

Voices from the Classroom

Elementary Teachers' Experience
with Argument-Based Inquiry

Brian Hand and Lori Norton-Meier (Eds.)

SensePublishers

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*Elementary Teachers' Experience with
Argument-Based Inquiry*

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DEDICATION

To all the teachers who are willing to “have a go” with the SWH Approach and to truly examine daily what it means to teach in the service of learning.

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BRIAN HAND AND LORI NORTON-MEIER

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QUESTIONS

We began with the question, “How can we support teachers to engage students in science and literacy with the SWH approach remembering that we must teach in the service of learning?” To answer this question, we had the help of many school districts, teachers, students, and administrators who joined us in this inquiry, asked their own questions about science and literacy and pushed us every day to think deeply about teaching and learning. This work would not have been possible without the support of a Math-Science Partnership grant and the State of Iowa who supported the teachers and researchers to engage in this investigation.

CLAIMS

Our claim is that this book would not be possible without the support of our colleagues at The University of Iowa, Iowa State University, and The University of Louisville. Specifically we must thank, Tracie Miller, Denise Dadisman, Mitch Williams and Allison Donaldson. Your attention to detail, pep talks, humour, and ability to multi-task made this book an intriguing endeavour. You reminded us daily of the important work we were doing. Daily, this work is made richer through our work with both graduate and undergraduate students who join us in this research endeavour. Also, a special thank you to Sense Publishers and Michel Lokhorst for seeing the value in this project.

EVIDENCE

Once the evidence was gathered, we reflected upon our understanding by writing. The results were overwhelming—when teachers are willing to re-examine their beliefs about teaching and learning and give the process a go, students and teachers

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are successful. Here we must thank the authors of the chapters of this book who “had a go” with the SWH approach in their own classrooms and took the time to write about their own learning and thinking at this time. The creation of this volume was supported by a Teacher Professional Continuum grant (No. ESI – 0537035) through the National Science Foundation. A consulting group provided extensive feedback on our efforts and pushed our thinking. That group included Lynn Hogue, Mickey Sarquis, John Tillotson, Leah McDowell, Bill Crandall, Kim Wise, and Jodi Bintz. Additionally, an advisory board has also provided thoughtful response and feedback on our efforts including Donna Alvermann, Sharon Dowd-Jasa, Todd Goodson, Kathy McKee, Wendy Saul, and Larry Yore. We thank you for your wisdom and continued “nudging” as we grow in our own understanding of teaching and learning, science and literacy.

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BRIAN HAND AND LORI NORTON-MEIER

INTRODUCTION

Teaching in the Service of Learning

Okay. I am officially hooked. Three of my classes got into arguments about whether or not matter can be created/destroyed or if it just changes. They talked about how energy has to be involved, whether or not a baby is created, what happens to dead animals when they decay, it was awesome! There were excellent points on both sides. I had to put my hand over my mouth to keep from joining them.

I am seeing roughly the same amount of fact retention at this time with SWH as I did when I was teaching with a more traditional lecture/notes method but my kids then would have never been able to argue with evidence as my kids did today. All of this and I have only begun to learn how to teach using SWH, I can't wait until I am halfway skilled in the approach! Thank you for helping us with this, both of you. (Email communication from James Haver, October 15, 2010)

James Haver is a sixth grade teacher who is new to the SWH approach and is in his first year of implementation. In this volume, you will hear the voices of teachers just like James who will share their own professional narratives ... narratives that detail their professional journey to implement argument-based inquiry into their own classrooms. Their stories of not only teacher learning but also student learning are compelling. So, just what is this approach that has a group of teachers talking, as James does in his email communication above, about the transformation they see happening in their various classrooms?

There is currently much interest within the science education community on the use of argument-based inquiry approaches within school classrooms. The intent of these approaches are to provide students experiences that are more closely aligned to how science is done, rather than on the traditional inquiry approaches that have been used over the last 10–15 years. There are a number of different perspectives about these approaches ranging from teaching students how to argue before they “do” science argument to teaching science argument as a critical component of an inquiry approach. The editors are firmly in the camp of the latter perspective in that we believe students learn about argument by “living” the argument as part of their inquiries.

This book is intended to provide the opportunity for teachers, who are interested in implementing argument-based inquiry into their classrooms, a chance to look inside the classrooms of teachers who are using the approach. The book brings together

teachers from Kindergarten through to grade 6 who have taken a chance on re-thinking about how they teach and have shifted their focus to be about learning rather on themselves as teachers, as well as some of the professional developers who are working with these teachers. All the teacher authors believe that their students need to focus on framing questions, making claims and supporting their claims with evidence. They are firmly committed to the idea that students need to live the language of science by using the language science as they experience it.

ARGUMENT-BASED INQUIRY AND WHAT IS NEEDED

In building a picture of argument-based inquiry, we need to discuss what are the critical elements of argument and how this varies from some of the early inquiry approaches. While there has been much discussion within the science education research community about what are the critical elements of science argument, the translation into practical teaching approaches has not always been clear. Importantly there are a number of different perspectives that researchers have taken in working with teachers. Some approaches highlight the need for students to be involved in critical discourse about science. That is, students need to learn about the importance of how scientists build knowledge. Students need to be able to engage in the argumentation approaches that scientists used to advance knowledge. To teach students about this, these approaches advocate a need for students to be taught about argument before they get to use the process. Students need to understand what the argument is, prior to them being engaged in doing science.

While we do not disagree with the idea of students needing to engage with argumentation, we believe that it is necessary for them to be actively involved in building their arguments as a process of learning about argument. We can teach students to engage in inquiry activities based on a questions, claims and evidence structure, that is, an argument-based inquiry approach. Students are full of questions about topics – we just need to let them express them and negotiate which of them are worth exploring. By placing demands on them to negotiate between the data they collect, and what claim they can make from the data, we can push them to deal with the concept of evidence. Children can be pushed to write a narrative that explains what data points they want to use and why they want to use them. We can help them understand that data plus reasoning results in evidence. Evidence is not free of reasoning. This is critical for us because we have to stop students from reporting under evidence or results – “see data” as though data speaks.

The approach used by the teachers in this project is the Science Writing Heuristic (SWH) approach. This approach was developed in the late 1990’s by Brian Hand and Carolyn Keys and is intended to encourage students’ negotiation of science through an argument-based structure. The following template (heuristic – a problem solving device) is the one a student is required to use for any inquiry activity (See [Figure I.1](#)).

As part of using such a structure, students are required to both publicly and privately negotiate what are their claims and evidence. They are constantly required to reason through their data, other students’ data and the public debates that are the norm of the classroom environment.

1. Beginning ideas - What are my questions?
2. Tests - What did I do?
3. Observations - What did I see?
4. Claims - What can I claim?
5. Evidence - How do I know? Why am I making these claims?
6. Reading - How do my ideas compare with other ideas?
7. Reflection - How have my ideas changed?

Figure I.1. The SWH approach student template.

The use of such a structure is based around involving students all along the way – they help pose questions, take part in public debate of their claims and evidence, and search the literature to see how their ideas compare with others including the practicing scientists. Science becomes something that they construct and critique, where their ideas are valued and debated, and where words such as “prove” are no longer the norm but replaced by “scientifically acceptable”. Science knowledge is to be contested and understood for that knowledge as being the best fit at the current moment.

DO TEACHERS NEED TO CHANGE?

If we want to have children actively involved in a question, claims and evidence approach to inquiry, we are going to have to make changes both in how we think about learning and how we act within the classroom. Rather than trying to talk about it from an academic point of view, we have inserted the words of Josh, one of the teacher authors of this book. He was asked by his school’s curriculum coordinator to explain what the SWH approach is all about. He chose to reply in the form of the SWH template.

Claim:

The Science Writing Heuristic focuses on student learning.

Evidence:

Traditionally, teachers are the center of the classroom and all information comes from them. This model of teaching has little impact on the students, in particular critical thinking. The students learn how to play the “guess what’s in my head” game, and therefore, can answer the teacher’s questions the way he/she wants. This simple recall of information does not cause the students to think critically about what is going on in the classroom.

The following question is essential to understand: What is teaching, and what is learning? When looking at the first part, teaching, one must understand that a teacher can NOT put information into a student's head. The teacher has absolutely zero control of learning. For example, as you are reading this claim and evidence, I cannot "teach" you about teaching and learning. For if I could, you would then agree with me and the conversation would be finished. Rather, you are negotiating what you believe to be true based on your previous negotiations (readings, experiences). So what is teaching? Teaching is the management of the classroom. This is a crucial part of the student's day. As the teacher's management keeps the environment safe and productive, it provides opportunities for the students to negotiate their current understandings.

Learning, the second part of the question is also known as negotiating your previous framework to make new meaning. The complexity of learning comes in when we begin to look at how the teacher's role is so powerful. Even though a teacher has zero control over the learning, they still have 100% control over the environment. Students who are not given public opportunities to negotiate only have private negotiation. Ideas that never go public can't be understood by the teacher (for planning) and cannot be challenged by other students/peers/teacher. If learning is negotiation, what is the level of learning in classrooms without public negotiations?

The focus of SWH is negotiation. In this approach, teachers use the students' interest to gain questions. These questions surrounding the "big idea" then give direction for the class. As the students begin to investigate their questions they begin to find additional support, changes needed, or new ideas about why things are and how they work. All of this is done on various levels: self, peer, expert. Each is equally beneficial.

One might say that SWH is limited to the science classroom. If you step back to look at science, science is language around science. Science is a world of theories that we are continually adjusting by the use of language. If you pulled the language (reading, writing, speaking, listening, symbol/picture, body language) out of the science classroom, you wouldn't be productive. The same would be true for all other subject matter. SWH, rather, is an argument-based approach that makes the curricula both rigorous and relevant. This is not a strategy.

If one truly believes that learning is negotiation, then what does the planning look like? The teacher still decides the "big idea" based on the Iowa Core Curriculum (ICC) and the district's requirements. From that point, the teacher has to look at a concept map of what they know, what is the structure of knowledge for understanding the "big idea", and additional research that may need to be done to understand the topic. Once the structure of the "big idea" is understood by the teacher, then they can start looking for the activities/experiences that could be offered to the classroom when the questions arise. It is critical to start with where the students are with their understanding of the "big idea". A quick pre-activity will allow the teacher

to know what they do or do not know. This also leads the students into questions. These questions are what would drive the rest of the unit. Activities/experiences are NOT sequential. Rather they should be utilized to best help with parts of the concept map, student questions, and tie back to the ICC.

Traditionally a teacher has set lesson plans from day 1 to day X based on the ICC or district requirements. This past year we looked at rigor and relevance, which I called a strategy for planning. Teachers tried to say why things are relevant. Who are we to say why things are relevant? Is it our learning or the students? Very similarly we tried to develop a unit plan or lesson plan that was rigorous. If we are about the student's learning, why are we planning how an activity will go, what will be done a head of time, and never negotiate?

There are many things being addressed by Josh – the need for negotiation, the setting of, and focus on, the “big ideas” rather than content facts, planning that builds off where the children are, and the idea of a possible non sequential order to the unit. While this list is not exhaustive, it does highlight that there are some significant changes that teachers need to engage with. All of us using this argument-based approach believe that our job is not about teaching but rather about learning. We in science education, and in education in general, have real trouble translating the learning theories that underpin the philosophy of science teaching into classroom practice.

Our focus in working with the teachers is not on a particular curriculum product, or a curriculum that we have developed (we have not done this or are interested in this task), but rather on challenging them to translate learning theory into practice. Every teacher adopts a curriculum to suit him/herself. If we focus on learning theory, and build teaching practices that address the theory, then teachers can use these regardless of what curriculum they asked to use. The SWH approach to argument requires teachers to understand and adopt a learning is negotiation approach to their classroom. While this is difficult, the rewards are significant.

THIS BOOK

Each of the authors or teams of authors have used the SWH approach within their classrooms or in helping teachers to use this approach. The authors have had success with this argument-based inquiry approach. However, the journey has not been easy for them. All the authors have had at least three years experience using the approach. They have all stumbled, been supported through their struggles and are still using the approach.

The chapters are intended to provide you with a snapshot of various aspects of what goes on in their classrooms, or with the professional providers who work with the teachers. The book is intended to help the reader to see that it is not all a bed of roses – it is not going to happen overnight, nor will it be without trouble spots. However, we believe that persistence will be reward.

The authors span teachers of young children through to 5th and 6th grade teachers. The early grade teachers do involve their students in public negotiation – students can make claims and provide evidence for their claims. The older children do develop more sophisticated arguments, but they are still based around a question, claims, and evidence structure. We encourage the reader to read this book in conjunction with our *Question, Claims and Evidence* (QCE) book (Norton-Meier, Hand, Hockenberry & Wise, 2008), as this will help provide the teacher stories behind the how to do the SWH approach which is the focus of the QCE book.

In particular, the reader will see three themes that emerge in this book. The first four chapters focus on the central theme of the SWH approach: *There is no science without language*. Lynn Hockenberry begins with a discussion of how language is used to learn in SWH classrooms followed by a chapter by Michelle Harris where she illuminates the role of discussion in the negotiation of learning. In Chapter 3, Michelle Griffen talks about the breadth of language demonstrating how reading, writing, listening and thinking are essential to the work of children as scientists. Finally, Amy Higginbotham and Christine Sutherland discuss the role of writing to their young students negotiation of meaning both in science and their developing understanding of how language works.

The second theme that appears throughout the volume but is particularly the focus of the next four chapters is that *negotiation is central to learning*. Kim Wise describes the focus on learning in Chapter 5 and how teachers engaging the SWH approach create classrooms where children learn. Following up on Kim's chapter, Joshua Steenhoek, Jill Parsons, and Kari Pingel discuss in Chapter 6 how the SWH lens has created a powerful space where their sixth grade students can negotiate their understandings about challenging science content. In particular, the authors focus on their use of technology to open up the opportunities for ongoing negotiation both in and out of the school setting. Often, members of the professional community doubt if young children can engage in this form of argument-based inquiry. In Chapter 7, Julie Sander details the learning of her kindergarten students who did in fact learn to use argument through science conversations. Peggy Hansen continues the conversation by highlighting the use of the terms claims and evidence in a fifth grade classroom and how this transformed not only her thinking but also that of her students by turning science learning into a space for negotiation.

The final theme is that *only the learner controls learning so we must organize our classrooms so that all students can engage with the big ideas of science*. In Chapter 9, Carrie Johnson talks about her experiences watching the classroom environment transform as teachers engage in argument-based inquiry. To lend a more detailed picture to the discussion of environment, Cheryl Ryan and Gina Johnson describe their third grade classrooms and in particular focus on how the use of nonfiction literature helped transform students thinking and help students learn science conceptually, not just random content facts. Building on their chapter, Julie Malin describes in Chapter 11 how her first grade students use concept maps to build their understanding of science topics while simultaneously experiencing how language helps us think about what we know and how we know it. Finally in Chapter 12, Sara Nelson describes her unique project where she uses music as a tool for students to summarize their

INTRODUCTION

learning with putting together science content learned with lyric writing. The result is an important learning experience where students are asked to transfer what they know into a new context.

We ask you to enjoy this journey that will take you through the pages of this text. As researchers, teachers, professional development providers, administrators, parents, and other interested community members, we believe this book has many lessons to be learned about teacher learning, teacher transformation, and how we support teachers to continually be able to challenge what they know and how we can continue to orchestrate opportunities for all students to learn in our classrooms. We started this introduction with an email message from James who has just started this journey with the SWH approach ... it is our hope that this volume will let him know as well as those of you reading this text also, that many have taken this journey and continue to ask important questions about teaching and learning. Let our journey continue.

REFERENCE

Norton-Meier, L., Hand, B., Hockenberry, L., & Wise, K. (2008). Questions, claims, and evidence: The important place of argument in children's science writing. Portsmouth, NH: Heinemann.

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