

# CRITICAL INQUIRY IN *ByDESIGN SCIENCE*:

## 10 REASONS TO LIKE THE *ByDESIGN SCIENCE* TEXTBOOKS



**T**eacher! Teacher! What made that happen?"

When students begin to question the phenomena that they have observed, much of the task of teaching is complete, and learning begins. Inquiry teaching methodology seeks to lead students on that quest.

*ByDesign Science* is a new customized faith-based inquiry science program for grades 1 to 8. This hybrid (print and digital e-book) science program has been developed for traditional and nontraditional classrooms. The program was developed by the Seventh-day Adventist Church's North American Division (NAD) Office of Education in collaboration with KendallHunt Religious Publishing.<sup>1</sup> The *ByDesign* elementary science textbook series stages the questioning, exploring, and explaining inquiry process to maximize the "teachable moments" in each student's science education. This process is implemented within the context of the Adventist worldview.<sup>2</sup>

Aligned with the new NAD science standards, *ByDesign* has been developed for traditional and nontraditional classrooms. The program is built on a foundation of inquiry that encourages wonderment, questioning, collaboration, and exploration of multiple resources to conduct research and investigations. This engaging, rigorous, and developmentally appropriate curriculum nurtures children's natural curiosity as they explore the wonders of God's creation through the lens of the Bible.

After serving as a member of the *ByDesign* series review team and listening to teachers talk about their experiences, I compiled a list of the top reasons to like the new science series:

### **Top 10 Reasons to Like *ByDesign* Science Textbooks**

#### **1. Scripture and the Adventist worldview are integrated parts of the curriculum.**

In the early stages of developing this new series, it became apparent that since every science concept impacted our worldview, it would

be impossible to have a science text with only a Bible scripture or religious nugget in each chapter. The committee's discussion determined that the presuppositions were not an add-on but a part of the rich biblical heritage needed to explain basic science concepts.

#### **2. Questions are the heart of the *ByDesign* curriculum** (see Chart 1).

The level and tracking of questions were intentional in the development of this series. Each question was tabulated, and the pacing of questions that students would encounter was put where it would have the maximum benefit.

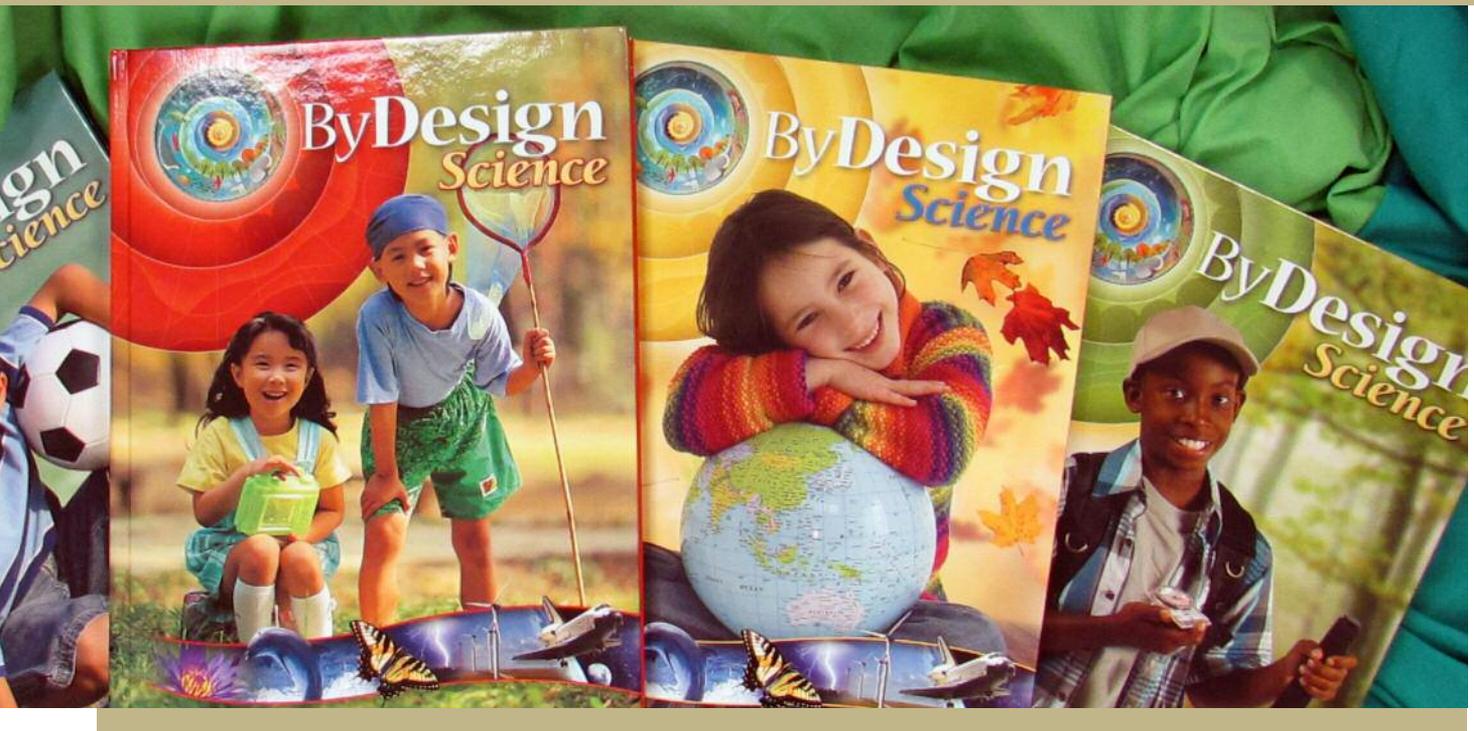
#### **3. Inquiry-based instruction saturates the curriculum** (see Chart 2).

All four levels of inquiry are used throughout the curriculum. The use of directed and structured inquiry predominates as students learn the language and processes of science. As students become more proficient, they can begin to ask their own questions and inquire through guided and open inquiry.

#### **4. Multigrade organization is available.**

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B Y J E R R E L L G I L K E S O N



**Chart 1. LEVELS OF QUESTIONS**

LEVELS OF QUESTIONS	COMMON FRAMEWORK QUESTIONS	CORRESPONDING SCIENTIFIC AND ENGINEERING PRACTICES	BLOOM'S TAXONOMIC LEVEL
<b>Factual Questions</b> Asks students what is known and understood.	Factual/Convergent	Asking questions and defining problems Using mathematics and computational thinking	Knowledge Comprehension
<b>Questions About Hypotheses</b> Asks students what can be predicted and tested.	Convergent	Asking questions and defining problems Planning and carrying out investigations Analyzing and interpreting data	Comprehension Analysis
<b>Inference Questions</b> Asks students to go beyond the immediately available information.	Divergent	Developing and using models Constructing explanations and designing solutions	Application
<b>Interpretive Questions</b> Asks students "What are the consequences?"	Evaluative	Engaging in argument from evidence Using mathematics and computational thinking	Analysis
<b>Reflective Questions</b> Asks students "How do I know I know?", "What do I still not know?", "What do I assume?"	Evaluative/Divergent	Obtaining, evaluating, and communicating information	Evaluation
<b>Transfer Questions</b> Asks students to take their knowledge to new places and to act on their knowledge in real-life situations.	Divergent	Constructing explanations and designing solutions Developing and using models	Synthesis

Created by Dan Wyrick, Director of Nature by Design Learning, and adapted from materials developed by Dennis Palmer Wolf.

The curriculum features a four-year cycle for the Grades 1 to 4 and Grades 5 to 8 student, and teacher multigrade resources.

**5. Science methodology is taught at every level.**

Science laboratory procedures, equipment, recording of data, and examples of great scientists' processes of discovery are all included in this series.

**6. Lab journaling is central to the learning process.**

Good science practice requires meticulously recording observations of all activities. This skill is emphasized throughout the Next Generation Science Standards for K-12 science.<sup>3</sup>

**7. Delivery is available in print and in e-book formats.**

Print and e-book resources are available for teachers and education associates. These are accessible once the series is purchased. E-book formats include flash applications for PC and Mac, and an HTML application for iPad. Resources are supported by Mac, PC, iPad, Tablet, Kindle, and Samsung Android.

**8. Teacher Editions (TEs) offer inquiry, instruction, and assessment in one location.**

The TE for each grade brings together the tools needed for lesson planning. The Big Ideas, Lesson Goals, and a plethora of tools—including features that address multiple intelligences, English language learners, language-arts writing support, differentiated instruction, vocabulary, scaffolding, and assessment—are all included.

**9. Health Challenges bring the physiological science concepts under study into students' daily lives.**

The science concepts become reality to students as they look at their own physical health.

**10. These beautiful books appeal to students and feature clear, up-to-date pictures, tables, and illustrations throughout.**

Many teachers have said this is one of their favorite aspects of the curriculum and a main reason why this series needs to be in their classrooms. When students see the books, they want to explore, discover, and read them.

**Concerns**

Yet, while there is excitement about the new series, there are two concerns:

**Chart 2. LEVELS OF SCIENCE INQUIRY**

LEVEL	DESCRIPTION	QUESTION?	METHODS?	SOLUTION?
1	<b>Directed Inquiry</b> You will confirm a science principle with an inquiry. You will likely know the expected results before you begin.	X	X	X
2	<b>Structured Inquiry</b> You will be given a question to answer. You will also be given a procedure for finding the answer.	X	X	
3	<b>Guided Inquiry</b> You will be given a question to answer. You will plan and do your own procedure to find the answer.	X		
4	<b>Open Inquiry</b> You will be given a topic, but you will decide the question you want to answer and how to answer it.			

*ByDesign: A Journey to Excellence Through Science, Teacher's Edition* (Dubuque, Iowa: KendallHunt Religious Publishing, 2012): Science Journal Overview, p. xxxi. Used with permission.

**1. Schools and teachers will not order the new series because of the costs.**

Although the initial cost of the textbook series is comparable to those of similar programs, the expense of preparing hands-on lab materials can be extensive. The school/teacher has a choice of self-assembling the materials or purchasing them as a lab kit to be used for a classroom full of students over multiple years. Many schools want to preserve teacher preparation time and not compromise on using the inquiry activities. Other schools wish to have a more hands-on approach to securing the materials from local sources. The concern is that the worst-case decision might be made: to not do the activities.

**2. Teachers will evade the rigor of preparing to use the multiple resources designed to support inquiry methodology and revert to lecture mode.**

It often seems easier to simply "tell" children what is going on in science and then test them on the concepts. Although this is efficient for the teacher, it is very inefficient for most students. We now know from brain research that a majority of students learn what they are interested in, and can see and experience.<sup>4</sup>

Unions and conferences are developing in-services, video labs, and other resources to assist in mastering inquiry methodology. And, with these resources, teachers who are

using the series can better support the learners in their classrooms.

To discover more about the *ByDesign* science program, visit <http://adventisteducationbydesign.com>.



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**NOTES AND REFERENCES**

1. KendallHunt Religious Publishing; <http://viewer.zmags.com/publication/7a19b16c#/7a19b16c/16>. All Websites in the endnotes were accessed February 8, 2016.

2. *ByDesign: A Journey to Excellence Through Science*: <http://adventisteducationbydesign.com>.

3. Next Generation Science Standards, <http://www.nextgenscience.org/>.

4. Judy Willis, "Cognitively Priming Students for Learning": <http://www.edutopia.org/blog/cognitively-priming-students-for-learning-judy-willis>; Margaret Semrud-Clikeman, "Research in Brain Function and Learning: The Importance of Matching Instruction to a Child's Maturity Level": <http://www.apa.org/education/k12/brain-function.aspx>.



# ByDesign Science

**By Design Science:**  
**A Journey to Excellence through  
Science for grades 1–8.**

**By Design: A Journey to Excellence through Science** is your new faith-based inquiry science program for grades 1–8. This engaging, rigorous, and developmentally appropriate curriculum nurtures a child's natural curiosity as they explore the wonderment of God's Creation through the lens of the Bible.

**By Design** is innovative and multi-dimensional in content and organization by offering a balanced and integrated development of science and health within the framework of the Adventist worldview.

Call **1-800-542-6657** to order this new faith-based program today! Visit [kendallhunt.com/bydesign](http://kendallhunt.com/bydesign) for more information.

**"All things were made by Him, and without Him was not any thing made that was made". John 1:3**

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