A REVIEW OF TECHNOLOGY EDUCATION TEACHER NEEDS IN VIRGINIA

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According to *Charting A Course for Success: America's Strategy for STEM Education*, a report sanctioned by the President of the United States, America should "(P)rioritize Federal support for STEM educator "upskilling" and professional development, including CTE and college preparatory teachers and educators …" (2018, p. 14). There are many ways to become a certified technology education teacher and receive "upskilling" throughout the U.S. Since technology education teachers can have such varied training experiences, this research collected data on secondary technology education programs in Virginia to discover teacher's needs and desires for support. Specifically, this study surveyed secondary technology education teachers in Virginia to answer the following research questions: (1) What is the educational background of technology education teachers? (2) What goals are emphasized in technology education programs? (3) What are the major issues confronting technology education teachers?

Methodology

The research was conducted in three phases. This descriptive qualitative study used a survey to gain insights into the research questions, a document review to examine the curriculum, certification, and regulations regarding technology education, and a focus group of technology education leaders to confirm and clarify any remaining questions regarding the research questions.

During phase one, a survey of thirty questions with two open-ended questions was created electronically in Google Forms. The survey was created to gather information about technology education status and their needs and desires for support based on the Schmitt and Pelley (1966) instrument. The Schmitt and Pelley instrument was used in prior research which created the *Standards for Industrial Arts Education Programs* (SIAP) (Dugger, 1980) and to

investigate the status of technology education practice in the United States (Sanders, 2001). According to Dugger (2002), the SIAP "contained the best thinking of the profession on what industrial arts programs should be and how they can be improved at the time of their publication" (p. 96). The information from the SIAP was revised in 1985 to reflect technology rather than industry which became the document, *Standards for Technology Education Programs* (Dugger, 2002). The survey request was sent to technology and engineering education teachers throughout Virginia from the state Department of Education Listserv and the Virginia Technology and Engineering Educators Association (VTEEA) Constant Contact list. The data from the survey was triangulated with a document review in phase two and was essential in creating questions for a focus group of experts in phase three.

A comparison was made to define areas of inquiry developed from the survey data collected in phase one and the documents on technology education licensure and professional development in phase two. A descriptions and clarifications table was made to add supplemental information to each question in the survey. The table was used to create questions for the focus group to gain new knowledge and compare and contrast data collected from the survey (Phase 1) and data collected from the regulatory documents (Phase 2).

In phase three of the study, focus group participants were recruited using a purposive sampling technique. The inclusion criteria were individuals who have taught technology education for more than ten years and, above all, had leadership experience within Virginia technology education through recognition from their peers, and were willing to participate in a 90-minute focus group session. The researcher aimed to recruit a diverse group of participants in

terms of age, gender, and ethnicity to ensure that the data captured a broad range of perspectives on the topic.

Two focus group sessions will be conducted, each consisting of five participants to allow for all participants to have time to express opinions. Each focus group session will be 90 minutes and moderated by the researcher. The focus group sessions will be conducted on Zoom and recorded with permission requested prior to the beginning of recording. Zoom automatically encrypts a transcript from the audio recorded during the sessions.

The interview guide contains open-ended questions that allowed participants to share their opinions, experiences, and perceptions in their own words. The questions were formulated after the data from the instrument survey and the document review were compared. The questions created opportunities to learn about discrepancies between data collected on teacher needs and governing documents. The focus group will be asked to clarify agreement or disagreement which was found in the data from phase one and two of the research. The focus group will be used to clarify information provided in phase one and two and provide a clear picture of the needs and desires of the technology education teachers in Virginia. Planned focus group questions are:

1. What skills are specific to technology education teachers?
2. What type of training is needed to prepare teachers to teach technology education?
3. How should support be delivered to technology teachers?
4. What are the major issues specific to technology education programs in the areas of…
    a. classroom management
    b. equity
    c. pedagogy

d. epistemology
e. assessment

5. What skills should students acquire in technology education classes?
6. How can teachers be encouraged to request information to improve their teaching skills?
7. How can teachers be encouraged to participate in activities that improve their skills?

The moderator will encourage participants to build on each other's responses and explore different viewpoints. At the end of each focus group session, the participants will be told how to contact the researcher with any questions and thanked for their time and participation. The use of purposive sampling ensures that the researcher captures a diverse range of perspectives, while the semi-structured interview guide provides a flexible and open-ended approach to exploring participants' experiences and perceptions (Morgan, 1997). The insights gained from the focus group study will be used to provide valuable insights and clarification of data for the research questions.

Theoretical Framework

Technology education is a unique discipline which uses design thinking to teach about the human designed world (STEL, 2020). Understanding the epistemology (content knowledge), the pedagogy (how to teach), and assessments (evaluation of learning) is essential to being an effective teacher (Knight et al., 2014). Knight et al. (2014) state that the learning sciences use a design discipline that occupies a “middle space” where epistemology, pedagogy, and assessment are intertwined. The teacher’s understanding of all three areas allows instruction to focus on the process of learning instead of narrower goals (e.g., answering the correct answer on a test). This

"sweet spot" between epistemology, pedagogy, and assessments is where the instructor can use higher level teaching methods.

In 2008, the National Assessment Governing Board, which is an independent, bipartisan group appointed by the U.S. Secretary of Education, began developing a framework for the assessment of students' knowledge and skills in technology and engineering (NAEP, 2020). The National Assessment Governing Board articulated the domain of technology and engineering literacy (TEL; i.e., knowledge and skills) that is important for all students, not just those pursuing STEM-related careers (NAEP, 2020). Technology and engineering literacy was assessed through three interconnected content areas of technology and society, design and systems, and information and communication technology. Based on the NAEP-TEL Framework (2018) and *Standards for Technological and Engineering Literacy* (ITEEA, 2020), Figure 1

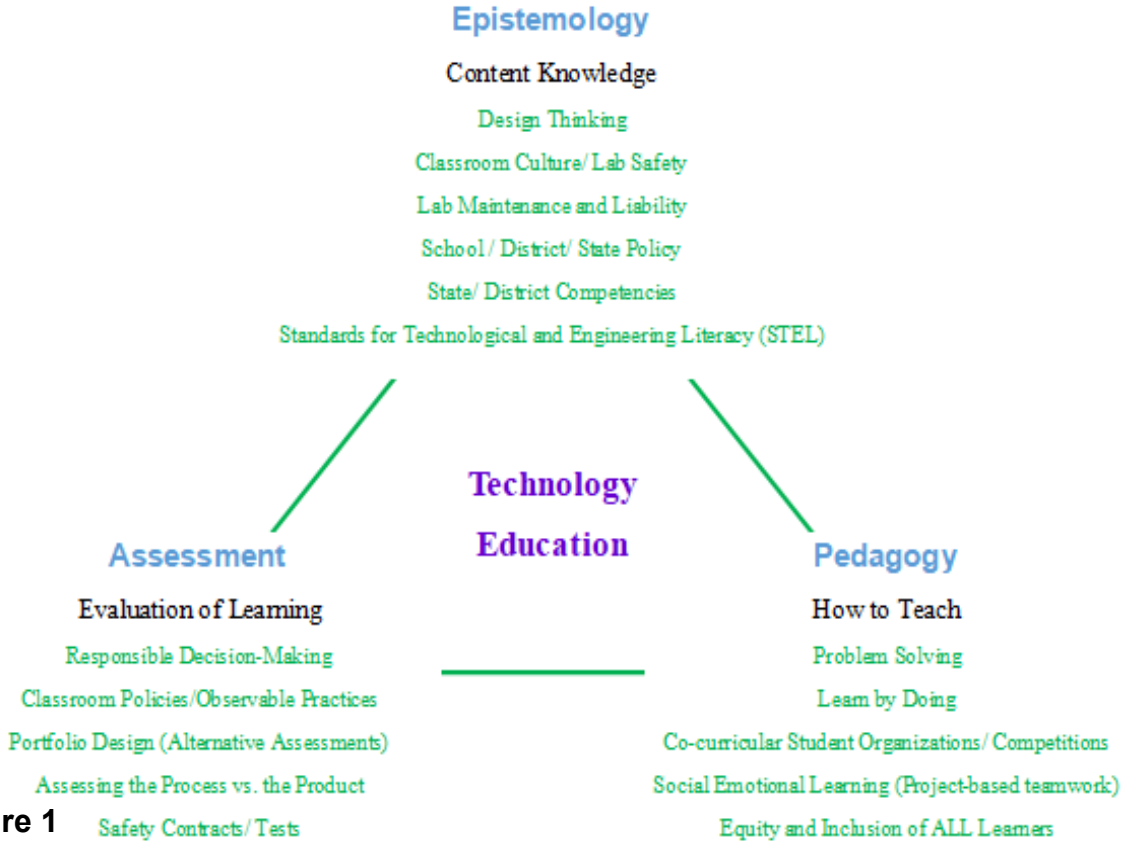

Figure 1

The Epistemology–Assessment–Pedagogy Triad for Technology Education

represents the epistemology, pedagogy, assessment triad which are unique to technology education and are the foundation of this research.

Summary

Previous studies clearly indicate that the need for technology education teachers has not been met by the institutions which prepare teachers (Daugherty, 1998, Katsioloudis & Moye, 2012, Volk, 1997). A trend has formed which indicates the gap between supply and demand causes the closure of valuable programs, creating a lack of services provided to students and parents who clearly value technological literacy skills (Katsioloudis & Moye, 2012). Students and parents desire the knowledge and skills provided by technology education teachers (Ndahi & Ritz, 2003; Phi Delta Kapan, 2017). This study was designed to research needs and the desire for support of Virginia technology education teachers in order to teach technological literacy skills based on the pedagogy, epistemology, and assessments that define the field. This research aims to provide information to support technology teachers in the classroom and retain teachers and career switchers with a prescriptive list of supportive needs in phase one and create a list of recommendations for professional development using the information from phase two and three.

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REFERENCES

Daugherty, M. (1998). A recruitment crisis: Strategies for affecting change. *The Technology Teacher, 57*(7), 21-26.

Dugger, W. (1980). The standards for industrial arts programs project: An overview. *Journal of Industrial Teacher Education, 18*(1), 5-13.

Dugger, W. (2002). Roots of technology education: Standards projects. *The Journal of Technology Studies, 28*(1/2), 96-98.

Executive Office of the President of the United States: Office of Science and Technology Policy. (2018) *Charting a course for success: America's strategy for STEM education: A report by the Committee on STEM education of the National Science & Technology Council.* https://www.energy.gov/sites/default/files/2019/05/f62/STEM-Education-Strategic-Plan-2018.pdf

International Technology and Engineering Educators Association. (2020). *Standards for technological and engineering literacy: The role of technology and engineering in STEM education.* https://www.iteea.org/STEL.aspx

Katsioloudis, P., & Moye, J. (2012). Future critical issues and problems facing technology and engineering education in the Commonwealth of Virginia. *Journal of Technology Education, 23*(2). Retrieved from https://scholar.lib.vt.edu/ejournals/JTE/v23n2/katsioloudis.html.

Knight, S., Shum, S., & Littleton, K. (2014). Epistemology, assessment, pedagogy: Where learning meets analytics in the middle space. *Journal of Learning Analytics, 1*(2), 23-47. https://doi.org/10.18608/jla.2014.12.3

Morgan, D. (1997). *The Focus Group Guidebook.* Thousand Oaks: SAGE Publications, Incorporated.

National Assessment of Educational Progress (NAEP). (2020, December 15). *Interpreting NAEP technology and engineering literacy results.* https://nces.ed.gov/nationsreportcard/tel/interpret_results.aspx

Ndahi, H., & Ritz, J. (2003). Technology education teacher demand, 2002-2005. *The Technology Teacher, 62*(7), 27.

Phi Delta Kapan. (2017). The 49th annual PDK poll of the public's attitudes toward the public schools. https://doi.org/10.1177/0031721717728274

Sanders, M. (2001). New paradigm or old wine? The status of technology education practice in the United States. *Journal of Technology Education*, *12*(2), 35–55. DOI: http://doi.org/10.21061/jte.v12i2.a.3

Schmitt, M. and Pelley, A. (1966). *Industrial arts education, a survey of programs, teachers, students, and curriculum.* Superintendent of Documents Catalog No. FS 5.233:33038.

Volk, K. (1997). Going, going, gone? Recent trends in technology teacher education programs. *Journal of Technology Education, 8*(2), 66-70.