AN ANALYSIS OF ASSESSMENT AND EVALUATION OF TECHNOLOGY EDUCATION TEACHERS IN WISCONSIN

by

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A Research Paper

Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
With a Major in

Industrial/Technology Education

Approved: 2 Semester Credits

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May 19, 2000

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ABTRACT

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Measurement and Assessment in Technology Education
(Title)

Industrial Technology Education	Dr. Howard Lee	5/00	80
(Graduate Major)	(Research Advisor)	(Month/ Year)	(Pages)

American Psychological Association (APA) Publication Manual
(Name of Style Manual Used in this Study)

The problem that this research addressed was the shortage of information regarding how technology education teachers within the State of Wisconsin are assessing grades 6 – 12 students. To gather information on contemporary assessment procedures a cross sectional survey was developed and administered to 85 teachers. Each of these teachers had, or was working towards DPI subject code 220, and was currently employed within a WI school district.

Significant findings from this research include that technology education teachers do frequently reference academic standards while creating lessons plans and assessment instruments. Over half of all assessments administered by the sample group over the past year were performance based. Common methods of measuring student psychomotor performance included the use of checklists and rating scales. One-third of all assessments were written tests, while oral examinations were only rarely used. The sample group utilized a high proportion of objective test questions, but rarely used

portfolios as an assessment strategy. Authentic assessments strategies were well represented by the sample group.

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Chapter I - Introduction

The main purpose of education is to aid students in achieving or mastering a series of intended learning objectives. These objectives are typically related to enhancing the students' cognitive thought patterns, affective or emotional development, or psychomotor activities (Linn & Gronlund, 2000). The Wisconsin Department of Public Instruction (DPI) has put a tremendous amount of effort into quantifying these goals and has recently published standards for eighteen separate subject areas. Standards have been developed for the study of technology education. These academic standards describe what the student population needs to learn and be able to do at specific times within their academic program. Standards logically provide the foundation for testing; and test results are a critical barometer of both student and teacher success (Wisconsin Department of Public Instruction, 1998). At least in theory, academic standards tell the technology education instructor what subject matter needs to be taught, and what material should be included within our assessment tools for the evaluation of students' progress.

Once the goals of an instructional program have been established, it is necessary to determine if the students possess the knowledge and skills needed to embark upon the planned instruction (Linn & Gronlund, 2000). There are several ways to conduct this initial placement evaluation. The teacher can administer a pre-instructional test to assess the student's current knowledge of the topic, review student records regarding past performance, make first hand personal observations of the students, administer student self-report inventories, or talk to prior instructors.

It is only after this initial placement evaluation that it is possible for teachers and other professionals to develop learning activities and experiences that are intended to bring about desired changes. After periods of instruction and student practice, teachers review student work and administer formative tests with the goal of ascertaining if the student is making progress towards attainment of the desired academic goals (Hopkins, 1998). Graphically the three interacting components of education would look as shown in Figure 1.

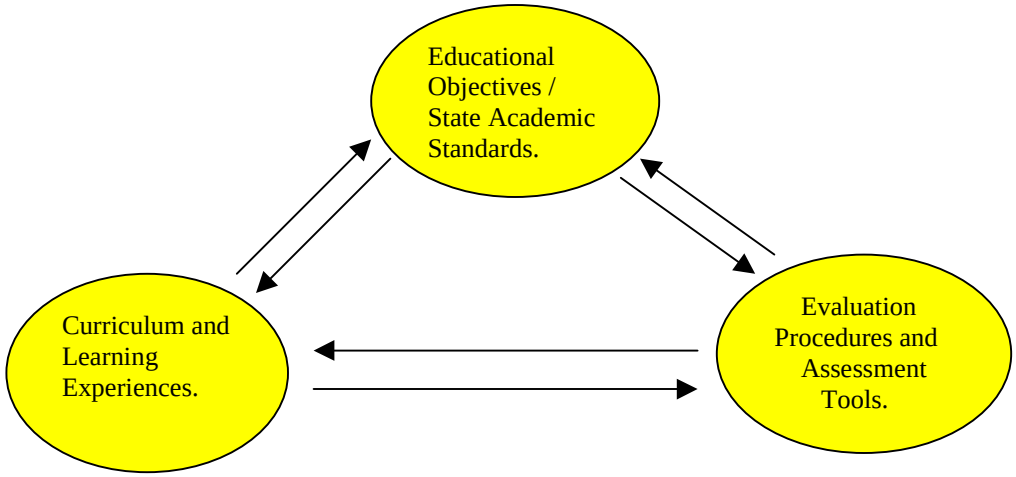

Figure 1. A graphic representation of the three interacting components of the educational process.

The bi-directional arrows positioned between the text boxes indicate that this is a very fluid and dynamic relationship. Decisions and results in one area continually cause revisions to occur in the other areas.

Assessments, measurements, and evaluations are closely related concepts that are confusing and frequently misused. People who have chosen education as their field of employment should make every effort to understand the subtle differences between these terms. Assessment refers to specific procedures and instruments used to gather

information regarding student performance (Turnbull, Turnbull, Shank, & Leal, 1999). Assessment tools and procedures are varied but include standardized and non-standardized tests, the student's cumulative school record, observations of the student in the school setting, checklists or rating scales being employed by the instructor while observing a task or finished product, or reviewing a portfolio of student work. Tests are assessment instruments, but can be further defined as systematic procedures for measuring a sample of behavior by posing a set of questions in a uniform manner (Linn, & Gronlund, 2000).

A great amount of student assessment takes the form of tests. All tests can be categorized as either written, oral, or manipulation and performance based (Wolansky, 1985). Oral and performance based tests are both extremely old. Wolansky states the philosophers of ancient Greece used oral tests, and performance tests would have been used as quality checks within early craft industries. Written tests are a more recent development and would not have been commonly used until literacy rates improved throughout the post medieval period.

Colleagues within the technology education discipline, college technology education professors, and administrators at the State DPI, all have excellent suggestions and theories about how students should be assessed. However, there appears to be a severe shortage of information documenting exactly how Wisconsin's technology education teachers are actually assessing their students. Further study of actual assessment procedures would be beneficial to current technology education teachers, college instructors, and Department of Public Instruction administrators.

Modern technologically advanced societies routinely measure distances, areas, volumes, temperatures, speeds, energy levels, power usage, skill levels, and individual knowledge or intelligence levels. Some of these measurements are considered to be "direct" because we can place a scale directly upon the object in question, and then count off the metric or English units. In the field of education, measurement can be defined as the process of obtaining a numerical description of the degree to which an individual possesses a particular characteristic (Linn & Gronlund, 2000). Measuring student skill, knowledge, and intelligence levels can be a very challenging task for educators. These are intangible concepts that cannot be touched in any physical sense (Bott, 1995). Educators frequently rely upon the students' performance on assignments and tests as "indirect" measurements regarding skill, knowledge, and intelligence levels. Whether the numerical description is good or bad cannot be determined by solely examining this raw assessment score.

Evaluation is the interpretation of the information secured though assessment (Turnbull, Turnbull, Shank, and Leal, 1999). The evaluation process tells the student, and their guardians what the scores mean. An evaluation is thus a summing-up process in which value judgments can play a significant role. Educators use two distinctly different evaluation processes. The first is referred to as criterion-referenced and the second is called a norm-referenced evaluation. A norm-referenced evaluation describes a student's test performance in relation to a distribution of test scores arranged from the lowest to the highest (Bott, 1995). The distribution of test scores can be from the current group of test takers, or any prior group of test takers. The group of students' scores that is used to compare an individual's score against is called the "norm group". Examples of norm

groups could include all students within a specific classroom, all same grade students within a given state, or all same grade students within the entire nation. Percentiles are a common example of how norm-referenced assessment results are communicated. A student is in the 90^{th} percentile if the student outperforms 90% of the scores within the norm group**.**

There are however, two problems with norm referenced testing procedures that reduce its usefulness to the technology education teacher. First, there is the situation where all students do extremely poor on a given exam. It is possible that a student would only get 50% correct and still be at the top of the norm group. There are few instructors if any that can justify an "A" evaluation for a student who only achieved 50% correct responses. Secondly, while norm referenced tests adopt easily to the traditional "A" through " F" grading system, the uniqueness of each student makes it difficult for technology education teachers to use norm referencing on a daily basis. No two students enter the classroom with the same social and educational background. Student rankings upon completion of a unit of instruction have considerably less value when the students did not begin the educational program with the same knowledge base.

An alternative to "norm referencing" is the concept of "criterion referenced" evaluations. Criterion-referenced evaluations are also referred to as being objective based because they use assessment tools that measure whether students can perform a specific task (Linn & Gronlund, 2000). Manual training schools, industrial arts programs, and technology education instructors all have rich histories of using performance objectives because of the extensive integration of labs and projects within their curriculum.

A correctly designed performance objective has three components. First, it must identify what the learner needs to do in behavioral terms. This behavioral performance, or the results of the performance, needs to be available for the instructor to observe. Secondly, the performance objective must also describe the relevant conditions under which the performance will occur. Lastly, the objective must define what criterion will be used to determine if the student has successfully completed the task (Bott, 1995, p.22). Typing 30 words per minute, during a classroom examination, with a maximum of two errors is an example of a performance objective that has all three of the fore mentioned components.

Philosophically there is one other huge difference between norm referencing and criterion referencing. Norm referencing is a more traditional approach to education where the time the students remain on task remains fixed, and what varies is the degree of competency achieved by the student. When an instructor uses norm referencing it is assumed that assessment results will have a normal bell shaped distribution, and that some percentage of students will fail. In contrast those instructors who stress performance-based assessments require that all students achieve some minimal level of competence prior too moving on to the next goal. With performance assessments it is assumed that all students can and will "pass" the assessments (Wolansky, 1985).

Assessments are an extremely critical component within the educational process. Studies have shown that students pursue course objectives more vigorously when they are aware that tests are frequently administered. This makes intuitive sense as people in general, and students in particular, are routinely faced with multiple demands being placed upon a limited amount of time. As a result of this time squeeze students give less

attention to those courses where the instructors are not as active in assessing their progress. Knowing that tests or other assessments are forthcoming makes the student more receptive to learning new materials, and encourages retention of new information for a longer period of time (Hopkins, 1998). Numerous small tests are a more effective motivator of students than infrequent long tests.

Statement of the Problem

An evaluation is a process that relies on tests and other assessment devices to determine if goals are being achieved. The problem this research will address is the shortage of information regarding how technology education teachers within the State of Wisconsin are assessing their grades 6 through 12 students. This research will quantify the degree to which technology education teachers are relying upon oral, written, and performance tests. It will also determine the frequency that specific types of questions are being used on written examinations. These question types include true false, multiple choice, matching, short answer, and essay. A secondary consideration within this research will be to determine how extensively technology education teachers are using checklists, rating scales, and portfolios. Only brief references will be made regarding the evaluation or interpretation of the resulting scores. By focusing on assessment instruments used, and not the interpretation of the information secured, it is hoped that this research can bypass some of the value judgments that do materialize when grading and promoting students.

Purpose of the Study

This study was conducted in an effort to improve the educational system at both the state and local level. Through out the 1990's, the University of Wisconsin-Stout has been the only state university to offer a program that leads to a DPI certification to teach technology education within the State of Wisconsin. To graduate from Stout's program in the year 2000 requires the student complete both a basic and an advanced course in Curriculum Methods and Assessment. However, once the student receives his/her teaching license there is no long-term follow-up procedure to determine if the practices and principles being promoted in class are actually being used. This is not meant as a criticism of Stout's program as all other teacher preparation programs statewide have the same problem in insuring long term implementation of proper teaching techniques.

This study will specifically examine the assessment practices being used today within Wisconsin technology education classrooms. A thorough examination of current assessment practices in the area of technology education could indicate that teachers are doing a fabulous job, or it might identify serious deficiencies that need to be addressed. Potential problems include not using appropriate assessment tools, not relating curriculum and assessments to the statewide technology standards, or not using the results to modify and refine existing learning activities. Veteran teachers pass on both good and bad practices to their understudies. It is hoped that this study will aid those college professors that are actively involved in the education of our next generation of technology education teachers.

It is also hoped that any individual technology education teacher reading the results of this study will find it enlightening and beneficial to their own teaching career. The

results of this study will minimally provide those teachers with a yardstick with which to judge their own assessment practices.

Research Questions

This research will answer the following questions:

1. How frequently are technology education teachers referencing some defined set of academic standards as they construct their lesson plans and subsequent assessment tools?
2. What percentage of assessments given by technology education teachers could be categorized as oral, written and performance based?
3. When technology education teachers make written assessments what percentages of questions were True-false, multiple choice, matching, short answer, and essay?
4. To what extent are technology education teachers using objective versus subjective assessments to assess their students?
5. To what extent are technology education teachers using checklists or rating scales to assess processes or finished products?
6. What importance do technology education teachers place upon the concept of authentic assessment?
7. How frequently do technology education teachers use student portfolios to evaluate long-term progress?
8. Is there a difference in assessment practices between technology education teachers that have graduated from the University of Wisconsin-Stout, versus those that graduated from other educational institutions?

Justification for the Study

How students are assessed is of concern to a wide range of people. Many students and parents want to know how current assessments relate to Wisconsin's Model Academic Standards. These academic standards are statements of what students should know and be able to demonstrate at a given time in their educational process (http://www.dpi.state.wi.us/dpi/oea/hsgtq&a.html). State law currently stipulates that beginning in the 2002-03 school year, no school district can grant a diploma to any student who does not pass a high school graduation test. Local school districts have the option of either adopting the State graduation standards, or they may establish their own local graduation standards, and to track their students progress towards the attainment of those standards. Testing will be in the subject areas of English language arts, mathematics, science, and social studies. Properly designed assessment instruments need to correlate very highly with the goals contained in whichever set of standards the local school board adopts.

Elected officials are also asking educators to set high standards to insure our students remain competitive and capable of competing on an international basis. Classroom instruction needs to provide students with the opportunity to learn and attain the knowledge and skills that are needed in our information based society.

The business community is also interested because assessments serve to verify claimed knowledge or competence, or to appraise readiness to master the training needed in order to perform specific job tasks. Entrepreneurs and business managers view assessments as a critical element in improving the match between the worker and a prospective job. If American corporate enterprises are to remain competitive on an

international basis, it is critical that our schools provide them with a continuous supply of technologically literate entry-level workers.

Taxpayers within the State of Wisconsin also have a vested interest in assessments because they are paying the State's education bill. The State of Wisconsin's general budget for fiscal year 2001 projects expenditures for General and Categorical School Aids will total $4.35 billion. This represents 39.4% of the total projected $11.04 billion State budget (State of Wisconsin Budget in Brief, 1999). Taxpayers want and need to see tangible results from all of their monetary investments. Education is one of the most sensitive areas of the budget due to the shear size of the monetary investment.

Limitations of the Study

1. According to the Wisconsin D.P.I. there were 1316 active technology education teachers employed by a Wisconsin school districts as of September 1999. Each of these teachers had D.P.I.'s technology education subject code 220 listed on their State of Wisconsin teacher's license, or were teaching under a provisional license while completing a certification program. The only people asked to complete the survey instrument used within this study were technology education teachers currently employed by a Wisconsin school district for the 1999-2000 school year. Therefore, the survey results are only intended to reflect assessment techniques used within Wisconsin technology education courses during the 1999-2000 school year. The conclusions should not be applied to any other disciplines, or to technology education courses outside of the State of Wisconsin.

2. Secondly, only 85 actively employed technology education teachers completed the survey. This is 6.5% of the 1316 employed technology education teachers within the State of Wisconsin. All survey instruments are unreliable to some degree, and those surveys with a small number of responses are subject to a greater probability of chance errors (Fowler, 1993).
3. Lastly, the Hawthorne Effect is another limitation to be considered. The Hawthorne effect is named after a study performed in the 1930's in Hawthorne Illinois in which it was discovered that the act of merely studying behaviors could impact and alter the behavior being studied. The Hawthorne effect in clinical trials is sometimes associated with the placebo effect (IQToolkit™ Glossary).

Methodology

The methodology used was a one page long cross sectional survey. The wording within the survey questions was carefully selected to insure the validity and reliability of the instrument. Each survey item addressed only one specific issue, and the instrument supplied the participant with a predetermined set of possible responses. The actual survey instrument is reprinted in Appendix "A" for your review.

The survey was distributed to employed technology education teachers in attendance at the 31'ST Annual Spring Conference and Trade Show of the Wisconsin Technology Education Association (WTEA). The WTEA is a professional association whose goal is to be an advocate and recognized leader for technology education (www.wtea-wis.org). The annual conference was held March 30– 31, 2000 at the Chula Vista Resort in the Wisconsin Dells.

Chapter II - Review of Literature

Introduction

The problem that this research will address is a perceived shortage of information regarding how technology education teachers are assessing their students. However, the educational process is very dynamic. This review of literature takes into consideration the earlier mentioned three-way multidirectional interaction between educational standards and objectives, curriculum and learning objectives, and assessment tools and evaluation procedures. Educational taxonomies are the first topic to be discussed within this review of literature. Educational taxonomies contribute to assessment efforts by categorizing and simplifying educational objectives. In a very broad context these taxonomies list the changes that we hope will be occurring within our students. Assessment tools then attempt to measure if those changes have occurred. After the review of what is being assessed, this review of literature will discuss the various purposes and functions that assessments serve within the classroom. Placement, formative, and summative assessments are all discussed. This section answers the question of "when and why" assessments occur. The last section of this review of literature will discuss "how to" assess students. It will examine specific categories of assessment tools. Assessments will be categorized as either oral, written, or performance based. Furthermore, the roles of true false, multiple choice, matching, short answer, and essay questions will be analyzed. Each type of assessment has its place within the education of our student population. There is no one single correct assessment technique because both objectives and the population of students are both so tremendously diverse.

Domains of Learning

Dr. Benjamin Bloom, and other education professionals in the 1950's developed a taxonomy, or classification system for educational objectives that is still relevant today (Woolfolk, 1993). Dr. Bloom and his colleagues identified three major areas in which learning occurs. These three distinct fields of learning have been named the cognitive domain, the affective domain, and the psychomotor domain. Each of the three domains was further divided into levels of learning that go from the simple to the complex (Bott, 1996). While the model portrays a hierarchical pattern to learning, Bloom and colleagues understood that learning is does not always follow a linear path. Learning is an ongoing process during which students are continually receiving information, interpreting that information, connecting it to what they already know and have experienced, and reorganizing and revising their internal conceptions of the world (Herman, Aschbacher, & Winters, 1992). Taxonomies are relevant to this research document because educators have found that specific assessment techniques have higher success rates than others depending on which knowledge domain is being assessed. Even within specific knowledge domains there is a need to use multiple assessment techniques.

The Cognitive Domain

The cognitive domain encompasses memory and reasoning skills. When ranked according to "degree of challenge" the six objectives within the cognitive domain include knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, Hastings, & Madaus, 1971). Knowledge according to Bloom, Hastings, and Madaus was merely recalling factual information. In this relatively narrow context, a student who

knows a fact may not yet understand the relevance of the information, or how to apply it in everyday life. Asking a student to define or name the parts of a camera or other similar facts would be one way for a technology education teacher to ascertain if the student had acquired knowledge (Bott, 1995). Comprehension is the second objective within the cognitive domain. Students comprehend material when they understand the material, and can restate the material into their own words. Application is the third objective within Bloom's taxonomy. It means that the student can use the learned material. Application of knowledge is when a student solves a problem by inserting appropriate values into a general rule or concept. For example, a student might insert voltage and resistance values into Ohm's Law to calculate the current flowing though an electrical circuit. The fourth objective within the cognitive domain is analysis. This means that the student is able to break material into its component parts. When students analyze material they attempt to recognize unstated assumptions, and distinguish between facts and inferences. Teachers frequently assess students' analytical skills by asking them to compare technologies, or debate issues. The fifth level of the cognitive domain is synthesis. Synthesis is when the student can take a new or different idea and combine them together to create something new. One example of how a technology education teacher could check if the student has synthesized the material in a residential construction course would be to ask the student to design a residential house. This would require combining or synthesizing ideas on material selection, construction techniques, building codes, and traffic flow into one finished product. The highest level of the cognitive domain is evaluation. Evaluation occurs when the student is able to judge the

value of the materials or concepts learned. Asking the student to select the best design, or rating various designs, would exemplify the evaluation process.

Bloom's taxonomy of objectives is helpful in planning student assessments. This is because some assessment procedures are simply more efficient than others in measuring student learning both within and across various knowledge domains. Written and oral tests are effective in assessing student learning within the cognitive domain (Bott, 1996). Written tests are used more frequently because the instructor can test an entire class simultaneously, whereas oral testing takes more of the instructor's time. There is evidence to suggest that knowledge, comprehension, application and analysis objectives can be measured with true-false, short-answer, matching, or multiple-choice tests questions (Woolfolk, 1993). Essay tests are an option for testing the middle levels of the cognitive domains, but must be used when measuring synthesis and evaluation objectives.

The Psychomotor Domain

The second broad area of learning is referred to as the psychomotor domain. One way to conceptualize the psychomotor domain is to think of it as voluntary muscle capabilities that require endurance, strength, flexibility, agility or speed (Kubiszyn & Borich, 2000). The psychomotor domain also relates to the student's ability to perform specific tasks. Psychomotor activities are thus physical movements that range from reflex actions to elaborate skilled motions. The psychomotor domain can be segmented into four skill levels. These four levels of skill are referred to as observation, imitation, practice, and adaptation (Bott, 1996). Observation being the lowest level merely requires that the

students watch or observe the teacher's actions. For example, a technology education teacher might ask the student to observe while molten aluminum is poured into a mold. Imitation is the second level of the psychomotor domain. Imitation occurs within the technology education classroom when the instructor demonstrates the correct procedure to perform a task, and then asks the student to replicate the operation. Following a written list of instructions on how to cut a piece of steel with an oxyacetylene torch can also be considered a form of imitation because you are retracing the actions of a more experienced person. Practice is the third level within the psychomotor domain. Practice is similar to imitation, but implies working with less supervision. Technology students might be asked to practice their shielded metal arc welding. The highest level of the psychomotor domain is that of adaptation. Adaptation occurs when the student can take learned skills, and apply them to new or novel situations. For example, a mechanical design student who has successfully used various computer software packages should be able to adapt when the lab installs a new or updated program.

Technology instructors need to be concerned with psychomotor assessment strategies because many of the laboratory objectives within technology education curriculums are related to physical movements. These physical movements range from directing a computer by manipulating a computer keyboard or mouse, to altering the appearance of a piece of wood by running it through a table saw or planer. While the technology education curriculum is not specifically to prepare the student for future employment opportunities within craft industries, the curriculum does acknowledge the importance of well-developed hand and eye coordination.

Testing within the psychomotor domain relies heavily upon establishing performance objectives as defined in the introduction to this research review. Vocational, technical, and physical education teachers have tested within the psychomotor domain for decades, but it is only recently that other disciplines have begun to realize the potential benefit to these psychomotor assessments (Woolfolk, 1993). Momentarily, this review of literature will expand upon how checklists and rating scales are used along with performance objectives to improve assessments within the psychomotor domain.

While psychomotor objectives on the surface indicate mere manipulative behaviors, they also include behaviors from the cognitive and affective domains. For example, the manufacturing of a wooden furniture piece might require the student to design and the select the wood stock for use in their design. Both the design and material selection process requires that the student use cognitive thinking skills. The shaping, smoothing, and finishing of the individual pieces can only be accomplished with a degree of craftsmanship that relies heavily upon the affective domain.

The Affective Domain

The last domain of learning to be discussed within this research document is referred to as the affective domain. The affective domain pertains to attitudes, feelings, values and emotions. As with the cognitive and psychomotor domains there is again a ranking of objectives. This ranking begins with the student having only a mild commitment to a belief, and concludes with being extremely committed. In order of commitment the five basic objectives within the affective domain were categorized as receiving, responding, valuing, organizing, and characterization (Bloom, Hastings & Madaus, 1971). By being

aware of, or paying attention to something in the environment, a person is receiving a message. Think of the many times every day that a student is aware of some message coming across the schools public address system. At the second level within the affective domain a person might respond, or participate in the environmental activity. Tapping out the beat as you listen to a song, or clapping at the conclusion of the schools theatrical performance would be examples of responding. Valuing is the middle level of the affective domain. When a person values something they show a commitment or involvement with the activity or belief. Students show they value activities whenever they attend extracurricular activities outside of the routine 8:00 AM – 3:00 PM school day. Organization is the next layer to last layer within the affective domain. Organization means the student has integrated a belief into their general set of values. Educational psychologists suggest that teachers can observe which values are high on the student's internal organization by monitoring which receive long-term commitments. The highest level of the affective domain is characterization. Characterization occurs when the person adopts and behaves in accordance to a long-term philosophy or value system.

Assessing student values, feelings, and emotions is more challenging than measuring their cognitive or psychomotor capabilities. Some students consider their feelings and values to be private, and outside the proper realm of the classroom. This explains why it is extremely difficult to directly assess students for affective learning by means of a written or oral examination. Accurate affective domain assessments can only occur when the teacher acknowledges student privacy concerns when writing unit objectives. Some professionals advocate writing these objectives in terms of observable behaviors (Bott,

1996). Student behaviors and actions are then used to indirectly assess their feelings and attitudes. For example, a student who routinely ignores requests to use safety guards while operating power equipment is clearly exhibiting a negative attitude towards safety. Conversely a student who routinely shows up for class on time, and helps with clean-up task is displaying a positive attitude towards both punctuality and responsibility.

Educational Taxonomies and Assessment Methodologies

Two general comments should be made about the relationship between educational taxonomies and assessment methodologies. First, most educators view knowledge domain objectives as a hierarchy with each skill building upon those below it. Conceptualizing the objectives as a hierarchy is helpful even though close scrutiny would find a few exceptions to the general rule (Woolfolk, 1993). Because educators think of objectives as a hierarchy, it is common to hear and read references to lower-level and higher-level objectives. In reality the higher-level tasks may not be more difficult for the student to accomplish. Rather the objective may only require that the student possess a greater understanding of the subject material. A benefit of the hierarchical conceptualization is that it helps to explain why there are different assessment strategies for the various levels within the knowledge domains.

The second comment that must be made is that educational taxonomies were an attempt to simplify educational objectives. While that is a worthy goal, it is equally important to recognize the complexity of human behaviors. Student behaviors rarely can be isolated into only one of the knowledge domains. In contrast, behaviors frequently cross over into all three or the knowledge domains simultaneously. For example, a social

studies student answering an essay question on the holocaust of World War II would draw from all three learning domains. The student is remembering and analyzing facts from the cognitive domain. The act of writing out the answer is a simple psychomotor task, and it is extremely likely that the student would experience some emotional response from the affective domain. Likewise, a technology education student engaged in laboratory tasks will frequently engage all learning domains simultaneously.

When and Why Assessments Occur

Assessment procedures and tests can be categorized according to the function that they serve within the classroom. Chronologically, the first assessment that the student would encounter would be referred to as a placement assessment. Placement assessments are made prior to any instruction, and serve to verify that the students have the prerequisite skills to succeed in reaching the stated goals (Linn & Gronlund, 2000). Only after the instructor acquires a sense for what the students currently know can general course goals get translated into actual classroom lessons and learning activities.

Formative assessments are conducted while the learning activities are going on. They monitor and guide the learning process and are intended to improve the learning process (Airasian, 1994). Informal formative assessments occur continuously as the teacher makes minute-by-minute decisions about how to proceed with any ongoing lesson. Experienced teachers are constantly examining student facial expressions, body language, and general classroom interaction as a guide to whether students are engaged by the lesson. While somewhat unusual, formative assessments in the form of quizzes, worksheets, and assignments can be recorded for future evaluation purposes. Formative

assessments benefit both the students and the teacher. Feedback to the student includes positive reinforcement for mastering unit objectives, or identification of those areas that need further study and practice. Feedback to the teacher helps to determine if additional time is needed prior too moving on to new objectives. If the role of the teacher is that of mentor, students should be able to convince instructors to radically adjust their lessons and learning activities under the guise of formative assessment.

There may be times when obstacles to the learning process cannot be overcome by routine formative assessments. When a student repeatedly fails in their attempt to master a subject, it may be necessary to do a diagnostic assessment. These diagnostic assessments search for the underlying causes to learning problems. They may be quite detailed and employ the services of trained educational and medical associates. Diagnostic assessments frequently result in the student receiving additional support services as authorized by the Individuals with Disabilities Education Act. Additional student support services are prescribed and outlined an Individualized Education Plan (IEP) for the student (Linn & Gronlund, 2000).

At the end of any instructional unit or course there needs to be a summative assessment to determine if the student has achieved the prescribed instructional goals and objectives. These assessments are frequently in the form of formal tests, projects, or term papers. Typically the results are in writing, and do get factored into the teacher's evaluation of student's progress for that lesson. Remember that the assessment is the tool or procedure used for determining student learning. The evaluation process then interprets the results of the assessment and provides the official interpretation of the results to the individual student, and their legal guardian (Airasian, 1994).

Categories of Cognitive Tests

There are three broad categories of tests used by teachers to assess students (Wolansky, 1985). These three broad categories are written tests, performance tests, and oral tests. All tests have unique characteristics by which their usefulness can be judged. Several of these characteristics include reliability, validity, objectivity, and efficiency. Tests are reliable when they give consistent measurement results over the course of several repeated applications, and they are valid when the test actually measures what it claims to be measuring (Farr & Trumbull, 1997). Objectivity is the opposite of subjectivity. A test is subjective if test responses are vulnerable to the scorer's personal biases and prejudices. Objective test results do not depend on the mood, identity, or personal judgement of the scorer. Increasing test objectivity has a very favorable impact upon the validity of the test (Hopkins, 1998). Test efficiency is also a consideration because time spent taking tests allows less time for other new learning experiences. Reliability, validity, objectivity, and efficiency are all desirable test characteristics that educational professionals need to keep in mind as they construct their tests. However, as you will shortly see, improvements in one test attribute are frequently made only at the expense of other desirable attributes.

Written tests include true or false questions, multiple choice questions, matching items, short answer, and essay questions. True-false tests present the student with a statement and ask the student to state if it is true or false. True and false questions are extremely objective and efficient, but not a very reliable indicator of student progress because you can guess the correct answer 50% of the time. Some teachers have

attempted to increase the reliability of the true-false question by adding an "explain" column in which the student has to justify their answer (Davis, 1993).

Multiple choice test items present the test taker with a stem statement that either contains a question, or an incomplete statement. The student is then required to select an answer from a list of four or five possible answers (Popham, 2000). The major advantage to using correctly designed multiple-choice questions is that they are capable of measuring the entire spectrum of the cognitive domain. Multiple-choice tests are efficient because many questions can be answered and scored quickly. They are also objective because there is only one correct response. Negative aspects regarding multiple choice questions include being somewhat unreliable in determining student comprehension because of a high probability of guessing the correct answer, and being of little value in assessing within the psychomotor and affective domains.

Matching test items present the student with two lists of words that need to be matched together. The list of words that require a match is called the premises, and the list from which selections are to be made are called the responses. Matching is efficient, objective, and somewhat reliable if you include more responses than there are stimuli. The greatest problems with the use of matching is that it can promote a students memorization of low-level factual information at the expense of higher level thinking skills, and that its use is restricted to a fairly short list of associated words (Popham, 2000).

Historically, true false, multiple choice, and matching questions have been associated with standardized written tests. These standardized tests consist of identical questions that have been given to large groups of students. With standardized tests, all students

receive the same instructions, and have the same time restrictions. Standardized achievement tests focus on general skills that are valued across many school districts. Because they are given to large groups at one time they tend to be easy to administer, cost-effective, and easy to score with electromechanical scoring devices. Standardized tests are also sometimes referred to as "norm referenced" tests because the results can be used to determine how well any particular student did in comparison to all other test takers. However, standardized tests have been criticized for emphasizing factual information at the expense of problem solving and critical thinking skills. Furthermore, educators are now aware that many traditional norm referenced tests have contained significant cultural and economic biases (Popham, 2000). This test bias was unintentionally introduced into the test because white middle-class professionals wrote the questions, and normed on the results obtained by white middle class students. Many test items common to the experiences shared by white middle class students were quite foreign to member of other ethnic, racial, geographical, economic groups.

Written tests can also include short answer items that either takes the form an incomplete sentence or a question. How to correctly finish the incomplete sentence, or how to answer the question asked, must be retrieved from memory or deduced by the test taker. This is more challenging than merely picking the correct answer from a list of suggested answers. Requiring the test taker to supply the answer greatly improves test reliability. The improvement in test reliability is because the chance of guessing the correct answer is much lower than when the student is presented with a list of possible answers.

Short answer test questions can also be designed to be extremely objective. This is accomplished by wording them so they can be correctly answered with only a single word, number, or phrase answer. When short answer questions require that the student provide a more lengthy response, a degree of grader subjectivity may be introduced. Short answer test questions are easier to write than multiple-choice questions, but take a longer time to score (Hopkins, 1998).

Multiple-choice, and short answer questions that require only one word to answer are used when the instructor desires to assess a student's mastery of specific knowledge or details. A review of educational literature suggests that tests have relied too heavily upon the student's mere recall of factual information (Davis, 1993). Many educators are claiming it is much more beneficial to assess students at higher taxonomy levels. This is because assessing at higher levels correlates better with the broader educational objectives set forth in course goals, and district wide standards (Hopkins, 1998). A second criticism of using test questions that have only one rigidly defined correct answer is that the student cannot do anything to dispute or redefine the question (Rowntree, 1987). There is no way for the student to explain or justify why an alternative answer was chosen.

To test beyond the mere recall of factual information, and begin to assess the higher levels of the cognitive domain, educators can use essay questions. Essay questions are effective in determining the student's ability to organize, integrate, analyze, and evaluate concepts and issues (Wolansky, 1985). The challenge to using essay questions is that they require sensitive and thoughtful judgements on behalf of the scorer. Using untrained clerks or electromechanical devices to score essay questions is not a viable option. Even

when trained scorers are employed, caution must be exercised to insure that subjectivity and bias do not seriously impact the reliability of the assessment (Hopkins, 1998). Essay tests may also have validity problems because there are frequently only a few questions asked per test (Davis, 1993).

Performance Assessment

The second major category of assessments can be described as being performance based. Performance assessments require students to actively accomplish complex and significant tasks, while bringing to bear prior knowledge, recent learning, and relevant skills to solve realistic or authentic problems (Herman, Aschbacher, & Winters, 1992). More simply stated, the teacher is checking to see if the student can perform a task. Performance tests can assess how well the student has successfully learned to execute the procedures, or it can assess learning indirectly by examining critical characteristics of the finished product (Wolansky, 1985). Whether assessing the product or the process, the performance test is based upon clearly defined objectives. Correctly designed performance objectives have three components. First, it must identify what the learner needs to do in behavioral terms. This behavioral performance, or the results of the performance, needs to be available for the instructor to observe. Secondly, the performance objective must also describe the relevant conditions under which the performance will occur. Lastly, the objective must tell the student what constitutes an acceptable performance (Bott, 1995). The drawback to using the performance-based evaluations is that they are more difficult to develop, costly, and subject to bias on behalf

of the scorer (Hopkins, 1998). Extensive training is required for valid administration and scoring, and typically only one person or product can be tested at a time.

Technology education teachers frequently write performance objectives in what is referred to as a checklist**.** While observing the student's performance the instructor observes whether the performance meets the defined performance criterion. If it does a checkmark is placed next to that criterion, and if the behavior was not present the checkmark is omitted. Technology education instructors also use checklists in assessing whether physical features are present within the products students have completed in their lab sessions. Checklists are popular because they can be used with multiple students or with the same student over time to gage the student's individual progress. The disadvantage of the checklist is that there are only two choices for scoring. An action or feature is either present or not. There is no middle or intermediate scoring possible. (Airasian, 1994).

To overcome the rigidity found in checklist based assessments many technology education instructors introduced rating scales into their assessment procedures. Rating scales have student behaviors or characteristics of the finished product, and some type of scale for indicating the degree to which each attribute is present (Linn & Gronlund, 2000). The scales used can be either numerical or descriptive. If numerical the scale begins with zero on the low side, and progresses up to five or ten on the high side. Descriptive rating scales substitute performance related phrases in place of the numbers as an aid to the technology education instructor in evaluating a student's work. For example, a descriptive scale for use on a welding test might appear as shown in Figure 2.

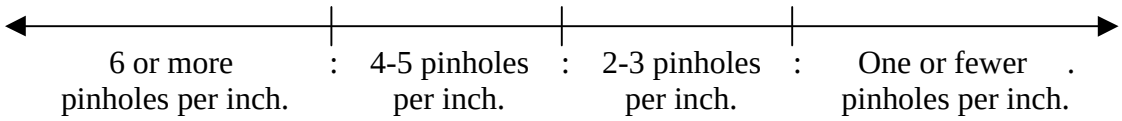

Figure 2. A Sample Descriptive Rating Scale for use on a Welding Test.

Rating scales provide the technology education instructor with more scoring flexibility than does the standard checklist.

Oral Assessments

Until the advent of inexpensive paper and pencils in the mid-nineteenth century, oral testing was standard within American schools. Oral testing has always been very effective in assessing within the cognitive and affective domains, and was used in every subject except writing. A practical benefit to continuing the practice of oral questioning comes from the today job market. Job interviews are frequently nothing more than an oral test to gauge the applicant's cognitive and affective characteristics. Contemporary educators do not use oral testing much outside of foreign language classes, and defending doctoral dissertations. Oral questioning has fallen from favor because they are inefficient since only one student can respond at a time, and difficult to assess objectively unless the scorer uses a tape recorder (Hopkins, 1998). Oral testing has been replaced with written essay tests because the written test is more efficient as all students respond to the same questions simultaneously.

Other Assessments

It is difficult to assess student psychomotor and affective development using written assessment instruments. Over the past few years there has been a growing interest in developing alternative assessment instruments where students not only complete or demonstrate desired behaviors, but also accomplish them in a real life context (Baron and Boschee, 1995). Some of these performance-based tools were given the name "authentic" because the instructional methods and assessments are designed to present tasks that are worthwhile, significant and meaningful. One of the underlying premises of authentic instruction and assessment is that students are able to learn new materials more rapidly, and will retain the knowledge longer, if the student is an active participant and can apply what they are learning. In other words there is substantially less emphasis on objective questions, and tests that can be answered by mere memorization of textbook facts.

The portfolio is an example of an authentic assessment tool that has gained acceptance within the field of technology education as an alternative to paper and pencil tests. Introduced in the early 1980's portfolios are collections of a student's work that attempt to illustrate the student's intellectual growth over time. Student portfolios consist of homework assignments, artwork, and individual projects that can be used by educators to assess the strengths and needs of their individual students. Portfolios are unique in that they focus on the student's strengths potential, and not on the deficiencies typically identified through traditional testing (Gredler, 1999). Some technology education instructors find the portfolio a useful tool because it encourages the student to accept responsibility for learning, and emphasizes education as a process or journey.

Assessments Within Technology Education

The focus of this research document is to determine how technology education teachers are assessing their students. This review of literature began by discussing how educational taxonomies categorize and simplify educational objectives. The purpose of discussing the taxonomy was to examine in broad terms what educators assess for. In fact, it was stated that knowledge and intellectual growth was not something that could even be directly assessed. Educators are forced to rely upon the students' performance on assignments and tests as "indirect" measurements regarding improvements in both skill and knowledge.

Several pages were also dedicated to the various functions that assessments perform within the school environment. In general those pages answered the questions of why teachers assess students, and when that assessment occurred. One of the main conclusions resulting from that review was that there is no single ideal or correct assessment technique. Certainly, individual students are unique and bring into the classroom different genetic capabilities, life experiences, and personal goals. One could predict that the professional technology education instructor would use many different assessment tools to accurately determine the degree of new knowledge that was acquired by each individual student.

Testing and Assessment in Occupational and Technical Education (1995), authored by Paul Bott, gives the reader some excellent insights on how technology education teachers are assessing students at the national level. Here are a few of his major conclusions. First, expect technology education teachers to extensively use performance-based objectives. Manual training schools, industrial arts programs, and contemporary

technology education courses all have rich histories of using performance objectives because of the extensive integration of labs and projects within their curriculum. Secondly, that technology education teachers will be less interested in norm referenced evaluation schemes. This is because the aforementioned performance-based assessments require that all students achieve some minimal level of competence prior too moving on to the next goal. Performance assessments assume that all students can and will "pass" the assessments, whereas norm referencing and standardized assessments require that some students fail. Thirdly, while both written and oral tests are equally effective in assessing learning within the cognitive domain, technology education teachers rely more upon written tests than oral ones. This is because with a written test the instructor can test an entire class simultaneously, whereas oral testing must be done individually and takes more of the instructor's time. This is purely an efficiency consideration. Fourthly, that checklists and rating scales will be extensively used as measurement tools while assessing within the psychomotor domain. Checklists and rating scales are desirable as they require the instructor to define grading criteria. These criteria can then be shared with the students at the start of a unit of study. Lastly, Bott asserts that technology education teachers will look with favor upon and extensively use the concept of authentic assessment. Assessments will be conducted under conditions that closely approximate real life situations.

Chapter III - Methods and Procedures

This research document is quantitative in nature. It is quantitative because it attempts to describe in mathematical terms the prevalence of specific assessment related activities currently being practiced by technology education teachers within the State of Wisconsin. The methods and procedures utilized within this study are explained in this chapter under the general headings of (1) method of study, (2) sample selection, (3) instrumentation, (4) procedures followed, and (5) method of analysis.

Research Design

Reviewing a multitude of published works on the subject of assessment in technology education was critical to the design of this research project. By reading through a sampling of both historical and contemporary publications it was possible to identify the major issues surrounding the assessment of our students. A very brief summary of those issues would include the following. First, that state legislators believe that teachers need to incorporate academic standards into their curriculums. Lawmakers have passed legislation that stipulates that beginning with the 2002-2003 school year, no school district can grant a diploma to any student who does not pass competency test upon completion of their high school education. Secondly, assessments can be categorized as being either written, oral, or performance based. The literature advises that no single assessment method will work in every situation, but rather the literature suggests a combination of techniques is needed to accurately assess student progress.

Thirdly, test questions that required the student to compose responses, in contrast to selecting an answer from a list, were better at engaging students in higher order cognitive, affective, and psychomotor activities. Lastly, by using objective assessments students are assured that favoritism and prejudices are not influencing assessment scores. This research was designed to address these issues.

Professional researchers categorize quantitative studies as descriptive, correlation, or comparative. This research is a descriptive study because it looked at, or attempted to describe, the features and behaviors of one population or group of people. The group being described is technology education teachers within the State of Wisconsin. There was no desire to correlate or compare technology education teachers against any other group of teachers.

Descriptive studies can either be made by direct observation of the target population, or by administering a survey instrument to a sample of the population. Both methods have a lengthy and successful history, but the technique chosen for this research was the survey. There were two primary reasons for using the survey instead of direct observation. First, the survey was more efficient from both a time and monetary perspective. A representative sample group was available at one location over a span of only two days. Direct observation would have required driving to many different locations, and taken significantly more days to complete. Secondly, was the belief that the study could be more accurately replicated if the population was asked to respond to a series of written survey questions. Duplicating studies that entail direct observation are difficult because the results are always greatly impacted by the amount of training the observer has received. The survey was therefore chosen as being easier to replicate. It is

entirely possible that another researcher may be able to use the results as reference data for some future longitudinal study.

Sample Selection

Surveys are administered to a representative sample or subgroup of some larger population. The researcher typically studies the sample population with the intention of generalizing the findings to the entire population. For this research The Wisconsin Department of Public Instruction provided a computerized database that indicated that there were 1316 active technology education teachers employed by Wisconsin school districts as of September 1999. These 1316 teachers are the entire population for this research. Each of these teachers had DPI's technology education subject code 220 listed on their State of Wisconsin teachers' license, or were teaching under a provisional license while completing a certification program.

The sample group for this research was those technology education teachers in attendance at the 31'ST Annual Spring Conference and Trade Show of the Wisconsin Technology Education Association (WTEA). This conference was held at the Chula Vista Resort in the Wisconsin Dells on March 30-31, 2000. Students, school administrators, commercial representatives and other non-teaching conference attendees were not allowed to participate in this survey. There were two distinct advantages to selecting the technology education teachers in attendance at WTEA conference as the sample population for this study. First, the teachers in attendance did represent a cross section of the larger population. Technology education teachers were in attendance from all geographic areas of the state. There were teachers from northern, southern, eastern,

and western districts in attendance. Furthermore, there were teachers from rural and urban districts. Secondly, the teachers in attendance had wide-ranging experience levels. There were first year teachers in attendance as well as veterans with forty years of experience.

The "central limits theorem" is a mathematical law that states that a sampling of a larger population begins to distribute in a representative curve after sixty samples (Wagner, 1992). Over the course of the two-day WTEA conference a total of 85 actively employed technology education teachers were randomly identified and asked to complete the survey. Everyone that was asked to fill out the survey acquiesced. This random sample of 85 respondents represents 6.5% of the total 1316 employed technology education teachers within the State of Wisconsin.

Instrumentation

The survey instrument used in this research was individually constructed by the researcher to determine what assessment tools and procedures were used within technology education classrooms this past school year. A copy of the actual survey instrument used can be found in the Appendix A. The survey instrument was developed to answer the eight research questions listed in the introduction to this research document. At this would be appropriate here to briefly discuss the rational for each survey question in the context of the eight general research questions listed in the introductory chapter.

- Survey question one asked the respondent about their educational background. This survey item will be used to answer the last of the research questions listed in the introductory chapter. The survey responses would be statistically analyzed to

determine if there was a difference in the assessment practices between technology education teachers that received their education at the University of Wisconsin – Stout, versus those that graduated from other academic institutions.

- Survey question two asked the respondent what grade levels they normally instructed. This question was included for two reasons. First, it served as verification that all survey respondents were indeed currently teaching technology education classes within the State of Wisconsin. Secondly, it further defined who was included within the sample group.
- Survey question three asked respondents how frequently they considered academic standards in developing curricular activities and subsequent assessments. This question was the very first research question itemized within the introductory chapter. It is important because the State of Wisconsin has mandated that school districts administer standards based examinations beginning in the 2002-03 school year prior to the granting of high school diplomas. This question will gauge how much support there is for academic standards among technology education teachers.
- Survey question four asked the respondents to categorize all assessments administered over the past year as either oral, written, or performance based. This survey question directly asks the respondents the second research question as listed within the introductory chapter. The rational for asking the question was that the review of literature stated that oral testing is rarely used because it is relatively time consuming and subjective. Conversely, performance testing was

thought to be in common use within the technology education classroom because of extensive integration of laboratory-based projects. This question should clarify these expectations and perceptions. Additionally, the results may prove of interest in determining whether the location of the respondent's academic training, has an impact on the types of assessments used.

- Survey question five asks the respondent to examine all written tests administered over the past academic year and to estimate how the proportions of true-false, multiple choice, matching, short answer, and essay question. This question is a restatement of the third research question listed in the introductory chapter. The review of literature states that if teachers want students to engage higher order cognitive skills, some educational psychologists advocate using written test questions that require the student to compose, rather than select an answer from a predetermined list of answers (Woolfolk, 1993). However, by using the open-ended short answer and essay questions, the teacher loose some test objectivity. The purpose of this question is to find out how technology education teachers are managing this trade-off between objectivity and creativity. Additionally, the responses to this question may allow for further statistical analysis to ascertain if the location of the respondent's academic training has an impact on the types of assessments used.
- Survey question six follows up on the previous question by asking the respondent how objective they perceive their assessment items to be. This question is the fourth research question listed in the introductory chapter. As with the previous

question, the responses will indicate how technology education teachers are managing this trade-off between objectivity and creativity.

- Questions seven and eight can be discussed together. Question seven asks how frequently checklists are used, and question eight asks how frequently rating scales are used. These questions restate and will be used to answer the fifth research question found in the introductory chapter. The review of literature states that checklists and rating scales were frequently used in Manual Training and Industrial Arts classes because of the extensive integration of laboratories. It is predicted that checklists and rating scales are similarly used in technology education classrooms while evaluating projects and student psychomotor skills (Wolansky1985). These two questions will quantify the degree to which these assessment tools are used.

- Survey question nine asks the respondent what percentage of assessments they consider to be authentic. It answers the sixth research question found in the introductory chapter. The question is designed to determine the importance that technology education teachers place upon performing tasks in a real life context.

- The last question on the survey asks how frequently the respondent uses the portfolio as an assessment tool. This was the seventh research question listed in the introductory chapter. This question also allows for further statistical analysis to ascertain if the location of the respondent's academic training has an impact on the types of assessments used.

There is an inverse relationship between survey length and response rate. With that in mind the survey instrument was limited to one page in length. To improve the post survey statistical analysis each question presented the respondent with a limited number of responses.

Pilot Study

A rough draft of the survey instrument was submitted to three Baraboo High School technology education teachers as a pilot test. There were three objectives to conducting the pilot study. First, it was imperative that the respondents had a clear understanding of what was being asked. In other words, were the instructions clearly stated, and adequate definitions provided. Secondly, these three teachers were asked to time how long it took them to take the survey. The length of time required to complete a survey is directly related to the survey response rate. It was hoped that the ten questions could be answered in less than five minutes. Thirdly, the pilot would allow general comments and suggestions for improvements prior to duplicating large quantities of the finished survey.

The pilot testing of the survey instrument yielded three results. First, the three technology education teachers that completed the pilot study all agreed that they considered the survey questions to be clearly stated, that the terms were clearly defined, and no changes were needed to the questions themselves. Secondly, the fastest respondent completed the survey in three minutes while the slowest took five minutes to answer all ten questions. A statement would be added to the general instructions indicating that most respondents complete the survey in less than five minutes. The third result was that another category of answers was added to the first survey question.

Technology education teachers could check a “both” box if they had undergraduate or graduate degrees from both UW-Stout and another university.

Procedures Followed

The general directions for taking the survey and a “Human Resources Consent Form” were typed up onto one sheet of paper. This document was used as a cover sheet for the survey instrument. A copy of this cover sheet can be found in Appendix B. The cover sheet, survey instrument, and formal request to distribute the survey at the WTEA Spring Conference were e-mailed to Executive Director Joseph Ciontea, and Conference Coordinator Jeff Dowd. Approval to distribute the assessment survey at their 31’st annual WTEA Spring Conference and Trade Show being held March 30 – 31, 2000 came in the form of a phone call from Conference Coordinator Jeff Dowd.

When conference attendees checked in with the WTEA upon arrival at the Chula Vista Resort, they were given a nametag. Since the nametag included the attendee’s job title and/or place of employment, it was relatively easy to distinguish between vendors, administrators, and teachers. As attendees entered and exited the central vendor display area it was possible to verify that the person was actively teaching, and to ask if they would complete a ten-question survey that required 5 minutes of their time. In total 85 conference attendees were asked to take the survey. All 85 agreed to participate.

Data Analysis

The University of Wisconsin – Stout employs a full time research associate to aid graduate student with the statistical analysis of data being used for their research project.

The 85 surveys were therefore sent to the UW – Stout Information and Operations Systems center for analysis. The primary focus of each statistical analysis was to find a middle number, or a "central tendency", that could be used to represent the results to each survey question. Loosely defined, the "central tendency" of a set of numbers is the tendency of the data to cluster around certain numerical values (Wagner, 1992).

Chapter IV - Results and Discussion

It was stated in the chapter on methods and procedures that this research is quantitative because it would describe in mathematical terms the prevalence of specific assessment related activities currently being used by technology education teachers in the State of Wisconsin. This analysis of the survey results does assume a basic comprehension of descriptive statistics. Terms such as algebraic mean, percentage, frequency and standard deviation are not defined. Many results are summarized in a tabular format.

A Profile of Respondents

The first two questions of the survey instrument were included to establish a profile of who had taken the survey. The analysis of the completed surveys revealed 58 respondents, or 68.2 % of the total, received their undergraduate degree from the UW – Stout. The remaining 27 respondents or 31.8% had undergraduate degrees from other universities. This statistical breakdown is represented in Table 1.

Table 1

Respondents Undergraduate Degree

Undergraduate Degree From	Number	Percent
University of Wisconsin - Stout	58	68.2
Other University	27	31.8
Total Respondents	85	100.0

Further analysis of the responses to the first survey question also indicates that forty-one respondents, or 48.2% or the 85 respondents, had not yet completed a graduate degree. A total of 44 respondents or 51.8 % of the 85 respondents had completed a graduate degree program. Twenty-five respondents reported a graduate degree received from the UW – Stout, 18 reported a graduate degree from another university, and 1 respondent had a graduate degree from both UW – Stout and another university. This data is summarized in Table 2 as shown below.

Table 2

Respondents Graduate Degree

Graduate Degree From	Number	Percent
Graduate Degree Not Completed	41	48.2
University of Wisconsin – Stout	25	29.4
Other University	18	21.2
Both UW-Stout and Other University	1	1.2
Total	85	100.0

The second survey question asked the respondents which grades they were currently teaching. Sixty-two respondents or 72.9% stated they were teaching grades 9-12. Twenty-one respondents or 24.7% stated they taught grades 6-8. The two remaining respondents stated they taught a combination of middle and high school classes. Simply stated this means that three-fourths of the sample group was employed at the high school level. Table 3 summarizes these results.

Table 3

Respondents and Grade Level Instructed

Grades Instructed	Number	Frequency
Grades 6-8	21	24.7
Grades 9-12	62	72.9
Combination 6-8 and 9-12	2	2.4
Total	85	100.0

Survey Results Related to Research Questions

The first research question listed in the introduction to this research document was "how frequently are technology education teachers referencing some defined set of academic standards as they construct their lesson plans and subsequent assessment tools"? The responses to survey question 3 provided data on the frequency of referencing academic standards. The survey limited respondents to answering in one of four following categories.

- Rarely (0-25%) considered standards.
- Occasionally (26-50%) considered standards.
- Frequently (51-75%) considered standards.
- Extensively (76-100%) considered standards

The results from this survey question are presented below in Table 4. This table reports that 55 of the 85 respondents occasionally or frequently referred to academic standards as

the constructed lesson plans and subsequent assessment instruments. These 55 "occasional or frequent responses" represent approximately two-thirds, of the sample group.

Table 4

Referencing of Academic Standards

Frequency Standards Referenced	Number	Percentage Respondents
Rarely (0-25%) considered	21	24.7
Occasionally (26-50%) considered	18	21.2
Frequently (51-75%) considered	37	43.5
Extensively (76-100%) considered	9	10.6
Total	85	100.0

The second question listed in the introduction to this research document was "what percentage of assessments given by technology education teachers could be categorized as oral, written and performance based?" The fourth question on the survey instrument defined the terms, and then asked each respondent to estimate these percentages based upon their experiences over the past year. An algebraic mean for the 85 survey responses has been calculated, and these values are presented below in Table 5. What this table shows is that over half of the assessments given by the sample group over the past school year were performance based. Furthermore, over one-third of the samples groups' assessments were written, and just over one tenth were oral in nature.

Table 5

Use of Oral, Written, and Performance Based Assessments

	% Oral Assessments	% Written Assessments	% Performance Based
Mean	11.62	36.14	52.24

The third research question listed in the introductory chapter asked, "What types of questions did technology education teachers use when they constructed written assessments". The fifth question on the survey asked each respondent to estimate what percentages of questions on their own written tests within the past school year were True-false, multiple choice, matching, short answer, and essay. The algebraic mean was computed for the responses given by the sample group. These values are shown below in Table 6. What the data describes is a sample group that uses short answer questions over one-fourth of the time, and multiple-choice questions almost one-third of the time. Furthermore, multiple-choice questions were twice as common as either true-false or matching questions, and three times as prevalent as essay questions.

Table 6

Analysis of Written Test Components – Algebraic Means of Respondents' Percentage Answers Given in Answer to Survey Question 5

	% True-False	% Multiple Choice	% Matching	% Short Answer	% Essay
Mean	16.21	32.02	14.23	26.56	10.98

Note. Algebraic means based on 84 survey responses. One respondent indicated no written tests were administered over the past year.

The fourth question listed in the introduction to this research document asked "to what extent are technology education teacher using objective versus subjective assessments to assess their students?" The survey instrument defined objectivity and asked the respondent to estimate what percentage of assessment items they believed to be objective in nature. The respondents to were limited to answering in one of four following categories.

- 0-25% objective items.
- 26-50% objective items.
- 51-75 % objective items.
- 76-100% objective items.

The survey results are summarized in Table 7 as shown below. What the table indicates is that fewer than one out of every 20 respondents believed they rarely used objective assessment items, whereas more than one out of four respondents reported extensively using objective assessments. The remaining two- thirds or 68.2% of responses indicated occasional and frequent usage of objective assessments.

Table 7

Percentages of Objective Assessment Items

Frequency objective items used	Number Responses	Percentage of Respondents
Rarely (0-25%) objective	4	4.7
Occasionally (26-50%) objective	29	34.1
Frequently (51-75%) objective	29	34.1
Extensively (76-100%) objective	23	27.1
Total	85	100.0

The fifth research question found in the introduction to this research asked "to what extent are technology education teachers using checklists or rating scales to assess processes or finished products?" Two separate questions were required on the survey instrument to answer this one research question. Survey question 7 defined checklists and asked how frequently the checklist was used. Survey question 8 defined rating scales and asked how frequently the rating scale was used. Both questions presented the survey taker with the following four potential responses:

- Rarely (0-25%) used.
- Occasionally (26-50%) used.
- Frequently (51-75%) used.
- Extensively (76-100%) used.

Table 8 as shown below shows the breakdown of responses as they relate to checklist and Table 9 gives the survey results with respect to the use of rating scales. Analysis and comparison of the survey responses yielded quite similar responses for both survey questions. Table 8 shows 45.8% of respondents reported frequent or extensive use of checklists and Table 9 shows 61.2% of respondents with frequent or extensive use of rating scales.

Table 8

Use of Checklists

Frequency checklists used	Number Responses	Percentage of Respondents
Rarely (0-25%) used	17	20.0
Occasionally (26-50%) used	29	34.1
Frequently (51-75%) used	28	32.9
Extensively (76-100%) used	11	12.9
Total	85	100.0

Table 9

Use of Rating Scales

Frequency rating scales used	Number Responses	Percentage of Respondents
Rarely (0-25%) used	14	16.5
Occasionally (26-50%) used	19	22.4
Frequently (51-75%) used	34	40.0
Extensively (76-100%) used	18	21.2
Total	85	100.0

The sixth research question listed in the introductory chapter asks "what importance do technology education teachers place upon the concept of authentic assessment." The ninth survey question defined authentic assessment, and then asked respondents what percentage of their assessments they considered to be authentic. A summary of the respondents answers are shown in Table 10 using the same format as earlier tables. What the tabulated results mean is that 78.8% of respondents did in fact believe they were in fact using authentic assessments.

Table 10

Percentage of Authentic Assessments

Percentage of authentic assessments	Number Responses	Percentage of Respondents
0-25% of all assessments used	18	21.2
26-50% of all assessments used	31	36.5
51-75% of all assessment used	28	32.9
76-100% of all assessments used	7	8.2
Total	84	100.0

Note. Number of responses is 84 as 1 respondent failed to answer this question.

The seventh research question listed in the introductory chapter asked, "how frequently are technology education teachers using portfolios to evaluate long-term progress?" The tenth and final survey question provided the data that was used for analysis regarding this question. A summary of the survey responses is presented in Table 11. What the table shows is that over one half of all respondents state they rarely use portfolios. Furthermore, more than three-fourths of the survey respondents stated they rarely or only occasionally use portfolios.

Table 11

Use of Portfolios

Frequency of portfolio use	Number Responses	Percentage of Respondents
Rarely (0-25%) used	46	54.1
Occasionally (26-50%) used	20	23.5
Frequently (51-75%) used	8	9.4
Extensively (76-100%) used	11	12.9
Total	85	100.0

The very last research question posed in the introductory chapter was "Is there a difference in assessment practices between technology education teachers that have graduated from the University of Wisconsin-Stout, versus those that graduated from other educational institutions?" The first survey question asked where respondents acquired their undergraduate and graduate degrees. As indicated in Table 1 there were 58 respondents that earned their undergraduate degree from UW – Stout, and 27 that earned their undergraduate degree from an alternative source. No analysis was done based upon where respondents acquired their graduate degree.

The UW – Stout Information and Operations Systems Department used their computer system to analyze all survey responses according to the source of the respondent's undergraduate degree. This analysis was uncomplicated for survey

questions 4 and 5 where the respondent was required to estimate percentages that characterized his/her own assessments over the past year. For survey questions 3, and 6 - 10, some improvisation was required. Each of these survey questions asked the respondent to place a check mark in front of the answer that most closely approximated their answer. In order to statistically compare the responses according to where the respondent received their undergraduate degree, a numerical value was assigned to these checkmark style answers. Numerical values were assigned as shown here:

- Rarely (0-25%) perceived, considered, or used given 1 point.
- Occasionally (26-50%) perceived, considered, or used given 2 points.
- Frequently (51-75%) perceived, considered, or used given 3 points.
- Extensively (76-100%) perceived, considered, or used given 4 points

Having established this method of converting checkmark style answers into a numeric format, it was possible to compute average answers to the survey questions according to where the respondent received their undergraduate degree. These algebraic means and standard deviations resulting from that analysis are summarized below in Table 12.

Table 12

Response Means and Standard Deviations by Location of Undergraduate Degree

Research Question	Undergrad Degree From	Number	Mean	St. Dev.
Frequency of Referencing Standards	UW – Stout	58	2.22	.92
	Other Univ.	27	2.78	1.01
Assessments - % Oral over past year	UW – Stout	58	9.86	11.52
	Other Univ.	27	15.41	14.24
Assessments - % Written over past year	UW - Stout	58	35.02	17.77
	Other Univ.	27	38.56	17.28
Assessments - % Performance Based	UW - Stout	58	55.12	18.94
	Other Univ.	27	46.04	17.72
% T-F Questions used on Written Tests	UW – Stout	57	15.82	14.10
	Other Univ.	27	17.04	13.35
% M. C. Questions used on Written Tests	UW – Stout	57	31.93	24.42
	Other Univ.	27	32.22	23.91
% Matching Questions on Written Tests	UW - Stout	57	13.42	10.27
	Other Univ.	27	15.93	13.59
% Short Answer Questions on Wr. Tests	UW – Stout	57	26.16	25.69
	Other Univ.	27	27.41	27.37
% Essay Questions on Written Tests	UW – Stout	57	12.67	18.45
	Other Univ.	27	7.41	12.53
Use of Objective Items in Assessments	UW - Stout	58	2.83	.86
	Other Univ.	27	2.85	.95
Use of Checklists to Define and Assess	UW – Stout	58	2.47	1.01
	Other Univ.	27	2.22	.80
Use of Rating Scales to Define & Assess	UW – Stout	58	2.62	1.02
	Other Univ.	27	2.74	.94
Use of Authentic Assessments	UW - Stout	57	2.25	.93
	Other Univ.	27	2.37	.84
Use of Portfolios	UW - Stout	58	1.84	1.07
	Other Univ.	27	1.74	1.06

Note. In a few categories there were only 57 UW – Stout respondents. One UW – Stout respondent had no written assessments over the past year, and could not analyze the composition of written test questions. A second UW Stout respondent neglected to answer the question on authentic assessments.

Reviewing Table 12 figures reveals several large differences in the means of the two groups. The following differences are noteworthy.

1. There was a difference of .55 in how frequently the respondent referred to academic standards while constructing lessons and assessments. Graduates of other universities referred to standards more frequently.

2. Graduates of other universities used oral assessments more frequently than UW – Stout graduates did. Here the respective percentages were 9.86% of all assessments for UW – Stout graduates versus 15.41% for graduates of other institutions.

3. Third, graduates of other universities used performance-based assessments less frequently than UW – Stout graduates did. Here the respective percentages were 46.04% for graduates of other institutions versus 55.12% for UW – Stout graduates.

4. Graduates of other universities used essay questions less frequently than UW – Stout graduates did. Here the respective percentages were 7.41% for graduates of other institutions versus 12.67% for UW – Stout graduates.

5. Graduates of other universities used essay questions less frequently than UW – Stout graduates did. Here the respective means were 2.22 for graduates of other institutions versus 2.47 for UW – Stout graduates.

The algebraic means for respondents' answers sorted according to where they received their undergraduate have further value. It is a common statistical procedure to compare the means of two sample groups to make inferences about the populations from which the samples were drawn (Wagner, 1992). Stated in lay terms, it is desirable to ascertain if the differences in averages exhibited by the sample group, can be applied to the larger populations. Statisticians frequently use "t-Tests" to determine if the differences shown in the sample groups are truly representative of the larger population. The five differences identified in the preceding paragraph are presented in Table 13

below. This table shows the significance level required for a two-tailed "t-test for equality of means, and the actual computed difference between the means. In the 2-tailed analysis both the frequency of referencing standards, and the use of performance-based standards yielded significant results.

Table 13

T-Test for Equality of Selected Means

Question being Statistically Analyzed	Significance Level for 2-tailed t-Test	Actual Mean Difference
Frequency of Referencing Standards	.014	.55
Assessments - % Oral over Past Year	.059	.055
Assessments - % Performance Based over Past Year	.039	.09
Assessments - % Essay over Past Year	.184	.05
Use of Checklist to Define and Assess	.275	.24

Note. Equal Variances were assumed

Chapter V - Summary, Conclusions and Recommendations

This final chapter is divided into three distinct sections. It begins with a summary section, which reviews the entire study. The second section will be on the conclusions that can be drawn from the analysis of the survey data. Lastly, will be a section that discusses both recommendations related to this study, and recommendations for future studies.

Summary

Because this section sums up the entire study, it will be subdivided into three more manageable topics. First, there is a brief restatement of the general research problem. The research questions are repeated on last time under this topical heading. Second, there is a summary review of the methods and procedures used in the study. Under this heading can be found information regarding the cross sectional survey used, who the sample group was, and when the survey was administered. Lastly, there is a brief overview of the major finding resulting from the study.

Restatement of the Problem

The problem that this research addressed was the shortage of information regarding how contemporary technology education teachers within the State of Wisconsin are assessing grades 6 – 12 students. Data was gathered to answer the following research questions:

1. How frequently are technology education teachers referencing some defined set of academic standards as they construct their lesson plans and subsequent assessment tools?
2. What percentages of assessments given by technology education teachers could be categorized as oral, written or performance based?
3. When technology education teachers make written assessments what percentages of questions could be categorized as true false, multiple choice, matching, short answer, and essay?
4. To what extent are technology education teachers using objective versus subjective assessments to assess their students?
5. To what extent are technology education teachers using checklists or rating scales to assess processes or finished products?
6. What importance do technology education teachers place upon the concept of authentic assessment?
7. How frequently do technology education teachers use student portfolios to evaluate long-term progress?
8. Is there a difference in assessment practices between technology education teachers that have graduated from the University of Wisconsin-Stout, versus those that graduated from other educational institutions?

Methods and Procedures Used

To gather information on contemporary assessment procedures a ten-question survey was created. The survey had 2 questions to aid in creating a profile of the respondents as a sample group, and 8 questions that would supply the data for answering the aforementioned research questions. Permission was secured from the WTEA to administer the survey instrument to current technology education teachers in attendance at their Spring Conference and Trade Show. This conference was held at the Chula Vista Resort in the Wisconsin Dells on March 30-31, 2000.

This research project was designed to be cross sectional analysis of the assessment practices of technology education teachers in Wisconsin. It was felt that the teachers in attendance at the WTEA Conference were in fact representative of the entire population of 1316 technology education teachers statewide. After all, the sample did come from all geographic areas of the state, worked in urban as well as rural environments, and had a wide range of classroom teaching experience. The response rate for this survey was 100%. Everyone that was asked to fill out the survey acquiesced. This random sample of 85 respondents represents 6.5% of the total 1316 employed technology education teachers within the State of Wisconsin in September of 1999.

The 85 completed surveys were sent to the University of Wisconsin – Stout Information and Operations Systems Department where a research associate helped to compile and statistically analyze the raw data. The goal was to be able to describe in mathematical terms the prevalence of specific assessment related activities currently being practiced by technology education teachers within the State of Wisconsin. The most commonly used mathematical descriptors used were mean, percentage, and

frequency. Many tables were constructed to summarize the results obtained from the analysis of the raw data.

Major Findings

Analysis of the survey results yielded three facts that were helpful in creating a profile of the sample group. First, was that slightly over two-thirds (68.2 %) of the sample group had undergraduate degrees from UW – Stout. Second, was that slightly over half (51.2%) of the respondents had completed a graduate level degree program. Lastly, it was determined that three-fourths (72.9%) of the respondents exclusively instructed classes for grades 9 – 12 students.

Analysis of the survey results revealed many important findings. The most significant findings are briefly summarized here. First, a majority of respondents (64.7%) stated they either occasionally or frequently referenced academic standards while constructing lessons and assessment instruments. Second, that the sample group used performance based assessments 52.2% of all time, written assessments 36.1% of the time, and oral assessments only 11.6% of the time. The third major finding was that multiple choice questions and short answer questions comprised 58.6% of all questions used by the sample group in the construction of their written examinations. The remainder of assessment questions being somewhat proportionally divided between true false, matching, and essay questions. The fourth finding was that only 4.7% of all sample respondents stated they "rarely used" objective test items, where as 27.1% stated they "extensively used" objective items. The fifth major finding was that roughly two-thirds of respondents claimed occasional or frequent use of both checklists and rating scales to

measure performance on an assessment instrument. The sixth major finding of this study is that 69.4% of all respondents claimed that they considered their assessments to be authentic between 26 and 75% of the time. The seventh major finding was that 54.1% of all sample respondents claimed they rarely used portfolios as an assessment strategy. Lastly, a few conclusions were possible regarding how UW – Stout graduates assess differently than do graduates from other universities. UW – Stout graduates did not reference academic standards as frequently, did use more performance-based assessments, and did use checklists more frequently than graduates of other universities.

Conclusions

The sample group for this study was 85 technology education teachers currently employed in the State of Wisconsin. Conclusions are only intended to apply to this small sample group. However, the study was designed to be cross sectional with regards to the entire population of technology education teachers within the State of Wisconsin. The reader is free to individually decide if conclusions being made about the sample group have relevance to the larger statewide population of 1316 technology education teachers. This researcher believes extrapolation to the general population of technology education teachers can be justified. While the reader may elect to extrapolate conclusions to the larger population of technology education teachers, it must be stressed that this study made no attempt to correlate or compare the assessment practices of technology education teachers against the assessment practices occurring in other geographic areas or disciplines.

The previous chapter presented the survey results in mathematical terms. Many tables were utilized because the tabular format is efficient when summarizing large quantities of information. Those results were presented in as scientific a fashion as possible. There were no personal interjections, or conjectures.

The conclusions stated here are quite different. While they are based upon the same statistical analysis, these conclusions do contain personal insights and conjectures. All eight of the original research questions will be discussed in proper sequence.

1. The first research objective was to determine the frequency that technology education teachers are referencing academic standards as they construct lesson plans and assessment tools. Table 4 indicated that the sample population of technology education varied greatly in their perception of academic standards. However, since 54.1% of the respondents stated they either frequently or extensively considered standards while creating lesson plans and assessment instruments, it can be assumed that there is general support among technology education teachers for academic standards. A majority of the sample group believed that the standards have merit in describing what students need to learn in order to be successful in their adult lives.

2. The second research objective was to ascertain the percentages of oral, written, and performance based assessments currently being used by technology education teachers. Data was presented in Table 5 that showed 52.2% of all assessments created by the sample group over the past school year were performance based. The discussion of performance-based assessments can be found in the review of literature. It was stated that performance-based assessments required that all students achieve some minimal level of competence prior too moving on to the next goal. Performance assessments

assume that all students can and will "pass" the assessments, whereas norm referencing and standardized assessments require that some students would fail (Woolfolk, 1993). This data supports the contention that technology education teachers adhere to the philosophy of "criterion referencing". Additionally, since performance based testing is generally associated with testing within the psychomotor domain, it can be assumed that technology education teachers frequently assess within the psychomotor domain.

The review of literature also stated that contemporary educators do not use oral testing much outside of foreign language classes, practicing for future job interviews, and defending doctoral dissertations. It was claimed that oral questioning has fallen from favor because oral assessments are inefficient since only one student can respond at a time, and difficult to assess objectively unless the scorer uses a tape recorder (Wolansky, 1985). The survey data agrees that technology education teachers largely ignore the option of oral testing.

3. The third research objective was to determine the composition of written assessments. The results presented in Table 6 indicate that 62.5% of all test questions are multiple choice, true false and matching. These question types are frequently given to groups of students at one time. They tend to be easy to administer, cost-effective, and easy to score with electromechanical scoring devices. These question types are extremely objective in that the questions can be scored by anyone in possession of the answer key (Bott, 1996). This data supports the conclusion that technology education teachers value objectivity and efficiency. However, the downside of using these question types is that these question types can promote a students memorization of low-level factual information at the expense of higher level thinking skills (Bloom, Hastings, and Madaus, 1971).

4. The fourth research objective was to determine how frequently technology education teachers used objective assessments. Objective assessment items were not vulnerable to the scorer's personal biases and prejudices (Bott, 1996). The data presented in Table 7 indicated only 4.7% of respondents stated that they "rarely used" objective assessment items. This data clearly supports the conclusion that the sample group does value objectivity as a desirable assessment characteristic.

5. The fifth research goal was to determine the extent to which checklists and rating scales were used to assess a process or a finished product. The review of literature stated that checklists were popular because they can be used with multiple students, or with the same student over time, to gage the student's individual progress (Wolansky, 1985). The statistical analysis presented in Tables 8 and 9 indicates roughly two-thirds of the respondents do in fact occasionally or frequently use them. However, there were also significant numbers of respondents that were at the extremes on the use of checklists and rating scales. One can conclude that most technology education teachers find checklists and rating scales to be useful tools, but not an absolute necessity. Other options do exist for scoring assessment instruments.

6. The sixth research objective was to determine the importance that technology education teachers place upon the concept of authentic assessments. Assessments were defined as being authentic when they asked students to do things in a real life context. The theory is that students will learn new materials more rapidly, and will retain the knowledge longer, if the student is an active participant and can apply what they are learning (Baron and Boschee, 1995). The data in Table 10 states that 21.2% of the sample group used authentic strategies less than 25% of the time assessments were given.

However, 69.4% of the sample group used authentic strategies for between 26 and 75% of their assessments.

7. The seventh research question asked how frequently technology education teachers are using portfolios to evaluate long-term progress. The data presented in Table 11 shows 54.1% of respondents rarely use portfolios. These supports the conclusion that portfolios were a fad of the 1980's, and are losing favor among technology education teachers.

8. The very last research question posed in the introductory chapter was "Is there a difference in assessment practices between technology education teachers that have graduated from the University of Wisconsin-Stout, versus those that graduated from other educational institutions?" The data stated indicated two areas of difference that were statistically significant according to the 2-tailed t-test for equality of means. These differences were that graduates of other universities used academic standards more frequently than did UW – Stout graduates. Secondly, the graduates of other universities did not use performance-based assessments as frequently as UW – Stout graduates. Professional scholars do state the use of academic standards and performance tests are desirable. More effort needs to be made to show and explain the benefits of standards to UW – Stout graduates.

Recommendations Related to This Study

Research projects are designed to answer questions. This study was successful in answering the eight research questions that it set out to study. However, descriptive statistics frequently raise additional questions because the reader wants to know why

something is as the data describes. The data analysis from this study did raise additional questions. Some of them are listed here.

1. While 54.1% of respondents frequently or extensively considered standards while creating lessons and assessments. This means that a majority of the sample group believes that standards are beneficial and probably do describe what students need to learn if they are to be successful as adults. But what about the 24.7% of the sample population that responded that they rarely considered standards? Do they consider standards a passing fad, or a form of ivory tower bureaucratic meddling within their classroom? Certainly, by passing post high school testing requirements state legislators believe that teachers need to incorporate academic standards into their curriculums. Administrators, DPI, and colleagues must provide continuing justifications for using standards.

2. Given that teachers are supposed to prepare students for a productive life beyond high school, how is it that 21.2% of the sample respondents rarely used authentic assessments? Certainly no single assessment method will work in every situation, but this researcher found it surprising that so many technology education teachers did not use authentic strategies. Was it that the respondents who did not use authentic strategies were also the respondents that also relied most heavily upon objective questions? If so, are there still technology education teachers in the workforce that insist upon using questions that can only be answered by mere memorization of textbook facts? More research into authentic assessment could answer these questions.

Recommendations for Further Study

1. A brief section within the Review of Literature chapter was devoted to learning and assessment within the affective domain. It was explained there that the affective domain pertaining to students attitudes, feelings, values and emotions. This research document focused mostly upon assessment within the cognitive and psychomotor domain. More research needs to be done on how technology education teachers are assessing within the affective domain.

2. The review of literature clearly stated that there is no single ideal or correct assessment technique for all situations. Certainly, individual students are unique and will continue bringing into the classroom different genetic capabilities, life experiences, and personal goals. One can predict that the assessment practices in use by technology education teachers will continue to change as new academic standards, curriculums, and assessment tools become available. Any researcher that wishes to conduct a longitudinal study may use the data from this research study.

3. Lastly, it is always a good idea to replicate any study to verify the findings. This study is no different, and should be held to the same academic standards. A follow-up study is warranted.

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Appendix A
A Survey of Technology Education Teachers

1.) Undergraduate degree earned from:

_____ UW-Stout.
_____ Other university.
_____ Both

Graduate degree (if applicable) earned from:

_____ UW-Stout.
_____ Other university.
_____ Both

2.) What grades do you most frequently teach?

_____Grades 1-5, ____ Grades 6-8, ____ Grades 9-12, ____ Post High School.

3.) When constructing lesson plans and subsequent assessment instruments, how frequently do you consider some defined set of academic standards? Standards could be from your local school district, State, or professional association such as WTEA.

_____ Rarely (0-25%) considered.
_____ Occasionally (26-50%) considered.
_____ Frequently (51-75%) considered.
_____ Extensively (76-100%) considered.

4.) Oral tests are answered with only the human voice. Written tests contain true-false, multiple choice, matching, short answer, and essay questions. Performance based tests rely on the student demonstrating a procedure, or submitting a finished product, and are frequently assessed with checklists or rating scales. This past school year what percentages of your assessment were oral, written, and performance based?

_____ % Oral Assessments
_____ % Written Assessments
_____ % Performance based Assessments
100 % of Assessments. Do your percentages total 100?

5.) Thinking back over the past academic school year to all your written tests. What percentage of questions were True-false, multiple choice, matching, short answer, or essay type questions?

_____ % True-false test questions,
_____ % Multiple choice test questions,
_____ % Matching test questions,
_____ % Short answer test questions
_____ % Essay test questions
100 % of test questions. Do your percentages total 100?

Objectivity refers to the degree to which an item can be scored without bias or the personal opinion of the scorer affecting the grades. What percentage of your assessment items would you describe as being objective in nature.

_____ 0-25% objective items,
_____ 26-50% objective items,
_____ 51-75 % objective items,
_____ 76-100% objective items.

Checklists and rating scales can be used to assess a student's competence in demonstrating a process, or in determining the degree that a finished product exhibits predefined characteristics.

6.) Checklists itemize predefined performance objectives. Checkmarks are recorded when objectives are achieved, and omitted when actions or features of the finished product are missing. How frequently do you use checklists?

_____ Rarely (0-25%) use checklists,
_____ Occasionally (26-50%) use checklists,
_____ Frequently (51-75%) use checklists,
_____ Extensively (76-100%) use checklists.

7.) Rating scales provide a numerical or descriptive scale that is used to score how well a student has performed required actions, or how well the finished product exhibits desired characteristics. How frequently do you use rating scales?

_____ Rarely (0-25%) use rating scales,
_____ Occasionally (26-50%) use rating scales,
_____ Frequently (51-75%) use rating scales,
_____ Extensively (76-100%) use rating scales.

8.) Authentic assessment can be defined, as a process where students are asked to complete or demonstrate desired behaviors in a real life context. What percentage of your assessments do you consider to be "authentic"?

_____ 0-25% of assessments
_____ 26-50% of assessments
_____ 51-75 % of assessments
_____ 76-100% of assessments

10.) Portfolios are collections of a student's work that attempt to illustrate student intellectual growth over time. How frequently do you use portfolios?

_____ Rarely (0-25%) use portfolios,
_____ Occasionally (26-50%) use portfolios,
_____ Frequently (51-75%) use portfolios,
_____ Extensively (76-100%) use portfolios.

Appendix B

Thank you, for consenting to complete this brief survey. Most respondents find they can complete the survey in less than five minutes. Fill in the blank, or place a check mark in front of the answer that most closely approximates your situation. Address any questions to the survey administrator.

Tom DeLain
333 Fourth Street
Baraboo, WI 53913
Phone: (608) 356-0767
E-mail: delaint@post.uwstout.edu

Human Research Consent Form

I understand that by completing and returning the attached survey, I am giving my informed consent as a participating volunteer in this study. I understand that the basic nature of the study is to determine teacher assessment practices currently in use, and agree that any potential risks are exceedingly small. I am aware that the information is being sought in a specific manner so that no identifiers are needed, and so that confidentiality is guaranteed. I realize that I have the right to refuse to participate and that my right to withdraw from participation at any time during the study will be respected with no coercion or prejudice.

Note: Questions or concerns about participation in the research, or subsequent complaints should be addressed first to the researcher or research advisor, and second to Dr. Ted Knous, Chair, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 Harvey Hall, UW-Stout, Menomonie, WI, 54751, phone (715) 232-1126.