Interview Dr. Joseph W. Shane

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Joseph W. Shane is a professor and researcher at Shippensburg University, USA. Dr. Shane's research interests focus on improving teaching and learning strategies in chemistry instruction as well as in science teacher preparation. Research methods emphasize qualitative techniques including focus group and individual interviews and structured classroom observations. Qualitative research, in brief, uses what people say, do, and produce to investigate and to make assertions about social phenomena. Qualitative methodologies are common in anthropology, sociology, and education and often serve to complement large-scale quantitative research. One particular application of qualitative research, called action research, is used in the STEM Master of Arts in Teaching (MAT) program that Dr. Shane coordinates. Students in the MAT program identify some aspect of their teaching that they wish to improve (e.g., classroom and time management, use of cooperative learning or educational technology, assessment) and then use a systematic, data-driven approach to accelerate their professional growth. He published the book: Making Sense of Science and Religion: Strategies for the Classroom and Beyond, among several articles. Dr. Shane is also co-director of a program designed to bring working STEM professionals into regional K-12 classrooms. In addition to teaching chemistry and training science teachers, Dr. Shane teaches a course in the Honors Program that addresses historical and philosophical interactions between science and religion.

1. Tell us a bit about your trajectory until you were involved in so many projects and in this diversity of activities. Why did you choose teacher education?

Dr. Joseph: I began my career in education as a high school chemistry teacher in Noblesville, Indiana which is a fairly rural, very socially conservative suburb of Indianapolis. I taught during the standards-and-accountability movement driven by the federal *No Child Left Behind* policy that used standardized testing, primarily for reading and mathematics, to monitor student growth and to hold school districts, schools, and teachers accountable for their work. I was skeptical about these top-down mandated policies.

When I returned to graduate school for my doctorate, my dissertation focused on how policies for science education in Indiana impacted teachers' beliefs and practices. It was an illuminating experience that sparked my interest in pursuing teacher education as a profession. I am fortunate to be able to continue to teach chemistry as well as train science teachers at the university.

2. In Brazil we find numerous challenges for initial and continuing teacher education, what challenges do you find in the US? How do you face them?

Dr. Joseph: At present, the biggest challenge is the teacher pipeline, especially in disciplines such as science, mathematics, and special education. At the beginning of my career, I routinely would have 15-20 undergraduate, pre-service science students in their capstone pedagogy courses. Recently, I went for many years with no science education students whatsoever. I have four undergraduates enrolled for the upcoming academic year.

My experience at Shippensburg parallels the nation. Teacher education enrollment has plummeted which leads to the inevitable, namely lowering of standards for teachers and increased numbers of non-expert, out-of-field teachers. As is unfortunately typical, the most affected school districts will be

the ones with poor families and few community resources.

About 10 years ago, I helped to start a Master's degree program for science professionals who want to change careers into teaching. These students understand all too well the challenges they face with attacks on public education, science, and the very notion of expertise. Nevertheless, these students are passionate about teaching from previous experiences (e.g., volunteer work and coaching) and are often simultaneously disillusioned by the monotony of their previous jobs.

Before I end my career, I would like to expand this Master's program to the entire state. I am in a state-funded university system with historical roots in teacher education. The current teacher shortage is something to which we should and must respond.

3. Another challenging issue in Brazil today is the clash, in my opinion unnecessary and counterproductive between science and religion, about which we have the example of teaching the subject of biological evolution. You and other collaborators have written a book about this subject: Making Sense of Science and Religion. How in the USA does this conflict also occur? How is it confronted and how do you participate in this confrontation?

Dr. Joseph: As your readers are likely aware, the science-religion conflict was largely driven in the United States by Christian Fundamentalist opposition to teaching evolution in public schools. Yes, there is much more theological and philosophical nuance to science-religion relationships, but this is where the "street level" conflict has historically occurred as evidenced by myriad court cases from *Scopes* in 1925 to *Kitzmiller* in 2005 (my first year at the university).

The impetus for the book was to encourage and give confidence to pre- and in-service science teachers to address science-religion relationships with their students. Many will enter their classrooms having already rejected evolution, geochronology, cosmology,

genetics, climate change, epidemiology, etc.

A science teacher with even a modicum of historical, philosophical, and theological understanding can make great strides in building trust with students which is at the core of any educational endeavor.

In my science education programs, I have students write lesson plans with science-religion themes and interview mentor teachers so that they are not surprised by these issues when they assume responsibility for their own classrooms.

I also conduct public outreach about science and religion in venues such as churches and public libraries. I take this as part of my professional responsibility as an academic.

4. Along these lines, tell us a little about the course you offer on the historical and philosophical interactions between science and religion. What are the goals of this course? Who is it aimed at?

Dr. Joseph: I have taught an interdisciplinary, undergraduate honors seminar course on science and religion four times at my university. It originally had the title "Introduction to Historical and Philosophical Interactions Between Science and Religion." A rather bland title. It is now called "Science, Religion, Self, and Society."

I use Ian Barbour's foundational work, *Religion and Science: Historical and Contemporary Issues*, as the primary text and supplement this with chapters from the *Oxford Handbook on Science and Religion* and *Zygon*. Guest speakers are essential as well.

In brief, the course is designed to (a) give students nuanced definitions and frameworks for science, religion, and their subsequent relationships, (b) review essential historical case studies such as Galileo, Newton, and Darwin, (c) understand the Christian Fundamentalist movement in the United States via judicial history, and (d) address more contemporary science-religion issues such as modern cosmology, gender and sexuality, and abortion.

5. The quality training of teachers for the early years of formal education is a constant concern in Brazil, tell us about your experience in the Program you are co-director of, which seeks to bring science, technology, engineering, and mathematics-related professionals into regional K-12 classrooms. Has this program achieved its goals? What are the biggest difficulties you encounter? Tell us a bit about how it works

Dr. Joseph: I am quite proud of this program which is now called the Science, Technology, Engineering, and Mathematics (STEM) Master of Arts in Teaching (MAT) program. We will graduate our seventh cohort of students after the upcoming semester. The program is delivered in a hybrid fashion meaning that much of the content of the course is online with periodic in-person meetings. We often use Zoom for meetings as well. Students are assigned a mentor teacher for the entire program to maintain an apprenticeship model.

We received a state grant to design the MAT with the understanding that students could maintain their employment during the program except for the 12-week practicum at the end.

Thus far, the program works very well. Schools and districts, quite frankly, love working with teachers who already have completed their degrees and who have professional experience. In many cases, our students are hired while they are in the program in cases of severe teacher shortages. As an example, all four of our current STEM MAT students will have full-time jobs in the upcoming semester.

The main difficulty is scale. My colleagues and I run the STEM MAT in addition to our normal academic teaching loads on campus. This makes it nearly impossible to expand the program.

6. You work in multiple programs, projects, publications, classes, research, etc. I ask how do you organize yourself to have so many activities? Currently, what are your priorities? What are your new perspectives for projects?

Dr. Joseph: I am quite fortunate to work at a university that values the range of projects with which I have been involved. We are not a cutting-edge research institution and, thus, I am not pressured to be an internationally recognized expert. In brief, I am free to pick projects and shift my career as circumstances change.

For example, religion-and-science was not part of my background or training. My interest began in 2005 with the Kitzmiller trial which eventually led to presentations, journal publications, church and public outreach, and the aforementioned book, *Making Sense of Science and Religion: Strategies for the Classroom and Beyond*.

With so much scholarship in this subdiscipline now, I may return to my roots, namely chemistry and teacher education and emphasize these areas in the final "third" of my career. I am also a candidate for the school board in the town where I live, so I may expand my experience into the political realm.

In an introspective sense, I am less interested in notoriety as I get older and would rather focus on the people and issues in my immediate sphere.

7. As you are involved in research and projects in the field of education, could you indicate what you consider to be the "hot" topics for a student planning to go into the field of teacher education and training? What are the most promising areas?

Dr. Joseph: In addition to the high-needs areas of biology, chemistry, physics, and environmental science, engineering and computer science are becoming more prominent in PK-12 instruction. This will be a challenge to have students from these disciplines go into teaching.

8. You tutor masters in these related areas of education that you work in, especially in teacher education, what are the characteristics that interest you most in your students? What tips would you give to those students who intend to apply for a place in your program?

Dr. Joseph: With prospective STEM MAT students, I have found that most of them have thought

very carefully about trading their current profession for teaching. They often have family, friends, and former teachers with whom they have consulted. By the time I am contacted, they have generally made the commitment.

It is rare (I don't think it has actually happened) that a prospective student is motivated primarily by job dissatisfaction and a naïve idea that teaching will be "easy."

Another thing I've discovered over the years is that prospective students, in addition to a passion for science, often have some other dimension of their lives they want to share with young people: athletics, music, theater, etc. I encourage them to pursue these interests and assure them that they can be excellent classroom teachers as well as a leaders in any number of extracurricular activities.

9. We have many readers who already work with research and have some difficulty in choosing research methods, you are an expert in methodologies. Tell us a bit about the advantages and disadvantages you perceive in quantitative and qualitative methodologies?

Dr. Joseph: I appreciate the sentiment, but I am far from an expert on research methodologies. I have enough experience to know that the theoretical framework, methodology (qual or quant), data collection and analysis techniques, and method for presenting results are each driven by the research question. A good research project must demonstrate consistency across each of these components.

I'll just use the research question from my dissertation as an example, "What are high school science teachers' beliefs about the intended and actual impacts of standards-based reforms?" That's a mouthful to be sure. I chose philosophical hermeneutics as my theoretical framework and I had to make a clear, literature argument for why teachers' *beliefs* are relevant. Given that the various dimensions of beliefs are not easily measured by a survey instrument, I argued for a qualitative approach using focus

group interviews. As is consistent with hermeneutics, my role was to be the voice of the participating teachers while acknowledging my own background and predilections. Participant observation is the general phrase used here. I presented the results, quite literally, as a story with plot lines in the tradition of narrative analysis.

To be honest, I find the general assertions that quantitative educational research is more objective and generalizable to be most unhelpful and rather boring. Qualitative research is often dismissed as vague, biased, and of little use. I could not disagree more, and I hope not to return to the "paradigm wars" that science education experienced in the 1980's. A *bricolage* approach is best meaning select the appropriate tools for the task at hand. Not every research question should be addressed in the spirit of a classic scientific experiment where variables are tightly controlled. Teaching and learning are messy.

10. Finally, in Brazil there is a certain discouragement among students to follow the path to become teachers. If you have chosen this path, and in my opinion, you are very successful, give us a word of encouragement for those who are thinking about this professional possibility. Tell us a little about the current condition of the teaching profession in the USA.

Dr. Joseph: I have always and to this day believe that teaching is a wonderful and fulfilling vocation. Even during early field experiences and practicums, my students see the positive impact they can have on young people with their patience, kindness, and insights. There are few professions where your daily choices matter so much and the ability to adapt and change can happen so rapidly. If today did not go so well, tomorrow is coming...