

Science Education Commission Newsletter

American Scientific Affiliation and Canadian Scientific & Christian Affiliation

Let's make some news!

In a recent phone call with a colleague, I asked "What should be in the Science Ed Newsletter?" He responded with the simple, correct answer: "News." I had to agree, but it made me nervous because... well, there was no news to report. Soon, however, my anxiety led to the practical question – What can we do to solve the problem? – that usually inspires productive thinking, and a decision to use this newsletter as an invitation to "make some news!"

You can make news in two ways: by doing things worthy of being in the news, and by reporting what's happening.

Being Newsworthy: As educators, we rarely make the evening news or front page. But you can "be good news" for others by improving the lives of people inside your circle of influence. As an educator you can help people in many ways. You can be a good teacher in the classroom, and also help your colleagues become better teachers, and promote constructive change in an educational system. We encourage you to do whatever you can by taking advantage of your opportunities, wisely using your unique abilities (given to you by God) and your unique situations (provided for you by God). "As we have opportunity, let us do good to all people." (Gal 6:10)

Reporting News: We hope you'll share what you know — about what you and others are doing, or ideas you've found in print or on the web,...; basically, anything you think others may find interesting or useful — so we can become a sharing community that is supportive, enjoyable, and productive.

Building a Community

Do you enjoy talking with friends about fascinating ideas? Do you like to work with colleagues on important projects? These are two of the ways you can participate in community. The main goal of this newsletter is to help you find friends and colleagues who can become partners in building communities around your mutual interests.

How? To help ASA members build communities, in the past year the ASA has provided some new ways for us to communicate. I'm especially excited about the ASA Bulletin Board, which collects and organizes what you write so we can share ideas. Our part of the bulletin board, the Science Education Forum, will have two types of topics, for information and conversation.

Information: You can share what you know, and see what others know, about events (conferences, lectures,...), people (tell us about yourself, and learn about potential friends and colleagues), projects (what are you doing? would you like some help?), communities (other forums or email lists, and organizations for educators or scientists), resources (on the web or in print), and jobs (mainly by describing the listing-

services of CHE, CCCU, ASA,...). And there will be poll-questions to discover what we do, and what we think about various issues.

Conversation: Some talk will be ongoing, but since we know you're busy (with more to do than time to do it) much of our conversation will occur in *scheduled discussions* about selected topics. Most of us won't take time to visit the Science Ed Forum every day. But many of us will visit every day for a week, and by doing this we can get a "critical mass" with enough people and perspectives to make the forum interesting for you, giving you a reason to read and respond. Our first scheduled discussion, about Christian Education, will be for eight days (W to W) beginning in mid-November. Later, we'll have discussions about other topics, including Origins Education, after making decisions about topics-and-timing in the forum.

How? You can visit four useful homepages by using web-logic to choose appropriate links: Go to "www.asa3.org" and click "Education" (top-left corner), "ASA Science Education Commission" and "ASA Bulletin Board" and then click on each link (ASA Matters,...) so you can see all available forums. After you register — it's quick and easy, and for a Username you may want to just use your own name, like I did — you can participate in discussions.

Building Many Communities: The ASA community contains smaller communities, each built around common interests. What are some possible interests? In education, teachers in four settings — Christian schools (K-12 and college), public schools (K-12 and college) — will share some interests with teachers in the other three groups (and with home educators) but there will be a closer match with teachers in their own group. In addition to these vocational connections (based on what you do), shared interests might be topical (what you like to think about and discuss) or geographical (where you live, so you can meet in person).

Joining Other Communities: Many of you are now in vibrant communities, thriving with stimulating people and activities. Tell us about your community. Who might want to join, and why? What are the common interests? Are you local, regional, or national? Do you interact electronically, in person, or both? If there is a bulletin board or email list, describe it: What are the typical topics, how frequent are posts, what is the mood (is it cooperative, confrontational, intellectual, practical, social, or...), what is the level and quality of ideas, and how do you feel about it?

Using Communities for Outreach: The mission statement of my church in Madison is "Building a Community to Reach a Community." We can use our ASA communities to reach other communities and individuals. The Science Education Forum is open to everyone, so you can invite anyone you think might contribute to the forum or benefit from it.

What else is happening? In addition to the general ASA Email Discussion Group, two communities in ASA — the geology and biology affiliates — have homepages (check the lower-left corner of www.asa3.org) that tell you about their own email ListServes. Soon, the ASA will begin sending monthly mini-newsletters by email. Basically, education is communication, so it's appropriate that two commissions (Science Education and Communication) met together in July at the ASA's annual meeting.

During the past year, the Communications Commission has been very productive, providing new ways for us to communicate (the bulletin board and email newsletter) and developing policies for the wise use of our communication resources. Overall, the ASA communicates in two main modes: vertical top-down from "the ASA" to its members (as in the journal and newsletters), and horizontal spreading-out among members (as in bulletin board forums and email lists). Both modes are useful.

Compared with a year ago, when the ASA Bulletin Board did not exist, our opportunities for building community are much greater now. The bulletin board and its forums are just beginning to develop. In fact, Science Ed will be one of the first forums that (I hope) will have a large number of people using it. What will happen? We don't know. We're making plans, but part of the plan is to be flexible, to improvise based on your response. For example, currently the Science Ed Forum is open to everyone, but in the future its members may want to restrict participation in some way. Or maybe not. We'll see what happens. There will be a similar "structured flexibility" in other forums. As various communities develop in time, they will evolve in their own ways, and a year from now the bulletin board will not look the same as when you first see it.

The rest of this newsletter is related to communication and community. The next two sections (An Educational Website, and Improving the Website) are about communicating through the web, and will be discussed in the Science Ed Forum. The final section (Christian Education) is background reading for the first scheduled discussion in our community.

An Educational Website

In his ASA Presidential Report for 2000, Jay Hollman described our many ministry possibilities and challenged us to invest the effort needed to achieve "the vision of what ASA could be if..." At the annual meeting in July 2003, Keith Miller urged us to be good "stewards of knowledge" by wisely using the abilities, experiences, and opportunities given to us by God. We can be good stewards by sharing what we know (in education) and by making wise decisions based on what we know.

The Science Education Commission is only one part of the educational mission of ASA. In addition to members working as individuals and in other commissions, there is the ASA/Templeton Lecture Series, and the ASA Lay Education Project that will "enable lay members of Christian churches to

understand...the appropriate use of God's dual revelations...in the Bible and in nature" by using the earth's age as a topic for study. The work of ASA, through its members, includes efforts to improve education inside schools (public, private, and home, in K-12 and college) and outside schools in the Christian community and in society as a whole.

Soon, these efforts will be made more effective, and more widely recognized, through communities facilitated by our interactions in the bulletin board forums. As explained in the introduction (Let's make some news!), this newsletter is about "future news" that I hope will happen.

In the past few years, however, the main project of the Science Education Commission has been a website whose purpose, as described in the homepage, is to "help you enjoy the exciting adventure of learning and thinking, while you're exploring the fascinating world created by God. We want to increase your knowledge and stimulate your thinking, while you're learning about Christian perspectives on nature and science. And if you're a teacher, we hope you'll become more effective in motivating your students and helping them improve their understanding and thinking skills."

Other pages explain the educational style and philosophy. "This website will help you learn quickly, on two levels: introduction and exploration. First, we'll quickly provide a coherent overview of important ideas, to help you understand the ideas and their relationships. Then, to help you explore more deeply, we'll provide links to pages that examine the ideas and relationships in more depth. In both phases, we'll adopt a 'multiple positions' approach by explaining different views, so you can be well informed while you develop your own perspectives."

My inspiration for this approach was a high school civics teacher who held debates in class: "On Monday he convinced us that 'his side of the issue' was correct, but on Tuesday he made the other side look just as good. After awhile we learned that, to get accurate understanding, we should get the best information and arguments that all sides of an issue can claim as support. After we did this and we understood more accurately and thoroughly, we usually recognized that people on different sides may have good reasons, both intellectual and ethical, for believing as they do, so we learned respectful attitudes. In our website, we want to encourage accurate understanding and respectful attitudes by accurately and respectfully describing the main views on each topic, so we can make progress in our search for truth."

This multi-position approach is especially useful and interesting in the area of origins: "Most websites express a single view of origins. But our goal is education, so our website should reflect the diversity of views within our organization and in the Christian community. Instead of claiming to provide The Origins Answer, we'll explore Origins Questions. ... Our goal is to help you understand a wide range of views about theology and science." This area — about *Origins Questions* — is related to three other areas: The Nature of Science, WorldViews, and School Options.

We'll explore *The Nature of Science* in fascinating Stories about Science (from history and current events) and exciting

Debates about Science (Are some views of science dangerous? Can too much of a good thing be harmful? Do scientists seek truth? Do they create reality? How can we avoid being carried away to extremes?) and conscientious Christians in Science.

A *World View* is "a mental model of reality (a set of theories about what exists, how and why things happen, and what it means), a view of the world that we use for living in the world, that serves as a foundation for our thoughts and actions." This area will describe Christian worldviews and will compare them with other views of the world.

School Options "compares four types of schools (home, private, public, and charter) to show the similarities and differences, advantages and disadvantages. ... Public concerns about public schools include questions about educational quality and religious neutrality. ... Why do some parents and educators have concerns about the worldviews that are the foundation for instruction in public schools?"

Three areas focus on basic education, on the process of preparing for life by learning useful ideas and skills: *Learning Skills* (motivation, concentration, memory, reading, writing, preparing for exams, taking exams, and using time effectively) are the foundation for education. *Thinking Skills* that are creative and evaluative are combined in the problem-solving methods used by scientists and designers. *Effective Teaching* offers practical Teaching Strategies and Teaching Activities to help teachers improve their effectiveness through goal-directed planning and action.

This website will be a valuable educational resource. Who is the audience? In general, "This website is for everyone who likes to think. It's for learners and teachers. Of course, this includes you, since each of us is a learner, a self-teacher, and a teacher of others." I think the "multiple positions" approach in *Origins Questions* is most likely to be noticed, and to make a positive impact in the educational community. But all areas will be useful, especially when they're more fully developed, and to do this I'll need your help.

Improving the Website

Why am I asking for help? My goals are improved quality and accountability.

Quality: Our website will be useful for ministry and outreach, if it has quality. I think the current website is excellent in some ways, but in other ways it needs to be improved. We should make it better, and you can help.

Accountability: When the ASA is represented in official media — in its journal, and in books, newsletters, email discussion groups, bulletin board forums, and websites (of ASA or its commissions) — this should be done in a way that is consistent with ASA policies, and that honors God. Until now, I've made most decisions about the ASA Science Ed Website without much formal accountability or assistance. But the Science Education Commission is all of us, so you should be part of the process.

Why might you want to help? Because one way to be a good steward of knowledge is to improve the educational value of our website. "It's A Wonderful Life" is my favorite movie, partly for its art (the plot, script, acting,...) but mainly for the message: Each of us affects other people, and life is better if we affect others in a way that is beneficial for them. In your limited time you can't do everything, and you have to make choices. Some of you — but not others, since God has called each of us to use our time in different ways — will want to help improve our website so it will have a more beneficial effect on its users.

How can you help? The best starting point is to explore the website, to see what is there, and decide whether you want to become involved in some parts of it. In developing our website the main productive activity, which is challenging yet enjoyable, is to search for web-pages with good ideas and style. Or you might write a *links-page* (describing the pages you think will be useful educational resources) or a *resource-page* "with good ideas and style." { The main function of a resource-page is to express ideas. A links-page describes resource-pages and provides links to them. }

Filling Gaps

The homepage explains that science education "is defined broadly so it includes a wide range of interesting ideas." This is beneficial for users, but doing all areas well requires time, and currently the website is underdeveloped in many areas: in Effective Teaching (with Teaching Strategies and Teaching Activities), parts of School Options (for Private Schools and Home Schools) and World Views (for many topics), plus The Nature of Science, environmental science, and more.

Since much of the website is underdeveloped, and all of it can benefit from thoughtful evaluation, and science education is broadly defined, you can probably find some way to use your interests and expertise. For example, some of you have devoted your careers to Christian schools. Compared with you, I know very little about this area, so who would be more skilled in developing it? If you look through the website, you'll find some areas where you're relatively expert and your knowledge will be useful. Or, if you're interested in a topic you can become more expert by learning more about it while you're developing the website.

Finding Web Resources

Because many excellent resource-pages are already on the web, our main strategy for developing the website will be finding these web resources and writing links-pages.

In searching for resource-pages, the key is selectivity. With a search engine and a few minutes, it's easy to find lots of pages. It's more difficult to find the best pages, but this is the goal. We want to recommend only high-quality pages, so users can learn quickly and well, without being overwhelmed by too many choices. But selectivity should not be censorship, and for controversial questions the range of views will be wide.

Selectivity requires effort. If you look at one page and say "I like it," this might be useful. But it's much better if you look at 15 pages and then, after careful evaluation, you decide

"I like these 3." Or if you look at 50 pages and say "I like these 5, here is why, and they can fulfill these functions in the website." Or you might evaluate 50 pages and make a short-list of 10, which you submit for discussion and evaluation in the Science Ed Forum. Yes, a careful selection of resources requires more work by us, but it will make the website better for those who will use it in the future.

Increasing the Impact

Will people use our website? So far, I haven't tried to get it more widely known and used, because I haven't thought that, in its underdeveloped state, it has deserved the attention. Hopefully, this will change in the near future.

When we decide that we want to attract more users, how should we do it? Do you have ideas for doing this effectively? Do you have training and experience in marketing, or intuitive skill in doing it? Are you a socially adept networker who can gracefully "advertise" a website to your colleagues? Do you know how to write effective emails that will get return-links from web editors whose pages we cite? Do you know how to make a page rank high in Google and other search engines? These skills will be useful for increasing the educational impact and ministry value of the website.

Giving it Visual Appeal

Part of our marketing will be intrinsic, by making the website more appealing, both verbally and visually. Do you have training, experience, or intuition for graphic design and page layout? Are you (or is someone you know) a clever cartoonist? And are you willing to help? { I've contributed thousands of hours as an unpaid volunteer because I view the work as a ministry, and we won't be able to pay you, either. }

Evaluating the Website

You can explore part of the website or all, and provide feedback about anything you want: look-and-feel, navigation structure, logical structure, idea quality, writing style, page layout and graphics, or choice of content-pages. When you're evaluating, honesty is important. If you think some aspects of the website are good, I'll be happy to hear this. If you think other parts need improving, I'll want to hear this, too. Why? So we can make the website better for its users. In the long run, you'll be doing me (and ASA) a favor if we fix a weakness early, before it's seen by more people.

To improve the website, and for accountability regarding content and quality, we can use the Science Ed Forum for feedback, suggestions, and discussions.

Getting More Information

For ideas about verbal and visual appeal, searching for useful web-pages, developing the origins area, and more, check "Improving the ASA Science Ed Website" in the homepage for the Science Education Commission, www.asa3.org/ASA/education/asascied.htm

Christian Education

As described earlier, part of our community building activities will be a scheduled discussion, in the Science Ed Forum, about Christian Education. The background reading for our discussion will include some ideas being shared by Mark Witwer, who has taught earth science and physics (among other things!) for 24 years, the last 19 of them at Delaware County Christian School in Newtown Square, PA. In addition to teaching, Mark is the school's high school science chair and K-12 curriculum director, and is a doctoral student at Oxford Graduate School in Dayton, TN.

The following ideas are excerpts from three of his longer papers, condensed (as indicated by ...) to 25% of their original length. If you're interested in seeing more complete versions of the papers, you can request these from Mark via e-mail.

Teaching Students to Think Christianly

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My Vision for Christian School Academics

Why Christian Education?

In many American communities, a smorgasbord of schools offers public, private, magnet, charter, on-line and home school education. Why add a Christian school to the mix? ... The reason is the same one that motivated the apostle Paul to risk his life planting Christian churches in the first century: the conviction that Christianity is true and alone among religions fully meets people's needs. This means that Christianity alone provides an accurate frame of reference for learning. Education that ignores this frame of reference is inaccurate: incomplete at best, false and misleading at worst. This Christian frame of reference is often called a Christian worldview or a Christian mind. A Christian mind thinks like Jesus and as a result behaves like Jesus. ...

Obstacles to Christian Education

As George Barna has demonstrated, few Evangelicals in post-Christian America have a robust Christian mind. ... An intellectual reformation is needed among Evangelicals. The logical place for this to begin is Christian schools, but three obstacles have hindered the effort so far.

First, Christian educators have often written about "the integration of faith and learning" but most of this discussion is general in nature. Specific Christian perspectives on each subject area are difficult to find. As a result, while teachers in many Christian schools agree that students need to be taught to think Christianly, they remain uncertain what this looks like.

Second, most Christian schools are small...and instructors in small schools often must teach outside of their areas of expertise. ...

The third and most serious obstacle facing Christian schools is anti-intellectualism in the Evangelical community. ...

My Vision

I dream of God using Christian schools to awaken the Evangelical mind. ... Over the last fifty years, the Christian school movement has experienced explosive growth. ... Has

God raised up the Christian school movement for such a time as this? ... In order to foster the growth of a *well-prepared* and *distinctly Christian* mind more effectively, Christian schools must do two things. Both involve becoming more intentional about what our students learn over the course of their entire education.

First, the faculty must create a relatively short list of critical data, concepts, skills and attitudes that students need to learn in each subject area by the time they graduate. These core learning goals...provide a framework around which every course in the subject area is built. With each course reinforcing the core curriculum over a student's entire educational experience, its goals are likely to be accomplished.

Second, the faculty must find specific ways to articulate Christianity's relevance to each subject area. These points of contact between faith and learning must be part of that subject area's core curriculum. This is the only way to dispel the sacred-secular dichotomy that plagues evangelical thinking. Students will not learn to think Christianly about every area of human thought and activity until they see this kind of thinking modeled.

My vision for Christian schools is that they will increasingly focus their academic efforts on achieving clearly articulated, academically sound core learning goals in each subject area, including specific and meaningful examples of how Christianity is relevant to that subject. This is a strategic way to more effectively develop a robust Christian mind in students.

Integrating Faith and Learning: Academic Contextualization

Christian truth cannot impact students' lives until they understand it. Contextualization, a term borrowed from hermeneutics and missionary theology...is the task of expressing Christian truth in such a way that it becomes relevant and meaningful to a specific audience (i.e., it makes sense within the audience's social and historical context). ... Academic contextualization requires a school to articulate a distinctly Christian perspective on each subject area and to do so in a way that is relevant and meaningful to students. ...

Despite good intentions, many Christian schools have failed to contextualize their academic instruction. Some have confused the integration of faith and community life with the integration of faith and academics. Others have mistaken the creation of a distinct educational subculture (e.g., characterized by Bible memorization, chapel attendance, modest dress, etc.) with educational contextualization. In both cases, the challenge of effectively integrating faith and academics remains. ...

What does effective contextualization in academic areas look like? ... *Christian truth must be expressed in a way that shows its relevance to the subject at hand and is meaningful to students.* Every unit of study must answer two questions: First, what relationships exist between this subject matter and what God has revealed in the Bible? Second, from a student's viewpoint, what does the answer to the first question mean and why should he or she care? ...

Together, these questions define an effective process of integrating faith and learning. The first question begins the process; the second completes it. ... *Academic contextualization begins with articulating a distinctly Christian perspective on a subject area and concludes with*

finding clear points of contact between this perspective and the student.

Appendix: Examples of Integrating Faith and Academics

[The remainder of the complete paper lists examples of academic contextualization in common school subjects, with key questions to establish their relevance to students. Several science examples are below.]

Science

1. Since the universe is God's creation, the more scientists discover about it, the more His genius and power are evident. "How can this [subject matter] help me to trust and/or worship God more?"

2. God transcends and governs nature. The Bible identifies God as the cause of natural events whose mechanisms have now been described by science (e.g., "Do the skies themselves send down showers? No, it is you, O LORD our God" Jeremiah 14:22 NIV; "... it is the LORD who makes the storm clouds" Zechariah 10:1 NIV). Therefore, natural processes are God's secondary agents and fully under His control. "Does God cause this or does it happen on its own?" ...

3. Both science and theology make truth claims, based on human interpretation of data from nature and the Bible, respectively. ... Thus, theological and scientific claims are equally vulnerable to human error. "How will I respond when science seems to contradict my understanding of the Bible?"

Teaching Science Content and Context in Christian Schools

Science students need to learn two types of material, which this paper designates "content" and "context." Content includes the data, conclusions, and applications associated with a particular area of science; it makes up the bulk of most textbooks. Context consists of three broad perspectives that give significance to the content. Two of these perspectives are important in any school: science's process (i.e., how content is obtained) and science's relevance to students. Christian education includes a third perspective: the relationship between science and faith. Thus, content is information about the natural world, and context is how that information is obtained, its relevance to students, and its relationship to faith. It is difficult to teach both content and context adequately. ...

The quality of precollege science education in the United States has become a source of concern in recent years. ... As a result of such concerns, 49 states now have curricular frameworks for science...and national standards have been written ... Some of these frameworks are extensive...[which] creates a problem for teachers. Teaching the content alone can occupy most of a teacher's instructional time, leaving little time to teach context. ... Christian school teachers have extra context...the relationship of science to faith, a topic public schools can ignore. ... When science content and context vie for instructional time, content usually wins. The most obvious reason is that most science textbooks emphasize content over context. Another factor is the influence of high-stakes tests. ...

After twenty four years in the classroom, and after reviewing the literature, it is this author's judgment that a simple, effective method of teaching the content and context of Christian school science is needed. The method proposed here, contextual teaching, involves occasionally asking five questions about information being taught. The questions develop understanding of context by conveying three ideas:

scientific claims are accepted because they are supported by evidence, scientific information has personal relevance, and it is important to integrate scientific information into a coherent biblical worldview. The five questions are:

1. “How do we know this?” Scientific claims are accepted because they are supported by evidence. Like detectives, scientists gather clues and try to explain them. ...

2. “How sure are we?” This question dispels the assumption that the word “know” always connotes certainty. The claims in science textbooks may be placed along a continuum of confidence, ...

3. “What should you do, as a result of this?” Better understanding of the things God made facilitates better management of them. ...

4. “How does this show God’s genius (or power)?” ... Science content contains many examples of God’s genius and power that can strengthen faith and encourage worship.

5. “Did God do this?” This question is rhetorical, reminding students to give God frequent credit for the science content being studied. ... The notion that a natural process happens “on its own” — meaning it is not done by God — confuses God’s use of secondary causes with His absence.

As students build a Christian view of science, they stop asking *whether* God did something in nature, and begin asking *how* God did it.

Contextual teaching is practical for Christian schools in four ways:

A. It minimizes the competition for instructional time between content and context. Rather than replacing or adding to content, contextual teaching views the information from certain perspectives — how the information was obtained, its relevance to students, and how it relates to faith — ...[that] give it higher meaning and engage student interest.

B. It does not require that a school with limited funds buy new materials. ...

C. It is not complicated. Any science teacher can highlight the context of a unit, by asking the five questions at appropriate times. Even if a teacher is unsure how to answer one of the questions, or if little time is available for discussion, students will learn by being asked. ...

D. Contextual teaching is based on educationally sound principles. ... It engages students in educationally productive thinking.