. Authors of accepted articles are sent guidelines for their final submission. Contributions to other sections such as Book Reviews and Reports are not refereed.

ISSN 2204-0242

Images provided by: Dreamstime.com

Editorial

Reports

Articles

Australian Geography Teachers' Association Limited

Chairperson:	Dr Grant Kleeman
Deputy Chairperson:	Trish Douglas
Company Secretary:	Susan Caldis
Company Treasurer:	Leonie Brown
Editor:	Nick Hutchinson
Reviews Editor:	Geoffrey Paterson
Correspondence:	c/o Susan Caldis PO Box 315, Artarmon NSW 1570. Email: susan.caldis@students.mq.edu.au
Design, typesetting & layout:	Office Logistics
AGTA website maintained by:	Rob Berry http://www.agta.asn.au
Proofreading:	Geoffrey Paterson

Editorial

Nick Hutchinson
Editor, Geographical Education

Volume 28, 2015 was to address the theme *Learning from Aotaeroa* however a new organising concept has been chosen, *Complementary Geographies.* Much was learned at the 2015 AGTA Conference in New Zealand. Professor John Morgan looked back to an earlier 1986 AGTA Conference in Brisbane where the theme *Teaching Geography for a Better World* arguably changed the ways in which Geography teachers approached their classroom work. He pondered about the social purpose of Geography in the Anthropocene where humanity is a prominent geomorphic force; where Geography has to move away from notions of normative growth and where sustainability narratives must be more nuanced.

I argue that *Complementary Geography* is even more than this. A Geography teacher from the New South Wales South Coast attending 2015 the conference remarked:

> Alongside the workshop program, the Conference planners were sure to include an exciting program of fieldwork experiences. We saw traditional Maori culture at the geothermal village of Whakarewarewa, jet boated, free-fell and bungeed at Agroventure Adventure Tourism, visited the SCION forestry research facility, toured a dairy farm and operations perched above Lake Rotorua and walked the trail by steaming lakes and boiling streams in a neophyte ecosystem at Waimangu volcanic valley. Rotorua really packed it in and the ever-present smell of sulphur and cinders served constantly to remind us that we had come to somewhere that was unique. New Zealand was a showcase of the many threads of Geography that we are so enthusiastic about (Giles, 2015, 9).

The contributions to this edition of the journal illustrate the eclectic concerns of the Geographer. Refereed contributions include: *What is powerful knowledge and can it be found in the Australian geography curriculum?* from Associate Professor Alaric Maude, Flinders University, Adelaide, South Australia; *The Australian Geography Competition: An overview of participation and results 2004–2013*, from Dr Iraphne R.W. Childs, School of Geography, Planning and Environmental Management, The University of Queensland, Brisbane, Queensland, and Kathryn Berg, Royal Geographical Society of Queensland, Brisbane, Queensland; *Working with students' ideas in physical geography: a model of knowledge development and application*, from Dr Rod Lane and Associate Professor Pamela Coutts, Department of Education, Macquarie University, North Ryde, Sydney, NSW; *The place of place-based education in the Australian primary geography curriculum*, from Dr Lou Preston, Faculty of Arts & Education, Deakin University, Geelong Waurn Ponds Campus, Victoria; and, *A Note on the Status of Geography Teachers in Indian Schools*, from Assistant Professor Sarfaraz Alam, Department of Geography, Faculty of Science, Banaras Hindu University, Varanasi, India.

In addition to Dr Grant Kleeman's *Chair of Director's Annual Report* and copy of AGTA's response to the Draft Humanities and Social Sciences Curriculum, a non-refereed report has been received and accepted, *The Role of Adaptability in Tackling Climate and Environmental Challenges*, from Professor Andrew J. Martin, School of Education, University of New South Wales, Sydney, and Assistant Professor Gregory Arief D. Liem, Psychological Studies Academic Group, National Institute of Education, Singapore.

Many thanks to Geoffrey Paterson as proof reader and Reviews Editor of the current volume. The review titles reflect a range of topics in Geography and the teaching of Geography. Each reviewer is thanked for finding time to write a review.

I look forward to contributions to the next edition of the journal Volume 29, 2016.

Reference

Giles, S. (2015). Conference Report by GTA NSW bursary recipient Shane Giles. *Geography Bulletin*, *47*(1), 8–10.

Chair of Director's Annual Report 2015

Dr Grant Kleeman
Chair, Australian Geography Teachers Association Limited

AGTA's principal focus in 2015 has been to support the implementation of the *Australian Curriculum: Geography.* A key element of this support has been the provision of professional learning opportunities for classroom teachers (the *AGTA Geography Roadshow*), the promotion of *GeogSpace*, and the publication of a skills-based text to replace *Keys to Geography Skills*. AGTA has also been active in defending the integrity of the Curriculum in the wake of the Federal Government's attempt to replace it with an integrated curriculum model incorporating content from History, Geography, Civics and Citizenship, and Business Studies. The fight against the *politicisation* of the curriculum will continue.

AGTA's Priorities for 2015

The AGTA Board agreed to focus on the following initiatives for 2015:

- formulating a response to ACARA's draft Humanities and Social Sciences curriculum;
- the AGTA *Geography Roadshow* – a professional learning program offered in conjunction with State/Territory-based affiliates;
- the publication of a Geography skills textbook;
- the ongoing promotion of *GeogSpace*;
- the production of a series of posters focusing on Geography's key concepts.

No Longer a Truly *National Curriculum*

The actions of governments have compromised the integrity of a truly national Geography curriculum F–12. Revisions have been made to the previously available Australian Curriculum following the Federal Government's Review of the Australian Curriculum chaired by Professor Ken Wiltshire AO and Dr Kevin Donnelly. The revisions are described as making the curriculum "easier to manage, particularly for primary schools, simplify the curriculum's presentation and strengthen the focus on literacy" (ACARA). Of particular concern to geographers is the decision to conflate the curriculums for History, Geography, Civics and Citizenship, and Business Studies into a Humanities and Social Sciences curriculum. While retaining the majority of the Geography Content Descriptors it is disappointing that Geography's identity, as a distinct discipline, is lost at least in F–6.

The implementation of the Curriculum also varies significantly from state-to-state. What follows is a summary of the current state of play:

NSW has rejected ACARA's Humanities and Social Sciences curriculum and proceeded with mandatory studies in Geography and History K–10 using a syllabus document based on ACARA's originally endorsed History and Geography curriculums (Version 7.5). The NSW Geography Syllabus is, however, a rather *liberal* interpretation of the *Australian Curriculum: Geography*. The content has been pared back and topics have been swapped from year-to-year in Years 7 and 8 and Years 8 and 9. No commitment has been made to implementing the Geography curriculum for the senior years even though the existing document is incompatible with the new K–10 Geography Syllabus. The current senior Geography syllabus is now 15 years old.

Victoria has developed its own state-based curriculum F-10. This is closely aligned with the content descriptors of the *Australian Curriculum: Geography* but reflects Victorian priorities and standards. In the senior years Units 1 and 3 (*Hazards and Disasters* and *Changing the Land)* are based on the ACARA endorsed curriculum. However, Units 2 and 4 are substantially different, being focused on studies of tourism and human population respectively.

The ACT will transition to the Humanities and Social Sciences curriculum (i.e. Version 8.0) by December 2016. The curriculum in the senior years is closely aligned with ACARA's Senior Secondary Australian Curriculum: Geography.

In the absence of a state-based curriculum document, South Australian schools are expected to transition to ACARA's Humanities and Social Sciences curriculum. At the senior secondary level, the SACE Board is currently developing the new Geography curriculum for Stages 1 and 2 (Years 11 and 12), due to be implemented in 2017 at Stage 1 and 2018 for Stage 2. The curriculum has been developed with reference to the ACARA Senior Geography Curriculum with modifications to suit local requirements.

In Western Australia, an integrated Humanities and Social Sciences curriculum has been

developed based on the *Australian Curriculum: Geography* (Version 7.5) – full implementation by 2017. Some content descriptors have been expanded in the *mandated content* and some have been placed into the *additional content* section. In the senior years, *Natural Hazards* and *Global Networks and Interconnections* are to be studied in Year 11 while *Global Environmental Change* and *Planning Sustainable Places* are studied in Year 12 – a re-sequencing of the ACARA topics.

In the absence of a state-based curriculum document, Tasmanian schools are expected to transition to ACARA's *Humanities and Social Sciences* curriculum. HASS is mandatory in F–8. At the senior secondary level, there are two Tasmanian Certificate of Education courses that draw on Senior Secondary Geography – Environmental Science, and Society and Geography.

AGTA's response to the Draft Humanities and Social Sciences Curriculum is attached to the end of this report. The Board would like to thank Malcolm McInerney for coordinating the preparation of this submission.

AGTA *Geography Roadshow*

The first AGTA *Geography Roadshow* took place in Brisbane in mid-March. The one-day professional learning event included both a primary and secondary program. Topics addressed included thinking geographically, inquiry in Geography, fieldwork, ICT in Geography, and developing literacy through Geography. More than 80 teachers participated in the activity.

Multiple *Roadshow* events are planned for NSW/ACT in late November following the release of the new NSW Geography Syllabus. These will be held in suburban Sydney, Newcastle and Canberra. The Western Australia *Roadshow* is scheduled for 2 November and the South Australia *Roadshow* in early March 2016. The Northern Territory *Roadshow* will take place in April 2016. Only Victoria declined to take place in the initiative.

Geography Skills Book

Work is progressing on a replacement for *Keys to Geography Skills*. The text, *Geography Skills Unlocked*, will provide students with an up-to-date resource aligned to the requirements of the *Australian Curriculum: Geography*. The writers (John Butler and Mick Law) are due to submit their final drafts late in 2015 and the process of commissioning an editor and designer has commenced. Publication is scheduled for mid- to late-2016.

GeogSpace

AGTA continues to promote the *GeogSpace* website. The website was an initiative of AGTA supported by the resources of Education Services Australia. This innovative web-based resource has been designed to support primary and secondary teachers implementing the *Australian Curriculum: Geography*. Developed by a team of practising Geography teachers, the site ensures that all schools across Australia have access to a unique resource that reflects best practice using current technology and pedagogies.

Posters

A set of classroom posters, aligned to the key skills addressed in *Geography Skills Unlocked*, is being developed by Anne-Marie Gerlach. The publication of the posters will be linked to the launch of AGTA's new skills book.

Other Activities and Initiatives

AGTA Conference

The 2015 AGTA Conference was held from 11–16 January 2015 in Rotorua, New Zealand. The Conference proved a great professional learning opportunity for 96 teacher participants. The Conference featured an extensive program of keynote presentations, workshops and fieldwork. There were also pre- and post-conference tours.

Participants were impressed by the quality of the Conference presentations, the fieldwork (White Island was amazing), extra-curricula activities and the catering. Nick Hutchinson, ably assisted by Rob Berry, did a terrific job convening the conference.

As Conference Convener, Nick Hutchinson had primary responsibility for organising the Conference program and liaising with the contracted conference facilitators Group Events. He also did a magnificent job providing a series of background papers which were published on the Conference's website.

Rob Berry had responsibility for updating the AGTA Conference website, preparing flyers and artwork, organising the workshop scheduling online and participant selection sheets, and producing and disseminating a certificate of attendance to conference participants. The magnificent selection of backup material present on the AGTA website is also attributable to Rob's endeavours.

The conference presentations, background papers and classroom resources can be found at http://agta.asn.au/Conferences/conf2015/presentations/index.php#workshopsRotorua. Reflections

on the conference can be found on the AGTA website linked to https://twitter.com/hashtag/AGTANZ2015?src=hash

Victoria has agreed to host the 2017 AGTA Conference. We all look forward to a great conference in Melbourne.

Publications

Geographical Education

Geographical Education is the professional journal of AGTA and is on the DEST Register of Refereed Journals. The journal was published in print form until Volume 25, 2012. Since then the journal has been published in a digital format and is available on the Association's website. The ISSN for *Geographical Education* is ISSN 2204-0242.

Contributions of varying length are invited, with a maximum of 5,000 words for major articles and research reports. Shorter articles of 2,000 words, featuring classroom strategies, reflections on particular issues and practices in geography teaching, in-service education workshops, and comments on previous articles are especially welcome.

Nick Hutchinson took on the role of Journal Editor in 2014 replacing Ken Purnell who had edited the journal for some years. Geoffrey Paterson continues in his roles of Reviews Editor and copy editor.

Geographical Education, Volume 28, is now available on the AGTA website. The 2015 issue features five peer-reviewed articles:

- *What is powerful knowledge and can it be found* in the A*ustralian geography curriculum?* By Associate Professor Alaric Maude, Flinders University, Adelaide, South Australia;
- *The Australian Geography Competition: An overview of participation and results 2004–2013*, by Dr Iraphne R.W. Childs, School of Geography, Planning and Environmental Management, University of Queensland, and Kathryn Berg, Royal Geographical Society of Queensland, Brisbane, Queensland;
- *Working with students' ideas in physical geography: a model of knowledge development and application,* by Dr Rod Lane and Associate Professor Pamela Coutts, Department of Education, Macquarie University, North Ryde, Sydney, NSW;
- *The place of place-based education in the Australian primary geography curriculum,* by Dr Lou Preston, Faculty of Arts & Education, Deakin University, Geelong Waurn Ponds Campus, Victoria;
- *A note on the status of geography teachers in Indian schools,* from Assistant Professor Sarfaraz Alam, Department of Geography, Faculty of Science, Banaras Hindu University, Varanasi, India;

Non-refereed report, *The role of adaptability in tackling climate and environmental challenges*, by Professor Andrew J. Martin, School of Education, University of New South Wales, Sydney and Assistant Professor Gregory Arief D. Liem, Psychological Studies Academic Group, National Institute of Education, Singapore.

AGTA thanks Nick Hutchinson and Geoffrey Paterson for their ongoing contribution to the work of AGTA. It is greatly appreciated.

Thinking Geographically DVD

The second edition of this popular resource has an extensive range of geographical thinking examples, exercises, articles and over 50 additional *Thinkpieces*. It also features new links to Australian Curriculum resource materials, professional learning presentations, and curriculum planning suggestions.

Being a Citizen CD

A new innovative product has been released to help teachers provide opportunities for students to explore the *Australian Curriculum: Civics and Citizenship*. Content of the *Being a citizen* resource includes: links to civics and citizenship teaching materials; political mapping classroom activities; social issues worksheets and processes; GIS and political mapping activities; links to curriculum documents and teaching materials on civics and citizenship; and professional reading links on civics and citizenship education.

Malcolm Mcinerney is to be congratulated on developing such an excellent education resource.

Geographia

Geographia is AGTA's newsletter. It is used to update the broader membership on the activities of AGTA and its State and Territory based affiliates. Alexandra Piggott is to be congratulated on the quality of the newsletter.

Competitions

Australian Geography Competition

AGTA is pleased to be associated with this important national initiative offered by the Royal Geographical Society of Queensland. In 2015, more than 70,000 students participated in the competition.

The National Geography Competition is a great opportunity to promote the study of Geography in schools. Winners of the competition can also be invited to join the Geography Olympiad team and attend Geography's Big Week Out (this year held in New South Wales). The Australian team represented the country at the International Geography Olympiad held in Tver University and Moscow in Russia in August 2015. The Australian team consisted of: Samantha Dixon-South, Ballajura Community College, Perth; Canada Gavin, Kinross Wolaroi School, Orange; Esrom Leaman, Pembroke School, Adelaide; and Giselle Pickering, Wavell State High School, Brisbane.

After many years, responsibility for the National Geography Competition has passed from Kath Berg to Bernard Fitzpatrick, Executive Officer at the Royal Geographical Society of Queensland. Kath's longstanding involvement in the competition is greatly valued and appreciated. AGTA and the Royal Geographical Society of Queensland are working on a new memorandum of understanding to document the responsibilities of the two bodies.

Primary Geography Challenge

AGTA and the Royal Geographical Society of Queensland are developing a Geography competition for primary school students. At this early stage, organisers are planning an online competition that tests a wide range of geographical skills and knowledge in an engaging way, using a variety of questions and graphics. The competition will be aimed at Year 6 students, at least initially.

The Primary Geography Challenge will complement the highly successful Australian Geography Competition.

Professional Advocacy

Australian Alliance of Associations in Education (AAAE).

The AAAE is a body specifically formed to represent the interests of teacher professional associations at a national level. There are 23 founding member associations, and the AAAE's role is to lobby at a Federal level on issues affecting teachers and their professional practice. AGTA is a founding member of the newly established entity. Malcolm McInerney continues to play a leadership role in the Association.

Australian Federation of Societies for Studies of Society and Environment (AFSSSE)

AFSSSE is a consortium of four professional associations – Australian Association for Environmental Education, Australian Geography Teachers' Association, Business Educators Australasia, and Social Educators Association of Australia. AFSSSE was formed in 1992 to act as the peak organisation for the broad area of study known as Studies of Society and Environment. Rob Berry continues to represent the views and interests of AGTA on AFSSSE.

National Committee for Geographical Sciences

The AGTA Board voted to support the Academy of Science's National Committee for the Geographical Science's *Strategic Directions for the Geographical Sciences*. The plan will include a focus on the contribution of school geography to the nation's strategic research priorities. The purpose of the document is to inform policymakers – in government and industry – about the role of Geography. Contributors include Jeana Kriewaldt, John Butler, Grant Kleeman, Malcolm McInerney, Nick Hutchinson, Susan Caldis and Rebecca Nicholas.

Recognition of Service to AGTA and Geographical Education

AGTA's Don Biddle Award honours outstanding contributions to geographical education in Australia made by individuals over a sustained period of time. Past recipients include Kath Berg, Mark Manuel, Roger Smith, Susan Bliss, John Butler, Stephen Cranby and Alaric Maude. The 2015 recipients are Rob Berry, Nick Hutchinson, Jeana Kriewaldt, Emmy Terry and Wayne Sutton.

Rob Berry has had an extensive and long history of involvement in geographical education at both a national and state level. He was AGTA President (1991–1993), AGTA Treasurer (2009–2013) and a member of the team that developed *GeogSpace*. Rob was also AGTA website manager. At the state level, Rob has been a member of the GTAV Committee since 1978, serving as President for four years and Treasurer for three years. He was convenor of the 1990 AGTA Conference in Melbourne and a member of the Editorial Advisory Panel of the AGTA journal *Geographical Education* for many years. Rob was a consummate team member, supportive colleague and a fine mentor. He has made an unrivalled contribution which has earned him the deep respect of close colleagues and of Geography teachers within Victoria and Australia wide.

Nick Hutchinson is one of Australia's leading geographical educators. He served as an AGTA Board Director between 2000 and 2013 and was AGTA Chair 2006–2008. Nick's contribution to geographical education extends over for 40 years in both schools and tertiary institutions in New South Wales. He is a long-standing member of the GTANSW Council and served in various leadership roles including a term as the Association's President. Nick was a key member of the *GeogSpace* writing team (2012–2013) and a national conference convenor. He is a recipient of the prestigious McDonald Holmes Medal in recognition of his outstanding contribution to the discipline of Geography.

In his time as AGTA Chair, Nick played a leading role in the securing Geography's place in the Australian Curriculum, and, between 2009 and 2013, was influential in shaping the nature of the curriculum developed.

Nick's commitment to Geography has left an indelible mark on school Geography in Australia and he is nationally recognised as having a deep interest in, and knowledge of, the discipline. He is widely acknowledged as an expert in his field.

Nick's contribution to AGTA is ongoing. He is editor of the Association's journal *Geographical Education*.

Jeana Kriewaldt has a made a long-standing and significant contribution to geographical education in Australia. She was an AGTA Board member 1995–2001, joint convenor of the AGTA 2002 Conference in Melbourne and continues to hold the position of Public Officer for AGTA. Jeana's contribution also includes the position of coordinating editor and contributor to AGTA's *Keys to Geography* and a c*ontributor to AGTA's Keys to Fieldwork* publications.

At a state level, Jeana has been associated with the GTAV since 1993, holding various roles including that of Vice President (1995–1998) and President (1999–2001).

At a professional level, Jeana is a well-respected geographical educator at the University of Melbourne where she has inspired many students through her passion for the subject. She was also the Coordinator, facilitator and writer of the 2006 Australian Research Council Linkage Grant *Professional Standards for Accomplished Teaching of School Geography resource (Melbourne University, AGTA and GTAV initiative) and a member* of the Australian Curriculum and Assessment Authority (ACARA) Curriculum Advisory Panel for Geography from 2009 to 2013.

Jeana has contributed numerous papers to AGTA's journal *Geographical Education* and is a member of the journal's Editorial Review Panel. She has also contributed to many geography textbooks for the classroom and pedagogy books for tertiary geography methodology classes.

Emmy Terry has made a significant contribution to Geography in Western Australia and Australia. She was and AGTA Board member 1999–2008, Vice Chair 2002–2004, and Chair 2004–2006. She was coordinating editor of AGTA's *Geographia* (2006–2013). Emmy also acted as AGTA representative on a number of national committees: National Education Forum, Australian Geography Competition, Secretary of the Australian Federation of Societies for the Study of Society and the Environment (AFSSSE), and Teaching Australia Forums to develop standards for professional associations.

Emmy was co-convenor of AGTA/RGSQ Geography Week in Western Australia (coordinating the development of the activities/ booklet for two years) and worked on national committees and coordinated components of AGTA joint initiatives including the Natural Disasters resource, the Arab Gateways Project, the AusAID Pacific Project, and the Olympic Projects. Emmy's professionalism and promotion of Geography within the national context brought valuable attention to the work of AGTA.

Grant Kleeman awards Louise and Stuart Sutton with Wayne's Don Biddle Award.

Vale Wayne Sutton

AGTA was saddened to learn of the sudden passing of Wayne Sutton, President of the Tasmania Geography Teachers' Association. Wayne Sutton has been a long-standing Director of the AGTA Board and made an outstanding and lasting contribution to the teaching of geography in Tasmania. Wayne was passionate about Geography and actively involved with providing leadership and support to geography teachers. He taught senior geography at Hobart College for 18 years where he was Head of Department. He was the chief marking examiner and had been the setting examiner and state moderator for Geography. In addition, Wayne was a contributing author for several publications and held positions on advisory editorial committees for a number of publications.

A kind, considerate and deeply caring person Wayne will be sadly missed by the geography community throughout Australia.

In recognition of Wayne's outstanding service to geographical education, AGTA has awarded Wayne the Don Biddle Award (posthumously). Louise Sutton (Wayne's widow) and son Stuart were presented with the award during AGTA's Board Meeting in Hobart on 2 May 2015.

The financial situation of the Association is sound and the Board is keen to invest in professional learning programs supporting the implementation of the *Australian Curriculum: Geography* and the promotion of Geography more generally.

Finally, I would like to thank the AGTA Board for its support throughout 2014–2015. A special mention goes to Susan Caldis (AGTA Secretary), Malcolm McInerney (Immediate Past Chair), Leonie Brown (Honorary Treasurer) and Trish Douglas (Deputy Chair).

Australian Geography Teachers' Association

Limited
ABN: 63 334 942 619

Postal Address
PO Box 315
Artarmon
NSW 1570

Website: www.agta.asn.au
Patron: Tim Costello AO
Chairperson: Dr Grant Kleeman

Dr Phil Lambert
General Manager, Curriculum
Australian Curriculum, Assessment and Reporting Authority
Level 10 255 Pitt Street SYDNEY
NSW 2000

6 May 2014

Dear Phil

The Board of the Australian Geography Teachers Association (AGTA) met in Hobart on 2–3 May to consider the proposed F–10 *Australian Curriculum: Humanities and Social Sciences*.

Before outlining our principal concerns we offer the following observations:

- AGTA believes that the rigour and veracity of the *Australian Curriculum: Geography* has been compromised the proposed changes published in the *Draft changes to F–10 Australian Curriculum: Humanities and Social Sciences* (April 2015).

- *Australian Curriculum: Geography* was developed through extensive consultation with Geography teachers around Australia from 2008-2013 and is considered to reflect the stated ACARA aim of developing a world standard 21st Century Geography curriculum.

- The conceptual progression and quality of the Geography curriculum has been recognised internationally by academics and jurisdictions and received positively by teachers involved in the F–10 implementation of the Geography curriculum across Australia.

- Beyond the anticipated and required monitoring and evaluation of the curriculum as it is implemented, AGTA sees no grounds for the drastic changes to the curriculum as appears in the draft revision document. Many of the revisions are at odds with the comprehensive and considered consultation undertaken by ACARA and AGTA with academics, jurisdictions and classroom teachers during the years of development.

- This document does not set out to provide item-by-item commentary but rather provides key messages to ACARA on our major areas of disquiet and concerns raised by the revision document.

Key concerns

1. **Diminished conceptual quality for the curriculum**

   The proposed revisions to the Geography content descriptions have had a significant impact on the intent and conceptual development of the curriculum. For example:

   - in Years F–4 there seems to be a reduction in the importance of the **Space** and **Scale** concepts with the removal of references in the content description to proximity, arrangement and spatial levels. As a progression of understanding of the Space concept such removals are problematic and need to be addressed.
   - in Years F–3 the richness of the **Place** concept has been significantly reduced by the frequent removal of references in the content descriptions to the perception of place and the impact of such perception on the nature, use and caring (protection) of places. Such removals show a lack of understanding of the place concept. Place is a concept that reflects modern Geography and is embraced by primary teachers as something students can relate to.
   - in Years F–6, the focus and quality of the concept of geographical **Interconnection** involving the idea of interdependencies has been diminished with references being made to a more generic view of interconnection between events and places.

2. **Impact of generic skills strand on quality geographical inquiry and skills development and progression**

   The **generic Inquiry and skills** strand removes important skills in Geography and the progression of skill development across the curriculum. These subject skills must appear in the curriculum to ensure that Geography is not just about learning content – the doing of Geography is critical. Surprisingly many of the skills continue to appear in the achievement standards but are not present in the content of the curriculum. Particular concern has been raised regarding the following changes to the Inquiry and skills strand:

   - The removal of the **Reflecting and responding** stage from the *Inquiry and skills* strand until Year 8 is a backward step for the teaching of modern Geography with a focus on active **citizenship and futures**. Considering students are still required to propose action in the achievement standards, it should be a stage of the generic Inquiry process.
   - Removal of any reference to **spatial technologies** in the Researching stage of the *Inquiry and Skills* strand is a significant loss to the 21st Century quality of the curriculum. All references to satellite images and spatial technology and other opportunities to use modern geographical technologies such as GIS/GPS have been removed from F–8). Such omissions have removed the requirement of a 21st Century Geography curriculum to engage with spatial technology in some way. There is a need to refer in some way to the use of modern technologies in the skill strand, and in turn the achievement standards, with reference to the capacity to use modern technologies such as spatial technology.
   - The important area of **fieldwork** has disappeared from the curriculum as a result of the removal of the subject specific skills in the Inquiry and skills strand.

3. **Loss of geographical rigour by the combined Year level achievement standard**

The combined achievement standard for HASS will make it harder for teachers to understand what they are assessing, and to design tasks that enable students to demonstrate the intended learning. The attempt to reduce the number of achievement standards has resulted in one achievement standard that is often dense and difficult to navigate. Statements such as '*They identify and describe the interconnections between components of environments, and between people and the characteristics of places, both human and environmental, past and present* (Year 5) are wordy and will require considerable unpacking by teachers to understand what students are expected to demonstrate.

The attempt to reduce the length of the achievement standards by an amalgam of terms and phrase has often resulted in the standards not clearly relating to what is described in the year level descriptions and content descriptions for that year level. The amalgam process has also resulted in inappropriate use of language across subjects i.e. *Students develop narratives about the past and present findings in a range of texts using language related to time, distance and location* (the term narrative is not relevant language for describing the geographical terms of distance and location).

4. **Geographical focus lost in overarching themes and inquiry questions for all subjects**

The overarching theme across HASS for each year level is problematic for teachers and planning. Whilst workable for F–3 (my personal world, my changing personal world etc.), from Year 4 onwards the themes become quite contrived, complicated and inaccessible. For example the Year 4 theme of *How people, places and environments interact, past and present* is too broad to be very useful and diminishes or even removes the subject focus of the published curriculum e.g. the original Year 4 geography theme was *The Earth's environment sustains all life*.

The intent of the learning is lost in some year levels by reducing the inquiry questions for each year level of HASS to 4 inquiry questions. If there is to be inquiry questions there needs to more than four to provide appropriate coverage of the four HASS subjects/strands at each year level.

5. **Loss of opportunities to address Cross Curriculum Priorities**

Significant changes and deletions to content descriptions and Inquiry questions focussing on Aboriginal and Torres Strait Islander Peoples and the Asian region will jeopardise the opportunities and imperative for teachers to incorporate Aboriginal and Torres Strait Islander Peoples perspectives into teaching and learning in Geography.

6. **Other interventions that detract from the contemporary nature of Geography**

Other changes appear to have been made on a rather ad hoc basis. For example, the reference to 'human environment systems thinking' has been replaced with 'systems thinking' in Year 10. A systems-based approach to Physical Geography was popular in the1970s.

Also unexplained was the deletion of 'the decisions people make about where to live' (Year 7) which is the entry point of study to a consideration of peoples' perceptions about the liveability of places.

AGTA respectfully requests that ACARA address the concerns raised in this letter. We would be more than happy, as we have been throughout the development process, to work with ACARA to remedy the serious inadequacies of the revision document.

Yours sincerely

Dr Grant Kleeman
Chairperson
Australian Geography Teachers Association

The Role of Adaptability in Tackling Climate and Environmental Challenges

Andrew J. Martin
School of Education, University of New South Wales, Sydney
Gregory Arief D. Liem
Psychological Studies Academic Group, National Institute of Education, Singapore

Abstract

Adaptability is our capacity to respond to change, uncertainty, and variability. We report on recent research investigating how young people's adaptability is related to their environmental awareness, environmental concerns, and pro-environmental attitudes that support the need for policy and action to sustain the environment.

Climate Change, Environmental Challenges, and Adaptability

As the science of climate change gains wide acceptance, there is increased recognition of the need for individuals and society to make attitudinal and behavioural changes to reduce or reverse its harmful effects. This recognition is based on the assumption that adaptability is a factor relevant to tackling climate change and environmental challenges.

However, adaptability may be something that helps us adjust to climate change rather than tackle it. That is, through modifying our attitude and behaviour, we can adjust to the emerging environmental threats to our planet. As the planet changes, so do we. In this scenario, we do not tackle climate change and we do not assist the planet; we simply adjust as the planet changes.

Thus, there are two perspectives on adaptability when it comes to responding to climate change. In a recent study published in *Personality and Individual Differences*, we investigated which perspective stood up to scrutiny. We did so among a large sample of Australian adolescents. Here we describe and discuss our findings.

What is Adaptability?

Adaptability and how we deal with uncertainty and change have been central to philosophising as far back as figures such as Lao Tzu and the Buddha.

We define adaptability in terms of cognitive (thinking), behavioural, and emotional adjustments in the face of uncertainty and change.

- Cognitive adjustment refers to modifications in one's thinking to deal with new and changing demands.
- Behavioural adjustment refers to modifications in one's behaviour to deal with new and changing situations and conditions.
- Emotional adjustment refers to changes in one's negative or positive emotion in response to uncertainty and change.

Adaptable people successfully respond to uncertainty or change by appropriately adjusting their thinking, behaviour, and emotion.

Given adaptability is about adjustment in the face of change, it is possible that this is a psychological attribute highly relevant to the adjustment required to respond to environmental issues and climate change.

What do we Need to Know?

There has been very little research examining the role of adaptability in responding to climate change and environmental challenges facing the planet.

It is unclear whether adaptability would lead to heightened concern about environmental issues and the need to better support the environment – or whether it would lead to the individual adjusting to the reality of climate change and thus be not so concerned about environmental issues and the need to better support the environment.

Our research therefore investigated the following question: To what extent is adaptability associated with environmental awareness, environmental concerns, and pro-environmental attitudes that support the need for policy and action to sustain the environment?

Our Study

Our study involved a survey of 2,050 students from eight high schools in four states in Australia.

The survey included the Adaptability Scale that assesses cognitive, behavioural, and emotional adaptability.

The survey also included the following environmental measures from the OECD's 2006 Programme for International Student Achievement (PISA) survey.

- Environmental awareness: the extent to which students are informed and knowledgeable about ten major environmental issues including climate change, air pollution, and water shortages.
- Environmental concern: how concerned students are with each of the ten environmental awareness issues.
- Environmental expectations: the extent to which students believe the ten environmental awareness issues will worsen over the next 20 years.
- Pro-environmental attitudes: the extent to which students support actions and policies to sustain the environment.

We also included (and thus controlled for) measures of socioeconomic status, ethnicity, gender, age, parent education, prior achievement, and personality.

Our Findings

We found that adaptability positively predicted environmental awareness, environmental concerns, and pro-environmental attitudes, beyond the effects of personality, socio-demographics, and prior achievement.

Thus, students who are adaptable are also more environmentally aware, concerned about the environment, and hold pro-environmental attitudes supportive of the need for policy and action to improve the environment.

We also found that environmental awareness, environmental concerns, and environmental expectations positively predicted pro-environmental attitudes.

Thus, young people who are environmentally aware, concerned about the environment, and believe the environmental threats will worsen in the next 20 years, were in turn more likely to hold pro-environmental attitudes supportive of the need for action and policy to improve the environment.

Clearly then, adaptability is associated with environmental attitudes, knowledge, and intentions that are relevant to improving the environment and addressing climate change.

Indeed, this probably makes sense: as adaptation is fundamentally about survival, it is possible that those who are more adaptable are motivated by a future-oriented view to survival – in this case, motivated to sustain the environment and the planet that are essential to support long-term human survival.

Building Young People's Adaptability

This then raises the important question: can adaptability be taught?

In answering this question, we return to our definition of adaptability: appropriate cognitive, behavioural, and emotional adjustments in the face of uncertainty and change.

A substantial body of psychological and educational research has shown that young people can change their beliefs and knowledge, can change their behaviour, and can learn to more appropriately regulate their emotion. To the extent that this is the case, we propose that adaptability can be taught.

- For cognitive adaptability, this might involve better instructing young people on the significance of a changing climate, the evidence base underpinning this, and its medium- and long-term effects.
- For behavioural adaptability, this might involve promoting positive and constructive actions among young people that support and sustain the environment – such as, saving electricity by unplugging appliances not being used, recycling, using *green* products, harnessing clean energy, watching water use, and encouraging others in the home and school along these lines.
- For emotional adaptability, it might involve discussions about how excessive negativity and pessimism about the planet's future can lead to helplessness and inaction – and how to maintain hope, positivity, and action in the face of this.

Looking Ahead

Looking ahead, there remain important questions to answer that will help us better understand adaptability and how it may be helpful in responding to environmental threat and climate change. Is there a stage in life when adaptability is more/less easily developed? Does adaptability instruction rely on the adaptability of the instructor (e.g., teacher)? When is it more helpful to disengage and not try to adapt?

We are at the beginning of our research into adaptability. Thus far, the findings are instructive and encouraging.

Reference

Liem, G.A.D., & Martin, A.J. (2015). Young people's responses to environmental issues: Exploring the role of adaptability

and personality. *Personality and Individual Differences*, *79*, 91–97.

Acknowledgements

The authors would like to thank the Australian Research Council for funding this research.

Authors

Andrew J. Martin, PhD is Professor of Educational Psychology in the School of Education at the University of New South Wales. His research interests are student motivation, engagement, achievement, and quantitative methods.

Gregory Arief D. Liem, PhD is Assistant Professor in the Psychological Studies Academic Group at the National Institute of Education, Singapore. His research interests are cross-cultural psychology and quantitative methods.

What is Powerful Knowledge and Can It Be Found in the Australian Geography Curriculum?

Alaric Maude
Flinders University, Adelaide, South Australia[1]

The concept of powerful knowledge has been debated by British geography educators for several years (Catling, 2014; Catling & Martin, 2011; Lambert, 2014a; Lambert, 2014b; Morgan, 2011; Roberts, 2014). However, the debate has been mostly about philosophy and pedagogy, and little has been written about what powerful geographical knowledge might actually look like. In this paper I will explain the concept, interpret what it might mean in geography, and discuss examples from the Australian curriculum that represent powerful knowledge. It is an idea that could be of value in school geography. First, the concept might help teachers who have not been trained in geography, and some who have, to see beyond the content descriptions in the curriculum to higher levels of thinking and conceptualisation. Second, it might help students to see some structure and order in our subject, rather than a mass of unconnected information. Third, it could be a way of explaining to others what geography is about, and how it adds to school education because of the distinctive and significant knowledge it teaches. Given the widespread lack of understanding of the subject in the community and amongst education administrators this is crucially important.

The concept of powerful knowledge was introduced into educational debates nearly a decade ago by Michael Young, a British sociologist of education. He contends that the main purpose of schools is to teach knowledge that enables students to understand and think beyond the limits of their own experience, and describes this knowledge as *powerful*. In one of his early papers on the subject he writes:

> *Powerful knowledge* refers to what the knowledge can do or what intellectual power it gives to those who have access to it. *Powerful knowledge* provides more reliable explanations and new ways of thinking about the world and …can provide learners with a language for engaging in political, moral, and other kinds of debates (Young, 2008, p. 14).

Young has also explained powerful knowledge in these ways.

> 'Powerful knowledge' is powerful because it provides the best understanding of the natural and social worlds that we have and helps us go beyond our individual experiences (Young, 2013, p. 196).
>
> Knowledge is 'powerful' if it predicts, if it explains, if it enables you to envisage alternatives (Young, 2014a, p. 74).

These statements describe powerful knowledge as knowledge that enables young people to go beyond the limits of their own experience; better explain and understand the world; think about alternative futures and how to influence them; learn new ways of thinking; and follow and participate in current debates of local, national or global significance. These are all types of knowledge that give young people intellectual abilities that they are unlikely to learn from their everyday lives, and are therefore the knowledge that schools should be teaching. Another that is implied in the literature is the ability to acquire and evaluate knowledge. The rest of the paper discusses these different types of powerful knowledge, and illustrates them with examples derived from the Australian geography curriculum.

Type 1. Knowledge That Provides Students With 'New Ways of Thinking About the World.'

Ways of thinking can be powerful because they may change a student's perceptions, values and understandings, the questions they ask and the explanations they explore. They may even change their behaviour. In the Australian Curriculum, geography's ways of thinking are embedded in the major concepts, and on the Australian Curriculum, Assessment and Reporting Authority (ACARA) website these are explained at some length in the section on *Concepts for developing geographical understanding*. This section can be found by opening the Overview to the geography curriculum at www.australiancurriculum.edu.au/humanities-and-social-sciences/geography. The concepts are further described in the Glossary, which can also be found in the Overview. Geography has by far the most extensive

explanation of its concepts of any of the ACARA curriculums.

These are not substantive concepts like *city* or *climate*, but can be described as meta-concepts, which are concepts about concepts. Their role is "to generate, at the meta-level, conceptual tools that inform the development of concepts, substantive theories and explanatory schemes, and that underpin the design of empirical studies"(Sibeon, 2004, p. 13). They are consequently difficult to define in a single sentence because they have more than one dimension.

Place is perhaps the most fundamental of these concepts. While places are parts of the Earth's surface that have been defined, named and given meaning by people, the concept of place is about ways of thinking about the meaning, significance and effects of places. Creswell (2004, p. 11) calls place a way of "seeing, knowing and understanding the world".[2] The following statement is an example of a way of thinking based on the concept of place.

> Each place is unique in its characteristics. As a consequence, the outcomes of similar environmental and socioeconomic processes may vary between places, and similar problems may require different strategies in different places.

This statement says that because places vary in their environmental and human characteristics, the outcomes of similar processes may differ because of their interaction with these varying characteristics. It also says that strategies to address similar problems need to take account of the distinctive characteristics of each place, which could be environment, culture, economy, leadership or past experience. This is the core of geography's contention that *place matters*. Everything exists in a place, including us, and every event happens in a place, and the varied characteristics of these places influence what exists and what happens. This is a fundamental part of thinking geographically, and it is powerful because it leads to questions about how to explain, and to thinking about strategies to address problems. An illustration of the value of this way of thinking can be found in a recent article by Kirby (2014) on teaching about sustainability and cities. He argues that geography's understanding of the uniqueness of individual urban places equips it to develop the highly localised responses needed for the problems they face.

Space is also a fundamental concept in geography, and one aspect of spatial thinking is expressed in this statement.

> Spatial distributions have environmental, economic, social and political consequences.

The statement suggests that spatial distributions are worth understanding because they have consequences, a point that is often neglected in school geography curriculums and textbooks. Students are frequently asked to explain a spatial distribution, but less frequently to think about its consequences, so they don't get to understand the environmental, economic, social or political significance of a spatial pattern. In Australia, for example, the spatial concentration of the population into just five cities has environmental consequences, because of the concentration of pollution or the construction of water storages, and political consequences, because of the influence of urban voters on governments.

Environment is another major concept in geography curriculum, and one of its dimensions is described in this statement.

> Humans are dependent on the biophysical environment for their survival. It supports and enriches human life by providing raw materials and food, recycling and absorbing wastes, maintaining a safe habitat and being a source of enjoyment, inspiration and identity.

This summarises the four functions of the environment for people, which the curriculum describes as source, sink, service and spiritual (Maude, 2014). These range from the practical (such as the provision of food and water) to the emotional (such as inspiring landscapes). To understand the statement students will need considerable knowledge of the physical processes involved in each function, and of the ways people perceive, use and manage the environment. The statement could be complemented with this one.

> Environmental sustainability depends on the maintenance or restoration of the environmental functions that sustain human life and wellbeing.

This statement takes the idea of environmental functions and connects it with the concept of sustainability. If students adopt the way of thinking described in the two statements they will have an appreciation of how the environment supports and enhances their lives, the ways they are dependent on it, and the importance of sustaining its functions. This will influence their views on a whole variety of environmental issues. It might even change their behaviour, or make them politically active, which could be very powerful.

The statements described above, derived from the concepts, are examples of different ways of thinking geographically. They are powerful because they can change the way that young people perceive and think about the world and their place in it. However, they are ways of thinking that require a considerable knowledge of geography to be understood well enough to provide a basis for action. They can't be learned as purely abstract ideas devoid of any empirical content. Students will come to recognise them as geographical ways of thinking if they are shown how they underlie the content of the curriculum.

Type 2. Knowledge That Provides Students with Powerful Ways of Analysing, Explaining and Understanding.

Young argues that knowledge is powerful when it enables students to better understand and explain the world. In geography this type of knowledge could be a concept that can be applied to analyse or explain something, or a generalisation.

Analytical Concepts

Some of geography's analytical methods are shared with other subjects, but some are distinctively geographical because they are derived from the major concepts in the curriculum. Four of these are:

- analysing a spatial distribution for ideas on the processes that are influencing the phenomenon mapped (from the concept of space). A map of rainfall in Australia, for example, shows that precipitation declines with increasing distance from the coast and rises with increasing elevation, observations which identify two of the causes of rainfall;
- comparing spatial distributions as a way of exploring possible causal relationships (also from the concept of space);
- comparing places to identify the effects of a specific variable, such as climate or culture (from the concept of place);
- testing relationships by analysing them at different spatial scales (from the concept of scale). This method is important because different explanatory factors can be involved at different scales. For example, climate is the main determinant of the type of vegetation at the global scale but soil and drainage may be the main factors at the local scale.

In their ability to identify and test relationships between phenomena, all these methods should be considered powerful. The first two are well represented in the Australian Curriculum, but not the third. Its significance is explained in this quotation from an influential review of geography in the United States.

> Places are natural laboratories for the study of complex relationships among processes and phenomena. Geography has a long tradition of attempting to understand how different processes and phenomena interact in regions and localities, including an understanding of how these interactions give places their distinctive character (Rediscovering Geography Committee, 1997, p. 30).

In geography teaching, this method could be used to identify the effects of a specific variable, such as climate or culture, by comparing a number of places that are similar in one of these characteristics, but different in others.

The fourth method is used in the Year 10 unit on Geographies of human wellbeing, which involves a study of spatial variations in human wellbeing at global, national and local scales. Students should learn from this that while Australia has a high average level of wellbeing compared with other countries, within the nation there are places with much lower levels of wellbeing, and at the local level there are areas of relative disadvantage within all cities. The explanations of disadvantage are likely to differ between these scales.

Explanatory Concepts

Substantive concepts can also have the power to explain. For example, for students in regional Australia to explain why the settlements in their area vary in their size and growth, or even why they exist at all, they should understand and be able to apply concepts like geographical concentration and centrality. When combined with an understanding of people's changing mobility and consumer preferences, these help to explain why some settlements are declining and some growing, often at the expense of the former, and could be used to predict future trends in settlement sizes. There will, of course, be settlements that don't fit the expected pattern, because of history, location, community or individual entrepreneurialism, or politics, and explaining the anomalies makes for interesting geography.

Another example of a powerful explanatory concept is the water balance, described in this statement and in Figure 1.

The water balance models the determinants of the quantity of water available as soil moisture, surface water or groundwater.

This concept could be used to teach these elaborations in the Australian geography curriculum Year 7 unit on Water in the world by:

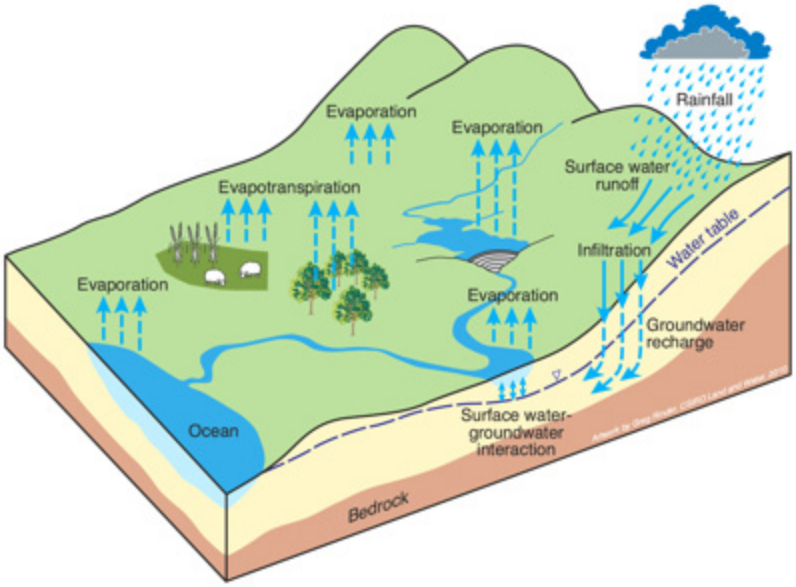


Figure 1: Diagram of the partitioning of the water balance components. Retrieved from http://www.ewater.com.au/uploads/images/Block%20diagram%202_5_2010(GR).jpg

- describing how water is an available resource when it is groundwater, soil moisture (green water), and surface water in dams, rivers and lakes (blue water), and a potential resource when it exists as salt water, ice or water vapour;
- comparing the quantity and variability of rainfall, runoff and evaporation in Australia with that in other continents.

If students understand the components of the water balance, and the relationships between them, they will have learned a conceptual framework for integrating several elements in physical geography, including rainfall, evapotranspiration, soil characteristics and land cover. They will also be able to use the concept to analyse and explain the availability of water for plants and people, and the differences between places and whole continents in water resources.

Processes are an important type of explanation in geography and illustrate the explanatory power of the concept of interconnection, because they are sets of cause-and-effect relationships or interconnections. For example, knowledge of the processes of weathering, erosion, transportation and deposition is fundamental to an understanding of landforms and flooding, while knowledge of sediment transport processes is essential in understanding coastal change. The concept of a system – a group of interacting objects, materials or processes that form an integrated whole linked together by processes – also belongs to the meta-concept of interconnection. It can be very helpful in investigating and understanding some of the interconnections within and between places, and can be applied to both environmental and, with more difficulty, human phenomena.

Generalisations

Some empirical generalisations can be powerful because they help students to make sense of a lot of information. For example, in both the primary and secondary years students will study some natural hazards: their spatial distribution, causes and impacts, and community responses to them. Out of these studies they could develop this generalisation.

> Each type of environment has its own natural hazards. The impact of these hazards on people is determined by both human and environmental factors, and can be reduced but not eliminated by prevention, mitigation and preparedness.

This statement synthesises a lot of detailed information about different natural hazards, and tells students several important things. The first is that all environments can have natural hazards, even the inner urban areas of temperate cities that don't experience tropical cyclones, bushfires or drought. The second is that the economic impact of natural hazards is the result of human as well as environmental causes, so when investigating an unfamiliar hazard, students should look beyond the environmental causes of damage. They may discover, for example, that flood damage has been increased by vegetation clearance, the draining of the wetlands that previously absorbed flood waters, the straightening of river channels or settlement on floodplains. The third is that there is a variety of strategies that can be used to reduce the impact of a hazard, so students should look beyond a single answer. These are powerful insights into how communities can understand and respond to a natural hazard.

Generalisations can be especially powerful if they include explanation or can be used to predict. This example is from economic geography.

> Because of the advantages of geographical concentration, economic activities tend to cluster in space unless tied to the location of natural resources or dispersed customers.

This statement is based on an elaboration in the Year 8 Australian geography curriculum unit on Changing nations, because it is a way of explaining urbanisation. It is powerful because it synthesises knowledge of the location of primary, secondary, tertiary and quaternary activities into one simple generalisation, and it adds a major explanatory concept, that of geographical concentration. The generalisation can be applied to explain why used car yards or second-hand

clothing shops often locate together, why half the world now lives in urban areas and why decentralisation is so difficult, because all of these involve the advantages of geographical concentration. It can be applied to forecast the effects of anticipated changes in the structure of the economy on the future pattern of economic activity within a nation. It is also a generalisation that students may be able to challenge by finding examples that don't fit, while explaining why they don't fit is again likely to be an educationally and geographically valuable exercise.

Another example of an empirical generalisation is this statement.

> Because of the interconnections between the components of the biophysical environment, change in one component may produce change in others. The subsequent changes may be experienced in the same place as the initial change, and/or in different places, or at a different scale.

The first sentence involves the concepts of interconnection and change, but is similar to the way science might define a system. The second sentence, however, makes the whole statement clearly geographical, by adding the concepts of place and scale.

Another example of an explanatory generalisation is:

> Where people grow up and live has an influence on their lives through its effects on their health, educational attainment, aspirations and economic opportunities.

This is relevant to the Year 10 unit on Geographies of human wellbeing, and identifies a significant social issue that government policies sometimes try to address. The statement can be illustrated from a recent study of Year 12 subject offerings in Perth schools, disaggregated according to the socioeconomic status of the school population. The study found that while all but one of the 48 schools in the top 40 per cent by socioeconomic status offered advanced maths, chemistry, physics and English literature (the subjects needed for admission to some professional university courses), only three of the 24 schools in the bottom 20 per cent by socioeconomic status offered all these subjects (Perry and Southwell, 2014). The career opportunities of students in the latter group of schools is much more limited than those of students in the former group.

An example of a generalisation that has both explanatory and predictive power is:

> Coastal areas are dominated by wave and tidal processes that drive weathering and sediment movement, and stopping natural sediment movements in one location on the coast may cause additional erosion and major coastal problems elsewhere (adapted from Holden, 2011, p. 119).

This statement warns students of the potentially negative effects of structures like marinas, and the importance of locating them in places where sediment movement is minimal. Understanding it would be a fundamental part of a study of coastal management in Year 10.

Generalisations that can be used to predict can also provide a "basis for suggesting realistic alternatives" (Young, 2010), as students may be able to use them to forecast what might happen, and compare this with what they might prefer to happen. They can then think about how their preferred future could be achieved, given their understanding of the processes influencing that future. This may enable them to identify ways of taking actions to improve their own and others' futures. Knowledge that results in actions should qualify as powerful.

The generalisations described are powerful because:

- they synthesise a lot of information, and so help student understanding;
- they are high level generalisations that can be applied to many contexts;
- some have analytical power;
- some have explanatory power; and
- they can be used to predict and therefore to think about futures.

Type 3. Knowledge That Gives Students Some Power Over Their Own Knowledge.

One component of the ability to have some power over your own knowledge is knowing how to acquire knowledge that is new to you. This does not mean the ability to undertake an academic research project to study something that has not been investigated before, but the skills to find information already available, and make sense of it. This enables young people to be independent of the dominant sources of information in our society. In the Australian Curriculum, this knowledge is taught through the Inquiry and Skills Strand, and by the end of Year 10 students should be reasonably competent in finding information.

The other component is knowing how to evaluate claims about knowledge, which gives students the power to be critical of the opinions of the

powerful, and to be independent thinkers. Young writes:

> Knowledge in the sense we are using the word in this book allows those with access to it to question it and the authority on which it is based and gain the sense of freedom and excitement that it can offer. (Young, 2014b, p. 20).

To do this students need to know something about the ways knowledge is developed and tested in geography, an aspect of the subject that has been explored by Firth (2011, 2013, 2014). This is about being able to answer the question: *how do you know?*, an underdeveloped area of geographical education. In the Australian curriculum, evaluation and reasoning should be taught through the Inquiry and Skills Strand, but the curriculum overemphasises technical skills like map construction, and underemphasises the more powerful interpretive, analytical, critical thinking and methodological skills that would develop the abilities of students to reason and evaluate. In particular, it neglects the critical thinking skills needed to test statements made by others.

Type 4. Knowledge That Enables Young People to Follow and Participate in Debates on Significant Local, National and Global Issues.

The ability to follow and participate in public debates is essential to full and equal participation in society and its conversations about itself, and without this ability young people lack power. Much of the content of the Australian Geography curriculum gives students this power, because it examines many of these issues. They include water scarcity, the liveability of Australian suburbs and the management of Australian places, natural hazards, urbanisation, food security, sustainability, the management of landscapes, the interrelationships between land cover change and climate change, global inequalities and migration. However, whether students learn enough about the physical and human processes involved to be able to have informed opinions on these complex problems is debatable, given the limited time allocated to geography in schools. In addition, students need Type 3 knowledge if they are to be able to assess conflicting statements about these issues.

Type 5. Knowledge of the World.

If powerful knowledge is knowledge that takes students beyond the limits of their own experience, then the geography that teaches students about places that are beyond their experience must be regarded as powerful. This is knowledge about the world's diversity of environments, peoples, cultures and economies, which may stimulate children's curiosity, wonder and awe. It is also knowledge of their links with other places and the interconnectedness of the world, which may develop an understanding of and empathy with peoples in other places. It is more general knowledge than that in Type 4, because it is not tied to a current event or issue. However, in Australia geographers have tended to resist the inclusion in the curriculum of anything that looks like regional geography, and as a result the teaching of world knowledge in the Australian curriculum is patchy. In the primary years there is a progressive study of the continents, working from Australia and its neighbouring countries to South America and Africa in Year 4, North America and Europe in Year 5 and the countries of the Asia region in Year 6. This study, however, is uneven, with content descriptions which have a different focus in each year. In the secondary years there are country case studies of themes in each unit that will enable students to learn more about particular regions or countries of the world. Case studies can lead to stereotyping, with Indonesia, for example, taught only as an example of urbanisation or deforestation, and India taught only as an example of population growth or poverty. This places considerable responsibility on teachers to ensure that students gain a balanced knowledge of the countries they study.

How Might A Unit in the Australian Curriculum Be Organised to Emphasise Powerful Knowledge?

I will use the Year 8 unit on Changing nations to suggest a way of structuring units to give them conceptual coherence, and provide students with practice in using the different types of powerful knowledge. The structure can be developed in logical steps, rather like an argument.

1. Some of the clues to the conceptual structure of the unit are in the year level description. The beginning of the description tells us that the unit is about the changing human geography of countries, and that it uses shifts in population distribution as the measure of change. So the way of thinking underlying the whole of the unit is spatial, because this is a very geographical way of investigating change. This illustrates powerful knowledge of the first type.

2. The description also says that population distribution is chosen as the measure of change because it is a sensitive indicator of economic and social change. This is using population distribution analytically, an example of powerful knowledge of the second type. The two most significant changes in

the spatial distribution of population within nations are urbanisation in developing countries and regional shifts in developed countries. Both are mainly produced by migration, both internal and international, because differences in rates of natural increase within nations are relatively small in comparison with the effects of migration. So to explain shifts in population distribution we examine the main forms of migration.

3. The two case studies suggested of internal migration are rural-urban migration in Indonesia and China. Indonesia is suggested because it is an excellent example of urbanisation, and provides one of the few opportunities in the curriculum to study Australia's important and complex neighbour. In these case studies, there is the opportunity to examine the causes of urbanisation, and to discuss an example of Type 2 powerful knowledge discussed earlier:

   Because of the advantages of geographical concentration, economic activities tend to cluster in space unless tied to the location of natural resources or dispersed customers.

   In an urbanising economy a growing proportion of jobs are in economic activities that are not tied to the location of natural resources, such as manufacturing or trade, and these tend to cluster in towns and cities.

   Students should understand that urbanisation is both a response to and a cause of profound changes in the economy and society of a nation. They should also understand that many of these changes are positive, such as higher educational levels, increased incomes, a growing market for rural produce, a possible reduction in urban poverty, cultural mixing and cultural change, and the growth of an urban middle class. It is also possible that urbanisation can reduce the use of fossil fuels (through the provision of efficient public transport) and reduce water consumption (through higher density housing). I mention this because too often the emphasis is on the negative effects of urbanisation, such as squatter settlements.

   If both Indonesia and China are studied it could be worthwhile making a brief comparison of the urbanisation experience of the two. This comparison will illustrate the statement discussed earlier in this article, about a similar process producing different outcomes in different places, using countries as places. China, for example, is much more industrialised than Indonesia, has much more government control over population movement, and these factors produce differences in the urbanisation process and its outcomes. Place matters!

4. The next case study is of Australia. Australia is no longer urbanising, and cities like Sydney, Melbourne and Adelaide are actually losing more people than they are gaining from internal migration within the country. Consequently, this part of the unit starts with internal migration, which is complex and reveals much about current economic and social change within the nation. The case study of Australia also includes international migration, which is unimportant in Indonesia and China, and because this is mainly to the major cities it counters the net loss of the population from some cities through internal migration, and so reinforces urban concentration. Where migrants settle in the cities is a spatial question, but the concentration of some groups in specific areas is also a current social and political issue. Space matters!

5. The next step uses the comparison of Australia and the United States to examine whether urbanisation produces the same spatial distribution of population in countries where the process is finished. This is again about similar process producing different

Table 1: Comparison of urbanisation and urban concentration in Australia, the USA and Canada, 2014

Measure	Australia	USA	Canada
Percentage of total population in urban areas	89	81	82
Percentage of total population in urban agglomerations of more than 1 million	59	45	45

Source: World Bank Data Bank (http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS; http://data.worldbank.org/indicator/EN.URB.MCTY.TL.ZS/countries)

outcomes in different places, using countries as places.

Two simple measures, readily obtained from the web, can be used to identify differences between countries in urban concentration and urban settlement patterns, as shown in Table 1. Canada is included to demonstrate that the USA is not an exception.

What the first measure shows is that Australia is more urbanised than both the United States and Canada, and this high level of urbanisation has been a feature of Australia for well over a century. The second measure shows that Australia also has a much higher level of urban concentration, with 59 per cent of the population living in cities with populations of more than 1 million. In Australia, there are just five of these cities. Suggestions on how to explain the difference between Australia and the United States are in this elaboration in the curriculum:

- researching the causes of urban concentration in Australia and the United States of America, for example, the history of European settlement, migration, the export orientation of the economy, the centralisation of state governments, environmental constraints and the shape of transportation networks.

The point here is that, although both Australia and the United States are highly urbanised countries, there are sufficient historical, environmental, economic, social and political differences between them to produce significantly different forms of urbanisation. For example, students could be asked to speculate on what the urban pattern of Australia might have been if there had been the same number of states along the east coast as in the United States.

6. The final step is about the last of the content descriptions in the curriculum, on the management and planning of Australia's urban future. This provides the opportunity to examine the consequences of the spatial distribution of the population, and particularly of the high level of urban concentration. As these are a matters of regular public debate students will gain experience of the fourth type of powerful knowledge. Note that in keeping with the spatial theme in this unit, one of the elaborations to this content description is:

   - examining how Canberra can be used as an example of urban decentralisation.

Many teachers see Canberra only as an example of a planned city, but it is also by far the largest city created by government policies outside the state capitals, and has an increasingly diversified economy no longer totally dependent on government employment. Consequently, if students raise the question of whether the growth of the major cities could be restrained by diverting population to smaller cities, Canberra provides an example of what is needed to achieve this.

The approach to the unit on Changing nations suggested here provides opportunities for students to:

- iIllustrate the application of ways of thinking associated with the concepts of space and place (type 1 powerful knowledge);
- use generalisations to explain (type 2 powerful knowledge);
- use concepts analytically (type 2 powerful knowledge);
- engage in debate on a national issue (type 4 powerful knowledge); and
- learn more about Indonesia, China, Australia and the USA (type 5 powerful knowledge).

Conclusion

This paper set out to identify geographical knowledge that could be described as powerful, using Michael Young's explanations of the concept. The five types of knowledge identified teach students ways of thinking, explaining, finding out and evaluating that are intellectually powerful, give them the capacity to participate in public debates, and take them well beyond their own experience. They could also help students to find deeper meaning in the factual content of the curriculum, and to see geography as a structured, coherent and ordered discipline. Furthermore, this knowledge may influence their ideas, values and actions, which would make it particularly powerful. All of the five types can be taught using content in the Australian Curriculum. But what could the subject gain from the concept of powerful knowledge? First, by focusing on ways of thinking, generalising, analysing and explaining, powerful knowledge could help to raise the intellectual challenge of geography in schools. Second, powerful knowledge could provide a way of identifying what we would like students to take away from their study of geography at school, and finding ways to ensure that they do. Third, powerful knowledge provides a way of explaining geography to non-geographers, by describing its ways of thinking, understanding and explaining, and demonstrating that these ways are educationally valuable. It also provides a further justification for geography's historic role of teaching about the world. All could be powerful for the position of geography in schools.

References

Catling, S. (2014). Giving younger children a voice in primary geography: empowering pedagogy — a personal perspective. *International Research in Geographical and Environmental Education*, *23*, 350–72.

Catling, S., & Martin, F. (2011). Contesting *powerful knowledge*: the primary geography curriculum as an articulation between academic and children's (ethno-) geographies. *The Curriculum Journal*, *22*, 317–335.

Creswell, T. (2004). *Place: a short introduction*. Oxford: Blackwell.

Firth, R. (2011). Debates about knowledge and the curriculum: some implications for geography education. In G. Butt (Ed.), *Geography, education and the future* (pp. 141–164). London: Continuum.

Firth, R. (2013). What constitutes knowledge in geography? In D. Lambert & M. Jones (Eds), *Debates in geography education* (pp. 59–74). London: Routledge.

Firth, R. (2014). Constructing geographical knowledge. In M. Young, D. Lambert, C. Roberts, & M. Roberts, *Knowledge and the future school: curriculum and social justice* (pp. 53–66). London: Bloomsbury Academic.

Holden, J. (2011). *Physical geography: the basics*. London: Routledge.

Hutchinson, N. (2012). Place writing: narrative, experience and identities. *Geography Bulletin*, *44(1)*, 32–47.

Kirby, A. (2014). Adapting cities, adapting the curriculum. *Geography, 99*, 90–98.

Lambert, D. (2014a). Subject teachers in knowledge-led schools. In M. Young, D. Lambert, C. Roberts, & M. Roberts, *Knowledge and the future school: curriculum and social justice* (pp. 159–187). London, Bloomsbury Academic.

Lambert, D. (2014b). Curriculum thinking, "capabilities" and the place of geographical knowledge in schools. *Syakaika Kenkyu* (Journal of Educational Research on Social Studies), *81*, 1–11.

Maude, A. (2014). Sustainability in the Australian Curriculum: Geography. *Geographical Education*, 27, pp. 19–27.

Morgan, J. (2011). Knowledge and the school geography curriculum: a rough guide for teachers. *Teaching Geography*, *36*, 90–92.

Perry, L. B., & Southwell, L. (2014). Access to academic curriculum in Australian secondary schools: a case study of a highly marketised education system. *Journal of Education Policy*, *29*, 467–485.

Rediscovering Geography Committee, National Research Council (1997). *Rediscovering geography: new relevance for science and society*. Washington, DC: National Academy Press.

Roberts, M. (2014). Powerful knowledge and geographical education. *The Curriculum Journal*, *25*, 187–209.

Sibeon, R. (2004). *Rethinking social theory*. Lonfon: SAGE.

Young, M. (2008). From constructivism to realism in the sociology of the curriculum. *Review of Research in Education*, *32*, 1–32.

Young, M. (2010). *Educational policies for a knowledge society: reflections from a sociology of knowledge perspective*. Keynote Lecture held at the GOETE (Governance of Educational Trajectories in Europe) kick-off meeting, Tubingen, 29 January. Retrieved from http://www.goete.eu/news/events/101-reflection-keynote-lecture-at-the-goete-kick-off-meeting-by-michael-young

Young, M. (2013). Powerful knowledge: an analytically useful concept or just a "sexy sounding term"? A response to John Beck's "Powerful knowledge, esoteric knowledge, curriculum knowledge". *Cambridge Journal of Education, 43*, pp. 195–198.

Young, M. (2014a). Powerful knowledge as a curriculum principle. In M. Young, D. Lambert, C. Roberts & M. Roberts, *Knowledge and the future school: curriculum and social justice* (pp. 65–88). London: Bloomsbury Academic.

Young, M. (2014b). Knowledge, curriculum and the future school. In M. Young, D. Lambert, C. Roberts & M. Roberts, *Knowledge and the future school: curriculum and social justice* (pp. 8–40). London: Bloomsbury Academic.

Endnotes

1 This paper is based on my Keynote Address to the Conference of the Australian Geography Teachers' Association, Rotorua, 15 January 2015, with some amendments.

2 Hutchinson (2012) has a typically rich discussion of the many aspects of the concept of place.

Working with Students' Ideas in Physical Geography: A Model of Knowledge Development and Application

Rod Lane and Pamela Coutts
Department of Education, Macquarie University, Sydney, Australia

Abstract

Researchers in science education have for some time recognised the need for teachers to develop an awareness of students' common alternative conceptions – a key element of pedagogical content knowledge (PCK) – and use this knowledge to develop student understanding (Morrison & Lederman, 2003). Less attention, however, has been devoted to the investigation of geography teachers' awareness of and work with students' ideas. This paper outlines what is currently known about the nature of alternative conceptions in physical geography, teachers' knowledge of these ideas and their use of this knowledge to inform instruction. The paper proposes a framework to explain the factors affecting the development of geography teachers' knowledge in this area and their application of this knowledge in the classroom. Implications of the framework for pre-service training, and the accreditation and ongoing professional learning of geography teachers, are discussed along with directions for future research.

Keywords: pedagogical content knowledge, alternative conceptions, geography

Introduction

It is now well understood that students construct robust mental models or conceptions of phenomena in an attempt to make sense of their everyday experiences and that these beliefs have a significant impact on learning (Clough & Driver, 1986; Duit, Widodo, & Wodzinski, 2007; Greca & Moreira, 2000). Awareness of these conceptions has led to a long tradition of research in science education exploring the nature of students' intuitive mental models and the processes and mechanisms of conceptual change (Vosniadou, Vamvakoussi, & Skopeliti, 2008). Researchers in science education have also explored the implications of these findings for the knowledge requirements of teachers. Following from Shulman's (1986) seminal work, numerous studies have investigated science teachers' understandings of students' common alternative conceptions and their use of this knowledge to inform instruction (Berg & Brouwer, 1991; Halim & Meerah, 2002; Morrison & Lederman, 2003). This research has shaped the nature and content of pre-service and in-service teacher education for mathematics and science teachers. Most teachers trained in these disciplines over the past 20 years will have been likely introduced to approaches for diagnosing students' alternative conceptions of core concepts and strategies for promoting conceptual change (Duit et al., 2007).

Like researchers in mathematics and science, scholars in geographical education have for some time acknowledged the need to first diagnose, then address alternative conceptions through instruction (Dove, 1999, 2014; Ghaye & Robinson, 1989; Harrison & Purnell, 2012; Lambert & Balderstone, 2010; Leat & Chandler, 1996). Researchers have investigated the nature of students' alternative conceptions in many areas of physical geography, which is logical given the close alignment between the epistemologies of physical geography and the natural sciences. Both hold a world view that rests on consensus-based understandings and logical positivism (Peet, 1998 cited by Hutchinson, 2013). A comprehensive overview of the research in this area is provided in *The Ludwigsburg-Lucerne bibliography of misconception research in the geosciences* (Reinfried & Schuler, 2009). The bibliography includes studies of teachers' and students' alternative conceptions of the Coriolis effect (Nelson, Aron, & Francek, 1992), greenhouse effect (Reinfried, Aeschbacher, & Rottermann, 2012), mass wasting (Nelson et al., 1992), groundwater (Dickerson, Callahan, Van Sickle, & Hay, 2005; Reinfried, 2006a), Arctic environments (Dove, 2014), weather (Dove, 1998a), pollution (Boyes & Stanisstreet, 1997), tropical storms (Lee, 1999), rock types (Dove, 1996), weathering and erosion (Dove, 1997), tropical rainforests (Dove, 2012) and rivers (Dove, Everett, & Preece, 2000).

In contrast to researchers in mathematics and science, however, geographical educators have rarely taken the next step of considering the implications of this work with students for research exploring geography teachers' knowledge. One consequence of this has been a lack of attention directed to the investigation of geography teachers' knowledge of students' ideas – an important component of pedagogical content knowledge (PCK) – and the factors influencing the development of this knowledge base. Likewise, little is known about the ways in which experienced geography teachers use their knowledge of students' world views – their views about the nature of reality and being (Olafson, Schraw, & Vander Veldt, 2010) – and intuitive mental models to inform their classroom practice. An understanding of geography teachers' knowledge and practice in this area would provide a useful guide for research and for the planning of professional learning initiatives to enhance the effectiveness of conceptual change instruction in geography classrooms.

This paper aims to start a conversation around the development of a framework to better understand geography teachers' knowledge of students' ideas in physical geography and the use of this knowledge to inform instruction. The paper is divided into two sections. The first section provides an overview of what we currently know about the nature of alternative conceptions and the implications for the development of geography teachers' PCK. The purpose of this section is to highlight the current state of research in this area. In the second section, a framework is proposed to explain the process of development of geography teachers' knowledge of students' common preconceptions in physical geography and their use of this knowledge to inform instruction.

Section 1: What We Know About the Nature of Students' Alternative Conceptions and Geography Teachers' Awareness of These Ideas

The Nature of Alternative Conceptions

The literature exploring the nature of students' alternative conceptions highlights several important features of these ideas. Firstly, alternative conceptions tend to be widely held by both school aged students and adults and are neither idiosyncratic nor culturally dependent (Driver, Squires, Ruchworth, & Wood-Robinson, 1994).

Secondly, while students' intuitive beliefs may appear to be incomplete or theoretically incorrect to a discipline expert they are often perceived as functional, plausible and evidence-based to the learner (Posner, Strike, Hewson, & Gertzog, 1982; Reinfried, 2006b). These ideas have a significant influence on the learning process because they act as a lens through which learners interpret and decode information in order to construct meaning (Driver et al., 1994).

Dove (1998b, 1999) and Reinfried (2004) cite a number of possible sources of alternative conceptions in science and geography, including the use of everyday language in domain-specific contexts, changing definitions, the oversimplification of concepts, overlapping similar concepts, rote learning, students' preconceptions from private world experiences, stereotyping and incorrect information in textbooks, myths, and inadequate prerequisite knowledge. Lee (1999) highlights the importance of the discourses or voices that children encounter in social and cultural contexts and the role they play in shaping students' beliefs. He argues that students make meaning from various information sources, including family, teachers, school, friends and the media. When examining the possible origins of students' conceptions in both science and geography it is important to remember the role of social interaction in the process of knowledge construction. Common sayings such as *the dew is falling, the force be with you* and *shut the door to keep the cold out* can provide students with overly simplified and incorrect analogies about the operation of physical processes, resulting in the reinforcement of alternative conceptions (Driver et al., 1994).

Finally, students' alternative conceptions tend to be both robust and resistant to change because they have been constructed from learners' personal experiences and continue to be confirmed and reinforced by their everyday interactions (Ozdemir & Clark, 2007). Vosniadou et al. (2008, p. 4) maintain that students' intuitive views of the world are "not fragmented observations but form a coherent whole [or] framework theory." These theories are constructed from learners' "interpretations of . . . common everyday experiences in the context of lay culture" (p. 15) and are used by learners to make predictions and to provide explanations of phenomena. Individual mental models are shaped by students' ontological and epistemological beliefs – their beliefs about reality and the nature and purpose of knowledge. These beliefs are stored in schemas or mental models and are often substantially different from both the ideas to be taught and from the established views of experts in particular subject domains (Driver, 1989; Vosniadou et al., 2008). Recently, the term powerful knowledge has been used to refer to these established expert views (Young & Muller, 2010). Powerful knowledge or disciplinary knowledge differs from intuitive, everyday

knowledge in that it is evidence-based, abstract and theoretical (conceptual), reliable (consistent and testable) and open to challenge. Children and young people are unlikely to acquire powerful knowledge through their everyday experiences at home or in the workplace as this knowledge is often counterintuitive and exists outside the direct experience of the learner (Lambert & Hopkin, 2014).

The relationship between powerful knowledge and alternative conceptions can be seen in the example of the greenhouse effect. According to Reinfried, Aeschbacher, and Rotterman (2012) students commonly believe that the human induced greenhouse effect is a result of the ozone hole – "a hole in the atmosphere allows more rays of sunlight to enter; they are then reflected by the earths' surface but cannot find the hole (i.e. "the exit") to escape resulting in a warming of the atmosphere" (p. 157). This belief is clearly inconsistent with the established scientific consensus communicated by the Intergovernmental Panel on Climate Change. According to leading climate scientists, ozone depletion is not the mechanism of global warming. Ultraviolet radiation represents a small percentage (less than one percent) of the energy from the sun which is not enough to cause a significant heating of the earth's surface. The main cause of global warming is the release of carbon into the atmosphere caused by the burning of coal, gas, and oil. These gases spread around the planet and capture solar heat that would otherwise be radiated out into space (Royal Meteorological Society & National Centre for Atmospheric Science, 2014). Despite being inconsistent with the current scientific consensus, however, these intuitive beliefs are plausible to the individual and therefore highly resistant to change.

The concept of alternative conceptions in human geography is more problematic as this sub-discipline draws its ontological and epistemological foundations from the social sciences and humanities. In many areas of human geography it is possible to have multiple truths, as the key concepts are values and perspective-based in contrast to the consensus-based understandings of physical geography. It makes little sense, for example, to talk about alternative conceptions of *place, community* or *the future*. The model discussed in this paper adopts the ontological and epistemological assumptions of the physical sciences as it focuses on teachers' knowledge of and work with students' ideas about weather and climate and the causes and impacts of tropical cyclones.

The Implications of Alternative Conceptions for Geography Teachers' Knowledge

Research across a number of domains (especially science) suggests that teachers require an awareness of students' common alternative conceptions in key topic areas if they are to help students build depth of understanding (Morrison & Lederman, 2003). The importance of this knowledge base is clearly articulated in Shulman's conceptualisation of pedagogical content knowledge. Shulman (1986) defines PCK as "expert content-knowledge of subject matter and curricular knowledge linked to effective teaching strategies within a content area" (p. 9). His initial conceptualisation of PCK consisted of two components, (a) knowledge of multiple methods for representing and organising subject content to make it comprehensible to students and (b) knowledge of what makes the learning of particular content easy or difficult for students including an understanding of students*' common alternative conceptions in key topic areas*. According to Shulman (1986), an understanding of the alternative conceptions that students develop prior to formal instruction, and the instructional conditions necessary for overcoming these beliefs, should be "at the heart of our definition of needed pedagogical knowledge" (p. 10). It is argued that teachers require knowledge of common alternative conceptions so that they can recognise these ideas during instruction and develop strategies for helping students articulate, compare, analyse, evaluate and, where necessary, restructure these ideas (Arnold, Sarge, & Worrall, 1995). Knowledge of students' alternative conceptions is also important for the development of valid and reliable assessments to diagnose and address learning problems in schools. Building teacher awareness of these ideas is, therefore, seen as an essential first step in the development of pedagogies for improving geographic literacy (Reinfried, 2006b).

What Do We Know About Science and Geography Teachers' Knowledge of Student Ideas?

Shulman's (1986, 1987) suggestion that teachers need strong PCK to develop student understanding has resulted in a number of studies exploring pre-service and in-service primary and secondary science teachers' knowledge of, and work with, students' ideas (Berg & Brouwer, 1991; Halim & Meerah, 2002; Morrison & Lederman, 2003). The results of this research suggest that teachers of science often pay a "striking lack of attention to children's ideas, predictions [and] explanations" (Smith & Neale, 1989, p. 12), are insensitive to students' viewpoints (Osborne, Bell, & Gilbert, 1983), and lack an awareness of the potential for

alternative conceptions to interfere with science learning (Hollon & Anderson, 1987). Jones, Carter, and Rua (1999) note that experienced teachers of primary and secondary science are often *shocked, surprised* and *intrigued* (p. 554) when made aware of the alternative conceptions held by some of their students. Teachers often respond by either ignoring students' ideas or assuming that these conceptions can be easily changed through instruction, for example, teacher exposition (Hollon & Anderson, 1987). When teachers are aware of students' preconceptions, their knowledge is often either general in nature or restricted to a narrow range of topics (Berg & Brouwer, 1991; Morrison & Lederman, 2003).

In contrast to the research in science education there are few studies exploring pre-service or in-service geography teachers' knowledge of student ideas. A recent study examined 16 experienced geography teachers' epistemological beliefs, knowledge of students' intuitive ideas (about tropical cyclone causes and processes) and use of this knowledge to inform instruction (Lane, 2015). To be classified as experienced a teacher needed to have taught geography for at least five years. This, according to Berliner (2001), is the minimum classroom experience required before a teacher can move to a more expert level of functioning. The results of this study indicate that the knowledge of experienced geography teachers in this area is both complex and varied. Even amongst these experienced geography teachers, the awareness of students' conceptions was uneven. Some teachers demonstrated a very limited knowledge of students' ideas. They were able to outline broad areas of difficulty commonly experienced by students but not specific alternative conceptions. These teachers lacked an understanding of the constructed and robust nature of alternative conceptions and tended to view these beliefs as errors/mistakes or a lack of knowledge. In contrast, other teachers with similar levels of experience were able to provide detailed and specific examples of students' commonly held alternative conceptions. These teachers also understood that alternative conceptions are constructed from students' everyday experiences and that they are based on students' developing (naïve) theories of how the world works.

How Do Geography Teachers Use Their Knowledge of Students' Ideas to Inform Practice?

Research on geography teachers' work with students' ideas suggests that experienced geography teachers use their knowledge of students' ideas in diverse ways in their classrooms. In emerging work with experienced geography teachers, five different uses of this knowledge were identified (Lane, 2015). The teachers used their knowledge of alternative conceptions to: (1) work closely with individuals and groups of students to identify their common alternative conceptions – adopting a constructivist/conceptual change approach to instruction; (2) identify "errors" and address them by "adding content" to their lessons and "build understanding from scratch"; (3) reflect on and evaluate their own content knowledge, epistemological beliefs and pedagogical approach; (4) limit the focus of lessons, script delivery of content, and minimise opportunities for lessons to go "off track"; and (5) prioritise the "covering of content" and avoid any engagement with students' "incorrect" ideas. Some of the teachers in the study adopted a combination of the above approaches.

While this research represents an important first step in our understanding of geography teachers' work with student preconceptions, further research is required to better understand the factors affecting the development of teachers' knowledge in this area. The following section proposes a framework to explain differences in experienced geography teachers' knowledge of, and work with, students' ideas.

Section 2: Model for the Development and Enactment of Geography Teachers' Knowledge of Students' Ideas

The literature in both science and geographical education suggests there is a process to the development and enactment of teachers' knowledge of student ideas and that a range of factors including teachers' content knowledge, epistemological beliefs, knowledge of evidence-based strategies and topic-specific self-efficacy affect this process (see Figure 1).

Emerging research with experienced geography teachers suggests these factors do not operate in a deterministic way but more like a series of filters or barriers affecting the development and enactment of this element of PCK. Each of the filters is of equal importance and their order of application is not important.

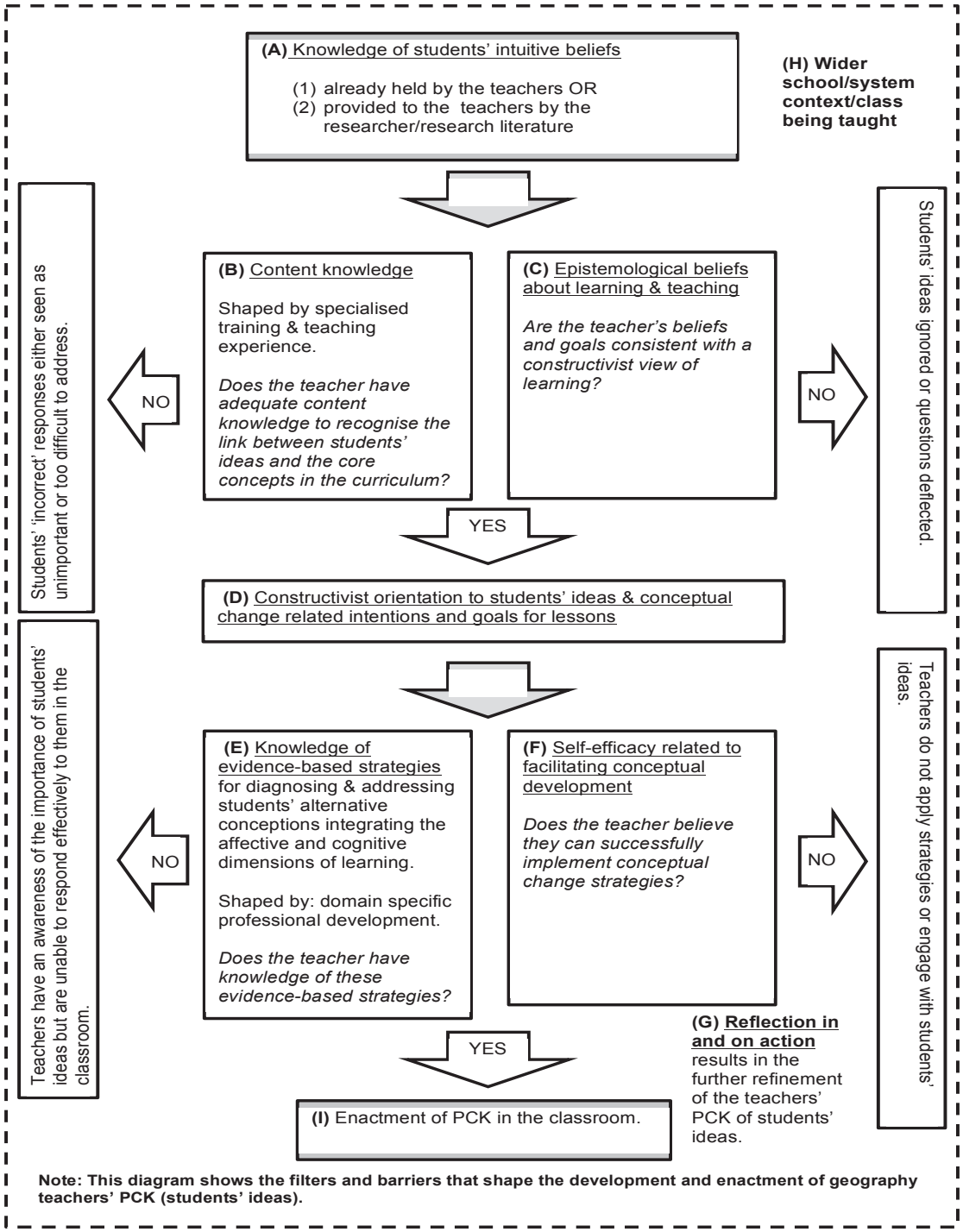
In this section, we propose a framework to explain the development of teachers' knowledge of students' ideas and their use of this knowledge in the classroom. Although models of PCK development and enactment in science education have been proposed in the past (e.g. Park & Oliver, 2008), the model proposed here focuses specifically on experienced *geography teachers'* and their *knowledge of and work with students' ideas.*

Elements of the Model

Figure 1 shows how experienced geography teachers build on their existing knowledge of students' intuitive beliefs and apply this knowledge in the classroom. As discussed in Section 1, the research suggests that experienced geography teachers vary in their initial knowledge of student ideas (as represented by Box A in Figure 1). Some teachers hold knowledge that is fragmented or uni-structural (Biggs & Collis, 1982) i.e. they can list some ideas but not explain the connections between them. Others hold detailed and relational understandings of students' ideas, their construction and development. It is hypothesised that experienced geography teachers use a combination of sources to develop this initial knowledge base. These sources include their own classroom experiences, information obtained from other teachers, studies reported in textbooks and (to a lesser extent) the research literature (Lane, 2009).

The available research with geography teachers indicates that the further development and enactment of this knowledge base involves a

Figure 1 – Factors affecting the enactment and further development of geography teachers' knowledge of students' ideas.



Note: This diagram shows the filters and barriers that shape the development and enactment of geography teachers' PCK (students' ideas).

two-stage process with four specific filters or barriers. Stage 1 [the planning stage] involves teachers developing an understanding of the role of alternative conceptions in the learning process and setting the reconstruction of these ideas as a key goal of instruction (see Figure 1 – Boxes A to D). There are two filters or potential barriers that affect the development of these instructional intentions. These filters include the teachers' depth of content knowledge and their epistemological beliefs about learning and teaching.

Stage 2 of the model considers the factors affecting the application/enactment of this knowledge in the classroom (see Figure 1 – Boxes E to I). Geography teachers with constructivist goals and relational content knowledge may be prevented from enacting their intentions by either a lack of knowledge of evidence-based conceptual change strategies or by a lack of confidence in their ability to successfully implement these strategies in the geography classroom (topic-specific self-efficacy). A teacher's ability to reflect in/on action and their teaching context also plays an important role here (Lane, 2009). The role of these filters/barriers in shaping geography teachers' work with students' ideas is discussed in further detail below.

Stage 1 – Factors affecting teachers' instructional intentions and orientations to students' ideas

(1) Depth and Accuracy of Content Knowledge

More than 30 years of PCK research in science education indicates that teachers' awareness of, and ability to diagnose, alternative conceptions is related to their depth of subject content knowledge (Box B, Figure 1). A number of researchers have noted, for example, that it is unlikely that teachers will be able to recognise, diagnose and address students' alternative conceptions if they themselves possess similar incorrect and imprecise mental models (Dahl, Anderson, & Libarkin, 2005; Hoz, Tomer, & Tamir, 1990; Schoon, 1995; Smith & Neale, 1989). Similarly, researchers in geographical education including Lambert and Hopkin (2014) and Firth (2014) argue that subject-based knowledge is essential if teachers are to be able to recognise alternative conceptions during instruction and develop strategies to help students articulate, compare, analyse, evaluate and where necessary, restructure these ideas. Lane (2011, 2015) in a study involving experienced geography teachers found that participants without a threshold level of knowledge of tropical cyclone causes and processes either failed to recognise alternative conceptions during lessons or avoided engaging with comments and questions from students they were unsure about. A relational understanding (Biggs & Collis, 1982) of atmospheric processes was required before the teachers could identify students' common alternative conceptions during instruction and explain the significance of these beliefs for student learning.

(2) Beliefs About Knowledge, Learning and Teaching

Another key factor affecting teachers' knowledge of and work with students' ideas is their epistemological beliefs (beliefs about knowledge and knowing) and their related beliefs about learning and teaching (Duit et al., 2007; Magnusson, Krajcik, & Borko, 1999). Research across a number of domains suggests that a constructivist orientation to learning and teaching is required before teachers are likely to set the diagnosis and addressing of alternative conceptions as key goals of instruction (Duit et al., 2007; Hashweh, 1996b; Pinnegar, 1989). The importance of teachers' epistemological beliefs in the development and enactment of PCK is represented by Box C in Figure 1. Research in both science and geographical education indicates that teachers' beliefs about knowledge and learning influence their sensitivity towards students' views and their willingness to consider students' preconceptions in their planning and classroom practice. As Schraw and Olafson (2003) note, the different epistemological world views of teachers influence the way they think and make important decisions about teaching and assessment practices. Teachers with a clear understanding of the constructed and intransigent nature of students' preconceptions are more likely to value students' ideas and develop strategies for exploring, extending and, where necessary, challenging these beliefs (Hashweh, 1996a; Lane, 2015).

Recent research with experienced geography teachers (Lane, 2015) demonstrates the important link between teachers' epistemological beliefs and their orientations towards students' ideas. The findings of this study with 16 experienced geography teachers indicate that teachers with constructivist beliefs are more likely to view students' ideas as resources for improving student understanding and sources for reflection and professional growth. The teachers with predominately non-constructivist views of knowledge and learning interpret students' alternative conceptions as signs of knowledge gaps; indicators of failure in the learning/teaching process; or distractions from the key goals of instruction. These contrasting beliefs about learning and teaching shape the way individual teachers use their knowledge of students' ideas

to inform instruction. The research suggests that teachers without an understanding of the constructed nature of students' ideas are unlikely to recognise the importance of supporting students to articulate, compare, analyse, evaluate and where necessary restructure their intuitive mental models. As a result, students' alternative conceptions may be overlooked or ignored during instruction. Inquiry-based learning approaches, such as those advocated in the Australian Curriculum: Geography, may not be adopted (see the arrow to the right of Box C).

Stage 2– Factors Affecting Teachers' Work With Students' Ideas

(1) Knowledge of Evidence-Based Strategies for Diagnosing and Working With Students' Alternative Conceptions and an Ability to Reflect on Practice

While constructivist goals and intentions help teachers recognise the importance of students' ideas, they alone are not sufficient. To work productively with students' ideas (Box I), teachers also require knowledge of evidence-based strategies for diagnosing students' preconceptions and for promoting conceptual development (Box E).

Although there is no singular agreement among researchers regarding the mechanisms of conceptual change (Clement, 2008), a number of possible approaches for improving the conceptual understanding of students can be identified from the literature. These strategies require teachers to consider the epistemological (views of knowledge and learning), ontological (worldviews or views about the nature of reality and being) and affective dimensions (emotions, motivation and social aspects) of learning (Duit, Treagust, & Widodo, 2008). Examples of evidence-based conceptual change approaches include the following:

- regularly assessing and monitoring the validity of students' conceptions (Ozturk & Alkis, 2010);
- engaging students in a variety of rich tasks where they are encouraged to explore and evaluate a range of explanations for geographical phenomena including their personal beliefs and theories;
- promoting the expression of intuitive conceptions in class and using students' ideas as the starting point for instruction;
- encouraging students to identify the key characteristics of concepts and to differentiate between related ideas – e.g. boiling and evaporation (Carey, 1991);
- designing curricula so that students from early years onwards are exposed to learning experiences that help them build the required prior knowledge for understanding more complex concepts in the curriculum (Vosniadou, 2008). An example of this is the progressive building of students' understanding of key weather and climate processes within the Australian Curriculum: Geography and Science (F–10);
- building students' reflective and metacognitive skills so they are more aware of their beliefs and assumptions and are able to identify and monitor inconsistencies in these beliefs (Inagaki & Hatano, 2003);
- promoting substantive discussions in class where students feel comfortable expressing their beliefs and are given the opportunity to identify and reflect upon inconsistencies in their explanations – e.g. using *Thinking through geography* strategies and other similar approaches (Leat, 2001);
- promoting argument and debate rather than consensus in the classroom. Dove (1999) suggests a number of strategies for achieving this in physical geography;
- modelling the application of processes and principles in real world contexts – e.g. through the use of simulations and hypotheticals;
- breaking down complex phenomena, such as the processes of a tropical cyclone, and providing opportunities for students to explore the individual processes and principles in a range of contexts1[1] ; and
- building students' critical literacy skills so they can question the accuracy of representations of geographical processes depicted in popular culture and differentiate these ideas from established scientific understandings (Luke, 1999). The dominance of images/representations of natural hazards in popular culture, for example, makes these critical literacy skills particularly important in physical geography. An awareness of the multiple purposes of texts can also assist students to decipher scientific fact from entertainment.

Without a repertoire of effective instructional approaches, geography teachers may struggle to translate the intention of working with students' ideas and building depth of understanding into action (see the arrow to the left of Box E in Figure 1).

Teachers most responsive to students' ideas also have a capacity to reflect on their practice both during and after lessons (Jones et al., 1999; Lane, 2011, 2015; Loughran, Mulhall, & Berry, 2008; Sperandeo-Mineo, Fazio, & Tarantino, 2006; Wang, 2004). These teachers are attentive to students' ideas and use the information collected from diagnostic/formative assessment to

identify alternative conceptions, monitor student understanding, and make ongoing adjustments to their practice (Box G).

Without an awareness of evidence-based strategies and an ability to effectively reflect on practice, geography teachers are unlikely to apply their knowledge of students' ideas in the classroom and further develop their understanding of students' common alternative conceptions.

(2) Teacher Self-Efficacy Related To the Application of Conceptual Change Strategies in Physical Geography

There is considerable evidence over many years of the importance of self-efficacy in shaping teaching practice (Dembo & Gibson, 1985; Guskey, 1988; Schunk, 1990). Self-efficacy, according to Bandura (1977, 1986), refers to an individual's belief in their competence to complete a task or meet a goal. In this case, the key factor is the teachers' confidence in their ability to effectively apply conceptual change strategies in specific topic areas. According to Park and Oliver (2008) ". . . when teachers believe in their capacity to execute their PCK effectively, the PCK will be more likely to be enacted in actual classrooms" (p. 270). They also note that greater teacher self-efficacy promotes the development of "worthier professional goals and manifests as a willingness to try new teaching strategies" (Park & Oliver, 2008, p. 271). Without this confidence, teachers of geography are unlikely to effectively employ topic-specific conceptual change strategies in the classroom (Appleton, 2006; Park & Oliver, 2008).

These findings suggest that self-efficacy related to facilitating conceptual change/development (represented by Box F in Figure 1) is likely to be important for the growth and enactment of geography teachers' PCK.

(3) Teaching Context

In addition to the above factors, the conceptual change research suggests that teaching context can play an important role in either encouraging or inhibiting teachers' work with students' ideas. Lane (2009) and Morrison and Lederman (2003) outline a number of elements of the teaching context which affect teachers' work with students' ideas. These include the perceived pressure to *cover* content for external examinations, time constraints, conflicting school/system priorities and lack of professional development focused on strategies for working with students' ideas. These pressures have a significant impact on teachers' priorities and are often cited by experienced geography teachers as reasons for not supporting students to articulate and evaluate their intuitive ideas (Lane, 2009). Box H in Figure 1 emphasises the likely importance of these factors in influencing geography teachers' work with students' ideas – an important component of PCK.

Further research using semi-structured interviews, lesson observations and video stimulated recall sessions may also help identify additional factors/filters shaping geography teachers' knowledge of common alternative conceptions and the use of this knowledge to inform instruction. It is likely, for example, that teachers' own school experiences and ontological worldviews – collective beliefs about the nature of reality and being – play a role in shaping their practice in this area (Hutchinson, 2013). Data collected from the exploration of these factors could be used to further refine the model of PCK development and enactment.

Discussion/Conclusion

The model presented above suggests it is insufficient for both research and professional development to focus solely on investigating and enhancing teachers' knowledge of new curriculum content or strategies for promoting geographical understanding. In particular it highlights the importance of adopting a holistic approach to the development of geography teachers' PCK. This has implications for the pre-service training, accreditation and ongoing professional development of geography teachers. Constructing and supporting the PCK of geography teachers is a complex task. To enhance teachers' work with students' ideas, we need to focus on building their knowledge and skills in each of the six areas (Boxes A-F) identified in Figure 1. Firstly, pre-service teachers need to develop a relational understanding of core geographical concepts and develop an understanding of the role of knowledge reconstruction in the learning process. Secondly, it is vital that geography teachers continue to consolidate their understanding of *the foundational concepts and processes* of physical geography throughout their careers and refine their ability to reflect on practice. Finally, it is important that teachers receive adequate system and school-level support to develop their knowledge of evidence-based strategies and to foster a strong sense of teacher self-efficacy (belief in their ability to affect learning outcomes).

A key message from Figure 1 and the literature is the need to ensure that teachers of geography have sound content knowledge. This presents a challenge for both pre-service teacher training and ongoing professional learning. According to the National Professional Standards for Teachers (Australian Institute for Teaching and School Leadership [AITSL], 2011, p. 10), graduate teachers should be able to "demonstrate

knowledge and understanding of the concepts, substance and structure of the content and teaching strategies of [their] teaching area". For geography teachers, it is important that this includes sound knowledge of the underlying processes and principles of both human and physical geography. The results of recent studies (Lane, 2009, 2011, 2015; Lane & Coutts, 2012) indicate that teachers without a background in core geographical processes find it most difficult to identify and work with students' alternative conceptions. This is likely to be more evident with pre-service and early career teachers since the research has shown they are more likely to be driven by self-efficacy concerns and a preoccupation with the procedural and practical aspects of day-to-day teaching (Evans & Tribble, 1986).

Minimum subject content requirements for accreditation play an important role in shaping the content knowledge of graduate teachers. The minimum discipline specific study requirements for teachers in Australia are mandated by AITSL. Students wishing to teach geography as a first teaching subject are required to complete at least six units of study in the discipline with no more than two units at a first year level. There is no specific requirement, however, for pre-service teachers to study a combination of units in physical and human geography. The model presented above and the literature on which it is based suggest that an academic major in geography, with a balance of units across human and physical geography, may provide graduating teachers with a better understanding of the key underlying processes for teaching secondary geography. Whilst it is not possible for pre-service teachers to complete undergraduate studies in all aspects of the curriculum, foundational studies in physical and human geography would appear to be essential (Lane, 2011). Indeed, it would make good sense for those advising pre-service teachers in geography to have a balance between the two as both are required in the teaching of geography in schools.

Once within the school system, there is a need to encourage geography teachers to continue to update and consolidate their content knowledge by engaging in ongoing professional learning. It is insufficient for professional learning to focus exclusively on new curriculum content, teaching approaches and support resources. It is vital that professional learning reinforces teachers' understanding of the foundational concepts and processes of physical geography. The Professional Standards for Accomplished Teaching of School Geography (University of Melbourne, Australian Geography Teachers' Association, Geography Teachers' Association of Victoria, & Victorian Institute of Teaching, 2010) state that accomplished teachers of geography should be able to "promote understandings of physical and human processes, structures and patterns and their interdependence in place, space and time" (p.4). This involves recognising alternative conceptions during instruction and developing strategies to help students articulate, compare, analyse, evaluate and where necessary, restructure these ideas. To achieve this, teachers need to "know the breadth and depth of the academic discipline including its concepts, skills, values and understandings" (p.3). Lane (2011) discusses a number of approaches for improving the accuracy and depth of geography teachers' content knowledge. These strategies include engaging teachers in reflection and discussions to promote cognitive conflict and promoting wider involvement with professional associations. Reflexivity can be strengthened through peer interactions and social media interactions between practitioners. These networks provide invaluable opportunities for critical reflection with colleagues and can help build motivation for lifelong learning. The resources provided by professional associations, including journals, conferences and workshops, can also provide important content knowledge support.

The literature and model (Figure 1) also suggest that working with students' ideas requires that teachers hold beliefs about learning and teaching that are consistent with conceptual change approaches to instruction. We cannot assume that all experienced geography teachers are aware of the impact of their beliefs on classroom instruction. Of the 16 experienced geography teachers in Lane's study (2015), none of the teachers with transmissionist or partly-constructivist beliefs (n=13) communicated any concerns about the implications of their beliefs about learning for classroom instruction. The first challenge, therefore, is to raise geography teachers' awareness of their beliefs about learning and teaching and the impact of these beliefs on classroom practice.

Raising awareness of epistemological beliefs and challenging them is a difficult process. Recent research (Reinfried, 2006b, 2007; Reinfried et al., 2012) using the model of educational reconstruction (Duit, Gropengiesser, Kattmann, Komorek, & Parchmann, 2012) and 5Es approach (Bybee, Taylor, Gardner, Van Scotter, Powell, Westbrook, & Landes, 2006) suggests that a mental model-building approach may be effective in challenging and reconstructing geography teachers' beliefs. These approaches provide teachers with an opportunity to experience conceptual change first-hand so they can gain a better understanding of the nature of students' intuitive beliefs and the importance of these ideas in the learning process. It should be noted,

however, that there is a paucity of literature investigating the nature of geography teachers' epistemological beliefs and the implications for instruction. This is, therefore, an important area for further research.

Having relational content knowledge and constructivist beliefs is, however, not sufficient for teachers to successfully implement conceptual change strategies in the classroom. Working effectively with students' ideas also requires knowledge of evidence-based strategies for facilitating conceptual development (Box E). A key feature of these strategies is that they encourage students to articulate, elaborate on and share their preconceptions about core ideas in the curriculum. It is vital that professional learning for geography teachers focuses not only on general approaches for learning new syllabus content but also on concept specific strategies for helping reconstruct common alternative conceptions in physical geography.

The developmental model outlined in Figure 1 also highlights the need for both systems and schools to build teachers' self-efficacy or confidence in their ability to promote student learning (Hoy, 2000). Research across a number of domains highlights the relationship between topic-specific self-efficacy and teachers' general feelings of self-efficacy. It can be hypothesised that having a strong sense of self-efficacy is a necessary precondition for the development of confidence in the use of topic-specific conceptual change strategies in physical geography. Jerald (2007), in his review of the research in this area, argues that teachers with a stronger sense of self-efficacy are more open to new ideas and are more willing to experiment with methods to better meet the needs of their students (such as the conceptual change strategies outlined earlier). In contrast, teachers with weak sense of self-efficacy are unlikely to engage with students' ideas because of a fear that student comments and questions might derail their lesson or that they may not be able to adequately respond to students' questions (Lane, 2009). While it is clear that teacher self-efficacy plays an important role in the process of PCK development, further research is required to better understand the individual elements of topic-specific self-efficacy and their impact on teachers' work with students' ideas.

References

Appleton, K. (2006). Science pedagogical content knowledge and elementary school teachers. In K. Appleton (Ed.), *Elementary science teacher education: International perspectives on contemporary issues and practice* (pp. 31–54). Mahwah, NJ: Lawrence Erlbaum Associates.

Arnold, P., Sarge, A., & Worrall, L. (1995). Children's knowledge of the earth's shape and its gravitational field. *International Journal of Science Education, 17*(5), 635–641. doi: 10.1080/0950069950170507

Australian Institute for Teaching and School Leadership (2011). *National professional standards for teachers*. Carlton South: Education Services Australia. Retrieved from http://www.teacherstandards.aitsl.edu.au/

Australian Meteorological and Oceanographic Society. (2014). *Review of the Australian Curriculum*. Canberra: Australian Government Department of Education.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall.

Berg, T., & Brouwer, W. (1991). Teacher awareness of student alternative conceptions about rotational motion and gravity. *Journal of Research in Science Teaching, 28*(1), 3–18. doi: 10.1002/tea.3660280103

Berliner, D. (2001). Learning about and learning from expert teachers. *International Journal of Educational Research, 35*(5), 463–482. doi: 10.1016/S0883-0355(02)00004-6

Biggs, J., & Collis, K. (1982). *Evaluating the quality of learning: The SOLO taxonomy (structure of the observed learning outcome)*. New York: Academic Press.

Boyes, E., & Stanisstreet, M. (1997). The environmental impact of cars: children's ideas and reasoning. *Environmental Education Research, 3*(3), 269–82. doi: 10.1080/1350462970030302

Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). The BSCS 5E instructional model: Origins and effectiveness. *Colorado Springs, CO: BSCS, 5*, 88–98.

Carey, S. (1991). Knowledge aquisition: enrichment or conceptual change? In S. Carey & R. Gelman (Eds.), *The Epigenesis of mind: essays on biology and cognition* (pp. 257–291). Hillsdale, NJ: Lawrence Erlbaum Associates.

Clement, J. (2008). The role of explanatory models in teaching for conceptual change. In S. Vosniadou (Ed.), *International handbook of research on conceptual change*. New York: Routledge.

Clough, E., & Driver, R. (1986). A study of consistency in the use of students' conceptual

frameworks across different task contexts. *Science Education, 70*(4), 473–496. doi: 10.1002/sce.3730700412

Dahl, J., Anderson, S. W., & Libarkin, J. C. (2005). Digging into earth science: Alternative conceptions held by K-12 teachers. *Journal of Science Education, 6*(2), 65–68.

Dembo, M. H., & Gibson, S. (1985). Teachers' sense of efficacy: An important factor in school improvement. *The Elementary School Journal, 86*(2), 173–184.

Dickerson, D., Callahan, T., Van Sickle, M., & Hay, G. (2005). Students' conceptions of scale regarding groundwater. *Journal of Geoscience Education, 53*(4), 374–380.

Dove, J. E. (1996). Student identification of rock types. *Journal of Geoscience Education, 44*(3), 266–269.

Dove, J. E. (1997). Student ideas about weathering and erosion. *International Journal of Science Education, 19*(8), 971–980. doi: 10.1080/0950069970190809

Dove, J. E. (1998a). Alternative conceptions about the weather. *School Science Review, 79*(289), 65–69.

Dove, J. E. (1998b). Students' alternative conceptions in earth science: a review of research and implications for teaching and learning. *Research Papers in Education, 13*(2), 183–201. doi: 10.1080/0267152980130205

Dove, J. E. (1999). *Theory into practice: immaculate misconceptions*. Sheffield, UK: The Geographical Association.

Dove, J. E. (2012). Tropical rainforests: a case study of UK, 13-year-olds' knowledge and understanding of these environments. *International Research in Geographical & Environmental Education, 21*(1), 59–70. doi: 10.1080/10382046.2012.639150

Dove, J. E. (2014). Exploring students' ideas about the Arctic. *Teaching Geography, 39*(3), 102–105.

Dove, J. E., Everett, L. A., & Preece, P. F. W. (2000). The urban child's conception of a river. *Education 3–13, 28*(2), 52–56. doi: 10.1080/03004270085200221

Driver, R. (1989). Students' conceptions and the learning of science. *International Journal of Science Education, 11*(5), 481–490. doi: 10.1080/0950069890110501

Driver, R., Squires, A., Ruchworth, P., & Wood-Robinson, V. (1994). *Making sense of secondary science. Research into children's ideas.* London: Routledge.

Duit, R., Gropengiesser, U. K., Kattmann, U., Komorek, M., & Parchmann, I. (2012). The model of educational reconstruction – a framework for improving teaching and learning science. In D. Jorde & J. Dillon (Eds.), *Science education research and practice in Europe: Retrospective and prospective* (pp. 13–38). Rotterdam: Sense Publishers.

Duit, R., Treagust, D., & Widodo, A. (2008). Teaching science for conceptual change: Theory and practice. In S. Vosniadou (Ed.), *International handbook of research on conceptual change* (pp. 629–646). New York: Taylor and Francis.

Duit, R., Widodo, A., & Wodzinski, C. (2007). Conceptual change idea: teachers' views and their instructional practice. In S. Vosniadou, A. Baltas, & X. Vamvakoussi (Eds.), *Re-framing the conceptual change approach in learning and instruction* (pp. 197–217). Amsterdam: Elsevier, in association with the European Association of Learning and Instruction.

Evans, E. D., & Tribble, M. (1986). Perceived teaching problems, self-efficacy, and commitment to teaching among preservice teachers. *The Journal of Educational Research, 80*(2), 81–85.

Firth, R. (2014). Disiplinary knowledge: task design in geography. In I. Thompson (Ed.), *Designing tasks in secondary education: Enhancing subject understanding and student engagement* (pp. 70–85). London: Routledge.

Ghaye, A. L., & Robinson, E. G. (1989). Concept maps and children's thinking: a constructivist approach. In F. Slater (Ed.), *Language and learning in the teaching of geography*. London: Routledge.

Greca, I. M., & Moreira, M. A. (2000). Mental models, conceptual models, and modelling. *International Journal of Science Education, 22*(1), 1–11. doi: 10.1080/095006900289976

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education, 4*(1), 63–69.

Halim, L., & Meerah, S. M. (2002). Science trainee teachers' pedagogical content knowledge and its influence on physics teaching. *Research in Science & Technological Education, 20*(2), 215–225. doi: 10.1080/0263514022000030462

Harrison, A., & Purnell, K. N. (2012). Sustainability education in Australia: Using the evidence. In M. Robertson (Ed.), *Schooling for sustainable development: A focus on Australia, New Zealand and the Oceanic region* (pp. 15–31). Sydney: Springer.

Hashweh, M. (1996a). The effects of science teachers' epistemological beliefs in teaching. *Journal of Research in Science Teaching, 33*(1), 47–63. doi: 10.1002/(SICI)1098-2736(199601)33:1<47::AID-TEA3>3.0.CO;2-P

Hashweh, M. (1996b). Palestinian science teachers' epistemological beliefs: A preliminary survey. *Research in Science Education, 26*(1), 89–102. doi: 10.1007/BF02356965

Hollon, R., & Anderson, C. (1987). *Teachers' beliefs about students' learning processes in science: Self-reinforcing belief systems*. Paper presented at the Annual Meeting of the American Educational Research Association, Washington, DC.

Hoy, A. W. (2000). *Changes in teacher efficacy during early years of teaching*. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans.

Hoz, R., Tomer, Y., & Tamir, P. (1990). The relations between disciplinary and pedagogical knowledge and the length of teaching experience of biology and geography teachers *Journal of Research in Science Teaching, 27*(10), 973–985.

Hutchinson, N. (2013). World views, a story about how the world works: Their significance in the Australian Curriculum: Geography. *Geographical Education, 26*, 12–24.

Inagaki, K., & Hatano, G. (2003). Conceptual and linguistic factors in inductive projection: How do young children recognise commonalities between animals and plants? In D. Genter & S. Goldin-Meadow (Eds.), *Language in mind*. pp 313–334. Cambridge, MA: MIT Press.

Jerald, C. D. (2007). *Believing and achieving*. Washington, D.C: Center for Comprehensive School Reform and Improvement.

Jones, M. G., Carter, G., & Rua, M. J. (1999). Children's concepts: Tools for transforming science teachers' knowledge. *Science Education, 83*(5), 545–557. doi: 10.1002/(SICI)1098-237X(199909)83:5<545::AID-SCE3>3.0.CO;2-U

Lambert, D., & Balderstone, D. (2010). *Learning to teach geography in the secondary school* (2nd ed.). London: RoutledgeFalmer.

Lambert, D., & Hopkin, J. (2014). A possibilist analysis of the geography national curriculum in England. *International Research in Geographical and Environmental Education, 23*(1), 64–78. doi: 10.1080/10382046.2013.858446

Lane, R. (2009). Articulating the pedagogical content knowledge of accomplished geography teachers. *Geographical Education, 22*, 40–49.

Lane, R. (2011). Exploring the content knowledge of experienced geography teachers. *Geographical Education, 24*, 51–63.

Lane, R. (2015). Experienced geography teachers' PCK of students' ideas and beliefs about learning and teaching. *International Research in Geographical & Environmental Education, 24*(1), 43–57 doi: 10.1080/10382046.2014.967113

Lane, R., & Coutts, P. (2012). Students' alternative conceptions of tropical cyclone causes and processes. *International Research in Geographical & Environmental Education, 21*(3), 205–222. doi: 10.1080/10382046.2012.698080

Leat, D. (2001). *Thinking through geography* (2nd ed.). Cambridge: Chris Kington.

Leat, D., & Chandler, S. (1996). Using concept mapping in geography teaching. *Teaching Geography, 21*(3), 4–7.

Lee, O. (1999). Science knowledge, world views, and information sources in social and cultural contexts: making sense after a natural disaster. *American Educational Research Journal, 36*(2), 187–219. doi: 10.3102/00028312036002187

Loughran, J., Mulhall, P., & Berry, A. (2008). Exploring pedagogical content knowledge in science teacher education. *International Journal of Science Education, 30*(10), 1301–1320. doi: 10.1080/09500690802187009

Luke, C. (1999). Media and cultural studies in Australia. *Journal of Adolescent & Adult Literacy, 42*(8), 622–626.

Magnusson, S., Krajcik, J., & Borko, H. (1999). Nature, sources and development of pedagogical content knowledge for science teaching. In J. Gess-Newsome & N. Lederman (Eds.), *Examining pedagogical content knowledge* (pp. 95–132). Dordrecht: Kluwer.

Morrison, J., & Lederman, N. (2003). Science teachers' diagnosis and understanding of students' preconceptions *Science Education, 87*(6), 849–867. doi: 10.1002/sce.10092

Nelson, B., Aron, R., & Francek, M. (1992). Clarification of selected misconceptions in physical geography. *Journal of Geography, 91*(2), 76–80.

Olafson, L., Schraw, G., & Vander Veldt, M. (2010). Consistency and development of teachers' epistemological and ontological

world views. *Learning Environments Research, 13*(3), 243–266.

Osborne, R. J., Bell, B. F., & Gilbert, J. K. (1983). Science teaching and children's views of the world. *International Journal of Science Education, 5*(1), 1–14.

Ozdemir, G., & Clark, D. B. (2007). An overview of conceptual change theories. *Eurasia Journal of Mathematics, Science and Technology Education, 3*(4), 351–361.

Ozturk, M., & Alkis, S. (2010). Misconceptions in geography. *Geographical Education, 23*, 54–63.

Park, S., & Oliver, J. S. (2008). Revisiting the conceptualisation of pedagogical content knowledge (PCK): PCK as a conceptual tool to understand teachers as professionals. *Research in Science Education, 38*(3), 261–284.

Peet, R. (1998). *Modern geographical thought*. Oxford: Blackwell.

Pinnegar, S. (1989). *Teachers' knowledge of students and classrooms.* (Doctor of Philosophy), University of Arizona, Tucson.

Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzog, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66*(2), 211–227. doi: 10.1002/sce.3730660207

Reinfried, S. (2004). Can we achieve scientific literacy in geography without understanding learners' mental models? Paper presented at the Expanding horizons in a shrinking world : symposium proceedings, University of Strathclyde, Faculty of Education, Glasgow.

Reinfried, S. (2006a). Conceptual change in physical geography and environmental sciences through mental model building: The example of groundwater. *International Research in Geographical and Environmental Education, 15*(1), 41–61.

Reinfried, S. (2006b). Educational reconstruction as a frame for development and research in the teaching and learning of geography – A new approach in the education of secondary teachers. *Changes in Geographical Education: Past Present and Future. Proceedings of the International Geographical Union Commission on Geographical Education Symposium.* Brisbane, Australia.

Reinfried, S. (2007). Educational reconstruction – a key to progress in geoscience teaching and learning. *Geographie und ihre Didaktik, 4*, 232–244.

Reinfried, S., Aeschbacher, U., & Rottermann, B. (2012). Improving students' conceptual understanding of the greenhouse effect using theory-based learning materials that promote deep learning. *International Research in Geographical & Environmental Education, 21*(2), 155–178. doi: 10.1080/10382046.2012.672685

Reinfried, S., & Schuler, S. (2009). The Ludwigsburg-Lucerne bibliography of misconception research in the geosciences – a project to capture the international research literature. *Geography and its Didactics, 37*(3), 120–135.

Royal Meteorological Society, & National Centre for Atmospheric Science. (2014). *Climate change updates: evidence from the 2013 Intergovernmental Panel on Climate Change (IPCC). Report for Geography Teachers.* Reading: Royal Meteorological Society.

Schoon, K. (1995). The origin and extent of alternative conceptions in the earth and space sciences: a survey of pre-service elementary teachers *Journal of elementary science education. , 7*(1), 27–47.

Schraw, G., & Olafson, L. (2003). Teachers' epistemological world views and educational practices. *Journal of cognitive education and psychology, 3*(2), 178–235. doi: http://dx.doi.org/10.1891/194589503787383109

Schunk, D. H. (1990). Introduction to the special section on motivation and efficacy. *Journal of Educational Psychology, 82*(1), 3.

Shulman, L. (1986). Those who understand: knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Shulman, L. (1987). Knowledge and teaching: foundations of the new reform. *Harvard Educational Review, 57*(1), 1–22.

Smith, D. C., & Neale, D. C. (1989). The construction of subject matter knowledge in primary science teaching. *Teaching and Teacher Education, 5*(1), 1–20.

Sperandeo-Mineo, R. M., Fazio, C., & Tarantino, T. (2006). Pedagogical content knowledge development and pre-service physics teacher education: a case study. *Research in Science Education, 36*(3), 235–268.

University of Melbourne, Australian Geography Teachers Association, Geography Teachers' Association of Victoria, & Victorian Institute of Teaching. (2010). *GEOGstandards: Professional standards for accomplished teaching of school geography.* Retrieved from http://www.geogstandards.edu.au/

Vosniadou, S. (Ed.). (2008). *International handbook of research on conceptual change*. New York: Taylor and Francis.

Vosniadou, S., Vamvakoussi, X., & Skopeliti, I. (2008). The framework theory approach to the problem of conceptual change. In S. Vosniadou (Ed.), *International handbook of research on conceptual change* (pp. 3–34). New York: Routledge.

Wang, J. R. (2004). Enhancing elementary science teachers' knowledge of teaching: the case of designing and implementing an instructional unit. *International Journal of Science and Mathematics Education, 2*(4), 455–476.

Young, M., & Muller, J. (2010). Three educational scenarios for the future: Lessons from the sociology of knowledge. *European Journal of Education, 45*(1), 11–27.

Endnote

1 Australian Meteorological and Oceanographic Society (2014, p. 188) notes in its Submission to the Review of the Australian Curriculum (p. 188), for example, that "It is not clear how students are supposed to understand or appreciate the mechanisms that drive meteorological or oceanographic hazards (e.g. tropical cyclones) without having prior and scaffolded exposure to the geophysical variables (e.g. ocean heat content, wind shear, earth's rotational effects) and the dynamical and thermodynamical principles which drive them."

The Place of Place-Based Education in the Australian Primary Geography Curriculum

Lou Preston
Senior Lecturer in Education, Deakin University, Geelong Waurn Ponds Campus, Victoria

Abstract

The idea for this paper emerged from a recent qualitative investigation which examined the ways in which six Australian primary teachers conceptualised geography and geography teaching (Preston, 2014b). A finding of this research was a strong correlation between the breadth of geographical understandings and the years of experience and age of participants. For early career teachers, conceptions of geography were narrowly confined to information-oriented perceptions. Whereas, the two teachers, with more than 30 years in primary schools, portrayed much more complex understandings. Their conceptions depicted geography as process-oriented and in relational terms, that is, understandings of geography that recognise the interactions and interdependence of people and environments (Bradbeer, Healey, & Kneale, 2004). Both these experienced teachers were also committed to place-based, inquiry approaches to geography teaching and had been using place-based methodologies long before it became a *new movement* in education (Morgan, 2009, p. 521). This prompted me to question why geography education seldom features in discourses of place-based education and to contemplate the oft-cited argument (at least in the United States) that the recent focus on curriculum standards is incompatible with locally responsive curriculum (Jennings, Swidler, & Koliba, 2005).

In order to answer these questions, I explore the intersections and divergences between place-based education and geography education in the Australian context. Drawing on Smith's (2002) and Gruenewald's (2003) conception of place-based education, and the new Australian geography curriculum document, I argue that primary geography education has strong synergies with place-based education methodologies and aims. I further suggest that a geographical perspective can augment place-based education to enrich and broaden students' understandings of the complex interactions between and within places. This argument is balanced with a critical examination of the practice of geography education acknowledging that the tradition of fieldwork might benefit from place-based education approaches that enable more embodied, socially engaged interactions with places. Thus, I contend, place-based education and geography education are mutually supportive and each can extend the other. The paper concludes with a reflection on the challenges in Australia in preparing primary teachers for the implementation of the new (place-based) geography curriculum.

Place-Based Education

The concept of place-based education is often attributed to US scholars, for example, Gruenewald (2003), Orr (1992, 1994), Smith (2002), Sobel (1996, 2004), Theobald (1997), and Woodhouse and Knapp (2000). It is viewed as a corrective to an educational climate that is perceived as increasingly framed by a discourse of accountability and a focus on standards-based teaching, decontextualized knowledge and mandated testing (Gruenewald, 2003). Advocates argue the benefits of a place-based education approach include: strengthening connections between students/schools and their communities (Smith, 2002), reducing student alienation through increasing the relevance and authenticity of learning experiences (Theobald & Curtiss, 2000), providing opportunity for active participation in democratic processes including problem solving and decision-making (Sobel, 2004), increasing students' appreciation of their local environments (Theobald, 1997), and fostering ecological literacy (Orr, 1992).

Place-based education takes a variety of forms but, in a review of place-based learning practices, Smith (2002, p. 593) identified five common elements. These include:

- using local phenomena as the basis for curriculum development;
- an emphasis on learning experiences that encourage students to become creators (rather than the consumers) of knowledge;

- a study focus that is determined by students' questions and concerns;
- the role of teachers as "experienced guides, co-learners, and brokers of community resources and learning possibilities" (p. 593); and
- increasing the permeability of boundaries between school and community and the frequency of participation and engagement in and with the community.

Gruenewald (2003) extends Smith's five key features by advocating for a transformative approach to place-based education; a pedagogy that is socially and ecologically critical and which has an ultimate aim of "learning more socially just and ecologically sustainable ways of being in the world" (p. 9). Below, I explore the extent to which these key characteristics outlined by Gruenwald (2003) and Smith (2002) cohere with the new Australian primary geography curriculum. But first, I examine some understandings of place-based education in the Australian context. This is followed by an interrogation of the term *place* drawing on the work of Doreen Massey.

Place-Based Education in Australia

In education literature, place-based education is characterised as a *new movement* or an *emerging field* (Morgan, 2009, p. 521). However, place-based education is not a new phenomenon. In its many forms, place-based education has a long history in cultural studies and natural history studies (Smith, 2002), and, in the Australian context, through outdoor and environmental education. Over the last two decades, writers in the field of outdoor and/or environmental education in Australia have been promoting the efficacy of a place-based approach to help reverse the detachment of humans from the more-than-human world (e.g., Birrell, 2001; Brookes, 1993, 1994; Cameron, 2001, 2003; Ellis-Smith, 1999; Gough, 1990; Martin, 1999; Nettleton, 1993; Preston, 2004; Seddon, 1997; Stewart, 2003, 2004; Wattchow, 2001a, 2001b; Wattchow & Brown, 2011). In my own work as a geographer *turned* outdoor and environmental educator, I have argued for an outdoor and environmental education practice that replaces "abstracted environments with particular places" and substitutes "generic methods with contextually specific learning opportunities" (Preston, 2004, p. 18). In the program in which I was then involved, I was seeking to cultivate and explicitly value the use of local knowledge and local places to improve connections between humans and the more-than-human world as well as providing meaningful opportunities for strengthening community links and action. Similar to Gruenewald's critical pedagogy of place, this *critical* outdoor education focuses on contextual knowledge of particular places to develop understandings, and a reshaping, of interactions, relationships and connections with individuals, communities and regions and their environments. This *situationist* approach, Brookes argues, brings "much needed sensitivity to cultural, regional, historical, and social contexts" (2003, p. 119). The critical lens also seeks to interrogate the cultural beliefs and practices that may be contributing to social injustice and ecological destruction, typically organised under headings such as rationalism, patriarchy, individualism, anthropocentrism, and positivism (Brookes, 1994; Martin, 1999). Such scrutiny, it is argued, provides opportunity to develop a capacity to identify and/or choose alternative *mindsets* (Brookes, 1993) or worldviews, that is, those that encourage more socially and ecologically just and sustainable lifestyles.

While geography, as the study of place, has obvious affinities of subject matter and purpose, it is seldom mentioned in place-based education discourse in Australia or elsewhere (Israel, 2012). For example, Gruenewald (2003) provides a comprehensive list of traditions that are connected to place-based education including "outdoor education, indigenous education, environmental and ecological education, bioregional education, democratic education, multicultural education, community-based education . . ." (p. 3); conspicuous in its absence is geography education. This omission is surprising given the distinct and significant contributions of geography to the study of place, particularly its utility in understanding and analysing the relationships between environments (places) and human activities. Geography's spatial and scalar perspectives provide rich insights into the study of place. These perspectives afford a means of analysing the myriad of connections and effects of natural, social, cultural, economic, political, technological and global processes at a range of scales. Geography thus attends to the multiple intersections and interactions within and beyond place. This, I argue below, is crucial to the critical perspective espoused by Gruenewald (2003) and, in the next section, I elaborate on the merit of an outward looking sense of place through Doreen Massey's conceptualisation of place.

Massey's Conceptualisation of Place

Although place is a term at the very heart of geography and ubiquitous in geography education, its meaning is contested in the academic field (Major, 2010, p. 90). Depending on the geographic persuasion, the meanings ascribed to place can be widely divergent. In this paper, I draw on poststructuralist, cultural geographer,

Doreen Massey to critique some views of place commonly associated with place-based education in order to show the ways in which a *critical*, geographical perspective on place can enrich and broaden our "understanding of the social world and how to effect transformation in and of it" (Callard, 2009, p. 219).

Massey (1994a) often defines place by describing what it is not. She depicts place as: not territorially bounded (but open and porous); not having single identities (but always multiple, unfixed and contested); not static (but dynamic, ever changing). She suggests that places should not be viewed as "points or areas on a map, but as integrations of space and time; as *spatio-temporal events*" (2005, p. 130, Emphasis in original). Massey does not deny the importance of the uniqueness of place but argues that the particularity of place lies in the mix of links and interconnections to that which lies beyond (1994a, p. 5). In other words, places are shaped by other places "constructed out of a particular constellation of social relations, meeting and weaving together at a particular locus" (1994b, p. 154). A further element of the specificity of place, she argues, is the accumulated history of a place – "the product of layer upon layer of different sets of linkages, both local and to the wider world" (1994b, p. 156). Thus, the assemblage of processes and linkages that construct places extend beyond the local, often at sites far removed in time and place. This outward looking or "a global sense of place" (Massey, 2005, p. 131) provides a relational reading of place; one which considers place as immersed in global networks, distant influences both past and present, and continuously changing.

Massey's conceptualisation of place is significant to understanding place in place-based education. The discourse of place-based education often represents local place as homogenous, unchanging and bounded (Israel, 2012; McInerney, Smyth, & Down, 2011); as "relics of the past" (McInerney, Smyth, & Down, 2011, p. 9). Massey cautions against these *nostalgic* notions of place; notions that, she argues, are founded on a desire for constancy, "a source of unproblematic identity" (1994b, p. 151) and/or "as a haven from the global world" (1994a, p. 10). Gruenewald and Smith, for example, situate place-based education as part of a local movement to "mitigate against the potentially harmful effects of globalization" (2008, p. xiv). Massey claims it is unhelpful to "romanticise the local and to instate the global . . . as . . .the only real struggle to be aimed at" (2005, p. 184). Her critical geographical perspective reminds us that each place has a distinct combination of broader and more local social relations; that places are constructed through webs of power relations and the unequal distribution of resources within and across places, within what she calls "the wider power-geometries of space" (2005, p. 130). McInerney, Smyth, and Down (2011) concur that we should take care not to romanticise the notion of place in identity construction, pointing out that:

> Many urban and rural environments are far from idyllic places for children and their families. It is easy to feel a strong sense of attachment to an aesthetically pleasing landscape ... much less so to a squalid, unsafe, environmentally degraded place or one that is fractured by social, economic and racial divides. (p. 10)

It is thus important to recognise that social relations in place are experienced and interpreted differently by those holding different positions as part of place.

Geography education's capacity to utilise multiple perspectives and scales to comprehend and analyse how places work, I argue, is well positioned to support place-based education theory and practice. From Massey's perspective, such a geography education would attend to a global sense of place; an understanding that place is both "internally multiple . . . [and] also a product of relations which spread out way beyond it" (2004, p. 6). In the following section, I explore these possibilities through the Australian geography curriculum. Here, I return to the characteristics of place-based education, as identified by Smith (2002) and Gruenewald (2003), to consider the synergies, differences and opportunities of place-based education with geography education in the context of the primary geography curriculum.

The Place of Place in the Australian Geography Curriculum

Geography, in the Australian curriculum, is characterised as the study of place. In the rationale of the geography curriculum document, geography is defined as "a structured way of exploring, analysing and understanding the characteristics of the places that make up our world . . ." (Australian Curriculum, Assessment and Reporting Authority [ACARA], 2014a). Place is also one of the seven concepts (Place, Space, Environment, Interconnection, Sustainability, Scale, and Change) through which geographical understanding is developed in the Australian curriculum. Place as a concept is a key idea that "can be applied across the subject to identify a question, guide an investigation, organise information, suggest an explanation or assist decision-making" (ACARA, 2014a). Maude, the Lead Writer of the Australian geography curriculum, explains that rather than defining

these geographical concepts as objects of study, they should be understood in terms of the thinking they produce (2014, p. 44). Thus, in the curriculum document, the concept *place* is described rather than defined:

> The concept of place develops students' curiosity and wonder about diversity of the world's places, peoples, cultures and environments. Students examine why places have particular environmental and human characteristics, explore the similarities and differences between them, investigate their meanings and significance to people and examine how they are managed and changed. (ACARA, 2014a)

Place in the descriptions above is not confined to an object of study. In geography, place is also understood as a means of analysis. This is an important distinction and gestures to one of the most potent aspects of geography, that is, its "ability to recognise the connections between different scales and different perspectives" (Shimeld, 2012, p. 41). Places are understood to be located spatially, connected to other places, dynamic and multifaceted. This understanding of place coheres with Massey's open and mutable sense of place described above.

In the above, it is clear that the study of place in the Australian geography curriculum is not limited to the local. However, in Foundation to Year 2, it undoubtedly meets Smith's (2002) criterion of using local phenomena as the basis of curriculum development. The curriculum at this level has a strong focus on students' personal worlds, "the geography of their lives and their own places" (ACARA, 2014a). The ACARA document explains that at these levels students learn about their own place and build a connection with it in order to develop "their sense of identity and belonging" and awareness that "places should be cared for" with a consideration of "how they can contribute to this" (2014a). It also states that interest and curiosity in distant places is encouraged at these levels and students are introduced to the concept of interconnections through thinking about how they are connected to other places. Place is thus conceived in relational terms and, even at this young age, there is opportunity for students to be introduced to the idea that the "'lived reality of our daily lives' is utterly dispersed" (Massey, 2005, p. 184).

In the middle years, Years 3 and 4, there is also a focus on the local, but the study of the human and environmental characteristics of places at this level extends to places in different locations at the regional and national scale. The importance of the environment to support life and sustainability are key areas of study in the middle years and an affective dimension is introduced as students "reflect on how people feel about places" (ACARA, 2014a). In upper primary, Years 5 and 6, the interdependence of various phenomena in and beyond the local is again highlighted as students explore "factors that shape the diverse characteristics of different places and how people, places and environments are interconnected" (ACARA, 2014a). At Year 6, a global scale is used to study sociocultural, economic and demographic diversity. The curriculum at these levels attends to Massey's contention that places are constructed through webs of power relations and through the unequal distribution of resources within and across places.

There is, thus, ample opportunity to study local phenomena (Smith, 2002) in the primary geography curriculum. Furthermore, the emphasis on interconnections with other places at different scales (and times) has the additional benefit of adding dimensions to what otherwise could be views of place that are static, essentialised, one-dimensional and contained (Massey, 1994a). As Swift (2004) suggests in her discussion of the United Kingdom *Valuing Place* project,

> a pupil's geographical experience would be flawed if teaching geography centred too much on the individual, the local scale and the local place. The challenge... is to provoke a similarly intense learning situation around the global in the local, global interconnectedness. (p. 10)

Engagement in and With the Community

Another element of place-based education identified by Smith (2002), that has strong coherence with geography methodologies, is engagement in and with the surrounding community and the frequent and direct interaction with local place/s. Geography educators have long seen the value of using first-hand experiences outside the classroom as a means of exploring and understanding characteristics of places. The significance of direct experience in geography is also evidenced in the Australian curriculum document which states: "The curriculum should also provide opportunities for fieldwork at all stages, as this is an essential component of geographical learning" (ACARA, 2014a). Fieldwork in this document is described as "any activity involving the observation and recording of information outside the classroom" (ACARA, 2014a).

The emphasis on skill development, information gathering and knowledge acquisition through fieldwork in geography education has some dissonances with a place-based approach to field experiences. Israel (2012, p. 79) points

out that place-based education uses "field-based experiences to enable students to situate themselves as members of social and ecological communities and to cultivate a sense of ethical responsibility for the well-being of those communities". While it is recognised that fieldwork in geography education can have ethical and affective impacts (Boyle et al., 2007; Fuller, Edmonson, France, Higgitt, & Ratinen, 2006; Hope, 2009; Hougie, 2010; Morris, 2010), it is often seen "primarily as a cognitive process of knowledge and skill acquisition" (Israel, 2012, p. 78). Israel contends that geography education could be enhanced by a place-based framework that connects field experiences with ethical objectives. This argument coheres with my own view that fieldwork, which does not engage the affective domain, represents a missed opportunity for deeper, more embodied engagement with place. In my own practice, I have become increasingly dissatisfied with traditional methods of geographical fieldwork that support a detached view of phenomena. I describe this as the clipboard style of field *work* – a task-oriented event in which participants observe phenomena and record information in order to answer predetermined questions. My discontent with an observed detachment between participant and place, in this type of field experience, prompted me to acquire and use the skills of outdoor education to assist students, through extended experiences in places, to develop relations with, and cultivate ethical concern for, people and places (Preston, 2004). This is less like *work* in the field but rather, an embodied, socially engaged interaction with places with the possibility that, at the end of the experience, participants might think differently about themselves and their surroundings. This place-based approach offers experiences of being in relation to one's self, others and the world.

Opportunities to engage with local place/neighbourhoods are also possible through the integration of children's personal geographies in the primary geography curriculum (Catling, 2005; Catling & Willy, 2009; Catling & Martin, 2011; Catling, Willy, & Butler, 2013; Martin, 2006, 2008). Catling and Martin have been strong advocates for a primary geography curriculum that draws on students' everyday lives and extends this to help students make sense of their world. In recent years, there has been increased interest in children's geographies including the study of children's engagement with, and use of, local spaces (including playgrounds, streets, and neighbourhoods) as well as children's wider connections with people and places (Catling, Willy, & Butler, 2013). This second point recognises that children are connecting to the broader world on a daily basis through television, stories, the internet, social media, online games, clothing, travel, popular culture, food and so forth.

Children's geographies also encompass imagined places as well as spaces where there is a "fantastical mixing of the material and the imaginary" (Jones, 2000, p. 42). Inherent in the work of children's geographies is a recognition that children experience the world differently to adults (Yarwood & Tyrell, 2012) and frequently subvert spaces within adult structures to build their own geographies (Jones, 2000). The places and spaces of children's geographies are thus permeable, flexible, variable and multidimensional and have obvious synergies with Massey's conceptualisation of place. Catling and Martin (2011) argue that children's experiences of and in localities such as "affordance, appropriation, subversion, exploration, social interaction, space and place knowledge, and environmental improvement" (p. 328) are largely not valued by the academic discipline of geography. They contend that such knowledge, understanding and experience is valid and *powerful* and "should be engaged with and not treated as lacking or impaired and needing simply to be replaced or amended" (p. 328). These authors call for children to be viewed as creators of knowledge rather than as recipients of *hand-me-down* curricula (p. 332). This aligns with the intent of an inquiry approach which frames the Australian geography curriculum and is elaborated in the next section.

Inquiry in Place-Based Education

In the above paragraphs, I have shown that geography education, to varying extents, attends to two of Smith's place-based education criteria – that is, using local phenomena as the basis for curriculum development and participating in and with the community (through fieldwork and attending to children's geographies). The remaining three aspects of place-based education identified by Smith (2002) are:

- an emphasis on learning experiences that encourage students to become creators (rather than the consumers) of knowledge;
- a study focus that is determined by students' questions and concerns; and
- the role of teachers as "experienced guides, co-learners, and brokers of community resources and learning possibilities" (p. 593).

These characteristics strongly align with geography education's inquiry approach. This is illustrated in the description of inquiry-based learning in the Australian geography curriculum:

> Inquiry-based learning assists students to develop their capacity for self-management. It gives them a role in

> directing their own learning and in planning and carrying out investigations... This enables them to become independent learners who can apply geographical understanding and skills to decisions they will have to make in the future. (ACARA, 2014a)

The document explains that "[i]nquiry will progressively move from more teacher-centred to more student-centred as students develop cognitive abilities and gain experience with the processes and methods across the years of schooling" (ACARA, 2014a). As well as being central to the pedagogical approach for teachers of Australian geography, inquiry is viewed as a methodology for ongoing, lifelong learning for students. One of the five core aims of the Australian geography curriculum states that geography seeks to develop in students "the capacity to be competent, critical and creative users of geographical inquiry methods and skills" (ACARA, 2014a).

A Critical Pedagogy of Place: Gruenewald

Another of the core aims of the Australian geography curriculum is to ensure that students develop "as informed, responsible and active citizens who can contribute to the development of an environmentally and economically sustainable, and socially just world" (ACARA, 2014a). This statement has clear synergies with Gruenewald's (2003) call to link school and place-based experience to "the larger landscape of cultural and ecological politics" – what he terms decolonisation and reinhabitation (p. 9). A critical pedagogy of place, he claims, involves firstly learning to live well socially and ecologically (reinhabitation) and secondly, recognising and changing ways of thinking that prevent us living well in our total environments (decolonization). Geography's contribution to Gruenewald's requisition is well articulated in the commitment in the Australian geography curriculum to sustainability as "both a goal and a way of thinking" (ACARA, 2014a). There is an acknowledgement that sustainability depends on "the maintenance or restoration of the environmental functions that sustain all life and human wellbeing (economic and social)" and "[a]n understanding of the causes of unsustainability" including human actions and "the attitudinal, demographic, social, economic and political causes of these human actions" (2014a). The curriculum is also cognisant of the contested views on how to progress towards sustainability and that "these are often informed by worldviews" (2014a).

In the year level descriptions for the primary geography curriculum, there are sound examples of content that support Gruenewald's reinhabitation and decolonisaton. In Foundation, students learn "about their own place and [how] building a connection with it contributes to their sense of identity and belonging and an understanding of why and how they should look after places" (ACARA, 2014b). Year 1 "continues to develop the idea of active citizenship as students are prompted to further consider how places can be cared for" (2014b). At Year 2, through the concept of interconnection, students investigate "their links with places locally and globally" and, at Year 3, they explore similarities and difference between feelings about places and how "feelings about places are the basis for actions to protect places" (2014b). Year 4 focuses on sustainability and "the different views on how sustainability can be achieved" including an understanding that "sustainability means more than the careful use of resources and the safe management of waste" (2014b). At Years 5 and 6, students explore the interconnections between people and environments/places at various scales including global.

Contrary to the arguments (often originating in the US) that state and national curriculum standards conflict with the purposes of place-based education (Jennings, Swidler, & Koliba, 2005), the above analysis suggests a complementarity between them. The geography curriculum is not only amenable to studies in and of place. It also advocates for a critical engagement with "attitudinal, demographic, social, economic and political causes" of unsustainable practices in and beyond place (ACARA, 2014a). This supports Gruenewald's (2003) transformative aim of "learning more socially just and ecologically sustainable ways of being in the world" (p. 9). While place-based education is not formally cited in the final curriculum document, it was explicitly included in the *Shape of the Australian Curriculum: Geography* document (ACARA, 2011) that preceded the curriculum document. In this text, a place-based perspective is situated as one of three perspectives that frame investigations of place in geography education. Further, this document speaks to my desire for a more embodied, relational approach to studies of place: "A place-based perspective also includes an exploration of people's aesthetic, emotional and spiritual connections to places and landscapes and the ways in which people's lives are shaped by where they live" (2011, p. 4). It would be interesting to know why these statements were not included in the final iteration of the curriculum document.

Conclusion

Smith's (2002) five elements of place-based education have been used to highlight some affinities between placed-based education and primary geography education in Australia. I have also pointed to divergences between the two traditions, namely conceptions of place and the conduct of field experiences (bearing in mind that both traditions have many forms and the degree of affiliation or deviation may vary). Drawing on Massey's outward understanding of place – a conceptualisation that attends to the networks of social relations and the "links and interconnections to that 'beyond'" (Massey, 1994a, p. 5) – I argue that geography can make productive contributions to the scholarship of place-based education. Through analysis of the Australian primary geography curriculum, I have demonstrated its potential to attend to Massey's notion of an outward or global sense of place. This rich understanding of place, I argue, can expand the learning possibilities of place-based education. I have also contemplated the contributions of place-based education to geography education. In particular, I noted the benefits of a place-based approach to geography fieldwork – one that promotes more embodied, socially engaged and ultimately, ethical relationships with place. This was followed by an exploration of the opportunities in geography education to further engage in and with communities (local and beyond) through the integration of children's personal geographies in the primary geography curriculum. Finally, some of the ways in which the Australian primary geography curriculum offers scope for a critical pedagogy of place (Gruenewald, 2003) was explored. Analysis of the curriculum indicates that place is an explicit and central element in the primary curriculum and there is some opportunity for critical inquiry.

Returning to the research findings that were the provocation for this paper, I cannot help but feel a little pessimistic about the implementation of place-based curriculum and a critical pedagogy of place in the primary geography context. The research findings indicated that pre-service and early career in-service primary teachers had very limited conceptions of geography (Preston, 2014a; 2014b). In these conceptions, it was clear that "place remains a convenient container for factual details about different parts of the world" (Major, 2010, p. 90). The success of a geographically-framed place-based education, as described in this paper, lies in an understanding of the multidimensionality of the discipline and a conception of place that attends to the complex assemblage of linkages, processes and social relations. Simplistic, unidimensional conceptions of geography and place, I believe, will limit the potential for rich and meaningful learning in, through and for places.

While there are examples of teachers currently using place-based approaches to facilitate effective geographical learning experiences in primary schools, research suggests that this is not the norm. Nor is it surprising given that there is no requirement for specialist geography training in geography for primary teachers and the diminutive time devoted to the area in teaching courses (Kriewaldt, 2006). The geography education community has been very successful in promoting the value and importance of geography and producing high quality curriculum. The challenge now lies in supporting the next generation of primary teachers in the implementation of the curriculum.

References

Australian Curriculum, Assessment and Reporting Authority [ACARA]. (2014a). *Australian Curriculum: Humanities and Social Sciences – Geography Overview [Version 7.2]*. Retrieved from http://www.australiancurriculum.edu.au/download/f10

Australian Curriculum, Assessment and Reporting Authority [ACARA]. (2014b). *Australian Curriculum: Humanities and Social Sciences – Geography Year level / band descriptions [Version 7.2].* Retrieved from http://www.australiancurriculum.edu.au/download/f10

Australian Curriculum, Assessment and Reporting Authority [ACARA]. (2011). *Shape of the Australian Curriculum: Geography*. Retrieved from http://www.acara.edu.au/verve/_resources/shape_of_the_australian_curriculum_geography.pdf

Birrell, C. (2001). A deepening relationship with place. *Australian Journal of Outdoor Education, 6*(1), 25–30.

Boyle, A., Maguire, S., Martin, A., Milsom, C., Nash, R., Rawlinson, S., Turner, A., Wurthman, S., & Conchie, S. (2007). Fieldwork is good: the student perception and the affective domain. *Journal of Geography in Higher Education, 31*(2), 299–317.

Bradbeer, J., Healey, M., & Kneale, P. (2004). Undergraduate geographers' understandings of geography, learning and teaching: A phenomenographic study. *Journal of Geography in Higher Education, 28*(1), 17–34.

Brookes, A. (1993). Deep and shallow outdoor education: Can we tell the difference? *The Outdoor Educator*, 8–17.

Brookes, A. (1994). Reading between the lines – Outdoor experience as environmental

text. *Journal of Physical Education, Recreation and Dance*, 28–33, 39.

Brookes, A. (2003). A critique of neo-Hahnian Outdoor Education theory. Part two: 'The fundamental attrition error' in contemporary Outdoor Education discourse. *Journal of Adventure Education and Outdoor Learning, 3*(2), 119–132.

Callard, F. (2009). Doreen Massey. In P. Hubbard, R. Kitchin, & G. Valentine (Eds.), *Key thinkers on space and place* (pp. 219–225). London: SAGE.

Cameron, J. (2001, 15–18 January). *Beyond dualism: Wilderness, outdoor education and everyday places.* Paper presented at the 12th National Outdoor Education Conference: Education Outdoors – Our sense of place, La Trobe University, Bendigo, Victoria.

Cameron, J. (2003). Responding to place in a post-colonial era: An Australian perspective. In W. M. Adams & M. Mulligan (Eds.), *Decolonising nature: Strategies for conservation in a post-colonial era* (pp. 172–196). London: Earthscan Publications.

Catling, S. (2005). Children's personal geographies and the English primary school geography curriculum. *Children's Geographies, 3*(3), 325–344.

Catling, S., & Martin, F. (2011). Contesting powerful knowledge: The primary geography curriculum as an articulation between academic and children's (ethno-) geographies. *Curriculum Journal, 22*(3), 317–335.

Catling, S., & Willy, T. (2009). *Teaching primary geography.* Exeter: Learning Matters.

Catling, S., Willy, T., & Butler, J. (2013). *Teaching primary geography for Australian schools*. Moorabbin, Victoria: Hawker Brownlow Education.

Ellis-Smith, G. (1999). Ancient land – current connections. *Journeys*, *4*(3), 13–16.

Fuller, I., Edmondson, S., France, D., Higgitt, D., & Ratinen, I. (2006). International perspectives on the effectiveness of geography fieldwork for learning. *Journal of Geography in Higher Education, 30*(1), 89–101.

Gough, N. (1990, 25–27 May). *Imagining our relationship with nature.* Paper presented at the Joint conference of the Camping Association of Victoria, the Victorian Association of Environmental Education and the Victorian Outdoor Education Association, Bendigo College of Advanced Education, Bendigo, Victoria.

Gruenewald, D. A. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher, 32*(4), 3–12.

Gruenewald, D. A., & Smith, G. A. (2008). Introduction: Making room for the local. In D. A. Gruenewald & G. A. Smith (Eds.), *Place-based education in the global age: Local diversity* (pp. xiii–xxiii). New York: Lawrence Erlbaum Associates.

Hope, M. (2009). The importance of direct experience: A philosophical defence of fieldwork in human geography. *Journal of Geography in Higher Education, 33*(2), 169–182.

Hougie, D. P. (2010). Learning outside the comfort zone. *Primary Geographer*, *95*(3), 26–27.

Israel, A. L. (2012). Putting geography education into place: What geography educators can learn from place-based education, and vice versa. *Journal of Geography, 111*(2), 76–81.

Jennings, N., Swidler, S., & Koliba, C. (2005). Place-based education in the standards-based reform era – conflict or complement? *American Journal of Education, 112*(1), 44–65.

Jones, O. (2000). Melting geography: purity, disorder, childhood. In S. Holloway & G. Valentine (Eds.), *Children's geographies: playing, living, learning* (pp. 29–47). London: Routledge.

Kriewaldt, J. (2006). Geography and geographical education in Victoria. *International Research in Geographical and Environmental Education, 15*(2), 159–165.

Major, B. (2010). Aspects of place. *Teaching Geography, 35*(3), 90–92.

Martin, F. (2006). Everyday geography: Re-visioning primary geography for the 21st century. *Geographical Education, 19*, 31–36.

Martin, F. (2008). Ethnogeography: Towards liberatory geography education. *Children's Geographies, 6*(4), 437–450.

Martin, P. (1999). Critical outdoor education and nature as friend. In J. C. Miles & S. Priest (Eds.), *Adventure programming* (pp. 463–471). State College, PA: Venture Publishing, Inc.

Massey, D. (1994a). General introduction. In D. Massey (Ed.), *Space, place and gender* (pp. 1–16). Cambridge: Polity Press.

Massey, D. (1994b). A global sense of place. In D. Massey (Ed.), *Space, place and gender* (pp. 146–156). Cambridge: Polity Press.

Massey, D. (2004). Geographies of responsibility. *Human Geography, 86*(1), 5–18.

Massey, D. (2005). *For space.* London: Sage Publications Ltd.

Maude, A. M. (2014). Developing a national geography curriculum for Australia. *International Research in Geographical and Environmental Education, 23*(1), 40–52.

McInerney, P., Smyth, J., & Down, B. (2011). Coming to a place near you? The politics and possibilities of a critical pedagogy of place-based education. *Asia-Pacific Journal of Teacher Education*, *39(*1), 3–16.

Morgan, A. (2009). Place-based education in the global age: Local diversity. *Environmental Education Research, 15*(4), 521–523.

Morris, G. (2010). Messing about in the environment – the foundations of living geography? *Primary Geographer,* Autumn, 28–29.

Nettleton, B. (1993). A perspective of outdoor education: Nature as a friend. *The Outdoor Educator,* September*,* 17–21.

Orr, D. W. (1992). *Ecological literacy: Education and the transition to a postmodern world.* Albany, NY: State University of New York.

Orr, D. W. (1994). *Earth in mind: On education, environment, and the human prospect*. Washington, DC: Island Press.

Preston, L. (2004). Making connections with nature: Bridging the theory-practice gap in outdoor education. *Australian Journal of Outdoor Education, 8*(1), 12–19.

Preston, L. (2014a). Australian primary pre-service teachers' conceptions of geography. *International Research in Geographical and Environmental Education, 23*(4), 331–349.

Preston, L. (2014b). Australian primary in-service teachers' conceptions of geography. *International Research in Geographical and Environmental Education, 24*(2), 167–180.

Seddon, G. (1997). *Landprints: Reflections on place and landscape.* Cambridge: Cambridge University Press.

Shimeld, J. (2012). (Dis)Entangling place. *Geographical Education 25*, 39–42.

Smith, G. (2002). Place-based education: Learning to be where we are, *Phi Delta Kappan, 83*, April, 584–594.

Sobel, D. (1996). *Beyond Ecophobia: Reclaiming the heart in nature education.* Great Barrington, MA: The Orion Society and the Myrin Institute.

Sobel, D. (2004). *Place-based education: Connecting classrooms and communities.* Great Barrington, MA: The Orion Society.

Stewart, A. (2003). Reinvigorating our love of our home range: Exploring the connections between sense of place and outdoor education. *Australian Journal of Outdoor Education, 7*(2), 17–24.

Stewart, A. (2004). Decolonising encounters with the Murray River: Building place-responsive outdoor education. *Australian Journal of Outdoor Education, 8*(2), 46–55.

Swift, D. (2004). Out of place in school geography*. Place and Space Occasional Paper*, No. 4, pp. 7–12.

Theobald, P. (1997). *Teaching the Commons: Place, pride, and the renewal of community.* Boulder, CO: Westview Press.

Theobald, P., & Curtiss, J. (2000). Communities as curricula. *Forum for Applied Research and Public Policy, 15*(1), 106–111.

Wattchow, B. (2001a, January 15–18). Outdoor education as the experience of place. Paper presented at the *12th National Outdoor Education Conference: Educating outdoors—our sense of place,* La Trobe University, Bendigo, Victoria.

Wattchow, B. (2001b). A pedagogy of production: Craft, technology and outdoor education. *Australian Journal of Outdoor Education, 5*(2), 19–27.

Wattchow, B., & Brown, M. (2011*). A Pedagogy of place: Outdoor education for a changing world.* Clayton: Monash University Publishing.

Woodhouse, J., & Knapp, C. (2000). *Place-based curriculum and instruction: Outdoor and environmental education approaches* (ERIC Digest). Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools.

Yarwood, R., & Tyrrell, N. (2012). Why children's geographies? *Primary Geography*, *97*(3), 123–128.

The Australian Geography Competition: An Overview of Participation and Results 2004–2013

Iraphne R.W. Childs
School of Geography, Planning and Environmental Management,
The University of Queensland, Brisbane, Queensland, Australia
Kathryn Berg
Royal Geographical Society of Queensland, Brisbane, Queensland, Australia

Abstract

The Australian Geography Competition (AGC) was established in 1995 by the Royal Geographical Society of Queensland (RGSQ) and the Australian Geography Teachers' Association to promote the study of geography in Australian secondary schools and to reward student excellence in geographical studies. Initially focusing on students at the lower secondary level, the Competition expanded in 2005 to include students up to Year 12. In 2013, the number of students participating nationwide in the AGC was 74,498. This paper firstly gives an overview of national participation by Australian students in the Competition over the 2004–2013 period. Secondly, more detailed analysis of the 2012 and 2013 competitions is presented in terms of overall results in the three age groups, the types and levels of difficulty of questions, and gender differences in achievement. Some concluding observations are made relating to the scope and significance of the AGC in the context of the introduction of the national geography curriculum from 2014.

Keywords: Geography, competition, Australia, secondary school, gender

Introduction

The Australian Geography Competition (AGC or Competition) was established in 1995 by the Royal Geographical Society of Queensland (RGSQ) and the Australian Geography Teachers' Association to promote the study of geography in Australian secondary schools and to reward student excellence in geographical studies. Initially focusing on students at the lower secondary level, the Competition was expanded in 2005 to include students up to Year 12. In 2013, the number of students participating nationwide in the AGC was 74,498.

The AGC consists of multiple-choice questions testing geographical knowledge and skills. Teachers administer the competition within schools, the answer sheets are centrally marked by computer, and results returned to schools. Students are graded in three age divisions: junior for students under 13 years; intermediate for students aged 14 and 15 years; and senior for students aged 16 to 18 years. The Competition question booklet has 50 questions and students in the different age divisions answer different subsets of these questions. All students have 35 minutes to answer the questions.

Based on AGC results, the top one or two students from each state proceed through different types of testing in order to select teams to represent Australia at two international geography competitions: the National Geographic World Championship (drawn from intermediate students) and the International Geography Olympiad (drawn from senior students). The need to discriminate at the upper end of students' results means that the overall level of difficulty of the Competition has been kept high.

The present paper presents an overview of the AGC over the ten years 2004 to 2013 in terms of overall national trends and participation. More detailed analysis of 2012 and 2013 AGC results is presented in terms of types of questions, levels of difficulty based on student achievement, and gender differences.

The following research questions are addressed in the present paper:

- Has participation in the AGC been rising or falling in Australia and in individual states?
- How do students perform on various types of questions? What types of incorrect choices do students choose?
- What are the differences in performance between boys and girls?

Overall Trends in Competition Participation

Over the ten-year period between 2004 and 2013. participation in the AGC across the Australian states has averaged 5.0% of all students enrolled in State secondary schools with a peak of 5.6% in 2008 (Table 1).

Table 1. Participation in the AGC 2004–2013 as a percentage of State Secondary School Enrolment in that State. (Non-shaded boxes display the total number of students that entered the competition in each state for each year. Shaded boxes are state participation percentages for each year.

Participation totals and participation as a percentage enrolled secondary students per state											
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**Average % per state**
ACT	2022	2464	2721	1842	2852	2869	2330	2599	2783	2166	
	7.1	8.6	9.5	6.4	10.0	10.0	8.1	9.0	9.6	7.4	**8.6**
NSW	37706	38406	42534	37845	37355	36532	33384	30217	30148	29323	
	7.8	7.9	8.7	7.7	7.6	7.4	6.7	6.0	6.2	5.8	**7.2**
NT	237	60	214	82	385	198	336	114	197	108	
	2.0	0.5	1.7	0.7	2.5	1.3	2.1	0.7	1.2	0.7	**1.3**
QLD	12476	12376	14851	14932	15147	15364	17957	15216	15283	13229	
	4.9	4.8	5.6	5.5	5.5	5.5	6.4	5.4	5.4	4.6	**5.4**
SA	4922	4941	4576	4669	4863	4411	4771	4215	4241	3903	
	5.4	5.4	4.9	4.9	5.1	4.5	4.8	4.2	4.2	3.9	**4.3**
TAS	620	757	761	816	679	797	787	713	789	559	
	1.7	2.1	2.1	2.2	1.8	2.2	2.1	1.9	2.2	1.6	**2.0**
VIC	16085	17915	18499	16559	18649	17231	15680	14997	14812	14116	
	4.4	4.8	4.9	4.4	4.9	4.5	4.0	3.9	3.8	3.6	**4.3**
WA	7376	8372	8286	9170	9626	9268	9856	10572	10855	11094	
	5.7	6.4	6.2	6.8	7.1	6.7	7.7	8.2	8.3	8.3	**7.1**
Total participation all states	**81444**	**85291**	**92442**	**85915**	**89556**	**86670**	**85101**	**78643**	**79108**	**74498**	
Average % participation all states	**4.9**	**5.1**	**5.5**	**4.8**	**5.6**	**5.3**	**4.7**	**4.9**	**5.1**	**4.5**	**5.0**

Source: Modified from ABS(2012) cat.4221.0 and RGSQ competition records

The Northern Territory has consistently had the lowest total number of students entering the competition each year, reflecting its low population when compared to larger states, as well as the lowest participation rate (average 1.3% of enrolled secondary students). The Australian Capital Territory also has a relatively low number of students entering the competition, although it has the highest average participation rate (8.6%). New South Wales has consistently the largest number of students entering and the second highest average participation rate of 7.2%. In terms of participation trends, the state that shows the largest increase in participation is Western Australia (from 5.7% in 2004 to 8.3% in 2013). In contrast, participation rates in New South Wales, Victoria and South Australia have fallen from highs of 8.7% in New South Wales (2006), 4.9% in Victoria (2008) and 5.1% in South Australia (2008). Queensland and Tasmania have remained relatively stable with average participation rates of 5.4% and 2.0% respectively (see Table 1).

Total participation in the AGC has been declining from a peak of 92,442 in 2006 to 74,498 in 2013. To attempt to gain some insights into the reasons for the overall decline in participation, the Competition organisers conducted short surveys of schools which competed in 2006 but not 2007 and schools which competed in 2010 but not in 2011. Response rates, however, for such surveys have been low, with only interested teachers returning forms. Only 12% of 224 surveys were returned in 2011 and 16% of 235 surveys in 2007. This low return rate in the sample would likely be biased towards teachers who are favourably disposed towards the Competition. The reasons cited for not entering the Competition were similar across the two surveys and mainly related to school organisational problems, timetabling, and logistical difficulties such as the usual contact teacher being on leave, or not being able to organise the entry by the deadline. Only 22% of respondents across the two surveys gave as a reason that the Competition did not relate to their school's needs, and this included aspects such as the difficulty-level of the questions or relevance to the curriculum. In some cases, geography was only taught for half the year and the timing of the Competition did not coincide with this. Only 3% of respondents said that they would not be entering their school in the following year, while 64% intended to participate and the balance were undecided.

Analysis of AGC Results: 2012–2013

We focus here on questions from 2012 and 2013 as being typical of the Competition throughout its history.

Types of Questions

The AGC attempts to test a range of geographical skills and knowledge in four categories. *Skills* questions typically include map and graph interpretation. *Factual knowledge* questions test recall of factual geographical phenomena. *Conceptual knowledge* questions test understanding of geographical processes and *Mixed* questions may require students to apply both skills and knowledge. In the 2012 and 2013 AGCs, the distribution of skills and knowledge questions was approximately 40% each with approximately 20% of mixed questions (Table 2).

Level of Difficulty

In terms of the level of difficulty of questions, AGC results reveal that it is not simply a matter of one category being easy and another difficult. The examples below from the 2012 and 2013 Competitions demonstrate this complexity in achievement on questions of varying levels of difficulty. Examples of questions which students found ***easy*** to answer in the four categories on the 2012 and 2013 AGC are given below. Correct answers are in **bold**.

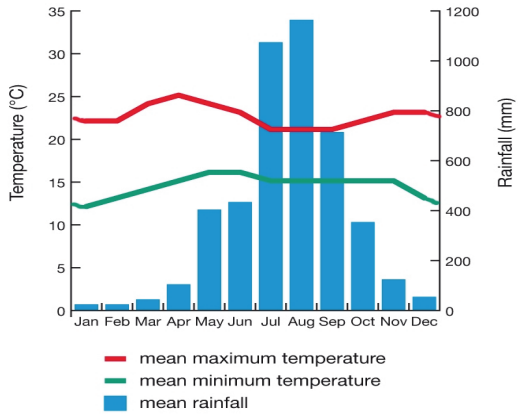
Table 2. Types of Questions in the 2012–2013 AGC

TYPES OF QUESTIONS					
	2012		2013		Overall % 2012–2013
	#Qs	2012	#Qs	2013	
SKILLS	20	40%	18	36%	**38%**
KNOWLEDGE	20	40%	24	48%	**44%**
factual	12		13		
concept	8		11		
MIXED	10	20%	8	16%	**18%**

Easy skills question

2013 Q.3

Figure 1. Climate Graph for Baguio, Philippines. Source Weatherbase



From Figure 1
What is Baguio's mean rainfall in August?

A 15mm
B 34mm
C 398mm
D 515mm
E 1160mm

This question required students to interpret a rainfall graph of Baguio in the Philippines. Only junior and intermediate students attempted this question, with 68% of junior participants and 72% of intermediate students answering correctly.

Easy factual knowledge question

2012 Q.6

Which religion do most people in Thailand follow?

A Buddhism
B Christianity
C Hinduism
D Islam
E Shintoism

This question required students to have knowledge of the geography of religion in Asia. Only junior and intermediate students attempted this question, with 62% of junior participants and 67% of intermediate participants answering correctly.

Easy conceptual knowledge question

2013 Q.11

Bushfire behavior is affected by:

A humidity
B rainfall
C temperature
D wind
E all of the above

This question required knowledge of bushfire behavior and climate processes. Only junior and intermediate students attempted this question, with 61% of junior participants and 76% of intermediate participants answering correctly.

Easy mixed question

2012 Q.11

Figure 2 Miyako, Japan. 20 March 2011. Source: U.S. Navy

What caused the devastation shown in Figure 2?

A fire
B tornado
C tsunami
D typhoon
E volcanic eruption

This question required students to identify an image of devastation in Miyako, Japan, and to identify tsunami hazard as the cause. Only junior and intermediate students attempted this question, with 87% of junior participants and 88% of intermediate participants answering correctly.

Examples of 2012 and 2013 questions in the four categories which students found difficult are given below. Correct answers are highlighted in **bold**. The most commonly chosen incorrect answers are indicated by the label *most commonly chosen incorrect answer*.

Difficult skills question

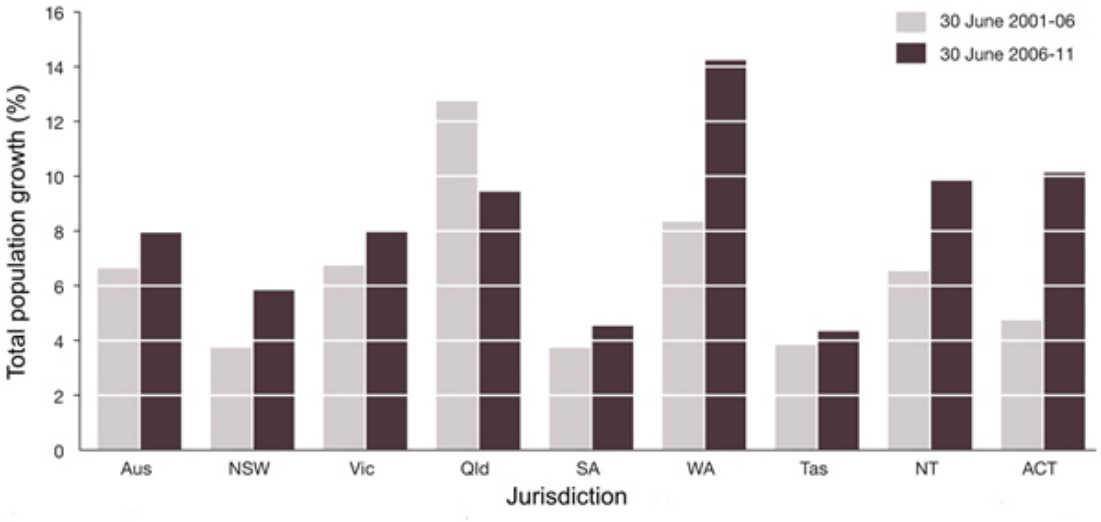
2013 Q.30

See Figure 3. *Total population growth, intercensal periods 2001 to 2011. Next page.*

From Figure 3, Which statement is true of the intercensal period 2006–2011?

A the ACT's population grew at a higher rate than the national average
B the population of all states grew at a higher rate than in the previous 5 years
C the population of Western Australia passed that of Queensland
D Queensland's population decreased
E all of the above *(most commonly chosen incorrect answer)*

Figure 3. Total population growth, intercensal periods 2001 to 2011. Source ABS.



	% choice selected		
Answer choice	**Junior**	**Intermediate**	**Senior**
Correct A	16.3	23.3	29.3
Incorrect E	26.6	29.5	31.6

This question required students to interpret a graph displaying data on population growth rates for the Australian states over two intercensal periods. It appears from the results that many students in all three age levels had difficulty interpreting the graph and probably did not understand the difference between *total population growth* and *rate of growth.* Choice E *all of the above* was the most commonly selected incorrect choice in all three age divisions. Choice E included choices C and D both of which referred to *total populations* of Western Australia and Queensland, rather than *rates.* Choice A is the only choice which correctly compares the *rate of growth* of ACT with the national average. The incorrect choice may also be the *best guess* choice if students did not know the correct answer. It was notable that males performed much better than females on this question.

Difficult factual knowledge question

2012 Q.2

Thailand has been sheltering approximately 100,000 refugees from which neighbouring country?

A Afghanistan
B Burma
C China
D Indonesia
E Vietnam *(most commonly chosen incorrect answer)*

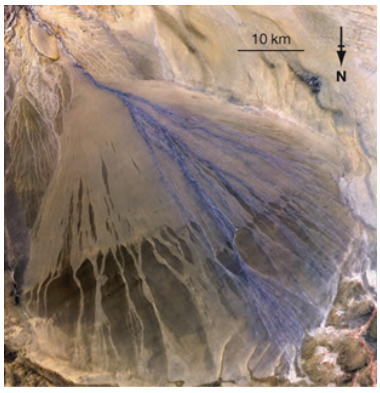
	% choice selected		
Answer choice	**Junior**	**Intermediate**	**Senior**
Correct B	14.8	23.1	-
Incorrect E	28.4	28.8	-

This question required simple knowledge of geographical location of countries within Asia. Only junior and intermediate age-level students answered this question. The results reflect a lack of knowledge in this area, in particular the fact that Burma and Thailand are neighbouring countries. The most commonly selected incorrect choice by both junior and intermediate age levels was E *Vietnam*. Juniors also commonly selected A *Afghanistan*, and intermediate students selected D *Indonesia* – i.e. answers were widely off the mark.

Difficult conceptual knowledge question

2013 Q.35

Figure 4. Satellite image, Taklimakan Shamo, China (blue indicates active stream flow) Source: NASA Earth Observatory



The feature in Figure 4 formed primarily due to:

A an abrupt change in slope
B changes in rainfall patterns
C climate change

D a significant landslide
E tectonic activity *(most commonly chosen incorrect answer)*

Answer choice	% choice selected Junior	Intermediate	Senior
Correct B	14.8	23.1	-
Incorrect E	28.4	28.8	-

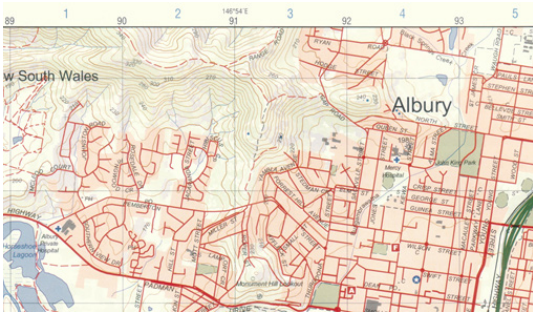
This question required an understanding of geomorphic and landform processes and identification of an alluvial fan. Only intermediate and senior students answered this question. The most commonly selected incorrect choice by both age levels was E *tectonic activity*, with smaller percentages of students selecting either B *changes in rainfall patterns* or D *a significant landslide*. The latter choice is more understandable given the image.

Difficult mixed question

2013 Q.16

Figure 5. **Topographic map. Source: Department of Sustainability and Environment 2011.**

(Note this is a portion of the original figure.)



Range Road (A3, Fig. 5) follows:

A an escarpment
B a peak
C a ridge *(most commonly chosen answer by intermediate & senior students)*
D a spur
E a valley *(most commonly chosen by juniors)*

Answer choice	% choice selected Junior	Intermediate	Senior
Correct D	9.3	11.8	14.6
Incorrect	25.7 C	30.6 C	33.1 C
Incorrect	32.0 E	26.2 E	23.2 E

This question required both topographic map interpretation and knowledge of physical geography terminology. The most commonly selected incorrect choice by junior students was E *valley*, which indicates a misreading of contours. Presumably, students mistakenly read contours to indicate descending elevation (a valley) rather than ascending elevation (a spur). In contrast, many intermediate and senior students correctly read the contours as representing an ascending landform, but chose the incorrect term C *ridge*, rather than the correct term E *spur*.

In summary, there was a significant difference in the percentage of students scoring correctly between the easy and difficult questions for all four types of questions. This emphasises the discriminatory power of the difficult questions where scores were overall low in all categories and in all age-levels.

Differences in performance between boys and girls

Over the period 2004–2013 without exception, the overall mean scores for males in the Competition have been higher than for females. This has been the case in all three sections of the competition, Junior, Intermediate and Senior (Table 3).

While there are very few exceptions on individual questions where females have scored higher than males, there is a consistent result of higher male

Table 3. AGC mean overall scores, male and female participants 2004–2013

	JUNIOR/30		INTERMEDIATE/40		SENIOR/35	
DATE	**MALE**	**FEMALE**	**MALE**	**FEMALE**	**MALE**	**FEMALE**
2004	14.2	13.6	19.6	18.6	–	–
2005	13.4	12.3	18.5	17.0	15.8	14.8
2006	12.5	11.5	17.5	16.0	15.7	14.3
2007	10.8	10.2	15.9	14.5	14.0	12.2
2008	11.6	10.5	16.8	15.3	14.3	13.0
2009	12.4	11.7	17.4	16.1	15.3	14.1
2010	11.9	10.8	16.7	15.1	14.8	13.2
2011	14.8	13.4	20.4	18.7	17.1	15.7
2012	13.8	12.5	19.1	17.3	16.8	15.0
2013	12.8	12.1	18.3	16.9	15.5	14.1

Table 4. AGC 2012 and 2013 percentage of answers correct by male and female participants by type of question

AGC 2012 and 2013 % correct Females & Males by Type of Question								
	Skills		Knowledge factual		Knowledge conceptual		Mixed	
JUNIOR	M	F	M	F	M	F	M	F
2012	47.3	43.1	49.5	44.4	55.4	51.6	42	38.5
2013	47.2	44.1	36.6	34.9	54.1	50.0	33.5	32.9
INTERMEDIATE								
2012	52.7	48.1	44.6	39.6	44.6	42.2	46.3	41.6
2013	53.7	49.4	40.6	37.3	49.3	45.2	37.0	34.8
SENIOR								
2012	55.3	49.9	33.8	30.7	41.5	37.7	42.8	37.2
2013	47.0	36.5	46.8	42.1	43.0	41.5	36.9	32.8

achievement. This remains the case across all question types. The results from 2012 and 2013 shown in Table 4 are typical.

Males also score more highly in the national geography competitions of other countries. This is borne out by the male/female ratios of school students selected to represent their countries in international geography competitions. The biennial National Geographic World Championship is for students in the Australian competition's intermediate age division (14–15 years). In the last two World Championships, only 14 of a total of 105 students (13%) have been female, with a similar percentage in other years. Australia has been entering since 1995 and in that time has had no females in its three-member teams.

The International Geography Olympiad is for students in Australia's senior age division (16–18 years). The Olympiad was biennial until 2012 and has been annual since then. In the five Olympiads since 2006, males still dominate, but less so than in the World Championships – 127 females out of 543 students (23%). Australia's four-member teams since 2006 have been composed of 10 females and 10 males. This balanced gender difference in Australia's teams arises from the selection methods. All students first sit the AGC, which comprises entirely multiple-choice questions that seem to favour males (see discussion below). The intermediate students are selected for the National Geographic World Championship and its questions are mainly multiple-choice or require one-word answers. Therefore, the AGC is already a good guide to how students may perform in the World Championships. The highest-scoring intermediate students, who are predominantly male, go through a selection method that tests a harder level of factual knowledge. This has resulted in all-male teams.

By contrast, the International Geography Olympiad tests a much wider range of geographical understanding and skills, including fieldwork and analysis. Because AGC organisers are aware of the likely male bias in their multiple-choice format, they positively discriminate to include female students in the selection process for the Olympiad team. Based on the results of the Australian competition, the highest-scoring male and female student in each state and the territories is invited to participate in the selection event, called *Geography's Big Week Out*. This comprises five days of challenging geographical activities focusing on such fieldwork as beach profiles, water quality testing, community amenity surveys, and using spatial technologies to analyse and present the collected data. At the end of the week, students sit a test that includes data manipulation, analysis and decision-making. Cumulatively over the five teams, exactly equal numbers of male and female students have been selected for the Australian team.

The topic of gender differences in cognitive abilities is controversial, due mainly to a variety of sometimes contradictory theories that attempt to explain the differences (e.g. Montello, Lovelace, Golledge, & Self, 1999; Wridt & Boehm, 2000; Hardwick, Bean, Alexander, & Shelley, 2000; Lloyd & Bunch, 2005; Keith, Reynolds, Roberts, Winter, & Austin, 2011). Despite this, some consistent findings and seemingly robust patterns have been found. This is important because understanding sex-related difference in the performance of various tasks could have implications for ameliorating occupational inequities in fields that frequently involve numeracy and spatial abilities.

There are two likely areas identified in the literature which may help to explain the gender differences in the results of the AGC. These are spatial cognitive abilities and the multiple-choice testing format.

Spatial Cognitive Abilities

Gender differences in geographical learning and achievement have been the focus of many educational studies that reveal complex patterns in the ways in which males and females approach different spatial tasks. For example, early research by Montello et al. (1999) concluded that there were many spatial tasks in which the two sexes did not differ and some in which females outperformed males. They found that males and females differed on average in their spatial abilities and styles on particular tasks. Spatial tasks in which males were found to outscore females included estimating distances and rotation tasks. The results of the AGC bear out such findings. For instance, the question *One centimetre on the map represents how much on the ground?* (Figure 5) required use of the scale bar. The result on this question was that 73.2% of males and 65% of females scored correctly. On the other hand, females have been found to outperform males in spatial tasks such as recalling landmarks. It is unclear, however, how and if these differences affect performance of males and females conducting complex spatial tasks.

Wridt and Boehm (2000) proposed **t**hree possible general explanations for gender differences in geography, including some interesting biological differences. They considered *brain lateralization*, which theorises that because males use the right side of their brain (which analyses problems in a spatial, holistic manner) more than their left side, they are biologically at an advantage when it comes to geography. By contrast, females use their left-side brain which analyses problems more analytically or verbally.

Lloyd and Bunch (2005) investigated differences in gender spatial awareness using map reading that focused on perceptual and memory processes. They found that differences were likely to be caused by a combination of, and interaction between testing biases, biological brain and hormone differences, and social and environmental factors, drawing on some evolutionary biology. This study suggested a possible disadvantage to females in answering test questions because of their general slower reaction time (slower processing) – females are more affected by time limits! The critical result of this study was that people with a combination of a brain structure that supports spatial processing and additional environmental experiences with spatial activities perform better on challenging map reading tasks.

Multiple-Choice Format

Many studies conducted into gender bias and multiple-choice questions have concluded that the multiple-choice format is biased against females. Hardwick et al. (2000) concluded that the multiple-choice test format, in which only one answer is correct, tends to privilege the type of thinking involving searching for a single correct answer. The problem-solving approaches used by males tend to be associated with finding a single correct solution, whereas verbal approaches used by females are more likely to seek complexity and less likely to differentiate between a single correct solution and alternative wrong solutions. Monk (2011) reported that males scored more highly on multiple-choice questions than did females, although girls outperformed boys on items that required an extended essay response.

In the AGC, the results of the highest-scoring senior students in the multiple-choice testing format can be compared with the results of those same students using a mixed assessment format. The latter is used to select Australian's Olympiad team and consists mainly of extended written response tasks and tasks that require spatial abilities such as producing an annotated map or plan. There is a strong contrast between the results of the highest-scoring male and highest-scoring female students in the multiple-choice format where males performing significantly better than females. However, this gender difference disappears in the mixed assessment format, with equal numbers of males and females getting the best marks and thus being selected for Australia's Olympiad team.

From the review of the above literature, the following points have been identified regarding gender differences in performance:

1. males have greater visual-spatial abilities;
2. males have higher test scores on multiple-choice tests; and
3. females receive higher scores on measures of extended answers and verbal ability.

The different results in male and female achievement in the AGC support findings in the academic literature both from Australia and internationally. This is both intriguing and somewhat worrying, given the large and increasing numbers of female students now in secondary and tertiary geography classes.

Conclusion

The bottom line for the AGC is that, even if the multiple-choice format is biased against females, the Competition really has no option but to continue using this format as there is no other viable way to mark the large number of 70,000 plus student scripts. The difficult knowledge and skills questions are also essential in order to discriminate to establish state and territory winners who go forward to further selection stages for the teams to represent Australia at the international competitions.

Australian Curriculum: Geography (ACARA, 2013), Australia's first national curriculum is being progressively introduced from 2014. In future, questions in the AGC will change to reflect the knowledge and skills included in the new curriculum.[1] The AGC, however, is age-based and the curriculum is naturally written for school years so, at least initially, the age divisions of the competition will not align with the years in the curriculum. The introduction of the new curriculum may have a positive effect on the numbers of students entering the AGC.

The national curriculum extended a stand-alone geography curriculum into the primary school years in Australia for the first time in decades. The AGC organisers are currently developing a primary-level competition which will align more closely with the national curriculum. Although the primary geography curriculum is currently being reviewed, and it may be reduced to an identified geography strand within a Humanities and Social Sciences subject, the AGC organisers believe it is worth proceeding in the development of a primary competition to support geography in this age group.

References

Australian Bureau of Statistics [ABS]. (2014). *Schools Australia* (Cat.No 4221.0)*National Schools Statistics Collection Table 40a Full-time students by States and Territories, Affiliation, Sex, Age, Indigenous status and grade (1998–2012)*

Australian Curriculum, Assessment and Reporting Authority. (2013). *Senior Secondary Australian Curriculum: Geography* Retrieved from http://www.australiancurriculum.edu.au/seniorsecondary/humanities-and-social-sciences/geography/curriculum/seniorsecondary#page=1

Bednarz, S.W., Heffron, S., & Huynh, N.T. (Eds.). 2013. *A road map for 21st century geography education: Geography education research*. (A report from the Geography Education Research Committee of the Road Map for 21st Century Geography Education Project). Washington, DC: Association of American Geographers.

Hardwick, S. W., Bean, L. L., Alexander, K. A., & Shelley, F. M. (2000). Gender vs. sex differences: Factors affecting performance in geographic education. *Journal of Geography*, *99*(6), 238–244.

Keith, T. Z., Reynolds, M. R., Roberts,L. G., Winter, A. L., & Austin, C. A. (2011). Sex differences in latent cognitive abilities ages 5 to 17: Evidence from the Differential Ability Scales – Second Edition*, Intelligence*, *39*, 389–404.

Lloyd, R. E., & Bunch, R. L. (2005). Individual differences in map reading spatial abilities using perceptual and memory processes. *Cartography and Geographic Information Science*, *32*(1), 33–46.

Monk, J. (2011). Politics and priorities: Placing gender in geographic education. *International Research in Geographical and Environmental Education*, *20*(3),169–174.

Montello, D. R., Lovelace, K. L., Golledge, R. G., & Self, C. M. (1999). Sex-related differences and similarities in geographic and environmental spatial abilities. *Annals of the Association of American Geographers*, *89*:3, 515–534.

Wridt P. J., & & Boehm, R. G. (2000). The influence of environmental exploration on geographic performance among adolescents: A gender and cross-cultural analysis. *International Research in Geographical and Environmental Education 9*(3), 211–222.

Further information on the Competition, including copies of past question booklets, is available at www.geographycompetition.org.au

Endnote

1. For more information on the curriculum, see http://www.australiancurriculum.edu.au/humanities-and-social-sciences/geography

A Note On the Status of Geography Teachers in Indian Schools

Sarfaraz Alam
Assistant Professor
Department of Geography, Faculty of Science, Banaras Hindu University, Varanasi, India

> Geography should be taught in schools and colleges by trained specialist teachers. Teachers are the most valuable resource in education. Because of this and because of the complexity of geography studies, well trained, specialist teachers are essential.
>
> (Haubrich, 1992, p.13)

Abstract

Pervasiveness of illiteracy has remained a foremost social and developmental challenge for India. This has prompted successive central and state governments to remain obsessed with increasing enrolments and decreasing dropout of children. However, these efforts are not accompanied by policies and programs for improving the quality of education. A pertinent issue in this context is the widespread incidence of underqualified teachers in Indian schools. The problem of underqualification of geography teachers is much more complex than in other subjects due to the distinct nature of geography. This paper looks into the problem of underqualification of geography teachers in Indian schools, its causes and implications.

Keywords: geography teachers, secondary schools, social sciences, teacher training, geography education

Introduction

Geography education in Indian schools is experiencing a teaching-learning crisis. A recent empirical study shows that there is a general lack of understanding of fundamental geographical concepts discipline and basic knowledge of world geography among geography students who have just completed their school (Alam, 2014, p. 35). Some scholars have tried to relate problems of teaching-learning crisis in school geography to school curriculum and textbooks (Misra, 1983; Sunny, 2006; Alam, 2010) and teachers (Brar, 2004; Banerjee, 2006) and the weak linkage between school and university teachers (Basu, Pawson, Akhter, Palmer, & Mervine, 2014). However, the specific problems related to teaching-learning of geography in Indian schools cannot be properly understood without analysing the general problems of school education in India.

As per the estimates released by UNESCO (2014, p. 71), India currently has the largest population of illiterate adults in the world (287 million). This is 37 per cent of the total illiterate population of the world. Even though the primary school net enrolment rate of 88.08 percent (2013–2014) is relatively impressive (Ministry of Human Resource Development, Government of India, 2013, p. 30), over 40% of children leave schools before finishing 8th grade despite a recent law designed to provide free and compulsory elementary education for all (Human Rights Watch, 2014) without learning the basic skills of reading and writing (Ramachandran, 2005, p. 2141). In fact, the pervasiveness of illiteracy has remained a big social and developmental challenge of India for a long time. This is, to an extent, also responsible for the poor image of the country in the international arena. The low level of literacy has significant bearing on educational policies and programs of the central and the state governments. The successive central and state governments have remained obsessed with quantitative expansion in literacy rate. Not surprisingly, most of these governments have a fascination with data and targets pertaining to enrolment, attendance, midday meal distribution, retention, etc (Ramachandran, 2005, p. 2141). However, these efforts have not been accompanied by suitable policies and programs for improving the quality of education at primary and secondary schools. It is, in this context, that UNESCO, 2014, p. 19) questions the quality of education in schools of India. The report places India among the 21 countries facing an extensive learning crisis. The report reveals that less than half of the population of children learns the

basics in these countries. India features in this list along with 17 countries from the sub-Saharan Africa, Mauritania, Morocco and Pakistan. It is widely known that the quality of education in schools has a direct bearing on higher education. However, this point is not visible in government policies and programs in India. Moreover, "the notion of quality in education is directed to post-graduate education, and to the IITs [Indian Institutes of Technology], IIMs [Indian Institutes of Management] and institutions of higher learning like them. There is a general observation that the foundation of primary and secondary schools has still to be established and nurtured" (Thapar, 2009, p. 1). No doubt, a large number of expensive private schools, mostly located in metropolitan centres, attempt to provide quality education. However, these schools are by and large accessible to children of upper middle class and elite families only. On the other hand, a large number of both government and lower-end private schools are ill-equipped to impart quality education. One most important reason for the lack of quality education in these schools is the presence of large numbers of underqualified teachers.

The issues of what constitutes poor quality of education in the context of geography and the relationship between the student outcome and the academic qualification of geography teachers have been cogently argued by Banerjee (2006, p. 287).

> A survey done in the end nineties showed that in many cases the teachers did not study geography after their own secondary stage. This had created a serious problem in geographical understanding. In the absence of adequate knowledge, the teachers, in most cases, refrained from explaining the concept part or the diagrams. A common practice was to switch over to the descriptive part and 'complete' the syllabus. Practical skill development was largely out of reach. This practice over the years has created a kind of fear/avoid psychosis among pupils about geography, maps and map reading. The lack of clarity about the concepts of geography was partially responsible for a certain degree of unpopularity of geography among the pupils.

In a similar vein, Tiwari (2012, p. 25) has examined linkages between a teacher's competency to teach geography and the quality of geography teaching. He points out that in India geography is taught as a part of social sciences and usually, there is only one teacher to teach all the social science subjects. If the teacher of social science happens to come from a discipline other than geography, and has no training in geography, he/she finds it difficult to teach the subject, and skips over the geography portion of the syllabus. In view of these, the present paper purports to ascertain the academic qualifications of teachers of geography in secondary schools of India. It also aims to look into the problem of underqualification among them, its causes and implications.

Methodology of The Study

This is an empirical study based on data collected for a University Grants Commission (UGC) funded research project of this author. Data have been obtained from a questionnaire-based survey of geography teachers of 170 secondary schools. These schools are affiliated to 21 different school boards of India. The survey was conducted during the years 2013 and 2014. These schools were purposely selected mainly from the urban centres located in different geographical regions across several states in India. The aim of the survey was to ascertain the status of geography teaching across different school boards of India.

Geography Teaching and Teachers

Geography is taught in schools affiliated to all the school boards of India. Nearly every Indian state has its own school board. These school boards have jurisdiction over schools located within the administrative boundaries of these states. However, two school boards – the Central Board of Secondary Education (CBSE) and the Indian Council of Secondary Education (ICSE) – have jurisdiction over schools across India. Primarily, these school boards provide affiliations to schools for conducting examinations, grant qualifying certificates to successful candidates of the affiliated schools, prescribe courses of study and many other academic activities for affiliated schools.

At the primary stage, geography is taught as an independent subject only in schools affiliated to a few school boards. In others, some geographical topics are taught as part of Environmental Studies (EVS). On the other hand, geography is a compulsory subject in all the secondary schools affiliated to the school boards. But it is taught mostly as a part of a composite social science subject. Although in the higher secondary schools affiliated to all the school boards geography is offered as an optional paper, in the majority of schools the subject is not offered.

The school boards have prescribed essential education qualifications for appointment of school teachers at different stages. For primary schools, the prescribed minimum educational qualification is generally intermediate with two years Basic Training Certificate (BTC). Subject

specific teachers are not appointed at the primary stage. That means even though some elements of geography are taught with EVS the schools do not find it necessary to appoint geography specialists as teachers. The essential educational qualifications for the appointment as a teacher of a subject are graduation in that subject with two years degree in Bachelor of Education (B. Ed.). However, the minimum basic educational qualification for appointing a geography teacher to secondary school is not uniform across various school boards. For example, a candidate must be a graduate in geography (for content/ subject competence) with a two-year degree in the bachelor of education (for teaching skills competence) to be appointed as secondary school teacher of geography in the CBSE affiliated schools. On the other hand, for being appointed as a geography teacher in secondary schools affiliated to secondary school boards of Odisha, Uttarakhand and Andhra Pradesh states, the minimum basic qualification is graduation degree with a B. Ed. It is interesting to note that these school boards do not specify subjects studied by candidates for their graduation degree. A candidate may have only a graduate degree in any subjects of social sciences (history, geography, political science, economics, sociology, psychology and anthropology) with B. Ed. degree. This means that the common practice in these and many other school boards is to appoint social science teachers who are assigned to teach all the subjects coming under social science. For higher secondary stage, the essential qualification of a geography teacher is post graduate degree in geography with B. Ed. However, in some school boards, B. Ed. degree is not mandatory.

Geography Teaching in India: Challenges and Implications

Improvement in the quality, efficiency, and equity of education, to a considerable extent, depends on the nexus of teaching and learning, which is, in turn, influenced by the quality of teachers (Pandey, 2006, p. 319). The Secondary Education Commission, also known as the Kothari Commission, (1966, p. 125) has also identified the teacher as the single most important factor influencing the quality of education. According to the Commission, the most important qualities of a teacher are his personal qualities, his educational qualifications, his professional training, his experience and the place he occupies in the school as well as in the community. All the Indian school boards, without exception, consider particularly two qualities – the knowledge of the subject (reflected through a bachelor's degree) and the teacher's professional training in teaching skills (reflected through B. Ed. degree) as the minimum basic qualifications for appointment as a school teacher. The eligibility criteria are based on the assumptions that a teacher with good knowledge of a subject (e.g. geography) may not be able to properly communicate his/her geographical knowledge in the classrooms due to lack of professional training in teaching skills. Similarly, a teacher even with a good grasp of teaching skills may fail to deliver in classrooms due to lack of subject knowledge.

The role of geography teachers in promoting geography in schools seems far more important than any other subject on account of two facts. First, geography is an inclusive subject. It draws heavily from sister subjects of natural sciences (e.g. geology, botany, etc.) and social sciences (history, sociology, economics, political science, etc.). Therefore, to be a good geography teacher, it is prerequisite for one to possess not only a reasonable knowledge of fundamental facts and concepts of sister subjects but also the ability to connect these facts and concepts with the discipline of geography. Second, being an integrating subject, a good teacher of geography must cross boundaries of sister disciplines to indicate the interrelationship between the human and the physical to develop a holistic understanding of the earth. These skills are not at all easy to acquire.

In view of these facts, the quality of geography teachers merits as the single most important factor in influencing the quality of geography teaching in schools. Despite this, the incidence of underqualified teachers of geography in secondary schools of India is widespread. This is clearly evident from the survey of 170 secondary school teachers teaching geography. The survey indicates that, in many government schools, geography is taught by teachers who are a graduate in history, political science, economics or sociology. Most of them have studied geography only up to matriculation or intermediate stage mostly taught by non-geography teachers.

As mentioned above, geography in India is taught as a part of social sciences in secondary schools. It is taught in combination with history, political science, economics, sociology and anthropology (National Council for Educational Research and Training, 2005, p.50). Ideally, there should be a separate specialist teacher for each of these subjects in every secondary school. However, it is a common practice in most of the school boards to appoint social science teachers. The social science teacher may have studied (for B.A. or M.A.) in only one or two subjects out of history, geography, economics, political science, sociology and psychology (George and Madan, 2009, p. 80). This clearly indicates that many of them may not have studied geography at

undergraduate level. It was found in the survey that an overwhelming majority of social science secondary school teachers was trained in subjects of social sciences other than geography. The survey informs that only 39.41 percent of 170 teachers had studied geography either as the main subject (35.29%) or a subsidiary subject (4.11%) in B.A. or B. Sc.

It was also found in the survey that in a large number of schools a single teacher is assigned to teach geography in combination with history, civics, and economics. In many cases, teachers lacking minimum qualifications in geography teach the subject. Of 170 teachers, only 45.30 percent reported that they were appointed to teach social science (of which geography is also a part). Crucially, not all of them had studied geography at undergraduate level. Only less than one fifth of the total teachers (i.e. 18.80 percent) were appointed to exclusively teach geography. Interestingly, 3.60 per cent of teachers reported that they were appointed to teach geography along with an Indian language. Thus, remaining teachers (32.30 percent) teach geography even though they were not appointed to teach geography or even social sciences. In India, it is not uncommon to find even language teachers (trained only to teach languages) teaching social sciences. It is particularly true in middle schools (6th to 8th classes) and some private high schools (9th and 10th classes) affiliated to the Central Board of Secondary Education (George and Madan, 2009, p. 76). One can easily infer that teachers teaching geography, without possessing essential educational qualifications, may lack in their knowledge of even basic concepts and purpose of geography. This has been revealed in a study of geography teachers of secondary school in the Indian state of Punjab. Brar (2004, p. 9) observes that a majority of geography teachers are not even aware of the aims and objectives of teaching geography in schools.

Another issue is the large scale appointment of untrained teachers (i.e. without B. Ed. degree) to teach geography. The survey indicates that nearly one fifth (19.40 percent) of teachers are without a B. Ed. degree. The problem is further compounded when the quality of teacher training is taken into consideration. George and Madan, (2009, p. 32) note: "Even the situation of trained teachers is not encouraging. In India, teacher training or college education do not sufficiently equip students (that is, teachers of the future) to assess children's needs or imagine how a curriculum should be designed". The situation in the majority of the second-rate private schools affiliated to CBSE and other school boards is worse. In most of these schools, geography is taught by untrained geography graduates or by trained non-geography graduates.

The problem of teaching of geography in schools of India is further compounded by the fact that social science subjects in schools are taken very lightly by students, parents as well as by school administrators. This attitude in society and the government is perhaps based on the implicit assumptions that social science subjects are less rewarding in terms of careers and financial benefits to students. Further, unlike degrees in science and commerce subjects, rewards in social sciences do not come instantly and are not tangible. Therefore, there is an attitude among school administrators and government officials that a person trained in any subject of social science or humanities can easily *handle* geography. In other words, they presume that even a non-geography graduate is capable to *teach geography*.

As one does not expect a teacher to teach physics, chemistry or mathematics without a degree in these subjects, why is a teacher without minimum qualification in geography assigned to teach geography? Alam (2010, p. 246) notes that:

> It is important to note that the teaching of geography requires some specialized skills like the construction of a scale, drawing, reading and interpretation of maps, and conducting fieldwork, among others. In the absence of trained geography teachers, practical geography would be further marginalised in school curricula.

Consequently, in the prevailing situation, more than any other subject of integrated social sciences, geography is the worst affected one.

Some geographers argue that compared to human geography, physical geography is marginalised in Indian universities (Mukerji, 1991, pp. 222–233; Schwartzberg, 1983, p. 239). The main reasons of the marginalisation of physical geography could be the practice of teaching geography as a social science subject in schools and the teaching of geography by social science teachers. It is worth noting that only 4 out of 170 teachers surveyed had training in science subjects like geology, chemistry, physics and mathematics at undergraduate level. The teaching of geography by a teacher trained to teach social science subjects implies that the already neglected physical geography may be further marginalised. One can expect a social science teacher with training in history, political science or economics to be relatively more comfortable with human aspects of geography. However, as a teacher he/she may not be able to do justice to physical geography. For giving a holistic understanding of the earth to students, which is the main object of teaching geography in schools, a teacher should strike a balance between *the earth as a physical*

entity and *the world as a human habitat* as well as strive to see relations between these two. As Aschmann (1962, p. 284) observes:

> An awareness of the intricate relationships between man and his environment is a major realm of scholarly investigation and informed concern on the part of all men who profess to be educated. A heightened understanding of such relationships can be gained only through a disciplined investigation of both sides of the fence, the natural environment, physical and biotic; and the human or cultural one. As a discipline geography endeavors to maintain this perspective.

It also needs to be emphasised that geology is not taught as a separate subject in Indian secondary schools. The elementary lessons on subject matters of geology (e.g. internal structure of the earth, movements in the earth crust, agents of erosion and deposition; sub-surface and surface features of earth, rocks and minerals) are taught in physical geography textbooks. Similarly, some of basic facts and concepts of astronomy (e.g. universe, solar system, stars, planets and satellites) are given in physical geography textbooks. But, when geography is taught by a teacher who is not qualified to teach the subject, the real losers are not only the students and the discipline of geography but also geology and astronomy. Thus, the assumption that any teacher can pick up some lessons of geography to teach the subject will not result in the kind of geography that "honors or best represents our science, or prepares our students to face the challenges of an increasingly diverse, troubled, and complex world" (Gritzner, 2004, p. 44).

Conclusion and Recommendations

In summary, we observe that there is a widespread incidence of underqualified teachers of various subjects in Indian secondary schools. The root of this problem can be traced to the prevailing structure and attitudes of the Indian society and the state. As the paper clearly shows, the problem of pervasiveness of underqualified teachers is particularly acute in the case of geography. A large number of teachers with little background in geography and inadequate teaching competence in the subject are found teaching geography in secondary schools in India. These teachers have educational background in subjects of social sciences and languages. It appears that if good teachers are scarce resources in India then good teachers of geography could be regarded as the scarcest resource. The problem caused by the teaching of geography by unqualified teachers in the secondary schools is quite serious. The most grievous consequence has been the marginalisation of geography in schools. As a direct consequence of this state of affairs, undergraduate and graduate geography education is suffering badly in India (Solem and Balachandran, 2014, p. 10). In particular, the teaching of geography as a social science subject has resulted in the marginalisation of physical geography in higher education in India.

What could be the solution! Currently, central and state governments and education planners are trying to solve this problem by designing textbooks of social sciences in such a way that even a non-specialist can teach the subject. Another approach has been to provide refresher/ orientation courses of the subject to non-specialist teachers. But these approaches are short term and partial solution to the problem. In the long term, the substitution of specialist teachers with non-specialists will eventually lead to the further marginalisation of social sciences and geography in schools.

Geography teachers are crucial to reform the teaching of geography in schools. It has been observed that many students develop likings for a particular subject because of good teachers. A good teacher takes his students beyond the four walls of classrooms and images of textbooks. In the process, students' thinking and imagining powers of seeing the world through a particular disciplinary perspective improve. Yerawadekar (2009, p. 612) observes that:

> It has been found that students do like geography when the teacher takes the topic beyond the books. Though many schools [in India] are now coming up with innovative ways like projects, presentations, group activity, etc., the conditions still need to be improved.

Therefore, the first step should be to appoint suitably qualified teachers to teach geography. A qualified teacher should mean *a geography teacher* not *a teacher of geography*. By geography teacher we mean that *teachers with formal geography training be appointed for teaching geography*. A geography teacher should not only possess an in-depth knowledge of his/her subject but should also have abilities and skills to transfer that knowledge, and enthusiasm for transmitting that knowledge among students in an interesting and innovative manner. The geography teacher has the responsibility of making the subject of geography real and of making it an intellectual discipline (Marchant, 1968, p. 135).

A teacher of geography, on the other hand, can be any teacher who, without adequate education and training of geography, picks up some knowledge of geography on his own to teach geography when asked by the school administration. The

survey informs that over 60% of teachers teach geography without having studied geography at undergraduate level. Generally, school teachers relish teaching a particular subject and develop a relationship to it if they are educated and trained in that subject. But when teachers are asked to teach a subject which they have not previously studied, they may not have same feelings for the subject. In view of these arguments, the present practice of appointing a teacher without training in geography to teach geography should be stopped in the interest of both the students and the discipline.

Second, it is generally observed that sometimes even trained geography teachers degrade into a weak teacher over time due to lack of opportunities to upgrade his/her knowledge and skills. It may be due to the fact that "all their initial education and training may not remain relevant and effective because of the present rate of change in the content and pedagogy in the national and world scenario" (National Curriculum Framework for School Education, 2000, p.) Therefore, school boards should provide opportunities for teachers to engage in ongoing professional learning. Keeping this fact in mind, in-service education programs were initiated as early as the 1960s. These programs aimed to train untrained in-service teachers and also prepare to teach such compartments of the curriculum which they may not have studied during their own schooling and training (Rajput, 2002, p. 209). In subsequent decades, emphases were placed on in-service training of teachers as well as trainers of teachers (known as key persons or resource persons). However, since 1994, in-service training of teachers has been accorded high priority to improve their knowledge levels as well as skills. However, in most cases these are neither planned well nor cater to teachers' needs; and therefore become a burden and ritual (Ramachandran, 2005, p. 2143). In this context, Thapar (2009, p. 1) observes that:

> There is a need to put much more into training teachers. In today's world, a teacher has to be technically proficient in the subject. Gone are the days when broad based liberal education sufficed. Subjects have become specialised. Teachers have to know how to handle this new knowledge.

These suggestions given for teachers of every subject taught in the school, apply most aptly to geography teachers as well. As a step in this direction, school boards may subscribe online access to important publications for school geography such *as Journal of Geography*, *Primary Geography, Teaching Geography, The Geography Teacher*, *Geographical Education* and *Geography and You*.

Third, field-based teaching is a highly neglected component of school geography. In most schools, field visits are hardly organised for geography students. Geography teachers are also poorly trained to undertake field-based teaching of geography. As a result, school children fail to develop a taste for geography. Therefore, field-based learning and teaching should be made an integral part of school curriculum because they will really enthuse the young minds, generate awareness towards the earth and its environs, and develop understanding of the nature (and culture) and natural (and cultural) phenomena (Kaur and Chaudhri, 2003, p. 619). The training of geography teachers in skills of field-based teaching should be made mandatory.

Finally, access of geography teachers to teaching resources, aids and supporting teaching materials is a major problem in India. A teacher in even a big city, let alone other places, cannot equip herself/himself with good child-friendly materials for their classes (George and Madan, 2009, p. 32). Therefore, school boards should ensure that geography classrooms are equipped with teaching facilities, resources and aids including information communication technologies. A well-equipped geography classroom should be equipped with at least up-to-date globes, atlases, samples of minerals, and wall maps (preferably raised relief map) of India and different regions of the world. Further, a computer with internet connection could help geography teachers to access freely accessible geography education-related websites such as NASA's World Wind, Wikimapia, Google Earth and geographyabout.com, Bhuvan (web-based GIS tool of Indian Space Research Organization, Bengaluru). The school libraries should have good quality geography textbooks. The availability of these facilities may help not only in upgrading teachers' knowledge and skills of the subject but also in motivating teachers of lesser abilities to improve their performance.

Acknowledgments: The author thankfully acknowledges the University Grants Commission, New Delhi for financial assistance to the research project. He would also like to thank the editor of *Geographical Education* and two anonymous referees for their useful suggestions. Thanks also to Dr. Anil Thakur (Assistant Professor, Department of Linguistics, Banaras Hindu University) and Dr. Swati S. Nanda (Assistant Professor, DAV Post Graduate College, Varanasi) for their help and encouragement.

References

Alam, S. (2010). Recent trends in school Geography in India. *Journal of Geography*, *109*(6), 243–250.

Alam, S. (2014). Reorienting undergraduate Geography curricula. *Transactions, Institute of Indian Geographers*, *30*(1), 33–43.

Aschmann, H. (1962). Geography in the liberal arts college. *Annals of the Association of American Geographers*, *52*(3), 284–292.

Banerjee, B. K. (2006). Geography education in Indian schools. *Internationale Schulbuchforschung*, *28*, 283–292.

Basu, P., Pawson, E., Akhter, M., Palmer, D., & Mervine, V. M. (2014). Connecting high school and university teachers in national and international contexts: perspectives from the 2012 Bangalore workshop of the AAG-CGGE. *Journal of Geography in Higher Education, 38*(1), 40–48.

Brar, J. S. (2004). *Teaching of Geography: A scientific appraisal*. Ludhiana: Hind Publishers.

George, A. M., & Madan, A. (2009). *Teaching of social sciences in schools: NCERT's New Textbook Initiative*. New Delhi: Sage Publications India Pvt Ltd.

Gritzner, C. (2004). The geographic "mental map": can "anyone" (really) teach geography? *Journal of Geography, 103*(1), 43–45.

Haubrich, H. (1992). *International charter on Geographical Education*. Retrieved from http://www.igu-cge.org/charters_1.htm#Challenges

Human Rights Watch. *Q&A: Talking discrimination and school dropout rates in India*, (2014, June 4). Retrieved from http://www.hrw.org/news/2014/04/22/qa-talking-discrimination-and-school-dropout-rates-india

Kaur, P., & Chaudhri, N. (2003). The status of geoscience in school curriculum. *Current Science, 84*(5), 618–619.

Kothari Commission. (1966). *Report of the Education Commission, 1964–66*. New Delhi, India: Ministry of Education, Government of India.

Marchant, E. C. (1968). Some responsibilities of the teacher of Geography. *Geography*, *53*(2), 129–144.

Ministry of Human Resource Development, Government of India. (2013). *Education for all: Towards quality with equity*. New Delhi: National University of Educational Research and Training.

Misra, R. P. (1983). Introduction. In R. P. Misra (Ed.) *Contributions to Indian Geography: Concepts and approaches,* Vol. 1 (pp. 1–10). New Delhi: Heritage Publishers.

Mukerji, A. B. (1991). What ails Indian Geography? Some statements. In J. Diddle (Ed.), *Emerging trends in Indian Geography* (pp. 135–155). Jaipur: Rawat Publications.

National Council for Educational Research and Training (2000). *National curriculum framework for school education*. New Delhi: National Council for Educational Research and Training.

National Council for Educational Research and Training (2005). *National curriculum framework 2005*. New Delhi: National Council for Educational Research and Training.

Pandey, S. (2006). Para-teacher scheme and quality education for all in India: Policy perspectives and challenges for school effectiveness. *Journal of Education for Teaching: International Research and Pedagogy. 32*(3), 319–334.

Rajput, J. S. (2002). *Dimensions of curriculum change*. New Delhi: National Council of Educational Research and Training.

Ramachandran, V. (2005, May 21–27). Why school teachers are demotivated and disheartened. *Economic and Political Weekly, 40*(21), 2141–2144.

Schwartzberg, J. E. (1983). The state of South Asian Geography. *Progress in Human Geography, 7*(2), 232–253.

Solem, M., & Balachandran, C. S (2014). Internationalizing geography education: a focus on India. *Journal of Geography in Higher Education*, *38*(1), 7–16.

Sunny, Y. (2006, January 21). Analysing current practices in Geography Education. *Economic and Political Weekly*, *41*(3), 270–278.

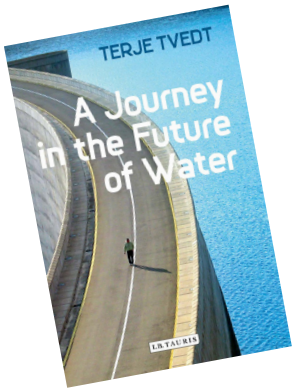
Thapar, R. (2009, January 25). Conversation about History: Interview with Kalpana Sharma. *The Hindu Magazine,* pp.1–2.

Tiwari, P. S. (2012). A Note on the teaching of Geography in India. Contributory paper presented in *Symposium on Teaching and Research in Geography in India*, organised by the Centre for Earth Science Studies, Thiruvananthapuram, Kerala (India) on December 12, 2012.

UNESCO (2014). *Education for All Global Monitoring Report – Teaching and learning: achieving quality for all*. (Paris: UNESCO Publishing). Retrieved from http://unesdoc.unesco.org/images/0022/002256/225660e.pdf

Yerawadekar, S. (2009). Relevance of school geography. *Current Science*, *97*(5), 612.

Book Reviews



A journey in the Future of Water.

By Terje Tvedt. London: I. B. Tauris,

2014, 245 pages, paperback, ISBN 9781848857452. http://www.ibtauris.com

Reviews Editor: Geoffrey Paterson

With the recent excitement over the discovery of possible traces of water on Mars, it is apt that the preface to Terje Tvedt's book starts by reminding us that the first pictures of Earth from space brought to us the reality that we are indeed the water planet. If we found another planet like this today, we would be in total awe. Terje then goes on to remind us that apart from the obvious roles of water in sustaining all life, facilitating travel and trade, and as source of both physical and political power, it is something that continues to mesmerise people. It has been a source of comfort, a metaphor in music and literature and is central in both religious cosmology and cultural rituals. With such an introduction, I found it hard to put this book down.

The author then proposes, with roughly 10,000 years of relative climate stability, that there has been little interest in how water has shaped society or its role in the future. This changed in the 1990s when there was an explosion of academic interest and study in the role of water as we entered, what he calls, *the age of uncertainty* in relation to climate change and the future availability of water.

The book is then divided into three sections. *Part 1 The new uncertainty about water* focuses on the age of uncertainty and the consequences that may follow. *Part 2 The age of water lords* presents an intriguing series of studies into the world's water hotspots and the likely shifts in geopolitical power that may result as nations seek to take control of and utilise their water resources. *Part 3 Water transforming the world* examines some of the world's largest water-based engineering proposals that could re-create the geography and maps of various countries.

Through these three sections, the author presents 23 very readable case studies of nations and regions where water is playing a vital role in the future development, potential prosperity and likely distribution of geopolitical power across the globe. Part storyteller, part travel guide and definitely an authority on water, the author takes us on a journey that builds with every chapter. The vital statistics, the numbers of people involved, the audacity of human plans and the possible repercussions tend to grow as each study unfolds. I found the case study on Spain particularly interesting as it so closely mirrors Australia's water landscape, and the proposals to ensure water supply have a familiar ring. I also found myself wanting to do further research on many of the regions and plans mentioned.

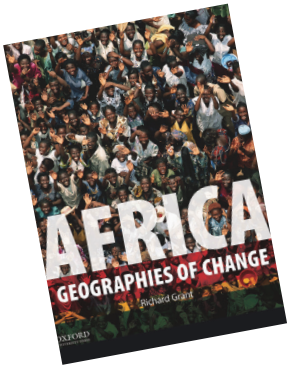
Themes of water rich and water poor nations emerge, as does the idea of water rich and water poor regions within nations and even cities. Emerging power struggles, at the sovereign state scale, are highlighted as countries start taking control of water at its source at the expense of the downstream water uses. The question over whether water can be owned or whether it is a basic human right is also explored.

Whilst I would see this as a teacher text, the reader will be able to use the many interesting facts and figures presented as the hooks to get their students captured into the narratives they are presenting in their learning programs. Many of the units across the Australian Curriculum: Geography naturally lend themselves to the content presented and teachers could even develop learning inquiries based on some of the case studies.

Despite having travelled through over 70 countries in his lifelong study of water, I was disappointed that the only continent the author does not specifically refer to is Australia! This is evident as soon as one sees his world map on page 10. I was also wondering why most of the case studies do not refer to dates much later than 2008. I then discovered that the book was originally published in 2007 and the 2014 publishing date was for the English translation by Richard Daly.

Overall a fascinating read. I can only hope Terje produces an update in the near future.

Darryl Michie
Morley Senior High School, Noranda, Western Australia



Africa: Geographies of Change.

By Richard Grant. Oxford: Oxford University Press,

2015, 356 pages, paperback, ISBN 9780199920563. https://global.oup.com/ushe

This book focuses on Africa in the 21st century, where urbanisation has supplanted the ubiquitous media image of subsistence farmers and migratory pastoralist as the experience of the vast majority; where cell phones have transformed

society; and China is rapidly overtaking the United States and European Union as the major investment and trading partner.

A central theme is the way in which the neo-colonial image of Africa has not only influenced popular perceptions but also international policies and development programs, albeit the examples of media and political bias are drawn largely from American and European examples. Nevertheless, it is an invaluable resource text for teachers at all levels and upper-level students wishing to look beyond the Australian experience.

Divided into thirteen chapters, each with case studies, relevant photographs, tables, charts and maps, as well as extensive references and additional readings, this book offers numerous opportunities for students to explore their own understanding of diverse issues. These include the changing face of rural socio-economies and gender issues; the dynamics of mobile phones on aspects such as social networking and informal economies; how migration and human trafficking has affected the continent; issues of disease, water and land management; the impacts of climate change, as well as projections of the problems and potentials of Africa's varied socio-economies.

Each chapter has the capacity to be set autonomously, as an independent focus of enquiry. The chapter on China's expansion into the resource sector in Africa is particularly relevant for Australian students grappling with the implications for their own future and the potential tensions that often accompany foreign investment.

In both the breadth of coverage and depth of analysis, *Africa: Geographies of change*, is highly recommended.

Dr David Dorward
La Trobe University, Bundoora, Victoria

Australian Environmental Planning: Challenges and future prospects.

Edited by Jason Byrne, Neil Snipe, and Jago Dodson. Oxford: Routledge,

2014, 269 pages, paperback, ISBN 9781138000711. http://www.routledge.com

Environmental planning in Australia is essential for the proper management of our resources, enhanced liveability and ensuring there is sound development for human habitation while preserving the natural environment. Yes, there are surprisingly few Australian resources available on this topic. For this reason, this book is indeed a welcome addition for teachers and lecturers who instruct in the areas of urban planning, geography, environmental studies/science and natural resources management.

This book, though, is very city-centric and I believe a better title might have included the words *city* or *urban*. There is thus little mention of challenges facing rural and regional communities – for example, the loss of valuable agricultural land for development, unconventional gas extraction issues and wind farm planning.

The book covers a broad range of topics that will make it a most useful resource for geography teachers – for example, Australian Curriculum Year 10 Unit entitled *Environmental change and management* – especially if the urban environment is chosen as the case study, as well as for university level programs in planning. I was keen to see how the chapters dealing with governance handle the tricky question of continually changing government departments and their Ministers – it does so by presenting a broad framework for the legislative environment without the specifics – a wise move! Other chapters are concerned with historical planning; water, air and wildlife in the urban environment; and energy, transport and housing.

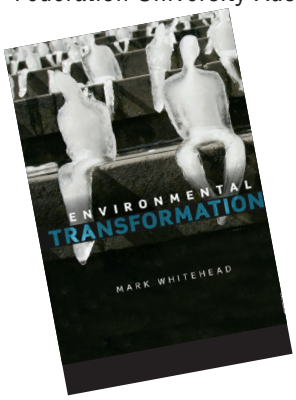
Two chapters especially stand out. One concerns the emerging field of industrial ecology (IE) in which we can

> reduce many of the waste and pollution problems facing Australia. IE is a materials and energy use practice that seeks to mimic biogeochemical cycles and patterns of energy use found in nature. It does so by modifying various supply chains, production and consumption systems, efficiently reusing wastes/byproducts, and cascading the use of energy, thus closing the loop on waste and emissions (p. 158).

The other chapter describes how planning can create healthy cities for its residents. Surprisingly, there is no mention of the excellent research undertaken by Deakin University and Parks Victoria that has underpinned the highly recognised *Healthy Parks – Healthy People* movement.

With 32 authors contributing to this book, there will naturally be inconsistencies in readability, style and level in the various chapters. However, the range and great relevance of topics presented make this a very important new resource in urban planning.

Professor Rob Wallis
Federation University Australia, Ballarat, Victoria



Environmental Transformations: A geography of the Anthropocene.

By Mark Whitehead. Oxford: Routledge,

2014, 175 pages, paperback, ISBN 9780415809849. http://www.routledge.com

Environmental transformations: A geography of the Anthropocene is a valuable companion text for both teachers and senior geography students. It looks beyond basic scientific explanations of environmental change, to help explain and build greater understanding of the human behaviours which drive our decisions; decisions which we now recognise to have profound effects on our natural world.

Mark Whitehead clearly sets out to change the way we study environmental transformations. Acknowledging the difficulty

in studying a real-time geological era – the recently termed *Anthropocene* – Whitehead challenges us to use more complex, and a greater variety of, methods to investigate and understand the origins and processes that maintain the Anthropocene.

The book is divided into two sections – *Environmental transformations of resources, air, soil, forests and cities*, and *Living in the Anthropocene*.

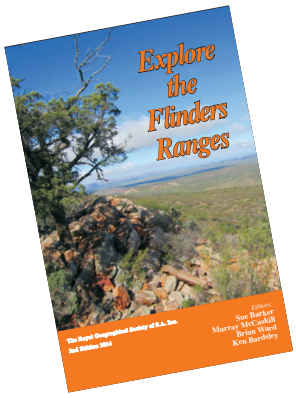
The short chapters on the changing nature of our world review the complex nature of change: the socioeconomic, political, historical and cultural contexts as well as the uneven impacts on, and responses by, different communities.

Each chapter includes case studies, an occasional exercise and further references to pursue. These references might be in the form of a YouTube clip, movie, article, web link, text or university paper. Clearly aware of the short-lived nature of textbooks, the author introduces the reader to his blog (*Placing the Anthropocene*) and invites continued interaction with his ideas and content.

The concluding chapters emphasise the role of nation states and international governance in addressing environmental challenges, and calls on behavioural psychology to help us understand the "predictable irrational" behaviours of humans and the drivers of consumerism, overconsumption, religion and industrial capitalism. Whitehead closes with the reminder that we cannot go back to a more natural environment, we have to learn to adapt and live sustainably in this new era.

Environmental transformations can be provocative and thought provoking. It adds layers of depth to our understanding of human-environment relationships. This text is a highly recommended addition to the senior Australian Curriculum or International Baccalaureate Geography classroom.

Julie Hearnden
Good Shepherd Lutheran College, Darwin, Northern Territory



Explore the Flinders Ranges Second edition.

Edited by Sue Barker, Murray McCaskill, and Ken Bardsley. Adelaide: Royal Geographical Society of South Australia,

2014, 218 pages, paperback, ISBN 9780909112363. http://www.rgssa.org.au

Explore the Flinders Ranges, written by geographers, is primarily a guidebook through the 400-kilometre dryland Flinders Ranges complex north of Adelaide. It provides background articles, 24 shorter themes of special interest, 18 well-described drives, nine town walks, 23 bush walks and a range of useful, easy-to-read reference segments including a Glossary and Index.

What geographic concepts does the resource cover?

Its focuses on the region's natural and cultural histories, covering geology, plants, birds, mammals, reptiles, Aboriginal art and stories, the history of European settlement and many localities.

What are its outstanding features?

The book contains many full-colour photographs, the glossy pages are clear and easy to read, and its sections are colour-coded at the top of the page for easy identification and reference. The breadth of information is compiled efficiently with clear subheadings, compact short paragraphs and concise multiple numbered site descriptions. The book is lightweight and easy to handle in the field due to its B5 size, strong flexible cover and coil binding allowing 360-degree wraparound page opening. The authors have done justice to an iconic area of our continent.

What are appropriate year and curriculum levels for the resource?

As a broad introduction to inland dry Australian rangelands, semiarid environments, a diverse fauna and flora and pre- and post-settlement human activities, there is much easily-accessible information for Years 11 and 12 students studying geography, biology, geology, environment, Indigenous and post-settlement history and (also importantly) tourism with multifaceted destinations.

As case studies for Australian settlement, there is much for students who will find deeper issues discussed clearly and concisely but addressing complex matters particularly within the topics listed under *Histories*. However, *Histories* as a title is a misnomer! These segments are geography in its widest sense from ancient geology right through to the social issues of changing landscape and resource use, all explained in easy to read text.

What applications can you envisage for this resource in the classroom and/or for teacher use?

The six segments under *Histories* noted above provide good working summaries of a large area with a lengthy history but they combine well to present a useful wide-scale case study of a semiarid land, its earlier inhabitants and the challenges to a new community of settlers from colder wetter climates with very different landuse traditions. Teachers could use this book, with other materials, literally as a classroom *exploration* of a new area (exactly as the title suggests). This could also provide an opportunity to lead into discussions of employment in the geology, mining, pastoral, rural support and innovative tourism industries. Such direction may be particularly appropriate for students in country schools whose understandings of their homelands can be enriched by a broader knowledge of its origins and development. Thus, the Flinders Ranges present teachers all over Australia with a very appropriate regional theme and principles which can apply right across our continent.

General comments

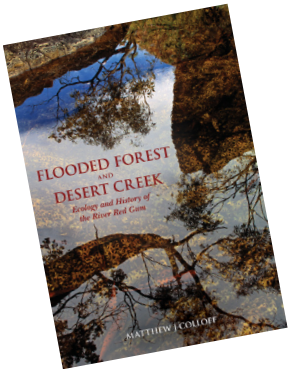
I feel that the four main regional maps covering the entire Ranges would have been better at the front or the back of the book. For me, accessible maps set the scene for understanding any region I visit. I would also have included the legend on each double page, not just on the first of the four, as there is plenty of room on each of them. I would also have liked to see

short bright red lines on the four area maps indicating all the 23 bushwalks rather than the very tiny black bushwalker figure and pointer lines.

The Drives and Walks sequences ably gather natural, built and cultural features together for the traveller. For teaching to themes, however, there would be a lot of searching in these sequences for relevant items. I would have coloured the numbered items of interest on the many town maps in some bright color so they stand out more.

This book would be an excellent planner for field trips of different types – geographical, botanical, historical, cultural or artistic and most certainly for combinations of these. Its content would enable planning for day trips or a week's travel or day activities radiating from a base camp accommodation.

Ian D. Lewis
Geological Society of Australia (SA Division), Adelaide, South Australia



Flooded Forest and Desert Creek: Ecology and History of the River Red Gum.

By Matthew J Colloff. Clayton: CSIRO Publishing,

2014, 325 pages, hardback, ISBN 9780643109193. http://www.publish.csiro.au

This well-written book describes the role of the river red gum to the Australian economy, society and ecosystem from before European settlement to the present day. It is organised in three parts containing eleven chapters. Part 1 outlines the role of forests in floodplains and rivers, their life history and ecosystem function. Part 2 details the forces of change – fire, grazing, harvesting, floods, droughts and river regulation. Part 3 traces the tree's journey from exploitation to conservation and from single value to multiple values. It is an extensively researched study of the iconic river red gum, covering scientific aspects and sociocultural interactions with the tree through time.

In Colloff's own words, the book is "historical ecology . . . how people have affected the environment and how their actions have changed the character and function of ecosystems" (p. xi). This comprehensive book discusses the tree's influence on poetry, literature and art, while also covering its ecology, life cycle and importance to aboriginal culture, and reflecting on the landscapes and cultural settings it has shaped.

This is a resource for teachers of many disciplines, including Science, Biology, Social Studies, History, and Environmental Science, as well as Geography. *Part 2 Forces of Change* provides some material that may be useful for the new VCE Geography Unit 3, Land Cover Change, as Colloff provides fascinating evidence challenging the long held belief that Aboriginal firestick activities were designed to influence the pattern and distribution of the river red gum forest. Instead, it may be that this was an indirect consequence of aboriginal people targeting other vegetation, such as reed beds.

This book's relevance to many disciplines justifies its addition to a school and individual teacher's library. It is value for money given its coverage, relevant colour photographs, and quality presentation.

David H. Jones
Kew East, Victoria

The Language of Global Development: A Misleading Geography.

By Marcin Wojciech Solarz. London and New York: Routledge,

2014, 181 pages, ISBN 9780415657020. http://www.routledge.com

The intriguing subtitle suggests that *geography may be a dangerous discipline* because it addresses daily life struggles and scholarly debates about human development, both of which can and do have multiple interpretations. Furthermore, that geographers illustrate those issues on maps for others to see often adds to different explanations. The focus of this short treatise on the *archaeology* and *biography* of development world discourses is a thoughtful and thought-provoking examination of how social and policy scientists, concerned with world economic and social development seek to provide some coherency to those realities. Labelling and mapping global and regional development is not a task for the timid and faint-hearted economist, anthropologist, historian, political scientist, geographer, or a professional working for the United Nations or the World Bank. The task of trying how best to classify and label the "world of worlds" (the author's words) is tricky, difficult and challenging. Nevertheless, the tasks are even more difficult for the geographer because she/he is asked (or expected) to come up with some labelled categories that will clearly demarcate "what country or region" belongs where. Maps showing distinct boundaries are just as important for the generalist as the specialist.

Solarz, who is on the faculty of Geography and Regional Studies at the University of Warsaw, carefully and critically looks at the origins of varying discourses surrounding global development in the past seventy years. He discusses backward *areas* (1931), underdeveloped *areas* (1940s), least *less developed countries* or LLDC (1971), *Third World* (1952), *developing countries* (1956), *North-South* worlds and divides (1977), *BRIC* countries (2001) and *emerging markets* (1981). Assessing the strengths and weaknesses of each term aids the reader in understanding not only what the term means vis-a-vis global development, but also what it means when placed on maps.

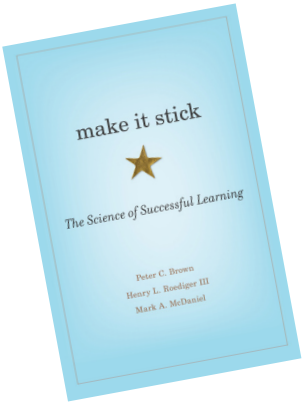
The book is divided into five chapters with the first four addressing the concepts stated above. Accompanying the text are two dozen maps showing the countries and regions included in the classifications: developed – developing; First, Second and Third Worlds; North-South worlds, the Brandt Line, and emerging markets.

The volume is much needed for those interested in the geographies and economies of global economic development. I can also envision it will be useful for the middle and high school teacher discussing globalisation and rich/poor, developed/developing, First/Third Worlds (second no longer exists) and North/South divide, and also the instructor discussing these labels in introductory university world regional, economic geography or global development. Providing students with background materials about how and why we regionalise the world the way we do, and why we use the labels we use, can promote critical thinking and mapping skills for those of all ages. The eleven page multilingual and multidisciplinary bibliography is invaluable for the novice and the professional studying the economic world from the 1950s to the present. There are much challenging ideas for those teaching advanced classes on global regionalisation or seminars on development discourses in regional economics, North-South and Third World Development, the cartographies of development, and geopolitics of the 20th and early 21st centuries. Comparative analyses of the maps might also be used for instilling critical thinking among students at multiple grade levels.

The discussions of events, processes and analyses highlight the major theoretical and/or conceptual arguments of those who study global development discourses and cartographies. I found the treatment of recent political and social changes basically unbiased and fair, including flaws in Soviet and Russian development policies. I found it difficult to identify major flaws in the author's arguments as his positions are in accord with others who look at development theory, Third World as a term, the *third way* (non-alignment), and World Bank and United Nations regional labelling.

Let me suggest several areas that might be pursued by others looking at the challenges facing the labelling and cartographies of global development. First, innovations and rapid diffusion of ICTs (information and communication technologies) are affecting all countries to some degree in today's worlds which mean traditional two-dimensional maps are proving somewhat unwieldy and inaccurate in present worlds. Networks and systems are replacing territories. Second, governmental institutions and organisations need to be studied alongside the impacts of NGOs. Third, a focus on the global and regional patterns of social well-being and quality of life indicators need study. The geographic patterns of HDI (Human Development Index) and GII (Gender Inequality Index) merit comparing with income and labor indicators. Fourth, security issues need study, a theme mentioned briefly in the last chapter. These include in-state and cross-border terrorism (physical and cyber) conflicts, but also food and energy security, the human rights of minorities, human trafficking, diseases and climate change, all which know no political boundaries. Studying these topics will introduce some new terminology into developmental discourses, but they are also important to study in interdisciplinary contexts to avoid the perpetuation of "misleading geographies and cartographies" and other "knowledge gaps" in development-oriented social and policy sciences.

Professor Stanley D. Brunn
University of Kentucky, Lexington, Kentucky,
United States of America



Make it stick: The Science of Successful Learning.

By Peter C. Brown, Henry L. Roediger III, and Mark A. McDaniel. Cambridge MA: The Belknap Press of Harvard University Press,

2014, 336 pages, hardback, ISBN 9780674729018. http://www.www.hup.harvard.edu

This book is a collaboration between two cognitive scientists and a wordsmith. It takes well-researched advances in cognitive psychology to offer concrete techniques which students and teachers can use to improve learning.

Analogies, metaphors and storytelling structure this book which makes it an accessible, even light read. Delving in to the unobtrusive footnotes, key references range from research dating back several decades to more recent studies. Meta-analysis of research was rarely undertaken.

The key ideas in this book may seem simple to educators. Reiterated many times, the key line of argument is that rereading text is not a productive means of deep learning. Instead, using techniques such as answering questions, completing quizzes, receiving corrective feedback and developing ways to express new content in one's own words all work better. As well, taking new ideas and arranging them into a personal mental model, or applying them in a new context deepens learning. The use of spaced and multiple tests or quizzes on the same content to strengthen long-term retention of ideas is also advocated.

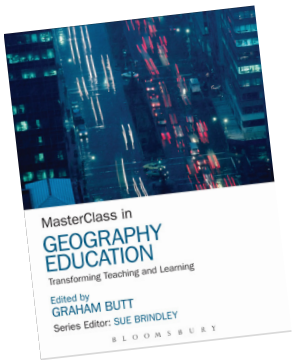
An interesting feature outlined is the use of interleaved or *spacing out* practice which is described when students mixing up their sequence of study is effective in improving their results.

Over the 336 pages, the authors explicitly repeat key ideas on the basis that this will enhance the retention of materials for the reader. Reading this as a teacher, many of the ideas in the book were not new so the repetition might be more effective for a non-teacher audience. For example, Carol Dweck's research on fostering a growth mindset in learners is mentioned. This is routinely incorporated in contemporary teacher education programs. It is a helpful reminder that when improvement is

attributed to effort, learners keep trying – they *dig deeper*, or in other words they persist.

The final chapter takes the ideas in chapters 1 to 7 and distils these into tips for students in schools and in higher education. They have application for teachers interested in guiding their students to stronger learning outcomes. If self-quizzing, using metaphors, learning to use mnemonic devices, and use of higher order questions to guide regular revision are new ideas, then this book will be of interest to you.

Dr Jeana Kriewaldt
The University of Melbourne, Carlton, Victoria



MasterClass in Geography Education: Transforming Teaching and Learning.

Edited by Graham Butt. London: Bloomsbury Academic,

2015, 219 pages, paperback, ISBN 9781472535719. http://www.bloomsbury.com/uk

MasterClass in Geography Education draws on the expertise of leading Geography educators to explore the major themes in Geography education research and pedagogy. The book's stated purpose is to support practitioners undertaking research in Geography education. In doing so, it guides the reader to an understanding of how research in Geography education can be appropriately designed and carried out. The stated intention of the book is to "provide an appreciation of how teachers engage with their own professional development, grounded in practical case studies and accounts from those who have undertaken the research journey" (p. 6).

The book's editor has assembled an impressive list of contributors. They include Professor David Lambert, Emeritus Professor Simon Catling and Margaret Roberts from the United Kingdom and Professor John Morgan from New Zealand. Together, these highly accomplished Geography educators provide the basis from which both experienced and beginning researchers can successfully scope, design and execute their geographical research.

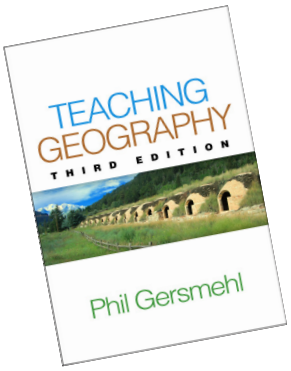
The work of the book's contributors is organised using the conceptual framework of *Contextualizing, Constructing, Researching* and *Producing*. Each section concludes with a discussion designed to promote reflection. Within this framework, the book incorporates discussion of the place of subject knowledge in Geography, the role and function of research in Geography education, the relationship between research and professional practice, and the practical aspects of undertaking research including the writing of the research proposal and ethical considerations.

The text would be especially valuable for those classroom practitioners keen to research their own professional practice, and tertiary students undertaking research at the honours and postgraduate level.

As noted in the book's forward, the work "robustly asserts the place of research in effective teaching and learning" (p. xi). It also reminds us of the reasons we chose to become Geography teachers – because we find learning about the world in which we live both stimulating and exciting.

The book is written in an engaging and very readable style.

Dr Grant Kleeman
Macquarie University, Sydney, New South Wales



Teaching Geography (Third Edition).

By Phil Gersmehl. New York: The Guilford Press,

2014, 332 pages and CD-ROM, paperback, ISBN 9781462516414. http:// www.guilford.com

I had the privilege of meeting and chatting with the author at a Geography conference in Michigan in October 2014.

To begin, I was very impressed with the meeting and discussions about his latest edition of the book. To go on, I have prescribed the textbook for a university subject in Geographical Education that I teach in the final year of a Bachelor of Education course.

So, I almost as enthusiastically concur with the summation provided by a K–12 Social Studies Consultant from Michigan, Sean McBrady on the back cover of the book: "The most entertaining and useful book about teaching geography I've ever encountered – should be required reading for social studies teachers".

I am particularly impressed with this textbook as a potential resource for teachers of Geography in general. Both for those who may have had substantial preservice and/or in-service professional learning, and others who might be real novices in the area. Indeed, I felt that taking novices and making them more expert, as well as the capacity to develop further the expertise of highly accomplished teachers of Geography, are key potential values of this book.

There are a number of references, of course, to United States examples. One needs to draw examples from somewhere and particularly relevant ones to illustrate points that the author/teacher is familiar with and have real worth for the intended audience. So at times, I substituted other examples from Australia and elsewhere as I read aspects of the text. As a teacher, particularly with expertise in Geography, I found it

very easy to read and understand the author's clear view on the essence of Geography and the teaching of Geography. The book provided ideas on not only what to do in areas such as pedagogical content knowledge, but also how to do it, and most importantly: why. I especially liked various sections in the book dealing with thinking about Geography and teaching Geography. It provided stretch goals time and again to develop in the reader their insights into Geography and teaching Geography. I was impressed too with understandings from aspects of contemporary neuroscience and their relationship to Geography and teaching of Geography dealt with in the book.

Therefore, as a person with Geographical expertise and a keen interest in learning and neuroscience, I found this book a valuable resource that I commend to teachers and those involved in teacher education for consideration.

Professor Ken Purnell
Central Queensland University, Rockhampton, Queensland

Australian Geography Teachers' Association Limited and its affiliated associations 2015

Australian Geography Teachers' Association Limited

Executive

Chairperson	Dr Grant Kleeman	grant.kleeman@mq.edu.au
Deputy Chairperson	Trish Douglas	tdouglas@elthamcollege.vic.edu.au
Immediate Past Chairperson	Malcolm McInerney	manning@chariot.net.au
Company Secretary	Susan Caldis	susan.caldis@students.mq.edu.au
Company Treasurer	Leonie Brown	brownl@bmg.vic.edu.au

Directors of AGTA Ltd

Anna Griffin – GAWA President (Appointed Director)	Anna.griffin@svacs.wa.edu.au
Darry Michie – GAWA Nominated Director	darryl.michie@education.wa.edu.au
Julie Hearnden – GHTANT Treasurer (Appointed Director)	julie.hearnden@ntschools.net
Anna Hind – GHTANT Nominated Director	Anna.hind@ntschools.net
Susan Caldis – GTANSW President (Appointed Director)	susan.caldis@students.mq.edu.au
Grant Kleeman – GTANSW Nominated Director	grantkleeman@mqeduau
Russell Smerdon – GTAQ President (Appointed Director)	russell.smerdon@ahs.qld.edu.au
Anne-Marie Gerlach – GTAQ Nominated Director	agerlach@stmargaretsqldeduau
Joanne Wegener – GTASA President (Appointed Director)	jwegener@concordia.sa.edu.au
Greg Way – GTASA Nominated Director	gway@cabra.catholic.edu.au
Trish Douglas – GTAV President (Appointed Director)	tdouglas@elthamcollegeviceduau
Leonie Brown – GTAV Nominated Director	brownl@bmgviceduau
Debbie Claridge – TGTA President (Appointed Director)	dclaridge@smc.tas.edu.au
Greg Calvert – TGTA Nominated Director	greg_calvert@hotmail.com

Member Associations

Geographical Association of Western Australia

President	Anna Griffin
Correspondence	GAWA, PO Box 1252, Subiaco, WA 6904

Geography and History Teachers' Association of Northern Territory

President	Loraine Caldwell
Correspondence	GHTANT, PO Box 41306 Casuarina, NT 0810

Geography Teachers' Association of New South Wales

President	Susan Caldis
Correspondence	GTANSW, PO Box 577, Leichardt NSW 2040

Geography Teachers' Association of Queensland

President	Russell Smerdon
Correspondence	GTAQ, c/o Royal Geographical Society of Queensland (RGSQ) 237 Milton Road Milton QLD 4064

Geography Teachers' Association of South Australia

President	Joanne Wegener
Correspondence	GTASA, 163A Greenhill Road, Parkside SA 5063

Geography Teachers' Association of Victoria

President	Trish Douglas
Correspondence	GTAV, PO Box 2066 (503 Burke Road), Camberwell West VIC 3124

Tasmanian Geography Teachers' Association

President	Debbie Claridge
Correspondence	TGTA, c/o Debbie Claridge, St Mary's College, GPO Box 1476 Hobart, TAS. 7001

ISSN 2204-0242