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Paradigms in 21st Century Global Science Education, A Review Essay of Derek Hodson's Looking to the Future: Building a Curriculum for Social Activism

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Abstract

This is a "Review Essay" based on the ideas and theoretical foundations of science education as espoused by Derek Hodson in his book *Looking to the Future: Building a Curriculum for Social Activism* (2011). Taking a more analytical and creative approach to reviewing and commenting on Hodson's work, the author explores the book chapter by chapter, highlighting the main ideas in science education and drawing parallels to concurrent movements and trends. The author explores the different paradigms in science education as communicated within the contents of each chapter and compares them to current trends, problems, challenges and issues in the field. The author critically, yet objectively and fairly, examines the different ideas and strategies suggested by Hodson for improving and promoting science literacy in modern society. Extended analysis and commentaries highlight the major challenges and problems of science education and the idea of Science Ethics or Applied Science Ethics is introduced consistent with the call for focus on sociopolitical action and confrontation of socioscientific issues in science education.

Keywords: Science education, scientific literacy, ethics, science ethics, paradigm shift.

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INTRODUCTION

The global economy and environment of the 21st century have created both challenges and opportunities for teaching and learning in science education. The developments in technology, transformed perspectives on environment and human roles and activities in shaping the future, the many problems and challenges faced by nations and people with regard to sustainability and survival, the emergence of new technology to affect almost every aspect of life, the increase call for accountability and political involvement in social responsibility, environmental and educational sectors, and the need to educate a more diverse population in a highly competitive world with limited resources and insurmountable conflicts have given rise to new paradigms and incentives in science education. One of the salient drivers of the transformed opportunities and challenges for teaching and learning in science is the education arms race which is driving nations to compete against each other on students' performance in the sciences. Currently, the United States with its great economic wealth finds itself in a position where many less politically and economically prominent nations are ahead in science

literacy or scientific literacy at all levels. For example, in 2007 and 2009, international comparative reports found that the United States ranked far below many nations in science achievement among elementary and secondary school children.

The realization that science education is critical to economic growth has led the United States government and other governments across the globe including those of China, Finland, among others to focus on scientific literacy across the board as a competitive educational strategy that promises high technological, social, and economic returns. Thus, the recognition of science education as indispensable to national and global competitiveness and progress has increased over the last few decades, especially after the cessation of the value decade (1990-2000), when phenomena such as global warming, change in climatic patterns and resulting natural disasters across the globe, increased understanding of linkages between human activities and environmental degradation as the green revolution garnered more serious attention from various stakeholders. Science education, especially as connected with environmentalism, economy and survival, has therefore acquired more prominent attention in both policymaking and national-global strategic spheres and initiatives. This has added new incentives to the call for changed approaches to science education from philosophical, pedagogical, methodological and practical perspectives.

Paradigmatic Shifts in the Approaches to Science Education

One author who has blended all of the above factor-considerations and more into the new call for changed paradigmatic approach and considerations on science education is Derek Hodson, Emeritus Professor of Science Education at the Ontario Institute for Studies in Education (University of Toronto), Adjunct Professor of Science Education at the University of Auckland and Visiting Professor of Science Education at the University of Hong Kong. Professor Hodson's deep grasp of the challenges and opportunities for science education and the issues that impact teaching and learning in the field is accurately reflective of his illustrious offices and titles as a most notable expert in the field as he presents to us, supplemented with extensive notes and an impressive array of top scholarly reference books and journals, *Looking to the Future: Building a Curriculum for Social Activism*. The title of the book is not only appropriate but communicates some of the author's fundamental beliefs about science education, but also reflect the paradigmatic shifts in approaches to science education and conceptions of the roles of science in individual, organizational and societal life and progress. The title of the book is highly descriptive of what Hodson calls "the four major elements of science education" and which he has developed and proposed over decades of understanding, writing about, and teaching science education and its history and philosophy. These "four major elements of science education" form the basis of Hodson's propositions and practical recommendations for transforming science education curriculum and teaching and learning strategies and methods to reflect, respond to, and adapt to the changing needs of 21st century global society and individuals. As preface to *Looking to the Future*, Hodson brings us back to the history of these ideas reflected in his writings as far back as 1992, which up to present, leads him to designate these "four major elements of science education" as:

1. *Learning science*: acquiring and developing conceptual and theoretical knowledge.
2. *Learning about science*: developing an understanding of the nature and methods of science, appreciation of its history and development, awareness of the complex interactions among science, technology, society and environment, and sensitivity to the personal, social and ethical implications of particular technologies.
3. *Doing science*: engaging in and developing expertise in scientific inquiry and problem solving, and developing confidence in tackling a wide range of "real world" tasks and problems.
4. *Engaging in sociopolitical action*: acquiring (through guided participation) the capacity and commitment to take appropriate, responsible and effective action on science/technology-related matters of social, economic, environmental and moral ethical concern (Hodson, 2011, p. ix; Hodson, 2003).

These four elements of science education represent in totally what science education in the 21st century entails, especially as Hodson points to the roles of technology, politics and social activism delineating differing stakeholders' interests in the field.

Learning science, learning about science, doing science (practical application of science or applied science), and engaging in sociopolitical actions represent the kind of whole approach to science education that 21st century problems and challenges demand. We must not only understand the philosophical and methodological basis of science, but the source of scientific theories and ideas as facts and apply them to resolve our social, economic, political and environmental problems. The conceptual and theoretical knowledge we acquire should have a major purpose, and that purpose should center on satisfying basic and justifiable human needs and wants, rather than on creating new issues to contend with, for example, nuclear bomb, environmental pollutants, or other heinous examples of the misuse and misapplication of science

that do not serve human needs and general interest. We must embrace a more comprehensible and sensible appreciation of science as an assistive body of knowledge in addressing our common causes, and in doing so, should seek to responsibly learn science, learn about science, do science, and engage in corrective and progressive sociopolitical actions.

Scientific Literacy in Perspective

Scientific literacy has evolved with technology and changes in the political, economic, social, and cultural values and agendas of individuals, organizations and small and larger communities, and thus, Hodson revisits scientific literacy in the first chapter of the book, re-orienting his readers with the decades of developments in scientific literacy perspectives, theories, and ideas across a spectrum of scholars, their works and eras. In Chapter 1, "Scientific Literacy Revisited", Hodson chronicles the development of the term "scientific literacy" with debates and ideas spanning over 50 years of literature. According to Hodson (2011), scientific literacy has become "increasingly prominent in international debates about science education" (p. 1), and is "a trend mirrored by a similarly expanding interest in technological literacy and environmental literacy" (p. 1). This reflects the views presented in the opening and introductory paragraph of this essay. Technological literacy and environmental literacy have been pursued and developed simultaneously with science literacy and education, acting as drivers of progress and growth in the field. This results from the need to shift the paradigm of science from being a lab-based highly technical and scientists-only matter to approaches and paradigms advocating and understanding the importance of what Hodson calls a "public understanding of science". This is one challenge for educators of science, making science a major concern for policy makers, and political and national leaders. Hodson also explores the rationale for scientific literacy in this chapter, and addresses this in terms of "why we need it and why we should promote [it]" (p. 2). This rationale has changed, changed in terms of being expanded or adapted to changed worldviews, values, and the requirements of life in the 21st century as reflected in socioscientific issues that are the subjects of the second chapter of Hodson's book. The rationale of scientific literacy are presented as (i) perceived benefits of science, (ii) benefits to individuals, and (iii) benefits to society as a whole (Hodson, 2011, p.2). Several other subjects highlighted in this extensive review of scientific literacy include value of a scientifically literate population, scientific and technological literacy, the cultural, aesthetic, and moral-ethical benefits that scientific literacy confers on individuals, the benefits of scientific literacy to society as a whole and to democracy and responsible citizenship, the notion of multidisciplinary scientific literacy, sustainable development, and environmental education (McFarlane, 2011).

Socioscientific Issues

Human societies everywhere are heavily pressed by social problems created by our differences, lack of knowledge, values and individual and collective behaviors that create undesirable results. Many of these social problems stem from natural human interaction, others from a combination of nature and nurture, and yet many from our misuse and misapplication of the products and byproducts of science. Because of the widespread impact of science and technology or technology through scientific knowledge on our lives and social well-being, we refer to these issues as "socioscientific" in nature. "Confronting Socioscientific Issues" which is the title of Chapter 2 of Hodson's *Looking to the Future* presents his argument that "the most effective way of learning to confront [Socioscientific Issues] SSI, is by confronting SSI, provided there are appropriate levels of guidance and significance" (p. 33). Hodson (2011) explains his "3-Phase Approach" to confront SSI as consisting of: (i) modeling, (ii) guided practice, and (iii) application. These three elements represent the cornerstones of new approaches being used in science education across the globe, especially in the United States where accreditation and accountability standards demand higher quality and standards in teaching and learning methods and outcomes. Hodson believes that a "Personalized Approach" which attends "to the particular needs, interests, experiences, aspirations and values of every learner, and to the affective and social dimensions of learning environments" (p. 35), is the best approach to scientific literacy. This is operationalized in the promotion of learner-centered strategies in science classrooms at all levels. Hodson advocates treating "science-as-culture" and making the approach to science education one of a more practical nature that treats of the subject as "functional science" (p. 37) rather than as just science. This emphasizes the paradigmatic shift to more practice-based than theory-based science in the 21st century. This, Hodson (2011) argues, leads to the provision of instruction and examination of students' learning and knowledge in the field of science from the perspective or notion of "*evidentiary competence*" (p. 39), which has many components. Hodson explains two approaches to science learning and teaching: explicit approach and implicit approach, which are bound in what he calls the "nature of science" (NOS). Furthermore, he discusses the importance of students' understanding of the nature of technology (NOT) and ability to apply this to science in developing practical knowledge for action based on the idea that, "knowledge requirements are not restricted to science and the nature of science or nature of technology" (p. 42).

Several other issues discussed in this chapter include: language and science, the nature of science argument, media literacy affecting science education and literacy and SSI; the role of information in science education and literacy, ideas of utility, control, risk, fate, and morality as related socioscientific issues and problems, the role of science education and scientific literacy in dealing with controversial issues from those intimate to the person of mankind to those dealing with our environment and broader planetary home, and the affective and social environments of learning as related to science education and the types of pupils that emerge from these environments.

Building Curriculum: Sociopolitical Factors

Chapter 3 of Hodson's book delves into emerging recommendations and debates about practice stemming from the ideas laid down in previous chapters as he discusses "Building Curriculum" for science and its rationale. The responsibility of science and technology educators are stated as "educating students about the complex but intimate relationships among the technological products we consume, the processes that produce them, and the biosphere that sustains us" (p. 71). Here, Hodson links responsibility and education back to scientific literacy rationale and practicality ideas. Hodson examines the challenges and problems that emerge in building science curriculum on a broader social level. Firstly, he sees social and political struggles emerging to hamper sciences rationale as thoughts, values, and aspirations in relation to the status quo of society and science education and literacy battle for supremacy. According to Hodson (2011), science must struggle against social and political norms to assert a more dominant place in individual and societal worldview. There are two groups of people in the world when in comes to the struggle in science: (i) "those who seek to maintain science education's current preoccupation with abstract, theoretical knowledge and with pre-professional preparation courses" and (ii) those "who regard the reformulation of science education in terms of more overtly political goals as undesirable" (p. 74). In order to assail both these contradictions and make science education a universal need and requirement, Hodson proposes a new curriculum for science education which "aims to encourage and support students to ask awkward questions, formulate an alternative view of what is desirable, and work towards changing the status quo, both within and between societies" (p. 75). Several other issues are presented in this chapter that affect the building of science curriculum: ideals of democracy and citizenship education, the viability issues in building a coherent curriculum, the ideals of priorities, interests, values and social justice as they influence and impact curriculum planning, concerns for human health; land, water and mineral resources, food and agriculture, energy resources, industry, IT and transportation and ethics.

Personal Framework for Understanding Science: Values and Science Education

There are many problems and challenges, needs and discoveries, and other drivers of globalization, change, survival and the like, pushing more and more regular people to seek out science for answers. Science has become the religion and faith of progress and survival, and thus, we are increasingly "Turning the Spotlight on Science" as the title of Chapter 4 communicates. Hodson (2011) believes after all, that "Science is a creative, collaborative and culturally embedded activity…" (p. 112), and thus offers the most viable methods for meeting our changing needs and demands. Hodson believes that values can now be construed of as dominantly emerging in scientific spheres "Constitutive Values of Science" as viewed from four perspectives: universalism, commonality, disinterestedness, and organized skepticism. Hodson believes that each individual's "*personal framework of understanding*" or "contextual values" (p. 115) affect individual views of science as a social activity involving investigations. Hodson also focuses on the changing nature of science in this chapter and the worldview theory of science.

Chapter 5 as a continuation of the major subject and themes of Chapter 4 focuses on values in science education ["Turning the Spotlight on Science Education"]. Hodson (2011) believes that science should become a valued-based subject which naturally falls within the stream of indispensable values that go into the creation of school curriculum, and as part of building individual scientific knowledge and literacy in our society. Hodson (2011) contends that school curriculums should contain values derived from three major sources: (i) science values, (ii) education values, and (iii) values of the surrounding society (p. 137). In making the new science education curriculum Hodson recommends asking four important questions: (i) *What* values are included? (ii) *Whose* values are included? (iii) Whose values are *excluded*? and (iv) What is made *explicit* and what remains *implicit*? (pp. 137-138). Hodson feels that a "Consumerist Agenda" dominates science education and curriculums today as many individuals and organizations strive to promote economic growth and technological development through science literacy. Thus, science education is increasingly characterized by ideas of compartmentalization, standardization, intensification, idealization, regulation, saturation, and isolation in impacting the teaching or planned curriculum for science or acquisition and application of scientific knowledge or literacy

(McFarlane, 2011). Hodson believes that the contexts and contents of science education must be examined relative to global economic, environmental and technological needs.

Approaches to Science Instruction

Chapter 6 of *Looking to the Future* discusses "Strategies, Responsibilities and Outcomes" in science education by examining approaches to teaching science, the resources available to enhance scientific knowledge and understanding, and the roles of multimedia and Internet-based activities in developing a curriculum to focus on (socioscientific issues) SSI. Hodson (2011) presents three important strategies in science education: (i) discussion, (ii) debate, and (iii) group work as important bases for successful action-oriented scientific literacy in the 21st century. Hodson believes that one of the most important strategies to enhance discussion approaches to teaching and learning science is encouraging, facilitating and fostering student talk in the science classroom or science education in the forms of exploratory and presentational talks (Barnes, 1988), and disputational, cumulative, and exploratory talks (Mercer, 1995, 2000). This will facilitate and promote understanding as Hodson believes that "SSI-oriented teaching promotes conceptual understanding" (p. 176). Closing this chapter, Hodson examines the concepts of trust, values, ethics, emotions, and intuition as they affect responsibility and outcomes in science education and looks at the problems, difficulties, and anxieties that teachers face in planning science curriculum and education in a diverse society with so many differing interests and needs (McFarlane, 2011).

Chapter 7 of Hodson's *Looking to the Future* focuses on "Teaching Ethics" in science education. Hodson (2011) examines and explains how ethical perspectives affect what becomes part of scientific knowledge; what becomes accepted as scientific value and facts, and then he examines several problems and issues of science relative to our understanding and ideas of right and as embodied in differing ethical perspectives. The issues dominantly emerging to affect determination of curriculum and teaching in science education include human health issues and rights, social and mental diseases and issues such as ADHD, DNA-genetics and stem cell research and debates, the human-life debate essentially construed in the question of what constitutes human life, ethics in science regarding non-human subjects in experimentation, and a variety of socioscientific issues effecting moral debates (Hodson, 2011). Hodson looks at ethical theories in science such as social construct (contract) theory, consequentialists-utilitarian theory, deontological ethics, virtue ethics, and the meaning of right and unacceptable as used in science research and education. Hodson ends chapter 7 of his book with a discussion of the rationale for teaching ethics in science and examines how science educators can effectively use case studies in science education classrooms.

The teaching of ethics in science is ever more important in current global society where the products and byproducts of science and their uses and applications threaten our very existence, and impose upon our psyche, fundamental questioning of our own worth and value as intelligent and compassionate beings. Science has long become the superior lord over man's mind and bodily compositions as we have nurtured the subject to dominate us and suppress the archetypal primitive nature, while antonymically and oxymoronically representing the powers of birth and death; creation and destruction over us. Our ethics and sense of sensibility and values have been so misshapen and relativized by science and scientific knowledge and ideals, that the very dimension of human conscience has been damaged beyond the scope of the "classical mad scientist" and has become the caricature and harbinger of confusion, death, disaster, fear, sickness and even hopelessness. Ethics is part of the philosophical tradition of care and caring that regulates the boundaries of human venture into the darker outcomes and application of science. It speaks to the human conscience and teaches us how to use the knowledge and fruits of science to create and cure rather than to destroy and devour with hostility. Science without ethics is science without social responsibility, and we have time and again seen how a lack of social responsibility displayed by both professionals and corporations has negatively impacted individuals and society in varied and many ways. Educational institutions teaching science must make greater efforts to make "Science Ethics" an important and mandatory course for science majors. Specifically defined, Science Ethics (Ethics in Science, Ethics and Science) or Applied Science Ethics as it could be called, deals with teaching socially responsible actions by exploring moral and ethical dilemma in the application of science knowledge, stakeholder considerations and scientific protocols relative to the profession and discipline of science based on various ethical paradigms.

Environmental Issues and Science Education

One of the great paradigm shifts taking place in science education today is that science theories, methods and education are increasingly focusing on environmental issues. This arises mainly out of a combination of factors: recognition of our many environmental problems, recognition of the roles of mankind and its activities in contributing to environmental

problems, the need for new and less toxic forms of energy, sustainability drives and drivers, increased competition for limited resources, climate change, and other factors described in the opening paragraph of this essay. Hodson addresses this focus on science education in chapter 8 of *Looking to the Future*, - "Confronting Environmental Issues". Hodson believes that despite emerging recognition of the relationship between people and environmental problems and well-being, a widespread case of "citizen ignorance" regarding science literacy and education still remains, as people and organizations across the globe as evident in environmentally disastrous practices remain "blissfully unaware of the extent of the problems" (p. 223). This provides added incentive for pushing science curriculum and education in schools at various levels. However, before this can happen, Hodson (2011) believes that we must overcome several barriers including the ways we live and failure to accept science and technology as part of this problem. Hodson believes that curriculum in science education should address root causes of science-related or socioscientific issues (SSI), and that science educators should approach this by starting with students' existing knowledge and expanding into scientifically determined rationale. Hodson sees fear and denial as factors affecting scientific literacy education and learning and believes that science curriculum should now focus highly on instilling "*pro-environmental behavior*" (Kollmus & Agyeman, 2002) in people despite the existing challenges to sustainability education (McFarlane & Ogazon, 2011). Finally, Hodson (2011) explores important propositions such as moralistic and democratic approaches to environmental education from the perspective of "social contract" (p. 238), and demonstrates how we are changing our environment both positively and negative through science education.

Social Activism and Science: Stakeholders' Actions

Social activism requires contexts and people, and these people must be able to understand what behaviors and actions are important in various contexts. Thus, the next chapter of Hodson's *Looking to the Future* is titled "Place, Community and Collective Action" and looks at methods and strategies for rethinking and redesigning science education and curriculum. Factors contributing to the development of the appropriate terrains and values where scientific knowledge is applied come from environmental and technological applications in meeting our needs through science. The idea of context is conceptualized by Hodson (2011) as one requiring educators to expand students' conception of the environment in building a curriculum for social activism. Hodson (2011) believes that an essential part of science education is helping students to develop a "sense of self" which he defines as "focusing on the immediate community in which students live, seeking out local resources, focusing on local issues and helping students learn how to ask and answer questions about the phenomena and events that surround them" (p. 271-272). Hodson believes that science functions in preparing students for social activism in the 21st century and that effective science education combines environmental literacy, technological literacy, and political literacy with scientific literacy, as all these formulate the foundation on which change is built.

Activism conceived of in Hodson's *Looking to the Future*, is not just for students of science to apply scientific literacy or knowledge in meeting the challenges and problems of the constantly changing human and physical world, it is a challenge to science educators and policymakers. Hodson essentially demonstrates through his own scholarly activism as a veteran of science education, the need to "Making It Happen" - the title of Chapter 10, which in essence is a challenge issued to the stakeholders of science education and literacy: "Make it happen!" Hodson has adequately demonstrated the various paradigms, approaches and contexts for enhancing and promoting science education, and he petitions science educators to build strong science education curriculums that engender the principles of modeling, guided practice, application and activism through these new paradigms proposed as ideals for revisiting and reconstructing scientific literacy and education. Hodson (2011) wants science educators and science teachers to transform science and the way it is perceived, conceived and imparted to individuals; the ways in which science is applied and the level of value it represents to individuals and society. Thus, he proposes the development of science educators in the roles of "transformative intellectuals" (p. 302), who possess abilities and authority to make the needed changes to bring scientific knowledge and literacy to the forefront of education systems. Science education must become more than just another body of knowledge; it must become both an indispensable individual and societal value relevant to survival, progress, and well-being.

Sustainability and Science Education

The idea of sustainability has become one, which institutions and individuals across the globe are rapidly embracing. Sustainability offers new hope for applied science ethics and truly understanding science in a more systematic manner as conceptualized under the four-pronged method developed by Hodson (2011): learning science, learning about science, doing science, and engaging in sociopolitical action. While many governmental and nongovernmental organizations (NGOs), as well as individuals are championing the sustainability movement, the challenges remain fundamental when it

comes to our understanding of science and our relationship with science. We must still seek to promote greater and more widespread knowledge of science – science literacy, and the responsibility of ethically applying science knowledge and ideas to make sustainability a realistic goal as science creates as well as destroys. McFarlane and Ogazon (2011) believe that there are significant challenges to sustainability education that must be overcome before true sustainability can become the reality and hallmark of our social, political, and economic institutions. The sustainability movement rests within the grasp of science and science literacy as these are the major avenues through which we come to understand the nature of the issues, the problems and challenges of sustainability efforts and practices (McFarlane & Ogazon, 2011). Science is both source and cause for sustainability, and we should recognize where Hodson's descriptor "engaging in sociopolitical action" comes in as one of the building blocks of principled and effective science education.

CONCLUSION

Every now and then a book emerges that synthesis all the theoretical, practical, and philosophical ideals and knowledge relevant to understanding the methods, history, and issues defining a branch of study or discipline. This synthesis is only achieved with profound ability of an author to link subject issues across the wider scope and overlapping themes from which they originate and emerge. Hodson has no doubt achieved this type of difficult synthesis in *Looking to the Future: Building a Curriculum for Social Activism*. This book presents science education in terms of the many issues and challenges we face in the 21st century. The author not only explores how these have emerged, but how we are dealing with them in the face of change and the understanding that science represents more than just a theoretical way to model our world; it is a way of life and increasingly becomes embellished and enmeshed in the ways we go about addressing social, economic, political and other socioscientific issues (SSI) and problems. Understanding the roles that science plays in individual and societal progress has become more apparent with our access to more and better information, increasing research linking human and natural-physical activities, the development of new technologies and methods as solutions and answers to our problems and questions, and concerted efforts by governmental and non-governmental organizations (NGOs) to make science education a priority as part of national-global competitiveness.

Hodson's book is very engaging and is vital as both a reference manual and textbook for understanding the problems and challenges of science curriculum and education. *Looking to the Future: Building a Curriculum for Social Activism* is well-written, detailed, and rich in theoretical and practical ideas and suggestions. It gets to the heart of the problems and issues facing science educators. Science curriculum developers and teachers should each be exposed to the profound and great ideas presented in this work of literature. Save for its highly philosophical nature and discourse, the ideas and recommendations are not only practical, but very viable and require simply understanding their implications for teaching and learning. Science education should not simply be about teaching facts, but understanding the philosophy of the subject as well as its historical and social development consistent with change in society, and the needs and wants, as well as the problems and challenges facing a civilization.

Science education is being confronted with change, both planned and unplanned, and this calls for a major paradigmatic shift in contents and approaches in the conceptualization of science in both teaching and learning practices. McFarlane (2011) best summarizes the nature of the change impacting the emergent need to revisit and revamp science education, curriculum, and perspectives. Thus, he remarks "Evidentiary toward such a prolific and consternating universal paradigm of 21st century society are the many global, international, regional, national, and local efforts by social, cultural, economic, legal, and political institutions in "building a curriculum for social activism" (p. 315). This means that science education more than ever before must become an increasingly flexible and transdisciplinary-oriented applied field in our quest to find answers to our many questions, resolve our historical, current, and emerging problems and challenges, while providing us or equipping us with new insights, knowledge, understanding, skills, technology, and ideas to secure survival, shape the future, and emerge victoriously as a transformed and enlightened people. Hodson's work in literature stands out because he has broadmindedly envisioned science outside the scientific method of application, and its power to successfully merge with other disciplines and ideas in helping us to look to the future with greater hope and more creativity. In summary, Hodson's work is exemplary and his book [*Looking to the Future: Building a Curriculum for Social Activism*] is a great addition to worthy literature in science education.

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