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Preparing Highly Qualified Technology Education Teachers

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PREPARING HIGHLY QUALIFIED TECHNOLOGY EDUCATION TEACHERS

A RESEARCH PAPER

PRESENTED TO

THE FACULTY OF THE DEPARTMENT OF STEM EDUCATION AND PROFESSIONAL STUDIES

OLD DOMINION UNIVERSITY

By

LOGAN FOSTER

SUMMER 2014

APPROVAL PAGE

This research study was prepared by Logan Foster under the direction of Dr. John Ritz for SEPS 636, Problems in Occupational and Technical Studies. It was submitted to the Research Advisor as a partial fulfillment of the requirements for the Master of Science Degree.

Approved By: _____ Date: _____

Dr. John Ritz

Research Advisor

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Logan Foster

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Chapter I

Introduction

Technology education is a subject that many secondary public schools offer in the state of Virginia. A typical technology education course has lessons, projects, and textbook work. Many teachers use different teaching strategies and practices in both the classroom and modeling lab to teach the content of the course.

Highly qualified teachers use teaching practices in their classroom/laboratories on a daily basis to deliver instruction. According to No Child Left Behind (NCLB), "the definition of a highly qualified teacher includes three components: obtaining a bachelor's degree; having full licensure as defined by the state; and demonstrating competency" (Bowen, 2013, p. 1). Teaching practices are learned through observing how others teach, not necessary from learning a subject's content (Wilkerson & Irby, 1998). Effective teaching practices are necessary to ensure students are applying creativity and problem-solving skills and gaining a passion for learning. Effective teaching practices are used in a classroom to engage students and motivate them to achieve (Public Schools of North Carolina, n.d.).

In many secondary technology education class settings, there are both learning classrooms and modeling laboratories. In each of these different settings, teaching practices must be used for classroom management as well as developing student's understanding of the material being taught. Educator's teaching practices are what make every classroom different. There are many different types of practices that work for various subjects and instructional situations. Teaching a technology education teacher the

best teaching practices will make them better prepared to have an effective classroom of their own.

Statement of the Problem

The problem of this study was to identify best classroom and modeling laboratory practices for preparing highly qualified secondary technology education teachers.

Research Questions

The objectives of the research were to answer the following research questions:

RQ_1: What are the best classroom practices performed by highly qualified technology education teachers?

RQ_2: What are the best laboratory practices performed by highly qualified technology education teachers?

Background and Significance

All have taught someone something. It can be as complex as sound waves, or as simple as how to use a new radio function on a cell phone. Most people have basic knowledge of a skill or content, but being able to express, teach, and manage a classroom is something highly qualified teachers do with ease. Technology education teachers use various teaching practices depending on what works for them in their classroom.

Teaching practices start with key behaviors. These behaviors are lesson clarity, instructional variety, teacher task orientation, engagement in the learning process, and student success rate (Borich, 2007). Each of these behaviors are linked to effective

teaching practices. There are many different teaching practices that secondary technology teachers use in their classroom that are based on these key behaviors. Some teaching practices include teaching a balanced and integrated curriculum, providing active learning opportunities, and lastly, differentiating instruction to meet all student's needs (Public Schools of North Carolina, n.d.).

Teachers face many challenges on a daily basis both in the classroom and out of the classroom regarding how and what to teach. Good teaching practices can improve both teachers' and students' attitudes about the lesson being taught and can increase a student's interest in learning ("Creating effective teaching", 2009). Every teacher should be prepared with multiple teaching practices to use in their classroom. Having good practices will prepare a teacher for teaching in any school system or in any classroom.

In a typical technology education classroom, teachers provide both direct and indirect instruction. Direct instruction uses a lecture type teaching practice. Teaching knowledge that involves facts, rules, and actions are used when teaching with direct instruction. Indirect instruction uses more problem solving and hands-on learning. This teaching practice involves concepts, patterns, and abstractions (Borich, 2007). By understanding the type of instruction commonly used in a secondary technology education class, a teacher can determine what practices will work with different types of content.

Many secondary technology education teachers do not have a specific set of classroom and modeling laboratory practices to use. However, these practices are needed to ensure both teacher and student success. There is currently a lack of information

regarding what teaching practices are useful for preparing highly qualified secondary technology education teachers.

Limitations

The study was limited to surveying highly qualified technology and engineering teachers who worked in Virginia. Highly qualified teachers are teachers that obtain a bachelor's degree, receive full licensure by the state, and demonstrate teaching competency. This study was limited to Virginia technology teachers who received a Virginia Technology Teacher of the Year Award.

Assumptions

This study was conducted under the assumption that all participants are highly qualified technology and engineering education teachers. It was assumed that all participants have or are currently teaching in a classroom and modeling laboratory environment in grades 6-12. Lastly, it was assumed that all participants model some of the best teaching practices because they received the Virginia Technology Teacher of the Year Award.

Procedures

The researcher developed and emailed a survey to secondary technology education teachers in the state of Virginia that have received the Virginia Technology and Engineering Education Teacher of the Year Award within the last five years. The survey asked questions regarding what teaching practices are used in their classrooms and what practices are used in their modeling labs. The survey also asked what practices were the best for their classroom and what practices were best for their modeling lab. The

information gathered was then analyzed to determine what best practices the teachers used in their classrooms and modeling laboratories.

Definitions of Terms

The following terms have special meaning in regards to this research study:

NCLB- No Child Left Behind Act which is provided to close student achievement gaps by giving all children equal opportunity to obtain a high-quality education.

Modeling Lab- A laboratory in technology education that allows students to work on projects, including but not limited to plastic, ceramics, and wood materials.

Teaching Practices- strategies that are used by a teacher in the classroom to deliver instruction and organize the classroom/laboratory.

Best Practices- strategies used by teachers in the classroom/laboratory that provide students with the highest success rate in learning.

Secondary Education- Grade levels sixth – twelfth.

Overview of Chapters

Chapter I, Introduction, explained what a highly qualified teacher was and how teaching practices are important for learning. The introduction provided information about what teaching practices are and how they are used in teaching. The study was limited to highly qualified teachers in Virginia and it was assumed that all participants used special teaching practices in both a classroom and modeling lab. The procedure of

collecting data for the research included emailing current highly qualified teachers to ask what their best practices are in both the classroom and modeling laboratory.

Chapter II, Review of Literature, discusses research that has been done regarding teaching practices in the classroom and teaching practices in the modeling lab. Chapter III, Methods and Procedures, will allow one to understand the processes used to collect data for the research problem. Chapter IV, Findings, will allow one to review what was collected and found regarding the study. The final chapter, Chapter V, is the Summary, Conclusions, and Recommendation, which completes the study and provides information for others research studies.

Chapter II

Review of Literature

This research study was conducted to determine the best teaching practices for a secondary technology education classroom and modeling laboratory. Former research has been done regarding best teaching practices in general classroom settings, but it remains unclear what the best teaching practices are for a secondary technology education classroom and modeling laboratory. The following information was reviewed to provide background regarding best teaching practices used in general education classrooms or hands-on learning laboratories such as an engineering classroom or science laboratory.

Secondary Technology Education

Technology education classes follow the Standards of Technological Literacy to create curriculum (ITEA, 2000). Studies are conducted to ensure student's satisfaction with technology education and their comfort level in this school subject (Haisler, 2000). Technology education has evolved greatly since the 1960s. Activities in secondary technology education classes help students find solutions to problems, which is more effective than giving them information to remember (Lewis, 1999). Technology education classes are usually project-based, and technical in nature, so they require best teaching practices for efficient student achievement.

Teaching Practices

Every teacher uses various teaching practices. There are both good and bad teaching practices. A teacher's teaching practices are the cause of student's learning

success. Teachers that use the best teaching practices typically have the best student success rates. In technology education, there are teaching practices used in the classroom and teaching practices used in the modeling laboratory.

Effective teaching practices can change for different subjects and different age groups of students. However, it is important to look at what teaching practices are the best for technology education, so one can become prepared to have a successful technology classroom of their own (Rüütmann & Kipper, 2013). Understanding and using the best teaching practices for both the technology classroom and modeling laboratory will ensure teacher and student success.

Teaching Practices Used in the Classroom

Teaching practices are used to help students understand and comprehend what is being taught. In a technology education classroom, student participation and student understanding are both key teaching practices (Sandholtz, 2011). For teachers to enhance the effectiveness of their practices and teaching methods, teachers must be able to reflect on their teaching as well as student learning. Best teaching practices include phasing clear questions and probing for clarification. Phasing clear questions includes only asking one question at a time and making it clear for students to understand what is being asked. Probing for clarification is reviewing or investigating to make sure that the learners are gaining a clear understanding of the concept or lesson being taught (Rüütmann & Kipper, 2013). Using these best teaching practices allows for more control over the classroom and can ensure student achievement.

Classroom management and best teaching practices for a technology education classroom are related. Having student centered classrooms, students are able to begin the process of becoming a strong and worthy person (Donahoe, Cichucki, Coad-Bernard, Coe, & Scholtz, 2013). When best teaching practices are used, classroom management becomes easier because the classroom is organized, and students are on task. In a technology education classroom, students should be properly monitored to ensure they have time-, task-, and resource management (Rüütmann & Kipper, 2013).

Student achievement is the result of best teaching practices. Students learn at different levels, different paces, and with different learning styles. Determining the best teaching practice in a certain situation may be difficult, so it is important for one to reflect on the students in the classroom and reflect on themselves as the educator (Rüütmann & Kipper, 2013). Reflection is a classroom teaching practice that allows educators to follow up on student learning. There are times that "learning happens without teaching and teaching happens without learning" (Rüütmann & Kipper, 2013, p. 44). Constantly monitoring students and using various best teaching practices, an educator can be certain that learning is happening in the classroom. Since students learn differently, the best teaching practices in a secondary technology education classroom may need to be adjusted, but the final outcome is student achievement and success.

Teaching Practices Used in the Modeling Laboratory

In a modeling laboratory, many lessons are technical and or project-based. The best teaching practices to use in a technical learning environment and modeling laboratory relate to the students working both independently and in groups. The most

beneficial and important teaching practice is to identify clear learning objectives. This practice is one of the best because students know the outcome of the lesson. Students understand what their learning goal is. While in the modeling laboratory, it is also important to monitor students for evidence of learning. When students are working on projects, teachers must actively be walking around to ensure students are learning and to confirm students are aware of the projected objectives. One other best teaching practice for the modeling laboratory is teaching in intervals. Allowing students time to reflect on what they learned is a best practice because it checks for student understanding before moving on in a lesson (Kipper & Rüütmann, 2013).

In a laboratory setting, such as a technology modeling laboratory, non-linguistic presentations are considered one best teaching practice. Non-linguistic presentations are showing pictures, graphs, film clips, and other media presentations to motivate learning (Kipper & Rüütmann, 2013). Reconstructing lessons to provide full student participation as part of a laboratory setting is one way to monitor and provide student success. Student-centered learning and participation are considered best teaching practices in the modeling laboratory (Sandholtz, 2011).

Lecture is a teaching practice used by many teachers, but it is not found as effective as alternative teaching practices such as inquiry or student-based learning. Teachers today must find a balance between lecture and hands-on learning to make sure learners are learning the content and can show what they have learned. Studies show that higher-performing schools use a hands-on instruction approach to teaching laboratory based classes (Oliveira, Wilcox, Angelis, Applebee, Amodeo, & Snyder, 2012).

Summary

Regardless of whether the teacher is in the classroom or modeling laboratory, the outcome of student success is all the same in technology education. This outcome is to prepare students for a technological world and make them become technological literate citizens.

Secondary technology education classrooms have a wide range of content and there are demographic differences in many of these classrooms. The best teaching practices are needed in a technology education classroom because of the importance of the subject matter and the various categories of information being taught. Secondary technology education modeling laboratories are designed to provide a hands-on, student-centered learning atmosphere. Best teaching practices will vary regarding which lesson is being taught. The best teaching practices for a secondary technology education classroom and secondary technology education modeling laboratory ensure student achievement and success as well as classroom management. These best practices are used on a daily basis and can be modified for different students and different lessons.

Chapter III will provide the methods and procedures that were used to collect and treat the data for this study. This includes describing the population, the instrument design, and statistical analysis.

Chapter III

Methods and Procedures

This study was a descriptive study used to identify the best teaching practices for a secondary technology education classroom and secondary technology education modeling laboratory for the purpose of preparing highly qualified secondary technology education teachers. Chapter III will discuss and identify the population, instrument design used to collect data, and discuss data analysis procedures

Population

Every year, the Virginia Technology and Engineering Education Association (VTEEA) awards two teachers in secondary technology education a teacher of the year award. One middle school and one high school teacher receives this award. The population for this study includes the past ten technology education teachers of the year for secondary technology education in Virginia. There were five middle school and five high school teachers in the study population.

Instrument Design

A survey was developed as an instrument to collect data for this study. The survey was designed by the researcher to determine what the selected technology teachers believed to be are the best teaching practices. The survey consisted of fifteen total questions. Eight of the questions were Likert scale, and they were used to determine what practices should be followed in a classroom. Five questions were multiple-choice, asking what different practices the teachers used or do not use in the classroom or modeling lab.

Lastly, one open-ended opinion question was written to determine what the teachers felt are the best teaching practices to apply in their technology classroom and modeling laboratory. Questions were based on a "best teaching practice" perception survey (Loehr, 2009). See Appendix A for copy of the survey.

Methods of Data Collection

The survey was distributed through email to the participants. The participants received an email with a link, which connected them to a Google document survey. A cover letter was provided in the email to make participants aware of why they were selected and why the study was being done. The surveys were submitted anonymously by the participants through Google Drive. It was estimated that it would take no more than 10 minutes to fully complete the survey. See Appendix B for a copy of the cover letter.

Statistical Analysis

The responses of this survey were calculated to determine what teachers believed to be the best teaching practices for a technology education classroom and modeling laboratory. The survey responses were entered into a spreadsheet. The mean and median were calculated for the Likert questions. Responses found to be 4.5-5.0 were strongly agree, 3.5-4.49 were agree, 2.5-3.49 were unsure, 1.5-2.49 were disagree, and 0-1.49 were strongly disagree. The open-ended question was clustered and number of instances was found.

Summary

Chapter III included the methods and procedures used for this study. It described the population, which includes the past Technology and Engineering Teacher of the Year recipients. Chapter III also described the instrument used to collect data, which was a survey that the researcher made. Chapter III also reported the statistical analysis that was used to interpret the data that was collected. In Chapter IV the findings of the research will be presented.

Chapter IV

Findings

The problem of this study was to identify best classroom and modeling laboratory practices for preparing highly qualified secondary technology education teachers. An electronic survey was used to collect data from middle and high school teachers that have received the Virginia Technology and Engineering Education Association Teacher of the Year Award (2008-2013). This chapter reports the survey response rate and findings.

Response Rate

The survey population were emailed and provided responses to survey. The survey period was ten days, and it was extended an additional ten days with two follow-up emails. All ten teachers responded providing a 100% response rate.

Report of Survey Findings

Each survey question is discussed in this section. The first eight questions were Likert-scale. Questions 9 through 14 were multiple choice, with an option to select other. Question 15 was an open-response question.

Item 1, "Best teaching practices" change as teachers gain more experience in teaching.

Sixty percent of the participants agreed to this statement and forty percent of the participants strongly agreed. The mean score for this question was 4.4, indicating that the average response to this statement was agree as reported by the 10 technology teachers of the year.

Item 2, Each individual teacher defines what a "best teaching practice" is for their students and because of this there might be different "best teaching practices".

Fifty percent of the participants agreed and fifty percent of the participants strongly agreed. The mean score for this question was 4.5, indicating that the average response to this statement was strongly agree.

Item 3, "Best teaching practices" are universal for technology and engineering education.

Twenty percent of the participants strongly disagreed with this statement and twenty percent of the participants disagreed with this statement. Forty percent of the participants were unsure. Twenty percent of the participants agreed. The mean score for this statement was 2.6, indicating that the average response was unsure.

Item 4, Students benefit when they are exposed to a variety of different teaching practices.

Fifty percent of the participants agreed and fifty percent of the participants strongly agreed. The mean score for this question was 4.5, indicating that the average response to this statement was strongly agree.

Item 5, A "best teaching practice" is providing rubrics and examples of high quality work.

Ten percent of the participants were unsure of this statement. Seventy percent agreed, and twenty percent strongly agreed. The mean was 4.1, indicating that the average response to this statement was agree.

Item 6, Teachers should allow open feedback from students about how to improve their class.

Ten percent of participants were unsure of this statement. Forty percent agreed and fifty percent strongly agreed. The mean of this statement was 4.4, indicating the average response was agree.

Item 7, Posting the day's objectives and going over the purpose of a lesson is a "best teaching practice"

Twenty percent of the participants disagreed with this statement. Forty percent of the participants agreed and forty percent of the participants strongly agreed. The mean of this statement was 4.0, indicating that the average response was agree.

Item 8, Providing recognition for a student doing good work is "best teaching practice".

Ten percent of the participants strongly disagreed with this statement. Ten percent of the participants were unsure of this statement. Thirty percent agreed and fifty percent strongly agreed with this statement. The mean of this statement was 4.1, indicating the average response was agree. See Table 1.

For Questions 9-14, the responses were teacher reflection, checking for student understanding, student journals, KWL (know, what you want to know, what you want to learn) Charts, teacher demonstrations, Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations), mediated lectures, planning each lesson and

course, technical problem solving/problem based learning, collaborative learning, and other. Following is an analysis of these questions.

Table 1

Survey Questions 1-8

Best Teaching Practices	SD 1	D 2	U 3	A 4	SA 5	Mean	Median
1. “Best teaching practices” change as teachers gain more experience in teaching.	0	0	0	6	4	4.4	4
2. Each individual teacher defines what a “best teaching practice” is for their students and because of this there might be different “best teaching practices”.	0	0	0	5	5	4.5	4.5
3. “Best teaching practices” are universal for technology and engineering education.	2	2	4	2	0	2.6	3
4. Students benefit when they are exposed to a variety of different teaching practices.	0	0	0	5	5	4.5	4.5
5. A “best teaching practice” is providing rubrics and example of high quality work.	0	0	1	7	2	4.1	4
6. Teachers should allow open feedback from students about how to improve their class.	0	0	1	4	5	4.4	4.5
7. Posting the day’s objectives and going over the purpose of a lesson is a “best teaching practice”	0	2	0	4	4	4.0	4
8. Providing recognition for a student doing good work is “best teaching practice”.	1	0	1	3	5	4.1	4.5

Item 9, What is one of the best teaching practices you use in your classroom?

Ten percent of participants responded teacher reflection, 10 percent of participants responded teacher demonstration, and 10 percent of participants responded technical problem solving/problem-based learning. Twenty percent of participants

responded collaborative learning, and 20 percent of participants responded other with the two responses being “all of them”, and “guided reading of technology texts”. Thirty percent of participants responded checking for student understanding. The highest number of instances was “checking for student understanding” with three participants responding.

Item 10, What is one of the teaching practices you would like to use MORE in your classroom?

Ten percent of participants responded planning each lesson and course, and 10 percent of participants responded technical problem solving/problem-based learning. Twenty percent of participants responded teacher demonstration. Thirty percent of participants responded student journals and 30 percent of participants responded collaborative learning. The highest number of instances was both student journals and collaborative learning with three participants responding to each.

Item 11, What is one of the teaching practices you would like to use LESS in your classroom?

Ten percent of participants responded student journals, 10 percent of participants responded teacher demonstration, 10 percent of participants responded non-linguistic presentations, 10 percent of participants responded technical problem solving/problem-based learning, 10 percent of participants responded collaborative learning, and 10 percent of participants responded other with the response being “none”. Twenty percent of participants responded mediated lectures and 20 percent of participants responded

KWL Charts. The highest number of instances was both Mediated Lectures and KWL Charts with two participants responding to each.

Item 12, What is one of the best teaching practices you use in your modeling laboratory?

Ten percent of participants responded planning each lesson and course, and 10 percent of participants responded other with the response being “all of them”. Twenty percent of participants responded collaborative learning. Sixty percent of participants responded teacher demonstration. The highest number of instances was teacher demonstration with six participants responding.

Item 13, What is one of the teaching practices you would like to use MORE in your modeling laboratory?

Ten percent of participants responded teacher reflection, 10 percent of participants responded planning each lesson and course, 10 percent of participants responded collaborative learning, and 10 percent of participants responded other, with the response being “none”. Twenty percent of participants responded checking for student understanding, 20 percent of participants responded non-linguistic presentations, and 20 percent of participants responded technical problem solving/problem-based leaning. The highest number of instances was checking for student understanding, non-linguistic presentations, and technical problem solving/problem based learning with 2 participants responding to each.

Item 14, What is one of the teaching practices you would like to use LESS in your modeling laboratory?

Ten percent of participants responded teacher demonstration, 10 percent of participants responded planning each lesson and course, and 10 percent of participants responded technical problem solving/problem-based learning. Twenty percent of participants responded teacher reflection and 20 percent of participants responded KWL Charts. Thirty percent of participants responded mediated lectures. The highest number of instances was mediated lectures with three participants responding. See Table 2 and Table 3.

Table 2

Survey Questions 9-11

	9. What is the best teaching practice you use in your classroom?	10. What is one teaching practice you would like to use MORE in your classroom?	11. What is one of the teaching practices you would use LESS in your classroom?
Teacher Reflection	1	0	0
Checking for Student Understanding	3	0	0
Student Journals	0	3	1
KWL Charts	0	0	2
Teacher Demonstration	1	2	1
Non-linguistic Presentations	0	0	1
Mediated Lectures	0	0	2
Planning each Lesson and Course	0	1	0
Technical Problem Solving/Problem-based Learning	1	1	1
Collaborative Learning	2	3	1
Other	2	0	1

	(All of them) (Guided reading of technology texts)		(None)
Highest Number of instances	Checking for Student Understanding	Student Journals and Collaborative learning	KWL Charts and Mediated Lectures

Table 3

Survey Questions 12-14

	12. What is one of the best teaching practices you use in your modeling laboratory?	13. What is one teaching practice you would like to use MORE in your modeling laboratory?	14. What is one of the teaching practices you would use LESS in your modeling laboratory?
Teacher Reflection	0	1	2
Checking for Student Understanding	0	2	0
Student Journals	0	0	0
KWL Charts	0	0	2
Teacher Demonstration	6	0	1
Non-linguistic Presentations	0	2	0
Mediated Lectures	0	0	3
Planning each Lesson and Course	1	1	1
Technical Problem Solving/Problem-based Learning	0	2	1
Collaborative Learning	2	1	0
Other	1	1	0
	(All of them)	(None)	
Highest Number of	Teacher Demonstration	Checking for student	Mediated Lectures

Instances	understanding Non-linguistic presentations Technical Problem solving/problem based learning

Item 15, List what you believe is your best teaching practice

All ten participants filled in the open-response question. There was no highest number of instances. See Table 4.

Table 4

Survey Question 15

List what you believe is your best teaching practice:	
Integrating core academics into technology and engineering education lessons and activities. This practice supports student learning in their core courses as well as give what I teach creditability.	My classroom was a synergistic technology laboratory. I had 16 stations and children were collaboratively taught by the computer! I was merely a facilitator! That worked well for me and provided 32 students variations in content that I could not provide alone! I loved that lab and it was totally dismantled when I left so now there is a huge difference in effective teaching styles today!
Technical Problem Solving/Problem based learning	I believe that I give my students many different resources to succeed on a project. After they have them, they are free to use them when and as they see fit.
I personally think that one of the best teaching practices does not really involve teaching rather it involves knowing your student body. Everyday I try to at least personally say hello to every student. I strive to learn something about every student and then as I am teaching I have a better knowledge of how to connect or reach every student. When students share some personal aspect of	Guided reading of technology texts. This reading helps students prepare for the modules/labs as well as understanding the definitions and terms needed to succeed.

their personal life with me it seems to open lots of educational doors for me.	
I believe getting students involved and showing encouragement is the best teaching practice, because it motivates students and gives them confidence.	Collaborative learning and group work
One of my best teaching practices is planning each lesson and having students review the objectives of the lesson. It keeps the discussion on topic.	Teacher demonstrations

Summary

Chapter IV reports the findings from the survey. The problem of this study was to identify best classroom and modeling laboratory practices for preparing highly qualified secondary technology education teachers. An electronic survey was sent out to ten technology teachers that received the Virginia Technology and Engineering Education Association Teacher of the Year Award. All ten teachers responded to the survey after two follow-up emails. Data were analyzed to determine the mean and highest number of instances. Chapter V will provide the Summary, Conclusions, and Recommendations of the study.

Chapter V

Summary, Conclusions, and Recommendations

This chapter provides a summary of the study and draws conclusions by answering the research questions. An overview of each research question will be included as well as the significance of what was found in the study. Lastly, the researcher makes recommendations for future studies.

Summary

The problem of this study was to identify best classroom and modeling laboratory practices that should be used in teaching technology education. This problem was studied in order to gather information for preparing highly qualified secondary technology education teachers. The objectives of this study were to answer the following research questions:

RQ_1: What are the best classroom practices performed by highly qualified technology education teachers?

RQ_2: What are the best laboratory practices performed by highly qualified technology education teachers?

This study was limited to surveying highly qualified technology and engineering teachers who worked in Virginia and received a Virginia Technology Teacher of the Year Award. The study was conducted under the assumption that all participants were highly qualified technology and engineering education teachers. It was assumed that all participants have or currently are teaching in a classroom and modeling laboratory

environment and that they present some of the best teaching practices because they received the Virginia Technology Teacher of the Year Award.

To collect data for this study, a survey was developed by the researcher. It was designed using "best teaching practice" perception survey (Loehr, 2009). It was designed to determine what participants believed to be the best teaching practices for delivering technology education. The survey consisted of 15 questions. Eight questions were Likert scaled and five questions were multiple-choice. Lastly, one open-ended question was given. The survey was distributed through email with a link attached for the survey. A cover letter was provided to make participants aware of why they were selected and why the study was being conducted.

A review of literature was conducted to determine what was known about best teaching practices. It was found that teaching practices are the cause of student's success and it is important to look at what teaching practices are best for technology education so one can be prepared to have a successful technology classroom of their own (Rüütmann & Kipper, 2013).

Conclusions

RQ_1: What are the best classroom practices performed by highly qualified technology education teachers?

Research Question 1 focused on what classroom practices were performed by highly qualified technology education teachers. Questions 1-4 asked participants what they believed were best teaching practices and how they should be used for teaching technology education. Survey Question 1 asked if best teaching practices change as

teachers gain more experience and the mean response was 4.4, indicating that participants agreed with this statement. Question 2 asked if each individual teacher defines what a best teaching practice is because they can be different and the mean score was 4.5, indicating that the participants strongly agree with this statement. Question 3 asked if best teaching practices were universal for technology and engineering education and the mean score was 2.6, indicating that the participants are unsure of the answer. Question 4 asked the participants if students benefited when exposed to a variety of different teaching practices and the mean score was 4.5, indicating that participants strongly agreed with this statement. The participants agreed that best teaching practices change as teachers gain more experience and that each individual teacher defines what a best teaching practice is because there are different best teaching practices. The participants also agreed that students benefit from being exposed to various teaching practices. However, the participants were unsure about whether or not there are universal best teaching practices for technology education.

Survey Questions 5-8 asked participants about various teaching practices. Question 5 asked if providing rubrics and examples of high quality work was a best teaching practice and the mean responses was 4.1, indicating that the participants agreed with that statement. Question 6 asked if open feedback from students to improve the classroom should be allowed and the mean was 4.4, indicating the participants agreed with this statement. Question 7 asked if posting the day's objectives and going over the purpose of the lesson was a best teaching practice and the mean score was 4.0, indicating that the participants agreed with this statement. Question 8 asked if providing recognition for a student doing good work is a best teaching practice and the mean responses was 4.1,

indicating that the participants agreed with this statement. The participants mean score indicated that all agreed on the four best teaching practices that these questions asked. However, some participants disagreed or were unsure about posting the day's objectives and providing recognition for students doing good work as being best teaching practices.

The second set of survey questions were multiple choice and directly asked what teachers believed to be the best teaching practice they used, and what teaching practices they would like to use more and use less in their technology classroom. Question 9 asked what the participants believed to be the best teaching practice they used in their classroom, and the highest number of instances was checking for student understanding. Question 10 asked the participants what teaching practice they would like to use more in their classroom and student journals and collaborative learning were the two highest number of instances. Question 11 asked the participants what teaching practice they would like to use less in their classroom and the highest number of instances was KWL Charts and mediated lectures. Results showed that participants wanted to engage in more collaborative learning and student journals, and less in KWL charts and mediated lectures.

From the data collected, it can be concluded that teachers who received the technology teacher of the year award believed student-centered learning (the use of journals, teacher demonstrations, collaborative learning, and problem-solving lessons) to be considered the best teaching practice. This type of learning can be considered the best for student success in technology education. It can also be concluded that these award winning teachers felt that using lectures and KWL charts would not be best teaching

practices in a technology education classroom because they move away from student-center learning.

RQ_2: What are the best laboratory practices performed by highly qualified technology education teachers?

Survey Question 12 asked participants what they believed to be the best teaching practice in their modeling laboratory and the highest number of instances answered was teacher demonstrations. Question 13 asked participants what practice they would like to use more in their modeling laboratory and the highest number of instances were checking for student understanding and non-linguistic presentations. Question 14 asked participants what teaching practice they would like to use less in their modeling laboratory and the highest number of instances in the study were mediated lectures. Results showed that participants wanted to engage in more non-linguistics presentations (showing pictures, graphs, and other multimedia presentations) and checking for student understanding and less mediated lectures.

Question 15 was an open-response question that asked the participants what they believed to be the best teaching practice. Some responses, such as teacher demonstration, technical problem solving/problem based learning, planning each lesson, and collaborative learning, were the same as the multiple choice Question 9. Other responses included integrating core academics into technology lessons, giving students different resources, creating a relationship with students, and getting students involved. Two responses dealt with modules and labs and included being a facilitator as their best teaching practice.

The results suggest that the award-winning technology teachers believed teacher demonstrations and non-linguistic presentations (showing pictures, graphs, and other multimedia presentations) should be used in a modeling laboratory as teaching practices that promote student success. These results are similar to the best teaching practices the teachers responded to be the best for a technology classroom. In both the classroom and modeling laboratory, technology education teachers believed mediated lectures should be used less for student success.

Recommendations

Following are recommendations for implementing the study's findings and conducting additional research studies. Although this study was limited to ten Virginia technology education teachers, the following recommendations are based upon their responses.

- In both the technology education classroom and modeling laboratory, teachers want to use less mediated lectures. It might be helpful if teachers were prepared to teach technology education with less mediated lectures and more hands-on learning or discussion activities.
- In the classroom, award-winning teachers felt best teaching practice is checking for student understanding. Constantly checking for student understanding will ensure success for their students. Teacher preparation programs should educate teacher candidates in how to properly and effectively check for student understanding.
- In the modeling laboratory, technology teachers felt the best teaching practice is teacher demonstration. Teacher demonstration is a very common teaching practice for

technology education and teacher preparation programs should educate teacher candidates in how to properly and effectively demonstrate a lesson for student learning.

Future Research

In order to benefit current and future technology education teachers, the continuance of research on this issue is necessary. A larger population size would provide more information regarding what the best teaching practice is. A bigger population would provide more information regarding what teachers believed to be successful. This study could be extended to technology education teachers of the year across the United States.

1. In the future, technology education researchers should explore through research studies how to better implement student-centered learning teaching practices.
2. Various demographics should be studied in regards to best teaching practices in technology education for a better understanding of what teaching practices impact age, gender, and socio-economic status of students

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Appendix A

Survey

Best Teaching Practices in Technology and Engineering Education

Purpose:
The purpose of this study is to identify the best teaching practices in secondary technology and engineering education classrooms and laboratories for the future preparation of highly qualified technology and engineering teachers.

Directions:
Select the best answer for the following questions. If answering other, please fill in an answer.

Special Definitions:
"Best teaching practices" can be defined as practices that provide the highest student success rate in your classroom or laboratory.
A classroom is where students have desks/tables and teaching takes place.
A modeling laboratory is a laboratory in technology education that allows students to work on design projects.

1. “Best teaching practices” change as teachers gain more experience in teaching.

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree
- o Strongly Disagree

2. Each individual teacher defines what a “best teaching practice” is for their students and because of this there might be different “best teaching practices” across schools.

- o Strongly Agree
- o Agree
- o Uncertain

- o Disagree
- o Strongly Disagree

3. “Best teaching practices” are universal for technology and engineering education.

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree
- o Strongly Disagree

4. Students benefit when they are exposed to a variety of different teaching practices.

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree
- o Strongly Disagree

5. A “best teaching practice” is providing rubrics and examples of high quality student work.

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree
- o Strongly Disagree

6. Teachers should allow open feedback from students about how to improve their class.

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree

- o Strongly Disagree

7. Posting the day's objectives and going over the purpose of a lesson is a "best teaching practice".

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree
- o Strongly Disagree

8. Providing recognition for a student doing good work is a "best teaching practice".

- o Strongly Agree
- o Agree
- o Uncertain
- o Disagree
- o Strongly Disagree

9. What is one of the best teaching practices you use in your classroom?

Select the best answer below. If you select other, please fill in an answer.

- o Teacher reflection
- o Checking for student understanding
- o Student journals
- o Know, What you want to know, and Learning (KWL) charts
- o Teacher Demonstrations
- o Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations)
- o Mediated Lectures
- o Planning each lesson and course
- o Technical Problem Solving/Problem Based Learning
- o Collaborative Learning
- o Other:

10. What is one of the teaching practices you would like to use MORE in your classroom?

- o Teacher reflection
- o Checking for student understanding
- o Student journals
- o Know, What you want to know, and Learning (KWL) charts
- o Teacher Demonstrations
- o Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations)
- o Mediated Lectures
- o Planning each lesson and course
- o Technical Problem Solving/Problem Based Learning
- o Collaborative Learning
- o Other:

11. What is one of the teaching practices you would like to use LESS in your classroom?

- o Teacher reflection
- o Checking for student understanding
- o Student journals
- o Know, What you want to know, and Learning (KWL) charts
- o Teacher Demonstrations
- o Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations)
- o Mediated Lectures
- o Planning each lesson and course
- o Technical Problem Solving/Problem Based Learning
- o Collaborative Learning
- o Other:

12. What is one of the best teaching practices you use in your modeling laboratory?

- o Teacher reflection

- o Checking for student understanding
- o Student journals
- o Know, What you want to know, and Learning (KWL) charts
- o Teacher Demonstrations
- o Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations)
- o Mediated Lectures
- o Planning each lesson and course
- o Technical Problem Solving/Problem Based Learning
- o Collaborative Learning
- o Other:

13. What is one of the teaching practices you would like to use MORE in your modeling laboratory?

- o Teacher reflection
- o Checking for student understanding
- o Student journals
- o Know, What you want to know, and Learning (KWL) charts
- o Teacher Demonstrations
- o Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations)
- o Mediated Lectures
- o Planning each lesson and course
- o Technical Problem Solving/Problem Based Learning
- o Collaborative Learning
- o Other:

14. What is one of the teaching practices you would like to use LESS in your modeling laboratory?

- o Teacher reflection
- o Checking for student understanding
- o Student journals

- o Know, What you want to know, and Learning (KWL) charts
- o Teacher Demonstrations
- o Non-linguistic presentations (showing pictures, graphs, and other multimedia presentations)
- o Mediated Lectures
- o Planning each lesson and course
- o Technical Problem Solving/Problem Based Learning
- o Collaborative Learning
- o Other:

15. List what you believe is your best teaching practice:

Appendix B

Survey Cover Letter

Dear Educator:

My name is Logan Foster and I am conducting research at Old Dominion University for partial fulfillment of my STEM master's degree. The purpose of this study is to determine what the best teaching practices are in secondary education technology and engineering classrooms and modeling laboratories.

You have been selected to answer these questions because you have received the Virginia Technology Education Teacher of the Year Award within the last 10 years, and because of this, you are considered one of the most highly qualified technology teachers in the state of Virginia.

I ask that you respond to fifteen questions for this study. Fourteen questions are multiple-choice and one question short answer dealing with "best teaching practices" for technology education. The survey will not take longer than 10 minutes to complete.

There are no correct or incorrect responses. I am trying to determine what you believe are the best teaching practices for the preparation of future secondary technology and engineering education classes.

https://docs.google.com/forms/d/1PHfedyzz583BMdn7S_rEAFklEZtWunSfkL9FvYu2558/viewform?usp=send_form

This survey is totally voluntary. Your answers will be anonymous and cannot be tracked back to you. **Please complete this survey before June 3, 2014.**

Thank you in advance for your assistance. If you have any questions or concerns, please address them to me at lfost008@odu.edu

Logan Foster
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