NORTH CAROLINA

Science Summit

K-8 SCIENCE EDUCATION: ELEMENTS THAT MATTER

A Report from the 2007 North Carolina Science Summit

James B Hunt, Jr Institute *for* Educational Leadership *and* Policy

Designing strategy. *Shaping* policy. *Driving* improvement.

"In my opinion, I can't think of anything we need to change more than science education. We're living in a world today where this has become absolutely crucial."

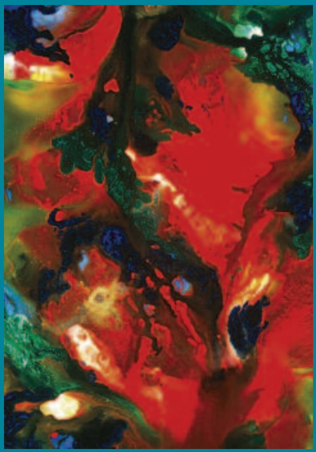
— Governor James B. Hunt, Jr., Chairman
James B. Hunt, Jr. Institute for Educational Leadership and Policy

"Today's students must be taught effective reasoning, creative thinking, decision making, and problem solving in the early grades. We must evolve science education to meet the needs of our students — and our society — and there's no one single approach."

— Judith Rizzo, Executive Director and CEO
James B. Hunt, Jr. Institute for Educational Leadership and Policy

IT'S BOTH.

Astronomy



Geology

Geometry

"Science is often placed in opposition to the arts and yet I look at the images science gives us and I see a very different picture. I see the beauty within those images."

Shirley Malcom, Ph.D.
Director, Education and Human Resources Programs
American Association for the Advancement of Science

Images, left to right:
The Cosmic Highway, Sandi Ritchie Miller
Stones from the Sky: Landscapes of Geology, Michael Collier
Shadows of Reality, Tony Robbin

GOOD SCIENCE EDUCATION: WHAT IT IS AND WHY WE NEED IT

Many recall the mixture of fascination and dread when the Soviet Union launched Sputnik — the first man-made object sent into orbit around Earth — and set off the U.S.-U.S.S.R race into space. Four years later, a Soviet cosmonaut orbited the Earth a few weeks before Alan Shepard became the first American hurled into space.

"It is my hope that all students will exhibit the same curiosity and enthusiasm for the natural world at the end of eighth grade as when they entered kindergarten, but have it enriched with the basic concepts of evidence-based reason."

David Evans, Ph.D., Former Under Secretary for Science at the Smithsonian Institution

Americans were stirred in 1961 by President John F. Kennedy's dramatic speech before a special joint session of Congress setting the goal of putting a man on the moon before the end of the decade. By marshalling scientific, mathematical, and technological expertise, the U.S. rose to the challenge — touching down on the moon in the summer of 1969.

We won the race to the Moon, and later prevailed in the Cold War. Now, our nation must run in another race: **a race to educate our youngest students in a way that ensures a meaningful contribution to a scientifically-driven society throughout their lives.** It is a race towards scientific literacy.

In today's world, we are challenged by issues that are increasingly complex: global warming, alternative energy, and genetic engineering. Today's citizens need ever-increasing knowledge — scientific literacy — to understand the impact of these on their daily lives and to make informed decisions. We need to prepare our students to tackle issues such as these by exposing them to learning experiences beginning at an early age. Children need to not only understand basic science, but also to apply its principles to everyday experiences. We do our children a disservice by providing anything less.

We must integrate science instruction with other subjects to ensure deep understanding for all students, especially in the earliest grades. Students in today's classrooms require more enriching and stimulating activity; more than planting a bean in a cup and watching it grow, or viewing an eclipse through a pinhole in a box.

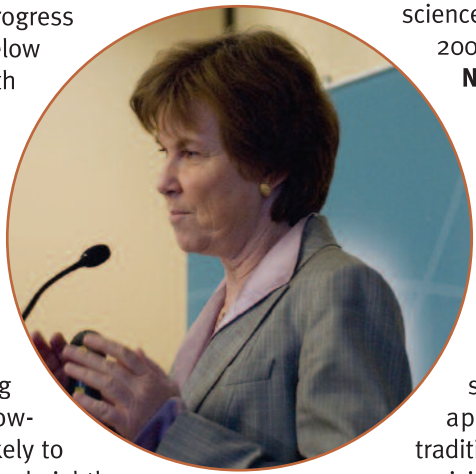
These, and other challenging issues, were considered during *K-8 Science Education: Elements that Matter* — the North Carolina Science Summit sponsored by the James B. Hunt, Jr. Institute for Education Leadership and Policy, in partnership with the Public School Forum of North Carolina and the North Carolina Science, Mathematics, and Technology Education Center. The statewide event — focused on improving science education in kindergarten through eighth grades — provided an opportunity for local superintendents, education deans, curriculum specialists, educators, and others to engage with national leaders and consider ways to cultivate students' innate enthusiasm and curiosity about the natural world while preparing for the world's increasing demand for science competencies.

Our understanding of childhood development has progressed significantly in recent years. While the predominant philosophy was once that children could only think in concrete and simplistic terms, research now shows that they are quite capable of sophisticated and abstract thinking. They utilize a wide range of reasoning processes that form the very basis of scientific thinking — drawing conclusions, drawing inferences, generalizing. The way we currently teach science does not capitalize on their learning potential; it limits children's experiences to very basic scientific operations.

Students arrive in classrooms with varying levels of science experiences, but all children bring basic reasoning skills, personal knowledge of the natural world, and innate curiosity — which provide a strong foundation for achieving proficiency and promoting a life-long interest in science. Beginning a good science education program for students at a young age is plain commonsense and imperative if we want to build upon children's readiness to learn.

Crisis in Science Education

Despite the need for greater knowledge in and understanding of science and scientific processes, today's landscape shows our children are not getting a solid science education. Science proficiency is poor in elementary school, and actually declines the longer a student stays in school. According to the 2005 National Assessment of Educational Progress (NAEP), 34 percent of fourth graders are below the basic level of science proficiency. In eighth grade, that number increases to 43 percent, and rises to 48 percent by 12th grade. In North Carolina, students' science proficiency is below the national average. Fourth-grade students ranked just below the national average for NAEP science scores, but eighth graders were in the bottom third of all states.



The statistics are even worse among disadvantaged students. Those from low-income families are about three times as likely to have below basic proficiency in the fourth and eighth grades. Among minorities, African-American and Latino fourth graders are more than three times as likely as white students to score at the below basic level. By eighth grade, these minority students are about two-and-a-half times as likely as whites to rank below basic. While the absolute percentage of African-American and Latino students scoring poorly is higher, the gap is closing because white students with below basic proficiency have increased by 56 percent.

From a global perspective, the picture is even more discouraging. In 1999, 15-year-old American students ranked 14th in science proficiency among 32 developed countries; in 2003, they ranked 19th among 29 countries. The one area where the U.S. does rank highly is inequality. U.S. 15-year-olds have the sixth largest gap between the highest and lowest achieving students in problem solving, and the eighth largest in math literacy.

Another disturbing trend is the impending shortage of U.S. science professionals. American companies already have to recruit an increasing number of foreign professionals to fill science and engineering jobs, and 25 percent of the current workforce in these fields is over 50 years old. The fact that students have lost interest in pursuing scientific higher education and careers is only exacerbating the problem, as the number of college students in engineering and physical sciences declined by 25 percent between 1980 and 2004. And right here at home, **The University of North Carolina only produced three physics teachers between 2002 and 2006.**

A New Approach to Science Education

New knowledge regarding children's capacity for complex thinking coupled with poor performance demonstrated by national and international measures suggests the need to establish new approaches to science education. The traditional model of science instruction focuses on memorizing scientific facts. This establishes only a minimal foundation for mastering science and limits students' ability to think about and interact with their environment. **This traditional approach is no longer adequate for preparing students for today's world.**

In contrast, good science education stimulates a child's natural curiosity through hands-on experiences. It helps children look for reasoned explanation, use observations as evidence, and understand how to listen to scientific information. Good science education educates students on **how** to think, not **what** to think.

Effective science education uses analogy and metaphor to help students understand abstract concepts so they can translate them into real life situations. The National Science Resources Center (NSRC) has documented recent Harvard University and MIT graduates who could not explain how a tree begins life as a tiny seed and gains the mass and weight necessary to become a full-grown tree. While all of them probably studied photosynthesis at some point in their education, none of them could connect that concept with the tree. This is an example of how the "memorization method" does not effectively yield students who are able to problem-solve.

Effective science teaching uses hands-on experience and a defined learning process to create a deeper level of understanding. According to the NSRC, such methods encourage students to:

- share their preconceptions about the topic, which is critical to creating conceptual change;
- explore the concept in-depth in a risk-free environment;
- reflect on what they have learned — sharing ideas and persuading others to understand the conclusions they have drawn; and
- demonstrate their understanding by applying what they have learned to a new situation and formulating new questions to investigate.

In short, effective science teaching helps children think logically and solve problems — including multiple activities that build upon each other to provide conceptual development. It teaches students how to make observations that apply learning to other real-life situations and to better understand the world in which we live. In addition, effective science teaching integrates other areas of curriculum, such as building literacy and mathematical skills through writing about observations and conclusions and graphing the results.

The Value of Inquiry-Based Science Instruction

Inquiry-based instruction is emerging as a hallmark of effective science education. For the purposes of this report, the inquiry-centered method of instruction is defined as a teacher-guided instructional approach that engages students in investigating real world questions within a broad thematic framework. It complements traditional instruction by deepening students' learning and tying it to broader concepts. Students acquire and analyze information, develop and support hypotheses, provide solutions, and demonstrate their thinking and learning in tangible ways.

The benefits of an inquiry-based model of science instruction reverberate across academic subject areas. Strong connections have been made between hands-on, inquiry-based science education and student literacy. These connections include higher reading scores, with participating classes outperforming non-participating ones. Significant improvements are seen across all groups of students, including minorities and English-Language Learners. Furthermore, evidence shows that the longer children participate in an inquiry-based science program, the better they will perform in reading, as well as math.

In a broader sense, inquiry-based science education also teaches children important life skills as well, such as critical thinking, finding order within chaos, and believing that practice leads to improvement. Feeling confident that you have control over what happens in your life, and that your effort does matter, shapes what you are willing to try and ultimately achieve.

International Programs that Work

While inquiry-based instruction has been implemented in various school districts across the U.S. — and within North Carolina — it has been adopted nationwide in a number of countries abroad. These experiences offer valuable insights into what facilitates the success of a science education reform program.

Initiated in 1996 by Nobel Laureate Georges Charpak, *La Main à la Pâte* (literally "Hand in the Dough") is a program of the French Academy of Sciences that uses inquiry-based instruction to teach science and expose children to the culture of science beginning in the primary grades. Only 3 percent of teachers were actually teaching science in the classroom when the initiative began in 1995; by 2006, more than thirty-five percent of teachers were teaching it and using a hands-on approach.

Scientists play a key role in the program, as does a Web site which provides connection to both a broad network of both scientists and teaching method experts. A wealth of curriculum materials and inquiry-based teaching resources is also housed there. This approach encourages teachers to build a learning community among themselves to share ideas and provide additional support. Because of the success in France, the *La Main à la Pâte* program is being replicated internationally, with similar national initiatives in countries such as China, Columbia and Chile.

China's "Learning by Doing" program has helped Chinese students rank among the highest achievers in science proficiency. Having a set of national education standards that emphasize science and align instruction has been crucial to the program's success. Other important factors are: a strong core curriculum which does not try to include everything; rigorous teacher preparation; exams that motivate students; and more time spent on inquiry-based science activities.

Overall, studies show that those countries which outperform the U.S. in science education tend to make it a national priority, spend energy and money to ensure high-quality curriculum for every school, and align that curriculum to clearly articulated national goals.

Building a Systemic Approach to Improving Science Education

The National Science Board Commission's study *Still at Risk: A National Failure to Implement* reviewed reports and recommendations directed at improving science and math during a 25-year period. It found that there was no structure for implementing all the recommendations and no coherence in implementation among the states or the systems.

This reflects the deep systemic problem that exists today in K-8 education. Studies show that elementary instruction time devoted to science actually decreased from a meager 9.2 percent of class time during the week in the 1993-1994 school year to only 7.1 percent of class time in 2003-2004. Other issues involve a broad array of factors such as state standards and testing, lack of science in teacher preparation programs, and outdated textbook adoption processes. As such, the need to move from a fragmented to more strategic approach should be considered.

A STRONG SYSTEMIC APPROACH TO REFORM INVOLVES EQUAL ATTENTION TO FIVE ELEMENTS:

1. **Research-Based Curriculum.** Comprehensive, inquiry-centered science instructional materials produced through a research and review process are at the heart of the reform process.
2. **Professional Development.** Given the lack of experience with scientific methods, teachers need adequate training in both science content and inquiry-based methods of instruction.
3. **Science Materials Support.** A materials support system is needed to ensure that science kits are ready for classroom use. A centralized science materials center for the district is an efficient and cost-effective solution.
4. **Assessment.** Assessments need to evaluate the ways students learn in an inquiry-based classroom. One option is to conduct a performance-based assessment to find out how much they retained, and if they can apply that knowledge to solving real-world problems.
5. **Administrator and Community Support.** Teachers need encouragement and guidance from outside the classroom. Parents also need to understand what inquiry-based learning means and how it will benefit their children. It is also essential for superintendents and principals to understand and advocate for inquiry-based science instruction.

Of course, all of these items need to be built on a foundation of a shared vision and goals for all parties involved in the reform effort, as well having a strategic plan linked to a proven science education reform model.

Source: National Science Resources Center

THE LASER EXPERIENCE

Washington State LASER (Leadership Assistance for Science Education Reform) — led by the NSRC and funded, in part, by the National Science Foundation (NSF) — is one of eight regional sites across the country. It is a good model for North Carolina because it has a similar-sized student population, 1.0 million students versus 1.4 million, respectively. And given nearly a decade with the program, its experience offers many valuable lessons — such as using regional centers to coordinate its work and distribute materials, tapping a collaborative science education community, and leveraging partnerships to meet a variety of needs.

The program has centered on helping school districts implement inquiry-based science instruction. The instructional materials and professional development offered by the program are based on the best research available regarding the qualities of a successful science education program. Fifteen school districts initially signed on in 1999. As of May 2007, 153 districts are on board, representing about 70 percent of Washington students, with two dozen more districts joining in summer 2007.

The technical assistance this initiative provides includes a variety of products and services so districts can choose the ones that best align with their strategic plans. Aside from the Strategic Planning Institute, these include: conferences and workshops; grants; assessment tools, curriculum showcases; Web-based resources; and regional alliances that provide instructional materials, professional development and science materials refurbishment.

KEY STRATEGIES FOR ACHIEVING THE PROGRAM'S SCALE IN WASHINGTON INCLUDE:

- Distributing leadership with key stewards. Stakeholders include business, K-12 education, higher education, informal science communities, parents and the community. All of these are tapped for their expertise, resources, and their reputation in science;
- Providing technical assistance through a variety of products and services for school improvement efforts;
- Conducting a grassroots campaign to build awareness among key influencers — from policymakers down to the classroom;
- Obtaining school district buy-in and leveraging the investment of federal, state, corporate, and foundation resources;
- Acquiring a mix of funding from business, industry, non-profit and district resources;
- Developing key partnerships that put a solid infrastructure in place and allow for growth;
- Creating regional alliances to help disseminate the elements of the LASER program and provide support to the districts; and
- Using understandable, proven models and tapping other extraordinary resources from groups such as NSRC.

In 2006, a study of the program concluded that curriculum, fidelity to the program, amount of professional development a teacher receives, and use of high quality, standards-based instructional materials all matter when it comes to student performance in the classroom and predicting student success on the state test. The study also theorized that inquiry-based science may be an equalizer, since it has proven to be effective with a racially and ethnically diverse base of students.

"The science education community was tight-knit, but we were doing alot of different things. It was clear that if we were going to scale up in any kind of effort, we were going to need a model that allowed us to work in a ***coherent, systematic, and systemic*** *way."*

— Jeff Estes, Co-Director, Washington State LASER

The North Carolina Science, Mathematics, and Technology Education Center, with support from the Burroughs Wellcome Fund, has entered into a 10-year agreement with the National Science Resources Center to provide LASER training for every school district in North Carolina. The North Carolina LASER K-12 Science Education Strategic Planning Institute offers preK-12 school districts an opportunity to develop a high-quality science education program aligned with North Carolina's Standard Course of Study. The LASER Institute will guide school district leadership teams through the process of developing a tailored strategic plan for initiating and implementing an effective inquiry-centered science program.

DIAGNOSING THE PROBLEM: NORTH CAROLINA'S MOST PRESSING NEEDS

Data demonstrates that North Carolina has a lot of room for improvement when it comes to the science literacy of our students. Of course, numbers don't tell the whole story. They are merely a symptom of an ailing science education system. On the other hand, practitioners see the root causes of the illness around them every day — and have a number of ideas regarding the changes needed at the state district level.

State-Level Challenges

Teacher Education
Teacher education needs to provide a deeper background in science. The current composition of the 128-hour degree program neither requires time for science, nor does it include inquiry-based instruction. Also, the course-by-course approach does not allow for the integration of subject areas.

Teacher Assignment
Studies also show that in schools across the country, those with higher proportions of poor and minority students have twice as many teachers with less than three years of teaching experience. Those schools also have about one-third of classes taught by teachers without a major or minor in the field. Essentially, students who need the most academic help are being given the least effective instructors.

It's particularly dramatic in the sciences where there are limited numbers of specialized teachers at the elementary and middle school level. It is not unusual at the secondary level to find middle and high school teachers teaching out of license in biology, chemistry, physics, and earth science.

Science Emphasis
Because language arts and math have been the focus for the No Child Left Behind Act (NCLB) in the primary grades, students get very little class time in science. In fact, one North Carolina school district found that elementary students were getting only 30 minutes of science every other week — if teachers were finished with language arts and math. At least two districts in the state have moved toward minutes-of-instruction requirements for science. Unfortunately, the challenge to find time for science given all the other subject-area requirements remains an obstacle for teachers.

Teacher Discomfort
Many teachers are uncomfortable teaching science because they do not have a good understanding of it. A lack of peer science leaders or specialists at the school for teachers to consult with can compound this problem. Consequently, a teacher who lacks confidence in his or her own science knowledge may be too intimidated to bring a science professional into the classroom.

Professional Development
Everyone agrees that more high-quality professional development is necessary, but the biggest challenge is finding the time given the constraints of the current school calendar that simply does not allot time for it. In addition, some promising programs such as the Teachers and Scientists Collaborating (TASC), funded by the National Science Foundation to train teachers how to use its approved science kits, can take as long as two years to complete.

Change in Expectations
The current educational system tends to expect less of some students than others, despite evidence provided by innovative schools and districts around the country that family life and income don't necessarily translate into low achievement. In fact, any child can be a high achiever in science if we set high expectations for them and give them the support and resources to get there.

Need for Advocacy
Broad support will be needed to implement systemic change, so it is important to establish a collaborative partnership of legislators, educators, parents, business, universities and the science community to build awareness of the need for science education reform.

Additional Funding
While it is not a cure-all, additional funding from a variety of public and private sources is key to providing the infrastructure required of a good science education for the entire state.



School District Challenges

Curriculum
Without a common curriculum, districts are left without a consistent, coherent guide for what students need to learn and how they should learn it.

Science-Qualified Teachers
Both the middle and elementary school levels have a dearth of teachers with adequate knowledge of science content and process. In addition, a confluence of factors are driving teachers to leave the profession, further compounding the science teacher shortage.

Resource Equality
Equity issues in funding, resources, and teacher quality exist both among and within North Carolina school districts. Furthermore, poor communication and lack of coordination means schools and districts are often unaware of resources that are available.

Parental Involvement
Most parents are satisfied with the amount and type of science education their children are getting simply because they don't understand what the curriculum is lacking. Therefore, they are not currently engaged in trying to drive change and may actually try to resist it.

Classroom Time
Science has not been a priority on the assessment tests, so it has not been a priority for instructional time. That may change somewhat as NCLB requires science assessments in every state beginning in the upcoming 2007-2008 school year. But teachers are already under pressure to cover the units currently required in the available instructional time, so adding more science to the current schedule further compounds the problem.

Professional Development
With many demands on districts, time for quality professional development in science is difficult to achieve. In addition, sustained professional development throughout the school year is challenging to administer.

Guidance and Support
While some districts across the state are resource rich, some areas have little or nothing when it comes to guidance and support. Entities like Regional Education Service Alliances (RESAs) are understaffed, lack resources to provide assistance to teachers, and have lost prominence in recent years.



RECOMMENDATIONS

State-Level Recommendations

Broad-based

- Establish a coordinated effort among K-12 education, higher education, government, science and education organizations, and corporations to reform science education — linking standards, curriculum, assessment, and teacher education.
- Leverage expertise and resources through strategic partnerships with corporations, academic institutions, museums, and other science-related organizations.
- Add science specialists at the Department of Public Instruction, regional level, and/or school level. Consider recruiting from industry for such positions.
- Consider adding instructional time, either to the school day or the to the 180-day calendar year.
- Build bridges between formal and informal science educational opportunities.
- Coordinate opportunities for future learning about science education.
- Provide support for districts to begin and/or maintain an effective program for inquiry-based instruction.

Curriculum & Materials

- Establish curriculum requirements that drill down to basic concepts, eliminating those that are not central to the development of science understanding.
- Earmark a portion of districts' education funding specifically for science equipment and materials.
- Ensure more equitable distribution of science materials and resources across the state and within districts. Consider organizing and funding distribution centers at the state, regional, or district level for maintaining and replenishing science materials.
- Revamp textbook and curriculum adoption process to incorporate and accommodate effective inquiry-based instruction.
- Revise textbook warehouse policy.

Assessments

- Develop assessments that are performance-based and reflect inquiry-based instruction.
- Increase the importance of science in the state assessment, so it becomes a higher priority for instruction time.
- Increase transparency of the state's assessment program so educators can take advantage of the data.

Teacher Recruitment

- Develop a plan to attract and retain highly qualified science teachers throughout the state, but particularly in hard-to-staff schools.
- Create more scholarships and/or loan forgiveness programs for science majors who go into teaching. Consider offering free education courses to science majors interested in teaching.
- Recruit more retired science professionals into teaching.
- Consider more flexible work arrangements to enhance the acquisition and retention of teachers, such as job sharing.

Teacher Preparation

- Reform pre-service training so that it includes more inquiry-based learning and teaching, better integrates the subject strands, and offers an opportunity to specialize in science.
- Move from hours-based instruction to mastery-based instruction.
- Create a scholarship program for teachers seeking a master's degree in science. Consider the N.C. Teaching Fellows Program as a model.
- Establish science leadership tracks in teacher education and for master teachers.
- Provide additional certification for elementary instructional leaders in science.

Professional Development

- Include science hours as part of the professional development requirement.
- Consider an 11- or 12-month contract so teachers can participate in training during the summer.
- Add more professional development opportunities overall, and in science particularly, especially in-depth, one- to two-week training institutes in science content and instruction, with financial incentives for teacher participation.
- Provide virtual professional development opportunities for science teachers, especially those located in remote areas of the state.
- Appropriate funds to remediate some teachers into science instruction for low-income, high-need areas.
- Identify and/or create demonstration sites for excellent science teaching to provide educators across the state with models of success.
- Centralize delivery of high-quality professional development in science through the state and/or through the Regional Educational Service Alliances (RESAs).

Advocacy

- Identify corporate advocates and supporters across the state, particularly in areas outside of the Research Triangle Park.
- Conduct awareness training for superintendents and school principals about the importance of quality science education and its relevance to other curriculum areas.
- Develop an advocacy campaign to inform the public about the importance of science education. Instead of focusing on how the U.S. does not have enough scientists and engineers, focus on the theme of science literacy as key to being an educated citizen in the 21st century.
- Develop an awareness campaign about science education for parents which emphasizes the benefits of inquiry-based science learning.

District-Level Recommendations

Broad-based

- Establish a vision of equally high expectations — and the importance of science education — for all students.
- Have clear and specific goals for what students should learn in every grade, including the order in which they should learn it.
- Incorporate dedicated instructional time for science into the elementary schedule.

Teacher Resources

- Provide science resource teachers or specialists at the school level to assist elementary teachers. Or, add science teachers who rotate among classes to teach elementary science.
- Make more materials available for science instruction on a local or regional level and coordinate distribution more effectively and equitably through a centralized location.
- Provide teachers with common curriculum and assignments, and establish mastery criteria to ensure common marking standards.
- Assess students every four to eight weeks to measure science progress, and act immediately on the results of those assessments.
- Foster an environment where teachers can plan and work collaboratively, mentor newer teachers, and take on leadership tasks at the school.

Professional Development

- Encourage participation in the week-long LASER training that the National Science Resources Center will provide through the North Carolina Science, Mathematics, and Technology Education Center during the next 10 years.
- Coordinate professional development opportunities with higher education institutions.
- Establish a structure for teachers to receive university-based professional development to improve their knowledge and skills.

Advocacy

- Educate local educational leaders and parents about what quality science teaching is and why it's important.
- Discuss the importance of and need for quality science education with local legislators, so they have background on the issue when faced with decisions during the legislative session.

WHAT POLICYMAKERS CAN DO

To guide and support the improvement of science education in North Carolina, policymakers should consider establishing a **collaborative, statewide effort** with education, government, government, business, and science communities to identify a comprehensive, long-term plan for K-8 science education reform. Obviously, there is a wealth of interest and knowledge just waiting to be tapped for this effort, and the recommendations cited here provide a strong starting point for further discussions.

CONCLUSION

This Report offers a clear call to action for preparing North Carolina's students for the science literary required of 21st century citizens by starting early and using research-proven methods of instruction. Building a systemic approach to reforming science education will require a broad coalition of dedicated support for the necessary reforms in standards, curriculum, teacher education, assessments, and resource distribution.

The good news is we are not starting from scratch. Districts, schools, and teachers around the state have already discovered innovative ways to tackle some of the challenges cited in this report — such as forming partnerships between teachers and science professionals and testing a pilot program to add an hour to the school day. What we need is to pool the collective expertise of all the stakeholders in quality science education to create a comprehensive and sustained approach to better preparing our students to meet the challenges of today's world. **The Hunt Institute remains committed to continuing the conversation and supporting state leaders as they develop and implement solutions to this important issue.**

Nobel Laureate Peter Agre, M.D.

Queta Bond, Ph.D., President, Burroughs Wellcome Fund

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