

Teaching Sensitive Topics from a Biblical Perspective - A Case Study in Computer Science

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Abstract: Connecting faith and learning might be an easy task in most courses. However, it is not easy in courses that deal with sensitive topics, such as evolution. In this article, first we introduce this problem with a case study in a course on computer science at Universidad de Morelos, an Adventist higher-education institution. Then, we present a Bible-based methodology to deal with sensitive topics. We found that the faith of our students can be strengthened when sensitive topics are faced from a biblical perspective.

Thematic area: Adventist Education.

Keywords: Computer Science, Faith and Learning.

1) TO TEACH, OR NOT TO TEACH SENSITIVE TOPICS, THAT IS THE QUESTION

I [Germán H.] still remember the time when I was working on my Ph.D. dissertation of computer science. That was the time when I had to deal, for the first time in my life, with a topic with evolutionary roots to solve a complex computational problem. Basically, my research work focused on the dynamic adaptation and the dynamic evolution of software based on Web service operations (1).

In literature, it is common to find cases in which the terms “dynamic adaptation of software” and “dynamic evolution of software” (including other terms in between) are used interchangeably (2, 3). However, there is a big semantical difference between them.

On one hand, adaptation is about adjusting to arising conditions (e.g. dynamic context events). Therefore, it is possible to say that dynamic adaptations of software are carried out to make punctual changes. On the other hand, evolution is about gradual or continuous growth. Dynamic evolution does not imply just punctual adaptations to punctual events but a gradual structural or architectural growth into a better state. This idea goes in line with Lehman’s eight laws of software evolution (4).

I am a creationist who believes in the six literal days of creation. However, I discovered that in the field of computer science the concept of evolution is necessary to achieve the dynamic evolution of software.

Some years ago, I faced a similar problem in an undergraduate course on Artificial Neural Networks (ANNs) at the School of Engineering and Technology, Universidad de Morelos. ANNs are a class of flexible nonlinear models designed to imitate biological neural systems (5). The basic principle of artificial neural networks is to solve a problem via cooperation of a large number of simple processing “neurons” (6).

In order to build a computer capable of “human-like thought,” it is necessary to use the only available working model, the human brain. However, the human brain is very complicated to model. In fact, the human brain is considered the most complex object in the universe (7). Rather, the only way to understand and mimic human thought is by studying individual neurons that make up the brain. This fact motivated my ten students, all of them active Seventh-day Adventists, to realize that as computer scientists and engineers we can barely grasp the complexity of God’s creation.

Nevertheless, at the middle of the semester we reached a very sensitive topic: Genetic Algorithms (GAs). A GA is a computational model of biological evolution (8). GAs were invented by John Holland in 1975 (9) and are inspired by Darwin’s theory about evolution. The GA attempts to find a good (or best) solution to the problem by genetically breeding a population of individuals over a series of generations. In the GA, each individual in the population represents a candidate solution to the given problem. The GA transforms a population of individuals, each with an associated fitness value, into a new generation of the

population using reproduction, crossover, and mutation (10). GAs have been successfully used to generate solutions to optimization and search problems (11).

Facing GAs in a Christian environment arose the following questions: Should this topic be included into the course plan? May this topic negatively affect the faith of our students? We believe that omitting sensitive topics, such as software evolution or GAs, in courses at Adventist institutions could have negative consequences. First, our students will lack key knowledge to deal with current problems found in science and technology. Secondly, they may feel these topics are avoided because we, as educators, lack evidences to support our Christian worldview. Last but not least, it will be difficult for our students to present strong arguments to refute theories contrary to their Christian worldviews when they do not know the background of those theories.

Since dealing with sensitive topics in the classroom is not an easy endeavor, we believe that it is necessary to count on a methodology to help educators in this task. Also, since the Bible is the supreme, infallible revelation of God, this methodology must be based on the inspired record. Therefore, the following section presents a biblical methodology to face sensitive topics with our students.

2) A BIBLE-BASED METHODOLOGY TO DEAL WITH SENSITIVE TOPICS IN THE CLASSROOM

In this section, we present a Bible-based methodology that can be used by educators to face sensitive topics in their courses. This methodology is composed of the following three steps:

1) Searching for Bible-Based Philosophical Presuppositions to Support the Academic Discipline: Academic disciplines are not religiously neutral (12). In fact, they are based upon beliefs. For instance, many academic books clearly state their foundation on the theory of evolution, others may have more subtle philosophical underpinnings. As students carefully read academic information, they may read worldviews that are explicit or implicit (13), and identify the beliefs of the author of the academic presentation. The search of the philosophical presuppositions is a reflective task students do with the guide of a professor. Out of this search, students may discover some core

concepts that tie together basic philosophical presuppositions from a biblical perspective. These core concepts may function as the pillars for the construction of a Christian worldview of knowledge.

For instance, during the course on ANNs, students were asked to look for biblical presuppositions in the underlying concepts of the course. As described previously, biological neuronal networks in the brain are the basis to comprehend ANNs. Therefore, in this exercise students searched for biblical presuppositions in scientific sources that talk about the complexity of the brain (7, 14-16). This exercise was supported by prayer in order to ask the Holy Spirit to guide their findings.

Students found three biblical presuppositions in this exercise: 1) science cannot explain the reasons for dreams. However, the Bible says that God can use dreams to communicate important messages to us (Genesis 37:5; Numbers 12:6; Daniel 2:1; Daniel 4:19; Joel 2:28); 2) science does not explain how our brains simulate the future. However, the Bible says that God has put eternity in our hearts (Ecclesiastes 3:11); and 3) science cannot explain intelligence. However, the Bible says that God can give us wisdom (James 1:5). In these examples, the scientific perspective of the brain from different authors is coherent to the biblical presuppositions in the discipline. Moreover, students found out that the Bible provides answers that are not yet understood by science. This fact helped us to demonstrate the superiority of the word of God.

2) Searching for Themes, Values, and Beliefs: At the same time that students search for philosophical presuppositions, some themes or topics that support or collide with the Christian worldview will surface. Those themes and topics need to be analyzed and discussed. Also, values and beliefs that are core to the discipline or the professional outcome from the perspective of faith can be identified. When students recognize these values and beliefs as essential parts of their learning process, they take serious steps to incorporate them into their lives.

In our case study, students found out that the theme of GAs could collide with their Christian worldview. As a result, it was necessary to reaffirm their belief on the biblical record of creation. To this end, the following steps were carried out in class:

- a) In order to understand the concept of GAs, it was necessary to describe its underlying "sensitive" theory. We believe that if the underlying theory is not described, then the concept cannot be completely explained (i.e., it will not have a theoretical basis). However, the description of the underlying sensitive theory does not necessarily have to be the core of the class. It is more important to delve into its application in the field that is covered in the course. For instance, more time was spent to describe how to apply GAs to the travelling salesman problem, a traditional NP-hard problem, than on describing the theory of evolution.
 - b) In order to show the two sides of the coin, in this step we used the Bible and science to support our belief of God as our creator. First, students read facts about the bacterial flagellar motor, a "nanotechnological marvel" (17). The remarkable intelligent design of the bacterial flagellum led students to realize there is a God who was in charge of creation. Then, they were asked to look for Bible verses related to creationism. By faith, students reinforced their belief of a creating God (Hebrews 11:3).
- 3) Developing Habits or Procedures:** Besides issues, values, and beliefs, almost every discipline requires the development of habits or procedures that allow to enhance a Christian worldview. Character development, in its essence, is the sum of habits. Often, professors assume that habits are developed spontaneously. However, unless there is an intentional undertaking to plan, implement, and evaluate the formation of key habits, those will not flow unexpectedly. The development of habits and mental procedures, and how they will be learned and evaluated, may be stated in the course plan.

3) RESULTS

In order to align the mental procedures of the students at the ANN course towards a strong creationist belief, the creationism-vs-evolutionism issue was covered in subsequent sessions. For example, students were asked to reason about the following Darwin's

statement and to contrast it to the example of the bacterial flagellar motor: "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down. But I can find no such case." (18). Then, they were requested to answer a questionnaire with the following five questions to express their experiences after covering the topic of GAs in the course:

- 1) Do you think that nature and science reveal the existence of a Creator?** In this question, all the students expressed that nature and science support our belief of God as our creator. For instance, one of them answered: "In addition to the bacterial flagellum, complex organs such as the human eye, demonstrate the existence of a Creator. Thinking that everything was created just by chance is like believing that throwing pieces of Scrabble on the floor will create a Shakespeare's novel." Another student answered: "It is impossible to think that a clock can be created by itself. A watchmaker is necessary to assemble all the complex pieces. I see the bacterial flagellum just as a micro-clock." One more student said: "It is necessary to have too much 'faith' to believe that the complex mechanisms in the bacterial flagellum are just a coincidence".
- 2) Do you think that using GAs to solve complex computational problems downplays God as our creator?** All the students agreed on the idea that although GAs are important in computer science, they do not diminish the creative role of God. Students expressed that human theories can never be at the same level of our powerful Creator. In fact, one of them said: "He is the Master. We are the students". Surprisingly, another student answered: "GAs strengthened my belief of God as our Creator. In the same way that GAs have to be programmed by a programmer, then the universe also needs a Creator."
- 3) Do you think that it is possible to use GAs in your role as an engineer and at the same time to be a creationist?** All the students had positive answers to this question. For instance, one student answered: "Give back to Caesar what is Caesar's and to God what is God's. Your

faith does not have to be destroyed by using science in your job.”

- 4) **Do you think that it is important to your professional life to cover topics such as GAs in our course?** All the students expressed that it was important for them to cover GAs in our course. They said that in order to be competitive as scientists or engineers, they need to know what is at the cutting-edge of science and technology. For instance, one of them said: “In order to strengthen my biblical worldview, it is important to understand its counterparts. We cannot just be ignorant of other worldviews.” Another student answered: “How can I express my worldview to evolutionists if I do not understand or barely understand their worldview?”

- 5) **Does the ANN course have strengthened your faith?** All the students said that this course reinforced their faith. They indicated that something as complex as biological neural networks can only be the result of an Intelligent Designer, not of mere coincidence. Also, they said that we can simulate some aspects of nature, but we cannot create it. It was interesting to notice that in addition to the biblical and scientific facts presented in the class, several students expressed that their faith was also strengthened by the biblical worldview of their professor.

4) DISCUSSION

The results show that facing sensitive topics from a biblical worldview can be used to invigorate the faith of our students. Therefore, instead of avoiding sensitive topics in the classroom, educators are encouraged to face them from a biblical perspective.

5) CONCLUSIONS

In this article, we tried to answer the following question: As Adventist educators, how can we face sensitive topics in our courses? In order to answer this question, we introduced a Bible-based methodology. This methodology is composed of three steps: 1. searching for Bible-based philosophical presuppositions

to support the academic discipline; 2. searching for themes, values, and beliefs; and 3. developing habits or procedures. This methodology was applied to a group of students in an ANNs course in an Adventist institution. The results indicate that the faith of the students was strengthened during the learning process of GAs, a sensitive topic from the Creationism point of view.

REFERENCES

1. Alférez, Germán H. 2013. Achieving Autonomic Web Service Compositions with Models at Runtime. PhD diss., Universitat Politècnica de Valencia.
2. Mens, Tom and Demeyer, Serge. 2008. *Software Evolution*. Leipzig, Germany: Springer-Verlag Berlin Heidelberg.
3. Maes, Pattie. 1987. Computational reflection. PhD diss., Vrije Universiteit Brussel.
4. Belady, Les A. and Lehman, Meir M. 1976. A Model of Large Program Development. *IBM Syst. J.* 15 (3), September: 225--252.
5. Seiffert, Udo. 2004. Artificial neural networks on massively parallel computer hardware. *Neurocomputing* 57 (0): 135 - 150.
6. Kock, Gerd and Serbedzija, Nikola B. 1996. Simulation of Artificial Neural Networks. *Syst. Anal. Model. Simul.* 27 (1), December: 15-59.
7. Eagleman, David. 2007. 10 Unsolved Mysteries of the Brain. *Discover*, August.
8. Forrest, Stephanie. 1996. Genetic Algorithms. *ACM Comput. Surv.* 28 (1), March: 77-80.
9. Holland, John H. 1975. *Adaptation in Natural and Artificial Systems*. Ann Arbor, MI: University of Michigan Press.
10. Koza, John R. 1998. Genetic Programming. In *Encyclopedia of Computer Science and Technology*, 29-43. Vol. 39, suppl. 24: Marcel Dekker, New York.
11. Mitchell, Melanie. 1996. *An Introduction to Genetic Algorithms*. Cambridge, MA: MIT Press.
12. Clouser, Roy A. 1991. *The Myth of Religious Neutrality: An Essay of the Hidden Role of Religious Belief in Theories*. Notre Dame, IN: University of Notre Dame Press.

13. Sire, James W. 1979. *How to Read Slowly: A Christian Guide to Reading with the Mind*. Downers Grove, IL: InterVarsity Press.
14. Van Hemmen, Leo and Sejnowski, Terrence. 2006. *23 Problems in Systems Neuroscience*. New York, NY: Oxford University Press, Inc.
15. Dennett, Daniel. 2001. Are we explaining consciousness yet?. *Cognition* 79 (1-2): 221-237.
16. National Public Radio. "Decoding 'the Most Complex Object in the Universe'." Accessed March 30, 2014.
<http://www.npr.org/2013/06/14/191614360/decoding-the-most-complex-object-in-the-universe>
17. Berg, Howard C. 2003. The Rotary Motor of Bacterial Flagella. *Annual Review of Biochemistry* 72 (1): 19-54.
18. Darwin, Charles. 1996. *The Origin of Species*. New York, NY: Oxford University Press.