# Preface

## Building a Foundation for International Collaborative and Comparative Research on Geography Learning Progressions

Since 2013 the National Center for Research in Geography Education has been leading a project known as GeoProgressions in an effort to build capacity to conduct research on learning progressions in the context of U.S. geography education. One of the major outcomes of GeoProgressions was the publication *Learning Progressions for Maps, Geospatial Technology, and Spatial Thinking: A Research Handbook* (Solem et al. 2015), which offers an introduction to learning progressions and examples of their applications in the context of spatial cognition research.

Drawing principally upon the work of math, science, and geography educators in the U.S., *Learning Progressions for Maps, Geospatial Technology, and Spatial Thinking* presents a methodology for researching how students develop increasingly complex and sophisticated understandings of fundamental geographic and spatial concepts along with the development of their cognitive learning capacities. Information of this nature may well assist geographers seeking a way of calibrating instruction to draw out what students know about spatial relationships, assess how they perceive spatial information, and help them successively build upon prior knowledge to reach more complex levels of spatial awareness and cognitive ability. Geography learning progressions have significant potential to assist administrators and teachers by providing evidence of students' conceptual understanding of disciplinary content.

The broader literature on learning progressions offers many examples that might serve as potential models for geographers seeking to conduct studies on learning progressions in relation to other domains of geographic knowledge as expressed in *Geography for Life: U.S. National Geography Standards* (Heffron and Downs 2012). In its review of this literature, GeoProgressions illustrated the importance of thinking about learning processes in terms of "grain size," that is, the relative breadth or depth of a progression in knowledge and thinking.

| Dimension | Simple → Complex | | |
|---|---|---|---|
| **Instructional context** | Question is closely defined with two-three potential answers | | Question is open with multiple potential answers |
| | Data set is small | Data set is large | Students define data set |
| | Data set is limited to appropriate data | | Data set includes both appropriate and inappropriate data |
| | Detailed scaffolds | Moderate scaffolds | No scaffolds |
| **Argumentative product** | Claims are defended | Claims are defended with evidence | Claims are defended with evidence, and reasoning |
| | Counterclaims are NOT rebutted | | Counterclaims ARE rebutted |
| | Claim addresses question asked | | Claim addresses question asked with a casual account |
| | Component (i.e. evidence, reasoning, rebuttal) is appropriate | | Component (i.e. evidence, reasoning, rebuttal) is appropriate and sufficient |
| **Argumentative process** | Claims are articulated, defended, questioned or evaluated | Claims are articulated, defended, questioned, AND evaluated | Claims are articulated, defended, questioned, evaluated, and revised |
| | Student participation in argumentative discourse is prompted by their teacher | Teacher and students share responsibility for prompting the argument | Students spontaneously engage in argumentative discourse |

**Fig. 1** A learning progression for scientific argumentation (Berland and McNeill 2009). The more *darkly* the cells are *shaded*, the more complex the students' work on that characteristic

Take, for example, Leema Berland and Katherine McNeill's learning progression for scientific argumentation (Fig. 1). This learning progression conceives a process of scientific argumentation in three dimensions, each having a linear gradient ranging from simple to more complex. Without prescribing disciplinary content or context, Berland and McNeill outline a coarsely grained progression showing hypothetical relationships between the instructional support provided to students as they think and reason with data, make claims and rebuttals, and draw conclusions about cause and effect.

For geographers, Berland and McNeill's learning progression might suggest a means of engaging students in a process of geographic inquiry and reasoning. It would be up to the geography educator to refine this progression by defining the qualities of the geographic questions, data, evidence, pedagogies, and communication techniques at play in the process of scientific argumentation.

This does, however, raise a specter within geography education: how dependent is this particular learning progression on students' prior knowledge? In other words, to what extent can a person engage in scientific argumentation without first having foundational knowledge in a discipline? One might be able to think and deliberate in very complex terms, and yet, still reach invalid or inaccurate conclusions because of inappropriate methods, faulty assumptions, and limited knowledge about a

problem and its context. While the debate on the topic of the relationship, causal or correlational, among knowledge creation capacities and chronologies is expected, this book maintains a focus on practical, experiential, and conceptual discussions of learning progressions within geography education. Further theoretical research is needed to formulate understandings and debates about how knowledge creation and foundational learning are interrelated, especially within geographic education.

One may consider the design of a learning progression that models a progression based on both content knowledge and scientific thinking process (Fig. 2). In this example, the learning progression presents a hierarchical portrayal of the scientific concept of biodiversity, with content progressing from foundational knowledge (i.e., knowing and being able to explain the difference between a plant and an animal) toward a conceptual understanding of what constitutes biodiversity in terms of richness species and taxa and abundance (Songer et al. 2009). This relatively fine-grained content progression is aligned with a more coarsely grained

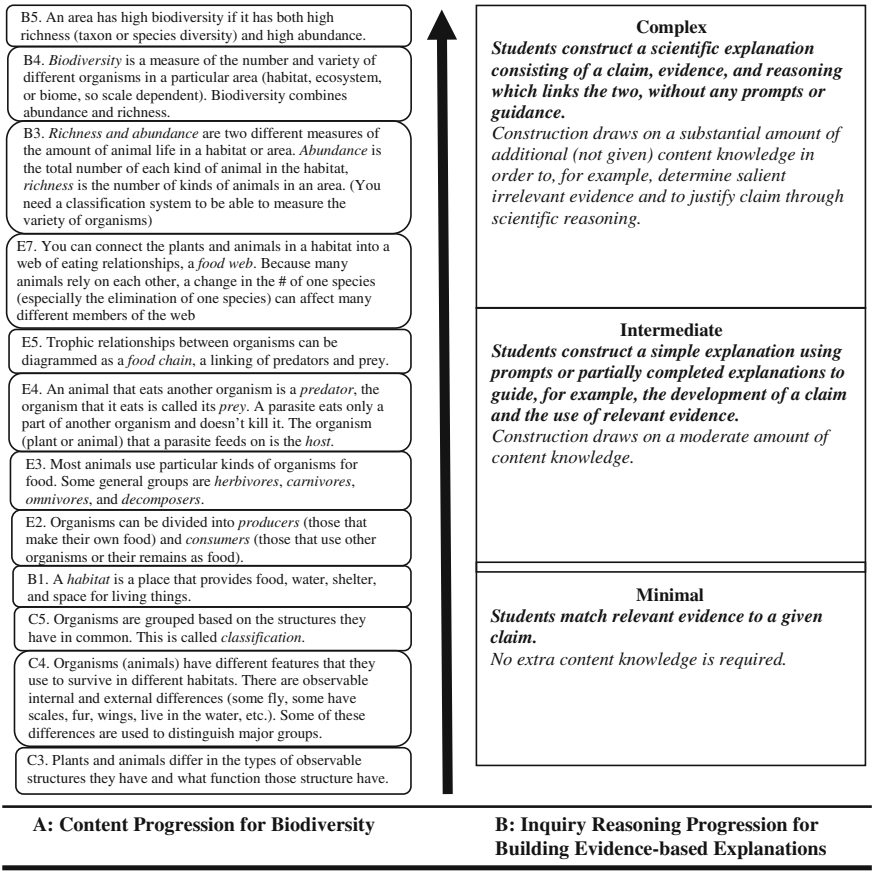


**Fig. 2** Learning progression for evidence-based explanations about biodiversity (Songer et al. 2009)

progression of what constitutes as simple to more complex qualities of scientific reasoning about biodiversity.

Although Songer et al. (2009) learning progression is an attempt to meld the relationship between knowledge and thinking in a process of making evidence-based explanations, there is very limited empirical research on whether such a tool, developed for a relatively "vertical" science such as biology, will be useful for investigations of learning processes in relation to geographical subject matter, such as urban environments, cultural landscapes, social justice, or economic interdependence. These and many other topics do not constitute a clear hierarchical arrangement (progression) of knowledge that may constitute a prerequisite for reaching more complex levels of conceptual understanding and higher cognitive thinking. Solem and Lambert (2015) address this and other cautionary assumptions in their concluding chapter to *Learning Progressions for Maps, Geospatial Technology, and Spatial Thinking: A Research Handbook.*

Despite the aforementioned uncertainties, learning progressions are attracting the interest of geography educators if for no other reason than the potential of this research field to generate empirical knowledge of student learning. Additionally, there are also many innovative practical values of learning progressions that warrant our attention.

## Practical Applications for Learning Progression Research in Geography Education

It is clear that models for learning progression research are available in STEM disciplines, and that they are catching the eye of geography educators. One could argue that this type of research may be among the most valuable in the process of geography education despite complexities that will be difficult to understand and even more complicated to measure. For example, Berland and McNeill's work uncovers the dilemma of "students' prior knowledge" and how this single variable might call into question students' ability to engage in argumentation. Now add to this the whole mosaic of students' value components and the social context of learning with regard to variables, such as race, religion, politics, socioeconomic background, family structure, and cultural preconditioning, and there is a complicated mental set of conditions that will no doubt affect how students learn concepts and skills in any discipline.

Nonetheless, it is in the student learning arena where learning progressions research may validate assumptions about a hierarchy of understanding geography, including how it is learned and, ultimately, within what stage of childhood development it may be more practical or effective to be learned and applied. Mastering this research process will take time. Geographers may be starting this new course in learning progressions behind scholars in other disciplines, albeit with gumption and determination to find a new way of teaching geography to future generations of students.

## The Case in the United States

Learning progressions research in geography education is of critical importance because it provides a unique understanding necessary for all of the other elements of teaching and learning in U.S. schools, components, such as instructional materials (including textbooks), content standards, performance standards, and assessments. A research based scope and sequence for American geography education may represent the starting point for all other teaching and learning processes in K-12 schools. Such a research-based scope and sequence might reach university-level teacher training courses so that beginning and pre-service teachers face their initial jobs with adequate and sensible preparation.

Geography educators are beginning to anticipate the 3rd edition of *Geography for Life*, national standards in geography in the U.S. While standards vary from state to state, *Geography for Life* is the opportunity for a national, research-based scope and sequence. Now is the chance for the profession to make practical research-based recommendations to curriculum developers about what and how students, at all grade levels, should learn geography. Teachers will pay closer attention to these standards, if it is widely known that they have been authenticated in classrooms with students. Learning materials will be revised and teacher educators, particularly those involved in certification programs, will use learning progressions in their teaching tool kits. While these comments apply to the U.S. system of teaching and learning, this volume clearly displays that the learning progression research challenge is similar in many of the other countries of the world. We can and do learn from each other.

## The Value of International Perspectives

Learning progressions are having an impact on geography education worldwide, within diverse education systems pertaining to local, cultural and institutional policies, assessments, and curricula. The idea for publishing a book capturing international perspectives on geography learning progressions arose during a panel session at the 2015 AAG Annual Meeting in Chicago, where researchers affiliated with the GeoProgressions project shared their work with the many international delegates in attendance. It soon became apparent from the ensuing discussions that the meaning of learning progressions varies, often considerably, from country to country. In some cases, a learning progression is understood to be a broad scope and sequence for a curriculum, taking the form of guidelines for teaching and learning disciplinary content, ideas, skills, and principles across primary and secondary levels of education. Elsewhere learning progressions are defined in relation to a child's cognitive development and thinking processes, often at a very fine-grained conceptual scale. In between this spectrum there are many other

permutations of what constitutes a learning progression in the realm of school education.

The chapters in this book illustrate the diversity, depth, and breadth of how geography educators conceive learning progressions as a theory of learning, as a research methodology, and as a practical resource for teaching, assessment, and curriculum development. By engaging in a discourse on learning progressions within different educational systems, geographers are building a community around which geography education can unfold to meet the demands of students in the twenty-first century. By working locally in GeoProgressions, geographers and teachers help to strengthen and reinforce geography education within the parameters and purview of national and international educational systems.

The debate about progression normally turns one's attention to technical issues that might help to determine some ways of approaching the ultimate goal of learning progressions within geography education. That attention needs to be purposefully directed, as it can lead to erroneous paths that stray from the end goals and ultimate purpose. Keeping in mind this possible difficulty along the road of studying learning progressions, the chapters are organized to follow a path symbolically introduced as 'progress in the highway to learning progressions' (Fig. 3).

Margaret Robertson, John Morgan, and Jeana Kriewaldt, representing Australia and New Zealand in Chap. 1, initiate the journey to confront the question of what constitutes progress in geography, and, at the same time, introduce the important distinction between progress of geography and progress in geography. The authors call for a revision of aims, purposes, and approaches of geography within the school system.

Péter Bagoly–Simó and Anke Uhlenwinkel in Germany take a stand on rigorous conceptualization of progression in Chap. 2. It is a good connection to the first

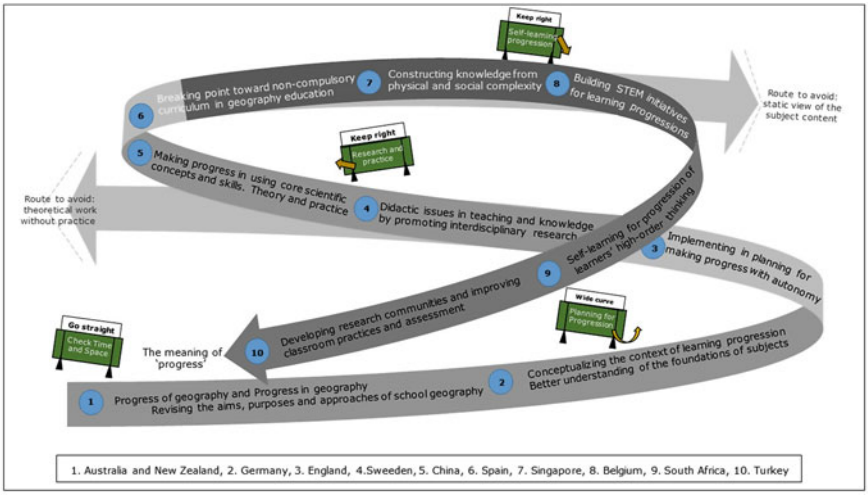


**Fig. 3** Progress and learning progressions. Countries' problems, approaches, and propositions

chapter because it leads to one of the major problems linked to disciplinary core ideas. The precise comprehension of concepts and skills is not exempt of barriers which might obscure the understanding of the foundation of subjects. The reader travels on this conceptual highway through a fixed path of learning progressions discussion that faces a wide turn toward an uncertain progress and future development.

In Chap. 3, Mary Biddulph and David Lambert tackle the policy context related to learning progressions. They focus on England to make remarks on education policy that involve a story of struggle. Progression is important, yet uncertainty is tackled with the presentation of both responsibility and implementation of progression in policy terms. The authors share a key lesson to learn from their experience: successful progression is implementing in planning coupled with teachers' autonomy. It is time to enter into practice.

The next two chapters enter into research and practice that are also a preoccupation of the next five contributions. In Chap. 4, Lena Molin and David Örbring, begin to describe the selective traditions based on didactics that give a static view of the subject content. The authors firmly recommend interdisciplinary research to increase the integration of knowledge to avoid hierarchical thinking. In Chap. 5, Yushan Duan and other authors see the need for a constant exercise of theory and practice, framed within the context of the Chinese educational system. Learning progressions research models are still weak in theoretical armament and practical verification. Consequently, they point out that research on learning progressions requires the collaborative effort of a research group of educators, especially working in empirical research. The definition and use of core scientific concepts and skills is the first step to develop learning progressions in the school system.

In Chap. 6, Rafael de Miguel González discusses the compulsory and non-compulsory curriculum within the context of the Spanish school system. The main challenge for learning progressions in geography education is the continuity of geographic and spatial subjects throughout all of the K-12 grades. He adds that geography as a compulsory subject with a renewed curriculum would not be sufficient to implement learning progressions. Further research and policy development must include assessments and changes based on practical experience.

In Chap. 7, curriculum development and geographical learning progressions link well with the preceding chapter. Chew Hung Chang focuses on the construct of geographical understanding within the schools in Singapore. He uses global climate change as a frame of reference across different levels of the educational system. In this way, knowledge construction requires a strong knowledge based on the phenomenon as a whole, yet each element has to be considered simultaneously and as interconnected units of study.

In Chap. 8, An Steegen, Joris Coppenholle and Lieve Slegers focus their attention on Flanders, Belgium, to uncover a difficult reality: the discussion on learning progressions is not a priority. However, a collaboration with colleagues from the French or German parts of Belgium should be considered, given the fact that the STEM (Science, Technology, Engineering, and Mathematics) initiatives are growing in impact in the schools. STEM might be the key to catalyze learning

progressions in the educational system, as geography education may take a queue from STEM to introduce or continue the development of learning progressions based on geographic and spatial knowledge creation and learning.

In Chap. 9, Aubrey Golightly and Christo P. van der Westhuizen continue the discussion on interdisciplinary research on learning progressions. A clear and definitive departure from a static view of the subject content, the authors' recommendations for interdisciplinary research is based on the urgent need for building robust geography content and pedagogical content knowledge. Higher order thinking is only possible to reach by self-learning processes. Hence, even the assessment stage should be accomplished through self and peer evaluation. This in turn will enhance the process of learning progressions in geography education.

In Chap. 10, Ali Demirci and Fikret Tuna close the book with a critical overview and prospects for the future. Learning progressions is growing in academic debates and require foundational data to start the process of implementing practical strategies in multilevel and multi-actor educational systems. A research community is an ideal way to create sustainable programs for learning progressions. Furthermore, improving classroom practices and assessments along with curriculum development are necessary steps for effective learning progressions.

Collectively, all of the chapters address a fundamental question: What is the meaning of progress in geography education? Within the multifaceted experiences of society, cultures, institutions, and education, the authors of this book hope to forge an innovative discussion of how learning progressions will impact geography education and improve and strengthen geography's role in the educational system.

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