

PAPER FOR IRPA 13 CONGRESS

Title: Recipe for Successful Science Teacher Workshops

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Abstract:

This paper discusses the strategies for paving a success path in conducting Science Teacher Workshops. Mixing the ingredients of teamwork, diversity, innovation, and humor, with an added spoonful of laughter, teachers of the 21st century become enthusiastically engaged in learning about radiation science. Through partnerships with private industry, government, academia, and professional societies the Virginia Chapter, Health Physics Society, has hosted numerous productive and enjoyable workshops designed to meet the challenges facing teachers of the 21st century. The approaches used to maximize and leverage resources economically will be shared. While presented with multidiscipline learning opportunities, teachers are equipped with a wide and varied spectrum of networking options which they can elect to pursue following the workshop. The recipe prescribed in this paper allows teachers to learn the facts about radiation science in a fun way while they receive the latest developments and state-of-the-art technologies of the nuclear field.

A. **Introduction**

The goal of Science Teacher Workshops (STWs) is to enhance the understanding and knowledge of Nuclear Radiation. The STWs were initially developed in the early to mid 1990s by the national Health Physics Society (HPS) as an outgrowth of one member's passion for promoting the truth about radiation, ensuring that factual information on radiation is taught to students, and is accurately printed in textbooks used in the schools. Through the diligent efforts of Ms. Ellie Katsikis, a member of the North Carolina chapter, the way was paved for the HPS to launch STWs using its network of local chapters to implement the program. Funding obtained through Department of Energy grants assisted chapters in providing the materials and resources to support the workshop curriculums. Upon completion of the course curriculum equipped with other educational resources, Ms. Katsikis travelled to various chapters throughout the United States, offering her expertise and guidance in presenting STWs. After doing this for a number of years, Ms. Katsikis "passed on the baton" to the HPS to continue the mission of educating teachers, students, and the public about radiation, dismissing its misperceptions.

B. Objective

This paper describes the recipe used by the Virginia Chapter (VCHPS), nurtured over several years, to implement successful STWs. Building upon the dedicated and inspiring initiatives of Ms. Katsikis, adopting “lessons learned” from other chapters, and maximizing the resources available locally to the VCHPS, hundreds of teachers have been taught the facts about Nuclear Radiation, which in turn has been passed on to students. The STWs offer an “economies of scale” outreach to the public in educating them on radiation and its effects. The teachers “teach” the students, who in turn bring that knowledge to family and friends through casual dialogue, and the outreach circle expands each time a new cohort of teachers attend a workshop.

Eliminating misconceptions and myths about radiation has been challenged in recent years with the explosion of social media. Erroneous information about radiation and its biological effects published in textbooks was the primary source in which many of these myths were attributed. More recently the internet, twitter, and face book provide a myriad of other avenues for misconceptions about radiation to creep in. Events, such as Fukushima, Chernobyl, and Three Mile Island, the introduction of food irradiation, and cancer modality treatments (e.g. Proton therapy and Positron Emission Tomography), have raised new questions and issues for the general public. More questions related to how radiation affects people are being asked, and which necessitate concise accurate responses that can be easily understood by the lay person.

C. History

In 1998 the VCHPS presented its first workshop, working with the VA section, American Nuclear Society (ANS), in Williamsburg, VA as part of a weekend technical meeting. From 1998 to 2005, one day workshops were held annually at different locations throughout the Commonwealth of Virginia. The workshops were taken “on the road”, being held at various facilities including government, private company, and hotels. The timing and location for these workshops were among the important factors contributing to excellent attendance, which averaged 25 – 50 teachers representing cross disciplines in science and math, and including elementary, middle, and high school teachers. While reaching teachers in the various school districts, scheduling workshops on Saturdays during non-peak academic periods and offering Continuing Education Credits (CECs) were favorable ingredients to the recipe. The Central Virginia Community College, located in Lynchburg, VA, was one of the academic institutions the VCHPS partnered with in conducting the one day STWs for three consecutive years. While the VCHPS continued to lead the one day workshops, in parallel with the ANS STWs, the VA

section, ANS designed a four day STW that was held during the summer months; this workshop was modeled after one developed at the University of Virginia (UVA) for teaching nuclear radiation topics during the period when UVA had an active nuclear engineering academic program and research reactor. Running two independent STWs each year became resource intensive, and after a few years, the VCHPS decided to eliminate the one day workshop and partner with ANS to become a team player in the four day STW, as well as establish partnerships with the North American Young Generation Nuclear (NAYGN), and the Lynchburg Chapter of Women in Nuclear (WIN-LC). These two professional organizations have members representing the younger (i.e., under 40 years old) and female population sector with interests in the nuclear fields. The value of these partnerships has been consistently reflected in the favorable critiques of workshop attendees. The energy and enthusiasm shared by staff and presenters are viewed by the teachers as future career opportunities for their students, as well as a passion for the nuclear sciences.

D. The Recipe

The first part of the recipe calls for teamwork. The blending of personnel resources leverages many talents and expertise from multiple and diverse disciplines. The VCHPS maximized its local talent from Virginia Commonwealth University (VCU) and Dominion Resources nuclear power community in Central Virginia (the Richmond metropolitan area) with the professional resources available through government such as the Thomas Jefferson National Accelerator Facility (JLAB) in Newport News and other private sectors such as AREVA Company, a fuel fabrication facility located in Lynchburg. The most valued members of the team are the teachers. The VCHPS has been most fortunate in having access to dedicated science teachers who have a passion for teaching science. These individuals are integral team players, serving as the “glue” and mainstay of the workshop. The VA Chapter has been especially fortunate to have a high school Chemistry teacher on its workshop staff who developed a Radioactivity Kit for Richmond’s Mathematics and Science Center. The kit includes a Teacher’s Guide containing lesson plans on radiation and nuclear science which also fulfilled the Commonwealth of Virginia requirements for Standards of Learning (SOL).

http://mathinscience.info/teach/612_science/chemistry/radiation_you/intro.html

Another aspect of teamwork which contributes to the value of the STWs is utilizing the people to determine the scope and content of the curriculum. The topics and presenters have been matched based on the composition of the staff and their expertise. For example, the individual from JLAB who presents the fundamentals talk on radiation offers expertise as a radiation safety professional working at an accelerator facility, while the person presenting a lecture on nuclear power or reactor theory works in the nuclear engineering field. The following hyperlink provides the STW flyer used to publicize the

workshops and register teachers. <http://local.ans.org/virginia/3dSTW/2012/2012.STW.flyer-redesigned.pdf>

An equally dynamic part of the recipe for success is workshop diversity. The STWs in Virginia have grown and developed over the years, integrating the VCHPS with multiple partnerships that have been established including the professional organizations, private and public sectors, university, and most importantly the teachers. The following hyperlink reveals the various sponsors associated with the Virginia workshops, denoting the varied organizations that have become affiliated with this endeavor over the years: http://local.ans.org/virginia/3dSTW/2011/2011_sponsors.html

The diversity employed by the Virginia workshops is illustrated in Figure 1 showing the teacher as the main hub of the bicycle tire and the multiple contributors, sponsors, and participants represented by the tire spokes.



Figure 1

The workshop's diversity provides the teachers with networking opportunities that can be shared with their students as well as among the teachers attending the workshop. The generational component of the workshops fosters invaluable learning for everyone. The partnerships with NAYGN, WIN-LC, and having a Professor Emeritus from University of Virginia as a team member have provided a dynamic and

powerful learning environment for all participants. Knowledge that spans the use of slide rules and overheads to the latest cyber learning technologies has been incorporated into the STWs by leveraging generational contributors.

Classroom instruction from a variety of industry experts covers Radiation Basics, Biological Effects of Ionizing Radiation, Radiation Detection and Measurements, Beneficial Uses of Radiation, careers in Nuclear Science, Engineering and Technology, and the Nuclear Fuel Cycle. Laboratory exercises, lead by a University of Virginia Professor Emeritus, Nuclear Engineering, show the teachers how to use Geiger Mueller portable instruments which are given to the teachers for use in their classrooms. The heart of the STWs is that portion of the workshop (usually about 2 hours) when the teacher member of the workshop staff walks through the classroom activities with attendees. Figure 2 depicts teachers engaging in some of the exercises during one of the STWs. Demonstrations of various in class activities, using commonly obtained articles, explain alpha and beta decays in the Uranium to Lead decay chain and homemade examples of chain reactions are demonstrated.



Figure 2

This portion of the workshop provides the forum and opportunity for teachers from the different grade levels to share ideas and experiences about teaching radiation and nuclear energy topics with their students. Teachers tour the Nuclear Medicine facilities at the Medical College of Virginia (MCV) and

the North Anna or Surry Nuclear Power Stations Control Room Simulator. Upon completion of a pre workshop homework assignment, workshop attendance, and a take home exam, teachers are eligible to receive four CECs.

A contributor to the success of Virginia's workshops, which can be easily overlooked or underestimated, is the innovation and humor that can be injected into the technical agenda, transforming a potentially monotonous four days into a vibrant learning experience for the teachers. Diverging from the basic agenda through humor and antidotal exercises accomplishes several positive things. Taking a relaxing "break" from the curriculum refreshes both staff and teachers. Introducing games such as "Jeopardy", "Who Wants to Be a Millionaire" or "Golf" to teach various concepts are ways to continue teaching on nuclear radiation topics while having fun. Another means of introducing levity into the curriculum is role playing through interactive scenarios which demonstrate a concept or principle. For example, planting radiation sources on a person or hiding sources, and asking the teachers to do some detective work, through a scavenger hunt, is an amusing way to teach the concepts of contamination and radiation. Interspersing these measures throughout the workshop adds "spice" to the recipe for successful learning.

E. Summary

In conclusion, the ongoing successes of the STWs in the Commonwealth of Virginia, which have reached out to several hundred science teachers during the past fifteen years, have been attributed to the passion, interest, and energy shared by many people who have decided to come together annually to educate the public on radiation. By combining teamwork, diversity, creativity, and humor the workshops continue to be an enjoyable experience for all participants and provide a sustaining spirit of promoting the knowledge and understanding of nuclear radiation.

F. Acknowledgements

Many individuals have contributed to the success of the STWs, volunteering hundreds of personal hours to provide education on nuclear radiation. The following primary organizations are recognized for their valuable support (including financial, logistical, and staff) to the success of Virginia's STWs:

Virginia Commonwealth University School of Engineering

Virginia Commonwealth University Health Systems

Virginia Tech (Department of Mechanical and Nuclear Engineering)

American Nuclear Society, National and VA Section

Health Physics Society, National and Virginia Chapter

North American Young Generation Nuclear

Women In Nuclear, Lynchburg Chapter

Dominion Resources, Inc.

AREVA, Babcox and Wilcox Company

Mitsubishi Nuclear Energy Systems

Maracor Software & Engineering, Inc.

G. References

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