

2006

## Every Learner Inquires: A State Science Education Initiative

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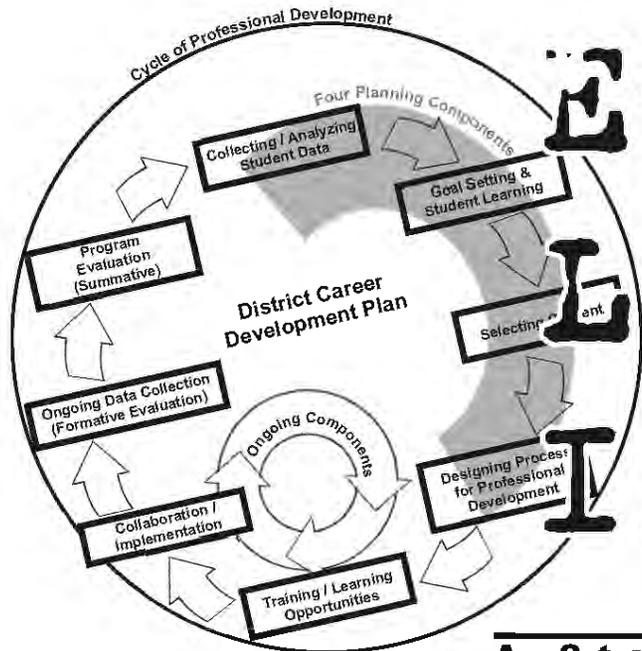
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### Recommended Citation

Heiting, W. Tony (2006) "Every Learner Inquires: A State Science Education Initiative," *Iowa Science Teachers Journal*: Vol. 33 : No. 1 , Article 3.

Available at: <https://scholarworks.uni.edu/istj/vol33/iss1/3>

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# Every Learner Inquires

by W. Tony Heiting

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## A State Science Initiative

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**ABSTRACT:** Learning, by its very nature, is an active mental process whereby learners work to make sense of experience in light of what they already know. Learning through inquiry encourages extensive mental engagement and, when implemented well, promotes a deep understanding of science concepts and the nature of science. For these reasons, having students learn science through inquiry has been at the heart of science education reform documents. However, teaching science through inquiry requires particular teaching skills that depart from time-honored practices. This article describes a new state science education initiative in Iowa titled “Every Learner Inquires” (ELI) that will begin prior to the 2006 school year. *This article promotes National Science Education Content Standards A and G, and Iowa Teaching Standards 1, 2, 5, 7, and 8.*

### Introduction

Iowa educators are likely familiar with two state education initiatives targeting reading and mathematics that were implemented in 1998 and 1999 respectively, “Every Child Reads” and “Every Student Counts”. These state education initiatives are designed to improve student achievement in reading and mathematics. Iowa test scores in reading and mathematics have been relatively flat between 1993 and 2004 showing no significant improvement (The Annual Condition of Education Report, 2004). While Iowa students generally perform better than students nationally, Iowa educators believe they can do much better. The same is true at the national level as evidenced by the *No Child Left Behind* legislation in 2002 which targets increased student achievement in reading and mathematics.

In 2007-2008, *No Child Left Behind* will require testing in science. Iowa test scores in science have shown some steady progress between 2001-2004 (The Annual Condition of Education Report, 2004), yet room still exists for improvement. This is especially noticeable when the test results are disaggregated by sub-groups (i.e. race, social status). With these conditions in mind, the Iowa Department of Education (DE) in December of 2004 convened a group of Iowa educators to begin planning a statewide science education initiative to improve science learning for all students. The DE established the following principles to guide this effort:

- ▶ The content focus of the capacity building plan will be instructional practices in science (K-12) with the strongest research base for improving student achievement;
- ▶ The Science Content Network will be the primary avenue for assuring research-based practices; for more information visit <http://www.state.ia.us/educate/ecese/tqt/tc/prodev/science.html>
- ▶ The plan will capitalize on capacity and resources that currently exist within the system;
- ▶ The plan will be “doable” and sustainable.

This initiative is titled “Every Learner Inquires” (ELI) and its implementation will begin with workshops running from July 31 to August 4, 2006. ELI will be a four-year state-wide initiative, so Iowa science teachers will be hearing a great deal about this important effort to promote science learning for all students.

### Focus of 'Every Learner Inquires' (ELI)

As the title of the initiative implies, ELI will focus on inquiry-based learning. Having students learn science through inquiry has been at the heart of science education reform documents. Inquiry is crucial for mentally engaging students in learning science concepts and the nature of science. The design of ELI will be guided by the National Science Education Standards (NSES) and how their emphasis on Science as Inquiry and Unifying Concepts. The NSES concepts unify science disciplines and provide a powerful scaffold for learning inquiry and concepts in all science disciplines.

ELI will encourage thoughtful implementation of the learning cycle and the 5E (engage, explore, explain, elaborate, evaluate) inquiry-based instructional approaches. Both have students actively exploring phenomena prior to and alongside the introduction of formal science concepts. By having students then use what they have learned in new situations, teachers will be in a better position to determine if students truly understand the targeted science concepts. In applying those concepts, students will also develop deeper and more robust understandings of fundamental science ideas.

The Planning Committee also focused on the Iowa Professional Development Model (Figure 1), assuring that the ELI initiative is in alignment with the components of the model. After the initial planning of ELI, a sub-group of the Planning Committee was formed in May 2005. Four exemplary Iowa science teachers joined this committee with the purpose of designing the professional development activities that will begin during the summer of 2006. The 'design' committee will continue to

meet through June 2006 to establish the outcomes for the summer workshops and design academic year follow-up activities that will occur during the four-year duration of ELI.

### Implementation

Although the implementation phase of ELI will be finalized in the coming months, Leadership Teams are envisioned in each of the Area Education Agencies (AEA's). The current proposal is that Leadership Teams would consist of:

- ▶ Science Curriculum Consultants
- ▶ Teacher Leaders
- ▶ Other Curriculum Consultants
- ▶ Special Education Consultants
- ▶ Higher Education educators
- ▶ Media/Technology Consultants
- ▶ Administrators (LEA Principals and Curriculum Directors)

Each AEA team may look a little different depending on the specific science needs in a particular AEA's school districts. The Urban Eight schools, as well as other schools, will be encouraged to participate in the ELI initiative and form teams to serve as case study schools.

During the first two years of the four-year state-wide ELI initiative, the AEA leadership teams along with Urban Eight school-based teams will go through intensive training in summer workshops and follow-up activities throughout the academic school year. In the third and fourth years of the ELI initiative, members of the initial training teams will “roll out” the initiative in their respective areas, school districts, and schools, thereby building capacity for the initiative.

### Research Base

For almost a decade, organizations such as the National Research Council (NRC) and the American Association for the Advancement of Science (AAAS) have made significant commitments to improve science education. A common theme among these efforts is the promotion of inquiry-based instructional strategies. Fundamental to our understanding of learning is that students must be mentally active—selectively taking in and attending to information, and connecting it to prior knowledge

FIGURE 1

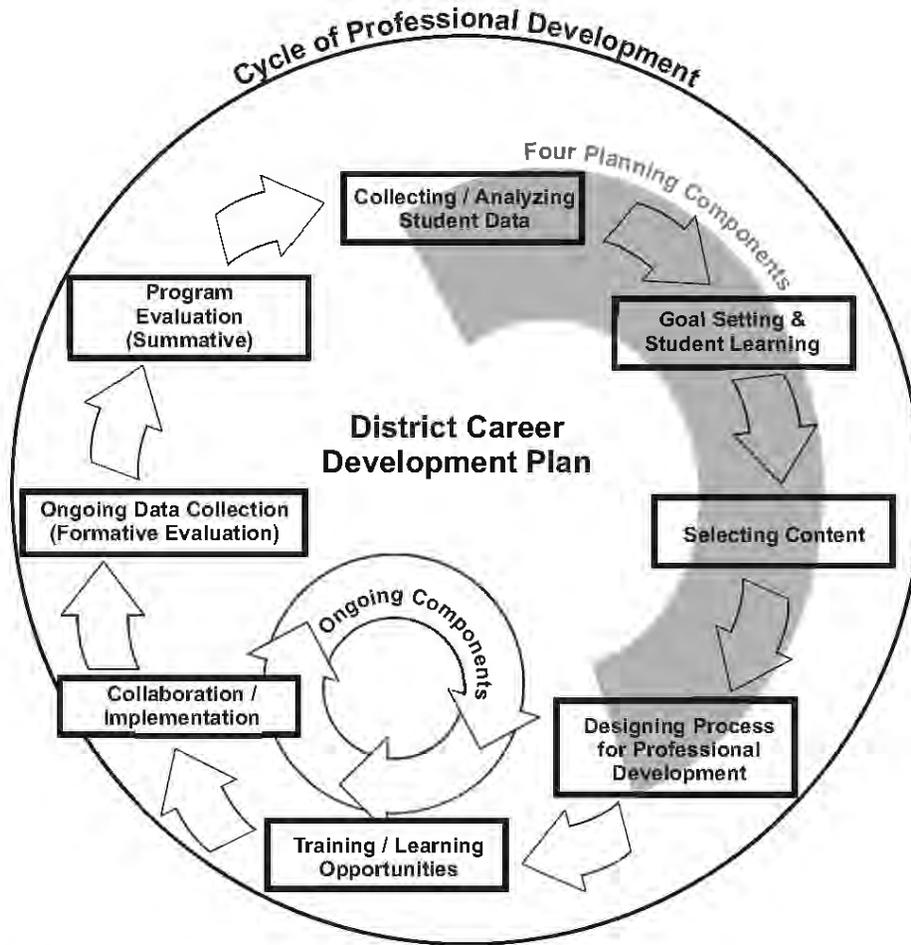


FIGURE GUIDE

**Collecting/Analyzing Student Data:** examine student achievement results and what we know about teaching by looking at NAEP, ITBS/ITED, State Indicators of Science and Mathematics 2003 and the 2004 Condition of Education Report

**Goal Setting & Student Learning:**

- ▶ **Student Learning Goal:** To improve science learning for all K-12 students in the state of Iowa
- ▶ **Teachers' Learning Goal:** Build teacher leadership and content expertise within the system
- ▶ **Organizational Goal:** Put in place a structure that would sustain the implementation of Every Learner Inquires

**Selecting Content:** Iowa Content Network for Science (research on inquiry-based instructional strategies/learning cycle models)

**Designing Process for Professional Development:**

- ▶ **Theory:** Research supporting inquiry will be presented
- ▶ **Demonstration:** Content will be modeled in both workshop and work-site (Learning Cycles)
- ▶ **Practice:** Rehearsal during the workshop and in the worksite through classroom implementation tasks
- ▶ **Coaching:** Collaborative reflection on the practice of teaching

**Training and Learning Opportunities:** Participate in a 3 to 4 year distributed and sequenced professional development initiative (Science Academies and Academic Year Seminars)

**Collaboration:** Participate in collegial learning structures at the building level (Lesson Study, Study Groups)

**Ongoing Data Collection:** Monitor integrity of implementation and the subsequent impact on student learning

**Program Evaluation (Summative):** An advisory group will be developed for ongoing evaluation of the effectiveness of the Every Learner Inquires professional development. Evaluation tools will be used to provide meaningful data on the following levels as defined by Guskey:

- ▶ Level 1: Participants' reaction
- ▶ Level 2: Participants' learning
- ▶ Level 3: Organizational support and change
- ▶ Level 4: Participants' use of new knowledge and skills
- ▶ Level 5: Student learning outcomes

to make sense of what is being received (Bransford, Brown & Cocking, 2000). Saunders (1992) suggested that:

Cognitive activities such as thinking out loud, developing alternative explanations, interpreting data, participating in cognitive conflict (constructive argumentation about phenomena under study), development of alternative hypotheses, the design of further experiments to test alternative hypotheses, and the selection of plausible hypotheses from among competing explanations are all examples of learner activities which [mentally engage students] (p 140).

However, science teachers know that carefully crafted inquiry experiences, by themselves, will not lead to a scientific understanding of the natural world. The teacher's role in student learning through inquiry is critical in both the designed inquiry activity and its implementation. Hence, ELI will also promote research-based teaching practices that are crucial in inquiry teaching and learning. The emphasis by *No Child Left Behind* on student performance is an indicator that the assessment of effective educational practices will rely on evidence from the classroom. The planning and design committees for the ELI initiative have researched and will continue to research the literature about the impact of inquiry science on student outcomes and teaching practices that promote desired outcomes. These findings will form the research base for the ELI initiative and be disseminated to administrators, teachers, and policy makers in making informed decisions about science education.

The Every Learner Inquires (ELI) state science education initiative will soon be rolling out to science teachers across Iowa. There have been and will continue to be meetings around the state to provide educators and the general public opportunity to provide input to this important state initiative. I encourage you to get involved in this important state science education initiative.

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