

## The Evolution of the Modern Era of Geographic Education through Messages that Established the Foundation for K-12 Educators

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### Abstract

This study examines key foundational documents and publications over the last several decades—the modern period of geographic education—to shed perspective on the evolution of the field through collaborations, writings, and events by pioneering leadership in K-12 geographic education. In doing so, this paper also identifies and elucidates seminal and significant “messages” of information, instruction, and guidance that have been disseminated by the university world of geography to K-12 geography teachers and opens the door for future research concerning the degree to which these “messages” have been received, understood, accepted and acted upon in the teaching of school geography.

**Keywords:** K-12 Geographic Education; Geography Education Instruction; Education Communication; Evolution of Geographic Education

At no time has the dichotomy between university geography and school geography been greater (Boehm, 2015). School geography remains the domain of the teachers and falls under the umbrella of the social studies. University geography is governed by professors who increasingly have turned their interests to process-oriented physical geography and geospatial technology, and therein lies the problem. These two conceptualizations of the nature of geography do not correspond well which creates a difficult situation as teachers often rely on university professors to guide their thinking, curriculum, and even teaching methodologies in classroom teaching of geography. One would think that clear and open pathways exist for university geography professors to speak to potential geography teachers about these matters in pre-service education programs;

however, this exchange is weak for a number of reasons, many of which are beyond the control of geographers, either at universities or in the schools. It is necessary then to examine key foundational documents and publications over the last several decades—the modern period of geographic education—to determine how these communications of instruction, guidance and information from the university world of geography to K-12 geography teachers have been received and operationalized in the classroom.

This study is based on a selection of seminal writings and key leadership organizations in geography education and begins by reaching back to the publication of *The Guidelines for Geographic Education* (Natoli, 1984). This early foundational work is widely credited for ushering in the modern period of geography education. This period has been marked by a number of prominent events, documents and publications resulting in disseminated “messages”—information, instruction, advice, and so forth—to K-12 teachers of geography over the past four decades. A description and analysis of the intent, purpose, and “message” of each foundational work is presented below with the goal of shedding perspective on how the field has evolved through disseminated writings by leaders in geographic education to their own university colleagues, as well as, teachers of K-12 school geography. Over the years, these “messages” have addressed deficiencies, reform and, directions in geographic education. For teachers, early messages focused on content and instruction for teaching geography employing traditional teaching approaches. In more recent times, messages have emphasized the importance of developing spatial thinking in students, and encouraged teachers to incorporate technology in the classroom to enhance spatial thinking.

These foundational “messages” disseminated by leaders in geographic education formed the backbone of research by Drs. Patton and Blanchard who investigated the effectiveness and usefulness of instruction, information, and guidance for teachers of K-12 geography. Their analytic research is reflected in the article that follows in this issue of *Research in Geographic Education*.

### **Early Messages in Geography Education**

#### ***Guidelines for Geographic Education: Elementary and Secondary Schools***

The modern era of geographic education began in 1984. That seminal year marked the introduction of the Five Fundamental Themes in geography—Location, Place, Human-Environment Interaction, Movement, and Region—which were included in the pioneering publication, *Guidelines for Geographic Education: Elementary and Secondary Schools* (Natoli, 1984). This joint effort between the formerly known as Association of American Geographers (AAG) and the National Council for Geographic Education (NCGE) recommended influencing standards, improving teacher expertise, setting up communication

networks, increasing the visibility of geography, and improving teaching and learning materials (Natoli, 1984; Natoli, 1994).

For much of the 20<sup>th</sup> century, geographic education had been neglected, thus, serious reevaluation began in the early 1980s. Leading up to the reassessment of the status of geographic education in the United States was a series of newspaper reports, nationwide tests, and studies that revealed poor performance of U.S. students in geography (Boehm, 1997; Hill, 1981; Natoli, 1988). The *Guidelines* put forth a concise and unified message that reverberated throughout the world of K-12 education and beyond. The message was simple: *across the board improvement is needed in geography*. Geography was, and is, much more than rote memorization, and in order to convince the American public of this truth, geography professional organizations, standards developers, and teachers needed to work together (Boehm, 1997; Joint Committee on Geographic Education, 1984; Natoli, 1988).

### **Geography Education National Implementation Project (GENIP)**

To facilitate the success of the *Guidelines*, the Geography Education National Implementation Project (GENIP) was launched in 1985 and comprised of, the Association of American Geographers, now American Association of Geographers (AAG), American Geographical Society (AGS), the National Council for Geographic Education (NCGE), and the National Geographic Society (NGS). In 1987, GENIP published *K-6 Guidelines* and, in 1989, *7-12 Guidelines* to enhance the scope and sequence message first introduced in the *Guidelines* in 1984 (Boehm, 1997). In addition, the *Guidelines* and geographic education as a whole were impacted positively by the foundation of the National Geographic Society's Network of Alliances for Geographic Education (The Alliance Network) in 1986 (Boehm, 1997; Grosvenor, 1995; Salter, 1986; Salter, 1987). The Alliance Network, still in place today, works to improve pre-service and in-service teaching. These events of the 1980s reinforced the unified message of leaders in geographic education that reform was necessary and needed to happen sooner rather than later.

### ***Geography Framework for the 1994 National Assessment of Educational Progress***

In 1992, the National Assessment Governing Board released *Geography Framework for the 1994 National Assessment of Educational Progress*. This work discussed what should be covered in the 1994 National Assessment of Educational Progress (NAEP) geography assessment at grades four, eight, and twelve. Drawing on the Five Fundamental Themes, the authors produced a scope and sequence that focused on three content areas: *Space and Place*, *Environment and Society*, and *Spatial Dynamics and Connections* (National Assessment Governing Board, 1992). Similar to the work of GENIP, this assessment represented a

concise and unified message from professional geography organizations, such as the National Geographic Society (NGS) and university scholars (Bednarz, 2002). Together, the NAEP assessment and the *Guidelines* represented the, “reintroduction of meaningful geography content into many K-12 classrooms” (Bednarz, 2002, p. 162).

***Geography for Life: National Geography Standards, 1994***

Following the reintroduction of geographic education to K-12 education, *Geography for Life: National Geography Standards, 1994* was developed and disseminated by the National Geography Education Standards Project in conjunction with AGS, AAG, NCGE, and NGS. This work that produced voluntary standards introduced Americans to the Six Essential Elements—*The World in Spatial Terms, Places and Regions, Physical Systems, Human Systems, Environment and Society, and The Uses of Geography*. These elements were then operationalized into 18 standards (Bednarz, Downs & Vender, 2003; Boehm 1997; National Geography Education Standards Project, 1994). Among the messages emphasized in this first edition of *Geography for Life* were:

- 1) the importance of using new cartographic technologies,
- 2) demystifying the belief that geography is nothing more than rote memorization,
- 3) stressing the geographic advantage of understanding multiple perspectives,
- 4) promoting the synchronized teaching of geography and history, and
- 5) using geography in everyday life (Boehm, 1997).

In addition to these messages, *Geography for Life* informed the various state geography standards throughout the country.

***A Decade of Reform in Geographic Education: Inventory and Prospect***

The first release of *Geography for Life* afforded geographers a moment to reflect on 10 years of geographic education reform in the publication, *A Decade of Reform in Geographic Education: Inventory and Prospect*. This work presented five broad themes, built on the following three premises which stated that:

- 1) geographic education should be treated as an interdependent system, from kindergarten through university graduate work;
- 2) pre-service and in-service teacher training must be improved in addition to improving learning materials; geography should champion its real-world applications;
- 3) standards are needed at all levels of geographic education, including the university level (Bednarz & Petersen, 1994).

These recommendations were borne out of the *1993 Summit in Geographic Education* held at Texas State University (at the time, Southwest Texas State University) which also echoed earlier concerns from the 1980s.

### ***Rediscovering Geography: New Relevance for Science and Society***

By the mid-1990s, the reform movement in geographic education, along with “messages” associated with it, made significant progress in K-12 education. In 1997, *Rediscovering Geography* was released by the Rediscovery Geography Committee through the National Research Council (NRC). This NRC initiative was supported by AAG, Environmental Systems Research Institute (ESRI—now, known simply as, Esri), NGS, the National Science Foundation (NSF), and other federal agencies such as the Department of Education.

Four overriding messages were produced in this work. The first focused on improving geographic understanding through research and collaboration among universities, agencies, and professional organizations. The intended audiences for this message mainly included professional organizations and universities. The second message focused on improving geographic literacy through standards and through education of the public. This message was intended for professional organizations as well as the federal government. The third message, intended for professional organizations, universities, and government agencies, called for strengthening existing geographic institutions through collaborations and technological advancements. The final message called for the implementation of the previous messages through the collaboration of professional organizations, especially AAG, NGS, NRC, and NSF. While the messages reflected previous ones in the above discussed works, *Rediscovering Geography* represented the first comprehensive evaluation of geography in the United States by the NRC since the 1960s (Rediscovering Geography Committee, 1997). This was significant in that it reinforced the progress made by leaders in geographic education since release of the *Guidelines* in 1984. Additionally, this was more than just a descriptive account of geography and geographic education—it addressed what should be done at the moment, as well as, in the future to perpetuate geography.

### ***The First Assessment: Research in Geographic Education***

Concurrent with the release of *Rediscovering Geography* was *The First Assessment*, a publication of the Gilbert M. Grosvenor Center for Geographic Education (GCGE). Released in 1997, the report was the product of a symposium of university scholars which addressed progress made since the release of the *Guidelines* and, included future research directions to support geographic education, as well. Five areas of research emerged: *Curriculum, Teaching Methods, Map Learning, Assessment, Learning Theory, and Special Populations*

(Boehm & Petersen, 1997). This work acknowledged former messages that had been disseminated through the first decade since the release of the *Guidelines*, but also pushed forward the frontiers of research in geographic education. *The First Assessment's* message was important, and is still relevant today, as it encourages innovation with respect to research. Although the report was released nearly two decades ago, *The First Assessment* encouraged the exploration and implementation of new technologies and educational theories to improve and lift to higher levels, K-12 geographic education. The nature of this message continues to resonate with leaders in geographic education today, and encompasses a large part of present-day information, instruction and guidance in geographic education.

### ***Path Toward World Literacy***

At the turn of the century, the Grosvenor Center for Geographic Education (GCGE) with a grant from the National Geography Society published two important works: *Path Toward World Literacy: A Standards-Based Guide to K-12 Education*, and *Path Toward World Literacy: A Scope and Sequence in Geographic Education, K-12*. These projects revisited the national standards set forth in *Geography for Life* and were rooted in research that sought to determine *what* certain skills and topics should be taught in schools, as well as, *when* they should be taught. The scope and sequence project involved background research not apparent in *Geography for Life*. A guide was created to assist teachers in navigating *Geography for Life's* matrix that explained the national standards and expectations for each grade cluster. Both documents continue to serve as reference tools and matrices for understanding the standards (Grosvenor Center for Geographic Education, 2001a; 2001b).

### ***Learning to Think Spatially: GIS as a Support System in the K-12 Curriculum***

In 2006, *Learning to Think Spatially*, an outgrowth of the National Research Council (NRC) and National Academy of Science's Spatial Learning Committee on Geography, was released. The dominant message of *Learning to Think Spatially* was that spatial intelligence and learning are vital to the continued existence of geography and geospatial technologies (NRC Committee on Support for Spatial Thinking, 2006). The *Geography for Life* national standards included spatial thinking as an important part of being a *geographically-informed person* and this demonstrated consistency between messages produced by leaders in geographic education. It also encouraged the incorporation of spatial thinking skills into K-12 education through viable support systems, such as geographic information systems (GIS).

While the implementation of such systems was, and still is, problematic, the more important message in this initiative was that it did not recommend a new curriculum; rather, it proposed that spatial thinking might be incorporated into the curricula of existing subjects. The authors also established that the use of GIS did

not mean an investment in expensive hardware or software; rather, they emphasized using tools and techniques that fostered spatial thinking growth, regardless of platform. Additionally, the report encouraged students to think spatially, regardless of the school subject, and stated that spatial thinking should not be taught as a stand-alone subject. The final part of the *Learning to Think Spatially* message was important to note because it demonstrated to teachers that little preparation was needed to blend spatial thinking skills into the established curriculum.

### **Recent Messages in Geography Education**

#### ***Geography for Life, National Geography Standards, Second Edition***

In 2012, *Geography for Life, National Geography Standards, Second Edition*, was published. This round of standards provided updates from 1994 and included “messages” that began to emphasize the use of more technology and spatial thinking skills in classroom teaching of geography. The second edition is presented in a concise fashion and includes a scope and sequence, making it a relevant reference tool not only for teachers familiar with the 1994 standards, but also for those unfamiliar with the first standards. In the second edition, Heffron and Downs (2012) address the changing landscape of geographic education in the United States and emphasize the increasing role of technology in K-12 education. For instance, the first geography standard in the *First Essential Element* (“The World in Spatial Terms”) states that the “geographically informed person must use maps and other geographic representations, geospatial technologies, and spatial thinking to acquire, understand, and communicate information (Heffron & Downs, 2012, p. 21). The authors also state that “problem-solving geospatial technologies, such as geographic information systems (GIS), global positioning systems (GPS), and remote sensing (RS) may be used across curricula and to do so, will have profound and pervasive effects on career opportunities” (Heffron & Downs, 2012, p. 9). Such statements represent a significant shift in American education, as technology has become an integral part of the learning experience, regardless of content (Pearson & Young, 2002).

#### ***Why Geography Is Important***

Also published in 2012, *Why Geography Is Important*, is a pamphlet produced by the Gilbert M. Grosvenor Center for Geographic Education in conjunction with AAG, NCGE, and NGS, that provides quality geographic explanations in an easy-to-read format. Like the works discussed above, it stresses the importance of having a firm grasp of geographic skills in order to take full advantage of geospatial technologies. “Each new development, from GPS-enabled smartphones to real-time traffic maps, demonstrates the importance of geographic uses of geospatial technologies (Gilbert M. Grosvenor Center for

Geographic Education, 2012, p. 6). Online mapping services and other geospatial technologies being used today demonstrate opportunities that teachers have to incorporate such technologies into their classroom usage, and in an effective manner.

### ***A Road Map for 21<sup>st</sup> Century Geography Education***

This joint effort between AAG, AGS, NCGE, and NGS echoed the sentiments expressed in *Geography for Life* and *Learning to Think Spatially*. Amongst the many recommendations is the continued and increased use of geospatial technologies in K-12 geography education. The authors state that geography is, “well positioned to utilize and integrate technology tools to enhance students’ experiences of geographic phenomena, especially with new resources in geospatial technologies (Schell, Roth, & Mohan, 2013, p. 99). Such technologies may assist in map understanding (Sinton & Lund, 2007), improving content knowledge (Bodzin, 2011; Shin, 2007) and spatial thinking skills (Resler & Kolivras, 2009; Theo, 2011; Wigglesworth, 2003), the growth of analytic abilities (Kulo & Bodzin, 2011), and such technologies help under-represented groups the most (Lee & Bednarz, 2009; Rutherford & Lloyd, 2001). They also acknowledge that such usage is dependent upon prior teacher training, resource availability. The authors also provide a list of available online resources for geospatial technology lessons. The *Road Map* makes a strong case toward encouraging teachers to use geospatial technologies in the classroom, and provides in great detail the numerous benefits for students and teachers alike.

### **Messages Arising from Professional Conferences**

Professional conferences generated a number of messages and represented opportunities for key events in the evolution of geographic education. The GCGE has hosted biannual research conferences for over two decades where the goals were to bring early career scholars into the geographic education research circle. Early career scholars worked with senior scholars, promoting collaborations amongst a variety of colleges, universities, and professional organizations. The AAG, NCGE, and the Applied Geography annual conferences all dedicated a number of sessions to geographic education. These conferences were vital to the health and growth of geographic education, as researchers from geographic education, as well as, diverse other sub-disciplines in geography had the opportunity to hear the latest research and trends in geographic education. At the same time, geographic education scholars pushed forward the frontiers of research through interactions, networking, and collaboration.

Each of the works discussed in this study are summarized in Table 1 below and demonstrate that leaders in geographic education have diverse viewpoints regarding “messages” for the classroom teacher in teaching



geography, such as in “how” to teach, “what” to teach, and “when” to introduce geography material. Early messages centered on traditional approaches for teaching geography while more recent messages have been influenced by science, technology, engineering and mathematics (or, STEM) directions which emphasize spatial thinking and ways to incorporate geospatial technologies in the classroom (Baker, 2005; Baker et al., 2009; Kerski, 2003).

Table 1

*Summary of Foundational Works and Events in the Evolution of Modern Geographic Education*

<b>Document/Event</b>	<b>Year</b>	<b>Purpose/Intent</b>	<b>Message for Teachers</b>
<b><i>Guidelines for Geographic Education</i></b> <sup>1,2,3</sup>	1984	Five Fundamental Themes; Scope and sequence	Across the board improvement needed
<b><i>GENIP</i></b>	1985	Facilitate success of the <i>Guidelines</i>	Improve pre-service and in-service teacher training
<b><i>Alliance Network</i></b>	1986	Improve pre-service and in-service teacher education	Improve pre-service and in-service training
<b><i>K-6 Guidelines</i></b> <sup>4</sup>	1987	Scope and sequence for <i>Guidelines</i>	Use the <i>Guidelines</i>
<b><i>7-12 Guidelines</i></b> <sup>5</sup>	1989	Scope and sequence for <i>Guidelines</i>	Use the <i>Guidelines</i>
<b><i>Geography Framework for the 1994 National Assessment of Educational Progress</i></b> <sup>6</sup>	1992	What should be assessed by NAEP at grade levels 4, 8, and 12	Assessments are related to the <i>Guidelines</i>
<b><i>Geography for Life</i></b> <sup>7</sup>	1994	Six Essential Elements; Eighteen National Standards	Voluntary national standards for geography

*Table 1 (Continued) Summary of Foundational Works and Events in the Evolution of Modern Geographic Education*

<b><i>A Decade of Reform in Geographic Education</i></b> <sup>8</sup>	1994	Integration and application of geography	Improve quality and quantity of geographic education
<b><i>Rediscovering Geography</i></b> <sup>9</sup>	1997	Descriptive and prescriptive assessment of geographic education	Collaboration; better research; public outreach
<b><i>The First Assessment</i></b> <sup>10</sup>	1997	New research in geographic education	Continue to push the boundaries of research in geographic education
<b><i>Path Toward World Literacy</i></b> <sup>11</sup>	2001-2002	Content-specific matrix; Scope and sequence	Use <i>Geography for Life</i>
<b><i>Learning to Think Spatially</i></b> <sup>12</sup>	2006	Increase spatial thinking skills in K-12	Infuse spatial thinking skills into curricula of existing subjects
<b><i>Geography for Life Second Edition</i></b> <sup>13</sup>	2012	Update the 1994 Standards	Incorporate more technology and spatial thinking skills
<b><i>Why Geography Is Important</i></b> <sup>14</sup>	2012	Easy to read reference guide	Increase use of technology and promote applied geography
<b><i>A Road Map for 21<sup>st</sup> Century Geography Education</i></b> <sup>15, 16, 17</sup>	2013	Improve geographic research and instruction	Update research, teaching techniques, and technologies

*Table 1 (Continued) Summary of Foundational Works and Events in the Evolution of Modern Geographic Education*

<b>Professional conferences</b>	N/A	Present research, push frontiers of research in geographic education	Improve content and pedagogical content knowledge
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(Sources: <sup>1</sup>Natoli, 1984; <sup>2</sup>Joint Committee on Geographic Education, 1984; <sup>3</sup>Natoli, 1994; <sup>4</sup>GENIP, 1987; <sup>5</sup>GENIP 1989; <sup>6</sup>National Assessment Governing Board, 1992; <sup>7</sup>Geography Education Standards Project, 1994; <sup>8</sup>Bednarz & Petersen, 1994; <sup>9</sup>Rediscovering Geography Committee, 1997; <sup>10</sup>Boehm & Petersen, 1997; <sup>11</sup>Gilbert M. Grosvenor Center for Geographic Education, 2001a; 2001b; <sup>12</sup>National Research Council, 2005; <sup>13</sup>Heffron & Downs, 2012; <sup>14</sup>Gilbert M. Grosvenor Center for Geographic Education, 2012; <sup>15</sup>Edelson, Shavelson, & Wertheim, 2013; <sup>16</sup>Schell, Roth, & Mohan, 2013; <sup>17</sup>Bednarz, Heffron & Huynh, 2013.)

### **Influences beyond Academia: Organizations for Geographic Education and their Messages**

Non-profit organizations such as the American Association of Geographers (AAG), Grosvenor Center for Geographic Education (GCGE), National Council for Geographic Education (NCGE), and National Geographic Society (NGS) (along with the NGS Network of State Alliances for Geographic Education) have been disseminating geographic messages throughout the late 20<sup>th</sup> and early 21<sup>st</sup> centuries, however, all have a different focus and purpose. The AAG promotes a distinct perspective, one in which geography provides answers to big, nebulous questions. For instance, the AAG's Geography Education Specialty Group promotes systemic professional development and research related to geography education in general; it is not confined to the constructs of K-12 geographic education (Association of American Geographers, 2013). The GCGE operates under the premise that the research and professional development conducted there will generate leadership opportunities to raise the quality of geographic education (The Gilbert M. Grosvenor Center for Geographic Education, 2012). The NCGE's mission statement echoes the sentiments of the Grosvenor Center as its main goal is to improve the visibility and quality of geographic education (National Council for Geographic Education, 2013) while the NGS—one of the largest nonprofit scientific and educational institutions in the world— seeks to create interested in our world, underlain with geographic concepts, since the nineteenth century (National Geographic Society, 2013). The NGS Network of Alliances for Geographic Education is a collection of state organizations with a unified goal of improving geographic education and its mission is to systematically help make Americans more geographically literate

(National Geographic Network of Alliances for Geographic Education, 2013). The Alliance Network is designed to bring K-12 and university educators together to improve the quality of geographic education. Each of these organizations promotes geographic education, yet Americans have room to improve their geographic knowledge.

### **Technology's Impact on Geography Education**

These organizations are at the forefront of geographic education in the United States and draw upon advancements in technology and education for message development and dissemination to teachers. Technological advancements over the course of the last few decades have introduced more choices for the way that Americans learn geography and interact with maps. Computer and phone-based mapping services are expanding and creating new challenges for users (Münzer et al., 2006; Ishikawa et al., 2008; Speake & Axon, 2012). Former President of the British Cartographic Society, Mary Spence, MBE, stated that the willingness to rely on technology implies a certain degree of fear to use traditional methods of navigation (Gray, 2008). More recent developments in information communication technology (ICT) also indicate that a fundamental shift in the way spatial learning takes place is occurring – a paradigm focused on technology and reliant upon the aforementioned professional organizations for promoting and disseminating messages about new ways of teaching geography.

### **Conclusion**

One might argue about the selection of “messages” used for this study regarding the intellectual linkages between the leaders of geography education, the mid-range consumers (teachers), and the final clients (students), but it doesn't really matter. The purpose of this research has been to analyze the extent to which there has been a translation of the thinking and writing of the leaders in geography education to teachers in a meaningful way. To this end, we might ask: “Have these “messages” had the desired effect on teachers and, by extension, on geography education in America's schools?”

Geography education in America's schools has not seemed to respond to the many thoughtful and creative attempts to improve and streamline the field. Has that been because of the well-financed and politically popular rise of interest in math and science? Is it because of the increasing chasm between school and university geography? Is it because of the long-standing difficulty in changing the landscape of public education? Perhaps it is the wave of geospatial technology that has permeated the university but languishes in the schools. Who knows? The answers are unclear, and demand more investigation. Regardless, the research in the following article looks at what might be a continuing problem, and asks, “To

what extent do teachers “hear” messages disseminated by the leaders in geography education; and, if messages are heard, “To what extent do the messages encourage the kinds of usage, improvements and reforms that are meant to characterize the modern reform movement in America’s schools?”

## References

- Association of American Geographers. (2013). “About AAG.”  
[http://www.aag.org/cs/about\\_aag/about\\_geography\\_2/overview](http://www.aag.org/cs/about_aag/about_geography_2/overview) (Last accessed October 11, 2013).
- Baker, T. R. (2005). Internet-based GIS mapping in support of K–12 education. *The Professional Geographer*, 57(1), 44-50.
- Baker, T. R., Palmer, A. M. & Kerski, J. J. (2009). A national survey to examine teacher professional development and implementation of desktop GIS. *Journal of Geography*, 108(4-5), 174-185.
- Bednarz, R. S. (2002). The quantity and quality of geography education in the United States: The last 20 years. *International Research in Geographical and Environmental Education*, 11(2), 160-170.
- Bednarz, R. S. & Petersen, J. F. (Eds.). (1994). *A Decade of Reform in Geographic Education: Inventory and Prospect*. Indiana, PA: National Council for Geographic Education.
- Bednarz, S. W., Downs, R. M., & Vender, J. C. (2003). Geography education. In G.L. Gaile and C.J. Wilmott (Eds.), *Geography in America: At the dawn of the 21<sup>st</sup> century* (pp. 461-478). New York, NY: Oxford University Press.
- Bednarz, S. W., Heffron, S. & Huynh, N. T. (Eds.). (2013). *A road map for 21<sup>st</sup> century geographic education: Geography education research*. (A report from the Geography Education Research Committee of the Road Map for 21<sup>st</sup> Century Geography Education Project). Washington, DC: American Association of Geographers.
- Boehm, R. G. (1997). The first assessment: A contextual statement, In R.G. Boehm & J.F. Petersen (Eds.). *The First Assessment: Research in Geographic Education* (pp. 1-16). San Marcos, Texas: The Gilbert M. Grosvenor Center for Geographic Education.
- Boehm, R. G. (2015). On matters of concern. *Research in Geographic Education*, 17(1), 15-19.
- Boehm, R. G. & Petersen, J. F. (Eds.). (1997). *The First Assessment: Research in Geographic Education*. San Marcos, TX: The Gilbert M. Grosvenor Center for Geographic Education.
- Bodzin, A. (2011). The implementation of a geospatial information technology (GIT)-supported land use change curriculum with urban middle school

- learners to promote spatial thinking. *Journal of Research in Science Teaching*, 48(3), 281–300.
- GENIP (Eds.). (1987). *K-6 geography-themes, key ideas, and learning opportunities*. Washington, DC: Geographic Education National Implementation Project (GENIP).
- GENIP (Eds.). (1989). *7-12 geography-themes, key ideas and learning opportunities*. Washington, DC: Geographic Education National Implementation Project (GENIP).
- Edelson, D. C., Shavelson, R. J., & Wertheim, J. A. (Eds.). (2013). *A roadmap for 21<sup>st</sup> century geographic education: Assessment*. (A report from the Geography Education Research Committee of the Road Map for 21<sup>st</sup> Century Geography Education Project). Washington, DC: National Geographic Society.
- Geography Education Standards Project. (1994). *Geography for life: National geography Standards 1994*. Washington, DC: National Geographic Research and Exploration.
- Gilbert M. Grosvenor Center for Geographic Education, The. (2001a). *Path toward world literacy: A Standards-Based Guide to K-12 Geography*. San Marcos, TX: The Gilbert M. Grosvenor Center for Geographic Education.
- Gilbert M. Grosvenor Center for Geographic Education, The. (2001b). *Path toward world literacy: A scope and sequence in geographic education, K-12*. San Marcos, TX: The Gilbert M. Grosvenor Center for Geographic Education.
- Gilbert M. Grosvenor Center for Geographic Education, The. (2012). *Why Geography is Important*. San Marcos, TX: The Gilbert M. Grosvenor Center for Geographic Education.
- Gray, L. (2008). Map reading skills 'dying out due to internet and satnavs'. <http://www.telegraph.co.uk/news/2639307/Map-reading-skills-dying-out-due-to-internet-and-satnavs.html> (Last accessed November 18, 2012).
- Grosvenor, G. M. (1995). In sight of the tunnel: The renaissance of geography education. *Annals of the Association of American Geographers*, 85(3), 409-420.
- Heffron, S. G. & Downs, R. M. (Eds.). (2012). *Geography for life: National geography Standards (2nd ed.)*. Washington, DC: National Council for Geographic Education.
- Hill, A. D. (1981). A survey of the global understanding of American college students: A report to geographers. *The Professional Geographer*, 33(2), 237-245.

- Ishikawa, T., Fujiwara, H., Imai, O., & Okabe, A. (2008). Wayfinding with a GPS-based mobile navigation system: A comparison with maps and direct experience. *Journal of Environmental Psychology*, 28(1), 74-82.
- Joint Committee on Geographic Education. (1984). *Guidelines for geographic education: Elementary and secondary schools*. Washington, DC and Macomb, IL: American Association of Geographers and National Council for Geographic Education.
- Kerski, J. J. (2003). The implementation and effectiveness of geographic information systems technology and methods in secondary education. *Journal of Geography*, 102(3), 128–137.
- Kulo, V. A. & Bodzin, A. M. (2011). Integrating geospatial technologies in an energy unit. *Journal of Geography*, 110(6), 239–251.
- Lee, J. & Bednarz, R. (2009). Effect of GIS learning on spatial thinking. *Journal of Geography in Higher Education*, 33(2), 183–198.
- Münzer, S., Zimmer, H.D., Schwalm, M., Baus, J., & Aslan, I. (2006). Computer-assisted navigation and the acquisition of route and survey knowledge. *Journal of Environmental Psychology*, 26(4), 300-308.
- National Assessment Governing Board. (1992). *Geography framework for the 1994 national assessment of educational progress*. Washington, DC: National Assessment Governing Board.
- National Council for Geographic Education. (2013). “About Us.” <http://ncge.org/about> (Last accessed October 11, 2013).
- National Geographic Network of Alliances for Geographic Education. (2013). “Our Mission.” <http://alliances.nationalgeographic.com/about/our-mission/edn8FD8788B6B4D3185C> (Last accessed October 11, 2013).
- National Geographic Society. (2013). “About Us.” <http://www.nationalgeographic.com/about/> (Last accessed October 11, 2013).
- National Research Council. (2006). *Learning to think spatially: GIS as a support system in the K-12 curriculum*. Washington, DC: National Academies Press.
- Natoli, S. J. (Ed). (1984). *Guidelines for geographic education: Elementary and secondary schools*. Washington, DC: Joint Committee on Geographic Education of the National Council for Geographic Education and the Association of American Geographers.
- Natoli, S. J. (1988). Preface. In S.J. Natoli (ed.), *Strengthening Geography in the Social Studies Bulletin, No. 81* (ix-x). Washington, DC: National Council for the Social Studies.
- Natoli, S. J. (1994). “Guidelines for geographic education” and the fundamental themes in geography. *Journal of Geography*, 93(1), 2-6.
- Pearson, G. & Young, A. T. (Eds.). (2002). *Technically speaking: Why all Americans need to know more about technology*. Washington, DC:

- National Research Council. President's Commission on Foreign Language and International Studies.
- Rediscovering Geography Committee. (1997). *Rediscovering geography: New relevance for science and society*. Washington, DC: National Academy Press.
- Resler, L. M. & Kolivras, K. M. (2009). A field-based technique for teaching about habitat fragmentation and edge effects. *Journal of Geography*, 108(4-5), 210–218.
- Rutherford, D. J. & Lloyd, W. J. (2001). Assessing a computer-aided instructional strategy in a world geography course. *Journal of Geography in Higher Education*, 25(3), 341–355.
- Salter, C. L. (1986). Geography and California's educational reform: One approach to a common cause. *Annals of the Association of American Geographers*, 76(1), 5-17.
- Salter, C. L. (1987). The nature and potential of a geographic alliance. *Journal of Geography*, 86(5), 211-215.
- Schell, E. M., Roth, K. J., & Mohan, A. (Eds.). (2013). *A road map for 21<sup>st</sup> century geography education: Instructional methods and professional development*. (Report from the Instructional Materials and Professional Development Committee of the Road Map for 21<sup>st</sup> Century Geography Education Project). Washington, DC: National Council for Geographic Education.
- Shin, E-k. (2007). Using geographic information system (GIS) technology to enhance elementary students' geographic understanding. *Theory and Research in Social Education*, 35(2), 231–255.
- Sinton, D. S. & Lund, J. J. (2007). *Understanding place: GIS and mapping across the curriculum*. Redlands, CA: Esri Press.
- Speake, J. & Axon, S. (2012). “I never use ‘maps’ anymore:” Engaging with sat nav technologies and the implications for cartographic literacy and spatial awareness. *The Cartographic Journal*, 49(4), 326-336.
- Theo, L. (2011). Simplifying central place theory using GIS and GPS. *Journal of Geography*, 110(1), 16–26.
- Wigglesworth, J. C. (2003). What is the best route? Route-finding strategies of middle school students using GIS. *Journal of Geography*, 102(6), 282–291.