Evaluation of Minnesota's Subsurface Sewage Treatment System Professional Experience Program

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Abstract

Minnesota rules for Subsurface Sewage Treatment System (hereinafter, SSTS) professionals require field experience with a certified professional before obtaining a full certification. A workgroup was commissioned by the Minnesota SSTS advisory committee to investigate the extent to which the SSTS experience and mentoring requirements under Minnesota Rules Chapters 7083.1500 and 7083.2000 adequately meet the needs of the SSTS industry in Minnesota. Triangulated results from three focus groups indicate that SSTS professionals value experiential learning, but share concerns about the manner in which aspiring practitioners are prepared. Focus group results informed the development of a survey instrument and were confirmed by a random sample of 1100 SSTS professionals with various levels of certification. The response rate was sufficient to carry out statistical analysis. Data about the knowledge, attitudes and practices of SSTS professionals were analyzed to prepare recommendations about the mentoring program. The study found that the current program was not implemented equitably across the industry and lacks clear guidance for both mentors and apprentices. SSTS professionals value a combination of classroom and experiential learning. Emphasizing mentoring relationships beyond the context of current requirements and introducing additional quality assurance measures may be the most practical ways to address programmatic shortcomings and improve the public health and environmental benefits that result from consistent, high-quality SSTS design, installation, and inspection practices.

Table of Contents

List of Tables

List of Figures

Introduction

Research Context

Statement of Purpose

The following thesis is intended to fulfill my requirements for a Master of Science degree in Water Resources Science. The applied research herein was conducted between 2007 and 2010. It is intended to identify and address practical policy and program implementation issues that have emerged in Minnesota's Subsurface Sewage Treatment Systems (hereinafter, SSTS) industry.

Minnesota Administrative Rules

Minnesota Rules Chapters 7080-83 are administered by the Minnesota Pollution Control Agency (hereinafter, MPCA) (MPCA, 2008). These rules regulate certification of SSTS professionals, business licensing, local program administration requirements, and the minimum technical standards for the design, installation, and care of soil-based sewage treatment systems treating less than 10,000 gallons per day. A person becomes an apprentice or a restricted certified individual after taking the required coursework and passing examinations based on one's specialization within the SSTS industry. The restricted tag is lifted once a person completes and submits an experience plan that meets the specifications of Minnesota Rules Chapter 7083.1050. Once fully certified, a SSTS professional can conduct SSTS business under a license and complete certified statements for required reports.

A pre-certification process has been mandatory for onsite practitioners in Minnesota since statutory changes in 1994 required a process to be established no later than January 1, 1996. One purpose for this significant revision was to increase the competency of onsite practitioners to better protect Minnesotans from risks associated with exposure to untreated wastewater in areas not served by centralized wastewater facilities (MPCA, 1996a and 1996b).

Traditional endorsement categories in Minnesota include designers, installers, inspectors, and maintainers. As of a rule revision dated February 4, 2008, the endorsement categories of advanced designer, advanced inspector, and service provider introduced specific categories for advanced (Types IV and V) and larger system types. This evaluation focuses on traditional endorsement categories because new categories do not have an experience requirement. However, the results of this study highlight the benefits of a mentoring relationship that may be applicable to all endorsement categories in future SSTS program revisions.

SSTS Advisory Committee and the Mentoring Subcommittee

One purpose of this evaluation is to present recommendations to the Minnesota SSTS advisory committee. This committee is established under Minnesota Rules Chapter 7083.6000 and is responsible for reviewing and advising the MPCA on issues pertinent to the administration of both state and local SSTS programs, legislation, technical data relating to SSTS, educational materials and programs for SSTS, and other SSTS activities considered appropriate by the committee. The SSTS advisory committee developed workgroups to address various issues that required a separate commitment on behalf of its volunteers, including a mentoring workgroup. This workgroup's stated purpose is to

"*bring a higher level of education and competence to the industry's professionals"*. Its goals include:

- Honest assessment of current training effectiveness
- Identify and overcome the barriers to the current mentoring program
- Identify potential improvements

The mentoring workgroup convened in early 2007. One of its first tasks was to investigate the manner in which other similarly organized trades administered mentoring/apprentice relationships, specifically plumbers and electricians. Further discussions led to the development of an evaluation strategy that included the use of focus groups and a survey instrument to identify whether concerns of the workgroup, SSTS advisory committee members, and MPCA staff were shared by SSTS industry professionals at-large.

This report is a review of the mentoring workgroup's activities in investigating the extent to which the SSTS experience and mentoring requirements under Minnesota Rules Chapter 7083.1500 and 7083.2000 adequately meet the needs of the SSTS industry in Minnesota (MPCA 2008a).

Comparison of SSTS and Other Trades With Apprenticeship Requirements

SSTS Professionals

Minnesota's SSTS practitioners seeking full certification must complete experience requirements outlined in Minnesota Rules Chapter 7083.1050 (MPCA 2008a). They must either work under the supervision of an unrestricted certified professional who is an inspector or has the same specialty area certification (installer, designer, maintainer)

they are seeking or they must acquire experience through MPCA accredited training that provides realistic in-field work situations. Individuals are allowed to work on SSTS without certification as long as they are employed by a licensed business that has at least one individual who is fully certified and is ultimately responsible for the supervision of non-certified employees.

A restricted designer, or apprentice, must co-complete with a mentor a minimum of fifteen SSTS site and soil evaluations, designs, and management plans. This work must be signed by a mentor. The designer apprentice also must observe a minimum of five installations and five service instances (tank cleanings). An installer apprentice must complete a minimum of fifteen SSTS installations and must observe five service instances. An inspector apprentice must have completed a minimum of fifteen inspections with a mentor. A maintainer apprentice must complete a minimum of fifteen septic tank pump-outs with proper septage management with the assistance of a mentor. Recent changes to the mentoring program were justified in the MPCA's SONAR and included (referenced by page number):

- A more restrictive set of criteria to define who can be a mentor (p. 329).
- The existence of minimum requirements that must be observed and supervised during the work by a designated mentor to qualify as experience (p. 357).
- Apprentices must submit the work documents from five jobs, plus inspection approvals (p. 357).
- Experience must be gained on systems without advanced treatment units (Types I-III systems) (p. 358).
- There must be one above-ground and one below-ground system (p. 358).

- Apprentice designers must observe five installations and service or operational instances (p. 358).
- Apprentice installers must observe five service or operational instances (p. 358).

(MPCA 2008b).

The classroom training for becoming fully certified in the SSTS industry ranges between 40 and 120 hours, including examinations (see Table 1). The experience requirement is not documented by time, but roughly ranges between 40 and 260 hours of field work.

Table 1: Training and specialty area certification requirements for SSTS Certification in Minnesota (MPCA, 2008)

To do this type of work	**You need this type of training (Pre-Certification Workshop)**	**And certification in this specialty area**
Installation	Introduction, Installing	Installer
Tank cleaning, tank repairs, portable toilets & septage management	Introduction, Maintaining	Maintainer
System assessment, system adjustments, trouble-shooting and system repairs	Introduction, Service Provider	Service Provider
Design of Type I – Type III systems <2,500 gpd	Introduction, Installing, Designing, Soils	Designer
Design of Type I – Type V systems <10,000 gpd	Introduction, Installing, Designing, Soils, Advanced Design-Inspection I & II	Advanced Designer
Inspection of Type I – Type III systems <2,500 gpd	Introduction, Installing, Designing, Inspecting, Soils	Inspector
Inspection of Type I – Type V systems <10,000 gpd	Introduction, Installing, Designing, Soils, Inspecting, Service Provider, Advanced Design-Inspection I & II	Advanced Inspector

Other Professions With Experience Requirements

The United States Department of Labor and the Minnesota Department of Labor and Industry recognize more than 800 apprenticeable occupations. In Minnesota, more than 80% of apprenticeship programs and opportunities are available in the construction

industry. The remaining occupational programs are found in plant maintenance, graphic arts, manufacturing, the power trades, and service and professional technical industries. Apprenticeship training is the preferred method of training skilled workers for all of these major occupational areas. Most programs take between one and six years and include on-the-job training of 2,000 to 10,000 hours. Most approved programs in Minnesota average 8,000 hours (four years). For each 2,000 hours of training on the job, 144 hours of classroom instruction are required (ISEEK, 2011).

Plumbers

There are a variety of plumbing license credentials one can obtain in Minnesota, ranging from a master plumber to a water conditioning installer. “Apprentice” is the starting position for aspiring plumbers. Apprentices must register with the State of Minnesota and work under the direct on-site supervision of a licensed journeyman or master plumber, or a plumbing contractor. After four years and at least 7,000 hours of practical work experience, an apprentice becomes eligible to take an exam for a journeyman license. One must have the minimum number of hours in the following plumbing phases: 2,000 hours of water distribution system installation; 2,000 hours of drain, waste, and vent system installation; 1,000 hours of fixture installation; and the remaining hours may be in any aspect of plumbing work as defined in the code. Water conditioning installers have a six month on-the-job experience requirement before they are eligible to take the examination (approximately 1,000 hours) (MN DOLI, 2009).

Electricians

Those working in the electrical field also have a number of license credentials, ranging from a master electrician to a class B installer. Experience must typically be

completed under the direct supervision of a fully licensed electrician. Experience requirements range from twelve months (approximately 2,000 hours) to sixty months (10,000 hours). The experience is broken down similarly to the plumbing and SSTS industry by job task: the planning, laying out, or supervision of the installation of electrical wiring; maintenance of electrical wiring; line work; installation of elevators; wiring or maintaining circuited systems; or control circuits. Apprentices are eligible to take the examination for the specialty area once they complete their education and experience. Unlicensed individuals who work in the electrical field are required to be registered by the Minnesota Department of Labor and Industry and must work under the direct supervision of a fully licensed individual.

Discussion

Members of the SSTS advisory committee and the mentoring workgroup recognized that the SSTS requirement is significantly lower than other apprenticeship thresholds in Minnesota. Some members argued that this is because the SSTS profession is a more specific trade, perhaps equal to certain types of plumbing contractors with reduced experience and training requirements. Others felt that the trades were comparable and the training and experience requirements should be commensurate with trades like plumbing and electrical contracting. Key differences between SSTS and other trades include:

- Aspiring SSTS professionals test after each pre-certification course, which can be before or after one gains experience. Plumbers and Electricians must always wait until all training and experience is completed to be eligible for exams.
- SSTS professionals have a much lower threshold for full certification.

Reasons for the key differences between SSTS and other trades include:

- The industry has evolved from an unregulated practice of facilitating wastewater disposal to a regulated practice of ensuring wastewater treatment.
- The licensing of businesses and certification of individuals was designed to allow access to and growth within the industry.
- SSTS work is frequently one area of expertise among licensed businesses. Many professionals are simultaneously engaged in other areas of the building trades industry.

Literature Review

The completion of the research outlined in this project's evaluation plan required the understanding and application of a variety of social science fields of practice and research tools. In this investigation, an over-arching goal for the utilization of the social sciences is to promote a collective understanding of issues at the forefront of a given audience, or group of stakeholders, with the intent of achieving long-term consensus in the form of durable policy. This can be achieved through collaboration, continuous interaction, and a feedback mechanism that allows decision-makers to understand and act on behalf of those they represent (Turner, 2009). The adaptive, if not circuitous process of utilizing social research is often, "less to arrive at solutions than to orient . . . [oneself] with problems". Weiss contends that the end-goal is "the percolation of social science concepts, theories, and findings into the climate of informed opinion" (Weiss, 1999). This study is a participatory formative evaluation plan using small group dynamics to communicate between the industry at-large and decision makers. Focus groups were used to listen to SSTS practitioners and a survey instrument validated the focus group findings and discovered information about the SSTS audience. Its emphases rest in program evaluation, adult education, and mentoring. The outcomes are recommendations, strengths and limitations, and ideas for further research.

Social Science Research Fields of Practice

Program Evaluation

Improving SSTS professional competence is a broad goal for the SSTS industry, regulators, and the University of Minnesota. Mentoring and on-the-job training appears to be crucial to professional development, but a context for defining terms like competence and improvement is appropriate.

Evaluation is the "*systematic assessment* of the *operation* and/or the *outcomes* of a program or policy, compared to a set of *explicit* or *implicit standards*, as a means of contributing to the *improvement* of the program or policy" (Weiss, 1998). This definition's five elements describe what an evaluation is in relationship to both how and why it is conducted. This evaluation was completed according to accepted social science norms in an effort to identify the way SSTS experience requirements are enacted and to what extent that meets the needs of the program's expected beneficiaries. The basis for comparison was a set of expectations identified by individuals in the SSTS industry in an effort to craft recommendations that better aligns program intent with program delivery.

Two constructs have been generally accepted in framing specific evaluations. The process-outcome construct denotes the particular phase of the program investigated (its operations or results), whereas the formative/summative construct denotes the intended role of the evaluator within an evaluation (to improve it or to pass judgment upon it for the use of others) (Weiss, 1998). These constructs have been challenged on the basis of their universality (Patton, 1996), though the terms have survived because of their capacity to position most evaluations.

"***Formative*** evaluation is evaluation designed, done, and intended to support the process of improvement, and normally commissioned or done by, and delivered to, someone who can make improvements" (Scriven, 1991). A difficult and complicated issue arises though, when one asks what is considered improvement? Answers to that question are relative to the evaluator's context and the field through which the evaluations are commissioned. Improved sales may indicate a successful marketing evaluation. Increased listenership could indicate the successful evaluation of radio listeners' preferences. A political victory could indicate the successful evaluation of campaign talking-points. Defining an evaluation's intended use is central to its ultimate success. Many leading researchers such as Patton, King, Scriven, Fetterman, Cousins, and Whitmore have delved into this topic to understand the relationship between the purpose or intent of an evaluation and the way in which its findings are used. Evaluation research and the development of a profession for skilled evaluators grew out of academic discussions that furthered the value of evaluation data. Models developed for evaluations with specific purposes (Patton, 1997), to integrate evaluation into an organization's practices (Stevahn and King 2010), further an organization's values (Fetterman, Kaftarian and Wandersman, 1996), or define an evaluation's merit through the process by which the data are collected (defining participatory evaluation, Cousins and Whitmore, 1998) have been central to this evaluation and the progress of the field itself.

Adult Education and Mentoring

SSTS professionals complete a certification process that includes coursework, examination, and experience requirements. They are recertified by meeting continuing education requirements. The concept that adult education (andragogy) is a separate and

distinct discipline from childhood education (pedagogy), was put forth in modern educational theory in the 1950's (Knowles, 1950). Strategies for adult education have since developed and can be summarized in a series of assumptions about adult learners;

1) The Need to Know and Readiness to Learn.

   Adults learn better if they understand the value of the material prior to engaging in learning behavior. Adults' readiness to learn is dependent on an appreciation of topic relevance. They are most capable of learning when they believe the knowledge will help them address real-life situations and problems.

2) The Learners Self-Concept.

   As people mature, they become less dependent on others and more self-directed, which should be accommodated in adult learning environments.

3) The Role of Experience.

   As people age, they accumulate more experiences from which to draw from, which is the richest source of learning for adults. Adults also connect deeply with the experiences of others, which is the basis for experiential techniques such as mentoring, case studies, and group discussions.

4) Orientation to Learning and Motivation.

   In contrast with subject-centered pedagogy, adult learners view their education as problem-centered, task-centered, or life-centered and they are motivated to learn when the topics pique any of those interests. Adults are further motivated to learn when they associate new knowledge with individually developed goals.

(Ozuah, 2005).

These assumptions have led to the evolution of a learner-centric model of education, though, perhaps to an extreme. "Ironically, both [andragogy and self-directed learning] have been criticized for a blinding focus on the individual learner while ignoring the sociohistorical context in which it occurs" (Merriam, 2001). A greater

context exists beyond the classroom (and the individual) and must not be ignored by the instructor or the learners themselves. Connecting curriculum with the world around it is not only a method of reaffirming lessons, but also of recognizing what behaviorist-oriented educational theorists identify as the second underlying assumption of the learning process: the environment shapes behavior (Merriam and Caffarella, 1999).

Experiential learning bridges the gap between the learner-centric model of andragogy and the behaviorist theory that what one learns is shaped by elements in the environment. Defined as learning in which the student is in direct contact with concepts being studied, experiential learning "broadens, extends, and deepens the intellectual content of instruction by integrating theory and practice, increasing student motivation through the experience of applying knowledge, and encouraging students to develop their skills as independent scholars" (Millenbah and Millspaugh, 2003).

The MPCA has recognized that one does not obtain all the skills necessary to conduct business effectively in the SSTS industry in the classroom and has instituted an experience requirement to eliminate the possibility that someone could be professionally hired to complete a task with which he has no previous experience (MPCA, 1996a, b). Ideally, this requirement fosters a relationship between the apprentice and the mentor that resembles the description of experiential learning above. As Clark quotes Daloz,

> . . . [educational] growth is a risky and frightening business, much like the journey into the unknown. Students are challenged to let go of old conceptualizations of self and their world and to embrace new understandings; the presence of . . .a mentor makes such a journey . . . less frightening. Mentors facilitate this growth process by providing support, challenge, and vision.
> (Clark, 1993)

To identify if the proper elements were in place in the SSTS industry to facilitate aspiring practitioners' success, the mentoring work group had to look at indicators of successful mentoring relationships. Both mentor and protégé characteristics are key antecedents of mentoring relationships (Wanberg, 2003). Mentor attributes are typically viewed with respect to the characteristics protégés look for in mentors. Mentors are described by Macrina as people who imparted wisdom, nurtured, sponsored, criticized, and cared for someone else (Macrina, 2005). A mentoring work group member suggested another attribute that was evaluated in the survey instrument: the ability to help a protégé avoid making mistakes.

Research has demonstrated that benefits of informal mentoring relationships include improved career satisfaction and commitment. Organizations that require formal mentoring try to replicate these benefits to varying degrees (Ragins, Cotton, and Miller, 2000). An interesting distinction between formal and informal mentoring was highlighted by focus group participants who often struggled in differentiating their descriptions of "mentorship" between those that fulfilled their officially required experiences for reporting to the MPCA and those with whom they developed informal and unofficial mentoring relationships. Our understanding of learning has evolved to the point where this makes sense. "No need is more fundamentally human than our need to understand the meaning of our experience" (Mezirow, 1990). If SSTS professionals take pride in their work and commit to lifelong learning and improvement, they cannot be expected to differentiate between formal and informal mentoring experience- learning is constantly taking place. However, an attempt was made to more clearly distinguish this difference in the survey tool by asking respondents to answer a similar set of questions about those that

provided official mentoring capacities and those that provided unofficial on-the-job training.

Social Science Research Tools

Small Group Dynamics

As discussed in the Research Context section above, the SSTS advisory committee is tasked with reviewing and advising MPCA on policy issues. The mentoring workgroup was the steering committee of this project. The research participants were volunteers and survey respondents from a variety of roles within aspects of the SSTS industry. Understanding and using this framework for discovery and decision making was critical to ensure outputs from this study reached the appropriate ends.

The concept of participatory evaluation was molded in the 1990's and defined as "an extension of the stakeholder-based model with a focus on enhancing the evaluation utilization through primary users' increased depth and range of participation in the applied research process" (Cousins and Earl, 1992). It was further refined in an article that identified two streams of participatory evaluation: practical and transformative. As the name implies, practical participatory evaluation is defined as a practical approach to broadening decision making and problem solving through systematic inquiry. Transformational participatory evaluation focuses on the reallocation of power in the production of knowledge, promoting social change, and overcoming oppressive conditions (Cousins and Whitmore, 1998). This evaluation falls under the "practical" stream of participatory evaluation as its intent is not revolutionary, but quite specific and reserved.

Research suggests that a clear understanding of the context through which decisions are made and the audience that is affected by those decisions is central not only to the development of useful data, but also to ensure its use for definitive improvements. Torres and Preskill illustrate a historical perspective on the organizational learning approach to evaluation. It outlines the field of evaluation's evolution, and points out that conscientious involvement of stakeholders throughout the evaluation in intended to increase:

(a) their buy-in to the evaluation,

(b) their understanding of the evaluation process, and

(c) their use of the evaluation's findings

(Torres and Preskill, 2002).

However, one can understand why program administrators are uncomfortable with instituting a learning-oriented approach given the fundamental change-oriented underpinnings of this type of formative evaluation. This barrier is a frequent source of conflict in organizations and was observed in this study, as agents of change recognize evaluation as a means to their end and those tasked with program implementation can see evaluation as a source of endless redirection.

Overlaying the following lifecycle concept to the practice of research results in the development of a policy that allows for change to be more universally embraced. By highlighting good practice guidelines, Holmes and Savgård effectively demonstrate that research's end-use has as much to do with the following of social and group dynamic elements as it does with the application of timely, appropriate, and sound research methods;

(a) stakeholder participation throughout the planning and development of research tools,
(b) effective communication through a sustained interaction between researchers and research users,
(c) the presence of interpreters capable of bridging gaps between research and user communities,
(d) providing a balanced account of uncertainties and their implications through two-way communication of stakeholders, and
(e) implementing evaluation processes that foster a learning cycle

(Holmes and Savgård, 2009).

Focus Groups

Focus groups are a valuable means of obtaining information from a small, targeted audience. The qualitative data resulting from focus groups are used for many reasons, from creating radio station play lists, deciding what food packaging options are best for sales, determining which issues comprise political campaigns, to choosing an ending to a Hollywood movie (Goldenkoff, 2004). This method has evolved into a valid research tool from more crude applications by advertisers to observe and learn about consumer behavior.

In applied research arenas, researchers discuss the use of focus group data in evaluation research. They highlight how focus groups are helpful in recognizing the social context through which programs function (Armstrong and Massey, 2002), in understanding how stakeholders regard certain programmatic requirements (in Kruger, 2009), and in understanding the "why" behind attitudes and behaviors (Greenbaum, 2000). By characterizing three different levels of latent data from thematic analysis (articulated, attributional, and emergent), Massey points out how the conscious use of

data derived from different methods of questioning and/or conversational facilitation can strengthen the arguments made from focus groups (Massey, 2011, in press).

Focus groups are best utilized when the intended uses of such data are identified outright (Patton, 1997). Patton does not exclude an exploratory purpose for a given evaluation- just that a concerted focus on developing agreed-on intended uses allows an evaluation's results to become the basis for subsequent design decisions and also increases the odds that an evaluation will have its desired impact. This concept was central to the progressive, adaptive nature of this investigation, which at its most basic level follows the iterative process of "grounded theory" (Bernard and Ryan, 2010). They suggest that via a feedback loop, the data collection, analysis, and hypothesis generation co-occur, resulting in emergent conclusions that arise from a cycle of data collection and analysis. The focus group results from this study were intended to frame the required experience requirement to the SSTS advisory committee and provide a basis and justification for the final survey tool.

As Krueger, points out, "focus groups work when participants feel comfortable, respected and free to give their opinion without being judged (Krueger, 2009). To create an atmosphere conducive to the setting Kruger describes, it was important to consider both the setting and introductory language used to welcome participants and explain the intentions and reasons for the focused discussion. All focus group participants sat in a circle, with the facilitator and note taker included. This was intended to promote a sense of equality. The introductory script (Appendix One) explained why the session was being recorded, encouraged participants to speak freely, and notified them that they could expect confidentiality in regards to their specific statements.

Assessing the validity of focus group data poses a number of challenges. While debated, the appropriate number of participants is accepted to be between six and 10 (Greenbaum, 2000; Goldenkoff, 2004), which is a small number if one hopes to achieve representative responses from a large group. Qualitative data obtained from any single focus group cannot be considered valid. Proper application of the methodology requires the repetition of the same exercise with multiple groups until saturation occurs. At a minimum, reportable data must be replicated at least three times, or triangulated (Weiss, 1998).

Another conundrum of utilizing focus group data is the notion of observer dependence. Because the information must be funneled through a researcher, it is inherently influenced by the researcher, either in how the questions are asked or in how the responses are perceived. The researcher is not an external observer, he is a participant himself (Walvis, 2003). If the questions are confusing, irrelevant, biased or leading, the responses may not reflect the participants true feelings (Massey, 2011). A key to minimizing this concern is to understand what type of data is being sought and to recognize the strengths and limitations of that data. Hypothetical research with focus groups (attributional data) can be dangerous in the absence of sufficient evidence or if the researcher discounts data that do not confirm the hypothesis (Massey, 2011).

The most defensible data in focus groups is “articulated data” which are data that are “expressed in a response to, or specifically addresses, the questions posed” (Massey, 2011). The primary strength of this data is that participant responses to questions are credible in their own right. He cites that another advantage of articulated data is the depth of understanding derived from the “capacity of group participants to recast issues from

their own perceptual framework." He further adds that participants have the ability to react to one another and expand on comments or disagree with each other. This allows the observer to understand the nuances of issues.

One cannot expect to identify emergent data in the completion of a series of focus groups. Emergent data are the "information related to group meanings, processes, and norms that add new insights and generate new hypotheses and is the unanticipated product of comments and exchanges of group members." Emergent data are the richest form of qualitative data, according to Massey, but also hold the highest potential for misinterpretation.

The facilitator of a focus group must follow standard practices to obtain valid results. At a minimum, the completion of at least three sessions, the use of a script or some other device to ensure each group proceeds similarly, and the presence of a note-taker and recording device is required to acquire valid findings (Weiss, 1998; Krueger, 2009). Focus groups were used in this evaluation plan to frame issues pertinent to SSTS professionals' experience requirements for the SSTS advisory committee and to identify if further investigation of preliminary results were warranted.

Survey Methodology

The knowledge, attitudes, and practices methodology (hereinafter, KAP) has been widely used in family planning and public health arenas for decades (Luaniala, 2009). It is defined as "a highly focused, and limited social research method that measures changes in human knowledge, attitudes, and practices in response to a specific intervention, usually education or outreach" (Eckman, 2011). It has been most popularly used by international assistance organizations to obtain data in a myriad of contexts; community

health, immunization, agricultural extension, water sanitation and supply, and family planning (Adhikarya, 1987; Luaniala, 2009; Yoder, 1997). It has been used in a variety of settings perhaps because of the interdisciplinary roots of the anthropological, educational, and public health practitioners who have piloted the method and developed the body of literature explaining its applications, strengths, and limitations (Luaniala, 2009; Adhikarya, 1987; Yoder, 1997; Smith, 1993).

A detailed manual for KAP implementation was developed by The Population Council (1970 and 1972) and the World Health Organization has recently produced its own guidance for the development of KAP survey tools (WHO, 2008). The Population Council's guidance document, intended for practitioners, identifies the four major purposes of KAP products as descriptive, evaluative, directive, and validative. Interestingly, these are the same underlying motivations for formative program evaluation and Patton's intended uses of findings (Weiss, 1998; Patton, 1997). KAP is oriented towards problem-solving, and thus, the keys to successful KAP implementation are similar to those of the program evaluation process. The following six steps emerge when one combines program evaluation and KAP guidance documents;

1) Define the setting/context
2) Define the audience
3) Design data collection methods
4) Implement with integrity
5) Analyze data
6) Utilize data

(WHO, 2008; Weiss, 1998).

KAP methods are a subset of more general social science practices. Standard protocol must be followed throughout the process of design, collection, analysis, and

interpretation to offer valid evidence. This evaluation followed textbook practices in focus group facilitation and survey tool implementation (Goldenkoff, 2004; Dillman, 1978; McCall, 1982). The importance of using accepted social science protocol cannot be overemphasized, as data reliability is foundational to the honest utilization of evaluation outcomes.

The question may arise of whether a methodology historically used by social scientists and public health professionals in international settings should be used to evaluate the experiences of septic system professionals in Minnesota. In addition to the similarities identified between KAP and more general formative evaluation procedures, research suggests that KAP strengths translate well to natural resource research in the United States, and has provided cost effective and valuable information for project planners in Minnesota (Eckman, 2010). Similar to Massey's description of articulated data from focus groups, KAP surveys provide easily interpretable results from quantifiable data (Luaniala, 2009).

KAP surveys are typically utilized as a pre- and post-intervention to provide longitudinal data documenting change. This investigation was not designed with a pre- and post-tool. It intended to set baseline data about the current knowledge, attitudes, and practices of SSTS practitioners and provide valuable descriptive statistics that can be attributed to their area(s) of specialization and tenure in the industry. This information can be evaluated from the perspective of a program planner to identify how effectively current educational requirements meet their intent and the expectations of their audience. The underlying purposes of educational policies should be periodically evaluated to ensure the desired outcomes are achieved. KAP methods provide quantifiable data that

can be easily interpreted and, assuming general survey instrument protocol is followed, be representative of a wider population (Luaniala, 2009).

KAP has not been critically evaluated as a general methodology. However, critical analyses of specific applications of KAP have drawn into question the applicability and/or relevance of data produced and thoroughly challenge any linear or predictive relationship between a group's knowledge, attitudes and their practices (Smith, 1993; Yoder, 1997). The subjects of the criticized KAP studies focused on reproductive health and fertility issues, suggesting that KAP studies focusing on more benign, less socially and culturally stigmatized issues may be more appropriate choices for this methodology. In terms of the predictive relationship critique, KAP is simply not intended to identify causal relationships. While an incomplete understanding of one's audience leading to an "unfocused inquiry into diffuse behaviors" (Smith, 1993) is not sound research, it is worth mentioning that critique of KAP is limited to a small subset of its applications.

It is true that KAP methods share the same challenges as other social sciences. However, there is a potential to misuse data or overreach conclusions in all scientific inquiry. Clearly recognizing potential problems and avoiding common pitfalls may truly be the art of science. For example, Manski claims it is, contrary to social psychologists' and demographers' probabilistic statistics, impossible to predict an individual's or a group's intentions in a survey (1995). There is something inherently unpredictable about people and their behaviors that continue to confound scholars (Manksi, 1995). This does not mean we stop trying to understand, just that we ought to be skeptical of predictive claims.

Incorporating the tenets of program evaluation, adult education, and mentoring research with participation-based organizational learning that used standard social science research tools allowed this investigation to systematically capture and deliver information as a means to an end. Attention was paid to both the intended uses of the study and data quality, providing a mechanism to deliver accurate information with which decision-makers could learn and act to improve the way in which SSTS professionals are prepared.

Methods

The Evaluation Plan

The impetus for this evaluation came from recommendations from a MPCA led self evaluation using the Six Sigma evaluation process, which is a process that forces the collection of public feedback and provides incentives to identify and address barriers to program success (MPCA, 2008b). Methods for that evaluation included informal interviews conducted by agency staff, opinions generated through field experience, insight from new staff members, and an upcoming rule change that included a more formal collection of public feedback. Results included concern regarding the way the State of Minnesota prepares its onsite practitioners for success in this changing and growing industry. The MPCA acknowledged widespread concern about the experience program identified in 2002 – 2006 Minnesota Rules Chapter 7080.8000 (MPCA, 2002). The Minnesota Onsite Sewage Treatment Contractors Association (now the Minnesota Onsite Wastewater Association (hereinafter, MOWA)), also identified the need for improved experience/mentor programs in their Model Program Review Report in January, 2002 (MOSTCA, 2002).

One result of these investigations was that the proposed Minnesota Rules, Chapters 7080-83 (adopted February 4, 2008) increased the rigor of the experience program. The Minnesota Rules 7080 revision process requires a legal justification for all changes. The Statement of Needs and Reasonableness (SONAR) justifies a number of changes in the way the experience program will be administered. A list of these changes

between the 2002 – 2008 Minnesota Rules Chapter 7080 and the currently adopted Minnesota Rules Chapters 7080-7083 can be found in the section entitled, “Comparison of SSTS and Other Trades With Apprenticeship Requirements” (page 4).

The primary sources of data in this study are focus group feedback and survey response data. Non-respondent abbreviated questioning was planned, but not required due to the high survey response rate and confidence level. This evaluation is intended to set a baseline for future investigation on the success of recent changes to the mentoring program. It seeks to build internal evaluation capacity and to provide an examination surrounding the framework of the implementation of the mentoring program. Ultimately it seeks to generate data about the knowledge, attitudes and practices of SSTS professionals that will be analyzed to develop recommendations about the future implementation of the experience component of the SSTS pre-certification process. Guiding evaluation questions include:

1. What are the best practices of mentoring that contribute to the development of high quality practitioners?
2. What variables among aspiring professionals affect the success of the experience program?
    a. previous experience vs. no previous experience,
    b. high vs. a low level of professional pride and motivation to succeed,
    c. completion of state required pre-certification training prior to or after completion of required experience,
    d. regular interaction with local inspector(s), and the
    e. quality of mentoring experience.
3. To what extent has the experience program improved practitioners’ abilities to perform both essential and best operating practices?

Through focus groups and a literature review, this study aimed to identify best mentoring practices, within Minnesota and regionally. Those practices were identified and integrated into survey questions used to assess mentorship quality. Ultimately, the goal is to correlate the delivery of best mentoring practices with what apprentices are taught and understand how those two educational dynamics affect long term job competency.

Data derived from the focus group and survey responses are sufficient to provide descriptive statistics and recommendations. The descriptive survey results are reported by groupings of question type; knowledge questions, attitude questions, mentoring relationship questions, and specialty area-specific practice questions. Discussion about the future application of metrics and correlation analysis can be found in the Recommendations and Discussion section of this thesis.

Focus Groups

Focus groups were used to frame issues pertinent to SSTS professionals' experience requirements for the SSTS advisory committee and to identify whether further investigation was warranted. The identification of SSTS industry-specific mentoring practices that improve long-term job performance was one goal of the focus groups. Specific attention was paid to creating an environment where practitioners would be comfortable sharing their experiences and opinions of the experience program. The variety of mentoring practices were then integrated into a survey to elicit data to correlate both the delivery (mentor score) and acceptance (learner score) of a high or low quality mentorship experience to a professional practice score. The goal was to answer the

question of whether or not mentorship matters in the development of professional competence in the SSTS industry.

Attendees at three General Continuing Education Workshops held in Detroit Lakes, Two Harbors, and Willmar, Minnesota in February and March, 2008 (UMN OSTP Courses #602, 603, 604) were asked to participate in a sixty to ninety minute discussion after the first day of the workshop to evaluate the effectiveness of professional preparation in the SSTS industry, particularly the experience program. An incentive of a paid group dinner was offered in exchange for the participants' time. Three focus groups were held to sort random responses from triangulated trends of responses, an accepted means of interpreting qualitative data (Weiss, 1997). They were held in three different regions of the state. Notes from each individual session are included in Appendix One. The author facilitated the focus groups. The sessions were audio recorded and a designated note-taker provided a written synopsis of the focus group proceedings. The facilitator used the same introductory and guiding script with each of three focus groups to ensure a consistent experience for participants (Appendix One).

Twenty-five individuals from the three workshops volunteered for the focus groups. Twenty-three participated, with eight in the first group, six in the second, and nine in the third. With the exception of three family members participating in one focus group and two employees of the same local unit of government participating in two different focus groups, participants came from a variety of backgrounds. The SSTS industry was well represented in these groups as all three endorsement categories, a variety of years of experience, and a mix of public vs. private employees participated. The geographical diversity of representation was excellent. Seven of the participants had

submitted an official experience plan to the MPCA as a certification requirement. Sixteen had not or did not recall doing so. All participants completed informed consent forms prior to participation (Appendix One).

Survey Development and Implementation

Due to the fact that human subjects were involved in this research, an exemption from review under federal guidelines 45 CFR Part 46.101(b) category #2 Surveys/Interviews; Standardized Educational Tests; Observation of Public Behavior was sought and granted (IRB Study Number 0807E38726).

The KAP survey provided quantitative data regarding the knowledge, attitudes, and practices of randomly selected SSTS professionals. Respondents' level of knowledge was assessed based on their response to the knowledge-based questions (both general and specific to their specialty area). It also assessed their attitudes surrounding observations identified in the focus groups. Lastly, the survey ascertained the level at which their stated practices reflected industry-defined best practices. The survey asked questions to quantify the extent to which beliefs or attitudes differ among specialization, tenure, knowledge level, and practice level.

MPCA documentation (Task Analyses) was used to begin the discussion with the mentoring workgroup about which practices ought to be surveyed. An outline of the survey drafting process prior to determining which practices would be analyzed is available from the author upon request. This study was designed to be adaptive and the focus group findings influenced the scope and extent of the survey. The mentoring workgroup reviewed several iterations of the survey draft before it was presented to the advisory committee for final approval prior to distribution.

One key concern identified during the focus groups and survey drafting was how to identify the difference between the effects of any mentoring program and the results of other on-the-job training. The author decided to ask the respondent to separate those two sources of experiential training, and two separate, but similar sections were created for comparison.

Based on the results of the focus groups, survey questions were refined to confirm or refute the following preliminary findings:

1. There is a high value associated with experience and learning gained from other practitioners.
2. Multiple endorsements or mentors provide a broader, higher quality experience
3. There are strong feelings that experience requirements should be cumulative as practitioners progress from installer through inspector.
4. A lack of experience is considered the most common cause of mistakes.
5. Good and bad mentors are not differentiated in the current experience program.
6. Variations in the quality of local programs affect practitioners' competence.
7. Lack of access to mentoring opportunities is a barrier to entering the SSTS profession.

A final draft of the survey is included as Appendix Three. Sixteen members of the SSTS advisory committee, mentoring workgroup, and other interested parties provided comments to improve the survey draft. An academic committee also reviewed the survey. The survey was piloted by six volunteers and improvements were made to instructions and question clarity.

Obtaining a mailing list of all possible subjects required approval by the Minnesota Attorney General because certified individual information is considered private data, whereas licensed business data is public. The mentoring workgroup insisted

on accessing the entire population of SSTS professionals rather than only those who owned businesses in Minnesota. Once approval was received, MPCA staff assisted with generating a list that included individuals who were once certified but whose certifications expired in 2008, individuals who were eligible for certification but their eligibility expired in 2008, individuals who are currently eligible for certification, and currently certified individuals (both restricted and unrestricted). Determining this entire population was a difficult, but important step because those currently going through the experience requirement have opinions that are very important to this subject.

Once the list was generated, the population size (N) was 3,276. With at target Confidence Level of .95, 550 responses were required to provide an adequate representation of the population (McCall, 1982). A .95 Confidence Level suggests that, given a random sample size of 1100, cumulative results are representative of the larger population (with a margin of error of approximately 3%) 95% of the time (McCall, 1982). A random number generator produced a list of 1,500 names and addresses. Randomization is important to ensure representative results. 1,100 surveys were mailed out and a response rate of 50% was anticipated.

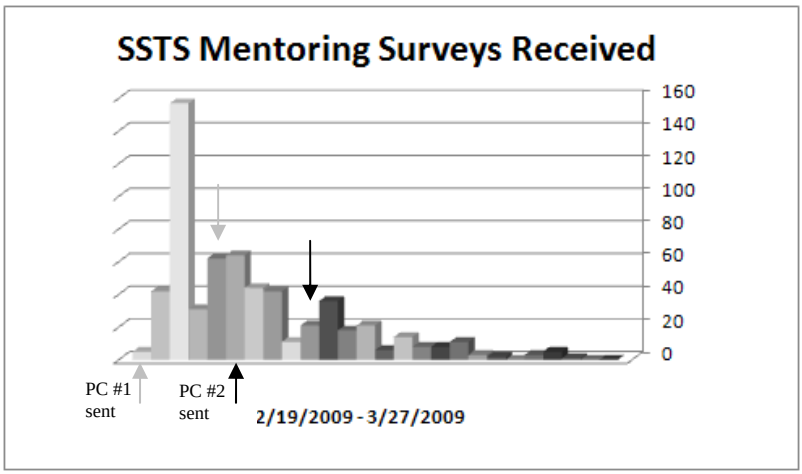
To improve data reporting, each survey was assigned a unique identifier. This code was used to generate a mailing list for final reminders. The original data did not include county information, but using a macro that linked the city, state, and zip code to county information provided a means by which data could be reported by jurisdictional boundaries. This is important because most local SSTS programs are administered at the county level and differences between jurisdictions may be a topic of future research. No response data will be linked to personal information.

The final mailing list was processed through the national change of address database to reduce the number of undeliverable parcels. Participants in the SSTS advisory committee and interested parties were removed from the master list before a random number generator was used to assign survey recipients.

The survey was mailed out using the Total Design Method identified by Dillman to maximize survey response (Dillman, 1984). The process included sending a pre-letter to notify the randomly selected recipients of the request to participate in the research study. One week later, a mailing with a cover letter and the survey was sent. A two-dollar bill was attached to the survey; participants were thanked for considering participation and urged to enjoy a coffee or snack while completing it. A postage paid return envelope was also included. A postcard was mailed to all recipients thanking those who had completed the survey and urging those who had not to please consider completing and returning the survey for analysis nine days after the survey was sent. A final postcard was mailed to those who had not returned surveys eight days later. Appendix Two includes correspondence to the randomly selected survey recipients in support of Dillman's Total Design Method. Figure 1 shows the quantity and date of survey response returns. The value of the Dillman method can be seen through the increased number of returns immediately following the original request for a response and reminder postcard mailings. This data is somewhat limited due to constraints in knowing exactly when something that is mailed is received, and how quickly people respond to a given request. However, it is notable that two "humps" emerged after the initial survey return period and two reminders were sent.

If a 50% response rate were not achieved, the contingency plan was to send surveys to the next in-line on the randomized mailing list (between 1,100 and 1,500). If the 550 response threshold was still not met, the plan was to call non-respondents. Additional randomized names were available if non-respondent data collection were required but impossible.

Figure 1- 615 surveys were returned between 2/19/2009 and 3/27/2009. Arrows and their corresponding increase in responses are indicated when Postcard #1(gray) and #2 (black) were sent, on 2/19 and 2/27.



Results

Focus Groups

Seven triangulated concepts emerged from the focus group discussions. Three were positive observations and four suggested challenges that a reorganized experience program could overcome.

1. Value of experience, learning from each other

All participants considered on-the-job training as critical to their success as SSTS practitioners. Cooperation with co-workers and family members, other contractors, inspectors, product distributors, and personal responsibility or ethics were articulated as sources of hands-on training that improved their competence. Open communication among practitioners was identified as a method for improving soils identification, communicating with homeowners, setting tanks, installing distribution systems, ensuring watertight connections, preventing the installation from sagging pipes, and installing systems to prevent freezing. Nearly all public inspectors identified that a significant part of their competence was developed through working with the contractors they inspect.

The way participants used terms like *experience* and *mentorship* indicated that these sources of improved competence were not always directly related to officially required experience, but always related to on-the-job training that was necessary and did take place, regardless of whether an official experience plan was submitted to the MPCA. The closest any group came to defining positive mentor characteristics was in Detroit Lakes, where the group agreed that a good mentor reinforces taught practices, teaches

basic techniques not explicitly covered in the classroom, and builds confidence in new apprentices. A challenge for future research will be how to differentiate officially required experience, which can be controlled, from on-the-job training, which cannot. More about this topic is discussed in the Good and Bad Mentors section below (p. 37).

2. Multiple endorsements or mentors provided for a broader experience

It became apparent at the first focus group that participants had strong feelings about gaining experience in multiple endorsement areas. This sentiment was carried throughout all three sessions by participants who carried multiple endorsement category certifications. Practitioners who learned from and conduct business in multiple fields of the SSTS industry identified a deeper understanding of the industry that results in better on-the-job practices. This emergent data was characterized by one participant who noted he could identify a design completed by someone who had installed systems in the past and one by a person who had never stepped foot in a trench by the simple mistakes that an experienced installer would never incorporate into a design, such as incorrectly identifying the depth at which water leaves the home. One exception to the general agreement about multiple endorsements was that participants agreed that knowledge of other SSTS industry job tasks does not necessarily improve one's ability to pump tanks. Discussion in one focus group did qualify that exception with the feeling that more maintainers are taking on system troubleshooting and repair responsibilities.

3. Perspectives of what experience requirements should be

Participants in all three focus groups unanimously expressed feelings that people who design septic systems should have first installed them. People who inspect septic

systems should have conducted both designs and installations. These feelings are directly related to the general agreement about multiple endorsements above and highlighted practitioners' beliefs that a septic system inspector ought to have the broadest and deepest understanding of the industry, job practices, and technical issues regarding septic system effluent acceptance and treatment. This discussion often led to another consensus item, that inexperienced practitioners are the most common cause of mistakes (see #4 below) and complaints about various local programs and inspectors (see # 6 below).

The universally identified challenges included:

4. Lack of experience was considered the most common cause of mistakes

The importance of practical field training was emphasized by the focus groups' introduction and acknowledgement of lack of experience as the cause for problems in the SSTS industry. One participant in Two Harbors commented that someone may be "book smart" but "dumber than a box of rocks" when it came to job completion. This sentiment was received well by the group and other participants agreed that most of the mistakes that are happening are a result of a lack of on-the-job experience. The intent of the experience program is to minimize or eliminate these mistakes, which in spite of its existence for twelve years, continues to occur in both private and public SSTS activities.

5. Good and bad mentors are not differentiated in current program

SSTS practitioners learn a great deal about their day-to-day job responsibilities in the field. The purpose of the experience program is to ensure that early career professionals have an opportunity to acquire some of that exposure in a semi-controlled or supervised environment. This can prevent early professionals from developing poor

work habits and helps to protect consumers, the environment, public health, and the SSTS industry. All focus group participants admitted that the current experience program does nothing to distinguish between good and bad mentors. The facilitator pointed out that the new rules attempted to address this by preventing practitioners with an enforcement history from acting as mentors. In the two focus groups where this was highlighted, the groups agreed that this was a positive step, but not sufficient in preventing bad mentoring from occurring. One Detroit Lakes participant noted that "there are a lot of [people] cutting corners out there." Most focus group participants were aware of reported experience events that never took place, or did not include appropriate supervision or even the presence of the mentor at any time. In Willmar, this topic was addressed succinctly with a consensus nodding after the comment, "There are people out there who will cheat. People who cheat should be identified and punished." Many of the participants also noted that positive reinforcement took place outside of the required experience program. It should be noted, that regardless of the fate of the experience program, most participants identified having a vested interest in doing good work and seek competent advice when needed, if available. However, it is the author's belief that as long as the quality of required experience is not monitored or controlled, the experience program will not be able to meet its intent.

The following characteristics were identified as typical of good and bad mentors.

Table 2. Summary of Focus Group Discussion on Mentoring Quality.

Good Mentoring:	**Poor Mentoring:**
Mentor is present	Is not present
Builds confidence	Does not correct poor behaviors
Teaches practical skills	Teaches one to do something incorrectly

6. Quality variations in local programs and inspector endorsement issues

An undercurrent of all three focus groups was a collective acknowledgement of the fact that the quality of local SSTS programs has a significant effect on the level of competence demanded of practitioners. There was a discussion about the variation in quality across different local programs at all three focus groups. One striking comment was that there are local inspectors out there who “don’t know what they are doing.” This comment received affirmation from the groups, as if everyone knew someone or somewhere where a local program was widely criticized. It was identified that in regard to experience, an inspector endorsement was the easiest to obtain. Most participants felt that this was backwards and that the inspector endorsement should be the most difficult to obtain.

One participant in Detroit Lakes pointed out that having designed systems in the past was critical to becoming a good system inspector. Another participant reiterated this point. The Detroit Lakes group collectively acknowledged that a broad understanding of the industry is critical to successful SSTS inspections (see #3, p. 36). There was a collective acknowledgement that good and poor local SSTS programs exist.

Two examples of how poor local programs negatively affect practitioners who want to do things correctly were discussed. In one instance, local programs did not require inspections. This negatively affects contractors by eliminating the need to be licensed. Participants pointed out that it is impossible to compete with those providing similar services as unlicensed professionals. Another example highlighted that in certain parts of the state, mounds are not installed, even though they should be according to Minnesota Rules Chapter 7080. This situation has been documented by MPCA

enforcement staff. This negatively affects SSTS practitioners who want to follow state rules but cannot because they cannot compete with the lower bid associated with improperly designed and installed in-ground systems. This situation also negatively affects homeowners who often need a certificate of compliance to sell their home when required by a mortgage company or buyer, not the local unit of government. It has created an environment in which private inspectors will refuse to inspect systems in certain areas because of a lose-lose situation: they fear alienating local contractors and undermining local government officials by correctly failing systems, or creating liability unto themselves by improperly passing incorrectly designed and installed systems.

The quality of local programs is an additional topic of research, but it does fit into this research context in terms of what type of experience is required for different endorsement categories; particularly new system inspectors. The focus group participants feelings were that field experience in all parts of the septic system design-maintenance continuum was critical to bolstering the amplified effect that local programs have on professionals' field practices.

7. Availability of mentoring opportunities

One widely acknowledged point was that currently one must obtain mentorship from a co-worker, a local unit of government, or a competitor. This can be perceived as a barrier of entry into the SSTS industry. Some might argue that a competitor may have ulterior motives in providing poor mentoring to a future competitor. The bottom line is that a competitor does not have any incentive to invest time and resources into the development of a highly skilled adversary.

Because acceptable experience can vary greatly in quality and is sometimes provided by competitors, all of the groups argued for some method of uniformity to assure that all new practitioners have gone through similar, supervised on-the-job training.

One participant proposed a state-run experience program that provided designs, installations, and system maintenance to low income or elderly homeowners. This type of program, he suggested, could help apprentices gain on-the-job training while providing services for those that cannot afford them.

Another suggestion was to enforcing implement a requirement for aspiring practitioners to work for a summer with an existing crew installing septic systems. Participants appreciated the intent of this idea, but questioned how that person would be compensated. Another participant mentioned that more intensive experience was okay, but that it had to happen in another region due to fear of competition.

When asked whether a mentor-matching program might improve access for aspiring professionals to acquire experience, some participants thought that linking new professionals to existing mentors could be helpful. However, one key challenge included identifying willing mentors who would mentor future competitors within a geographical region. Many participants suggested that the state should limit the number of people who can provide important on-the-job training. Significant support existed for controlled, tangible, accredited, on-the-job training that would reduce the number of people who depend on competitors for their experience. Resources for such an effort were acknowledged as a significant hurdle.

Focus Group Conclusion

The focus groups provided a more general discussion of the mentoring program than the specific practice inquiry originally anticipated. This was possible the result of mixing different specialties within the focus groups. SSTS installers, designers, private and public inspectors, and maintainers are not all familiar with each other's profession. Though this general feedback was valuable and did confirm previous concerns, the mentoring workgroup and other experts were used to identify questions for the survey about specific job practices and ways to prevent mistakes. The focus groups agreed with having a state requirement to gain experience prior to becoming a fully certified practitioner, but most did not feel that the current experience program meets the needs of these professionals.

The framework of the SSTS program in Minnesota lends itself to experiential learning throughout one's career. However, regulators cannot depend entirely on good training and mentoring to ensure adequate performance. A cadre of inspection professionals experienced in all aspects of the industry is crucial to perform the necessary oversight that will reinforce positive behaviors and correct unacceptable practices among the private contractors. Likewise, it is not prudent to depend on training and mentoring alone to ensure that local programs perform adequate oversight. Periodic quality assurance of local program implementation is logical and necessary.

Survey Results

General

630 of the 1100 surveys mailed on February 10th, 2009 were returned between the dates of February 19th and June 4th, 2009 for a return rate of 57.2%. 32 surveys were not usable because the respondent did not answer the gateway question asking whether they worked on septic system designs, installations or inspections. Of the 598 accepted responses, 55 or 9.2% answered 'no' to the gateway question. Thus, 549 completed surveys provided usable data. This met the minimum requirement for a probability sample and data is reported at a .94 Confidence Level. If we extrapolate that 9.2% of the entire population no longer works in the SSTS industry, a new N of 2974 would yield reporting at slightly higher than a .95 Confidence Level. Regardless of how the final N is calculated, response rates were excellent and this data can be considered reliable for further analysis.

75.7% of those who answered the gateway question affirmatively indicated they were certified as SSTS installers. 58.8% stated they were designers, and 42.2% identified themselves as SSTS inspectors. Many SSTS professionals hold multiple endorsement categories.

Asked when they began working in the SSTS industry, 61.0% stated 1996 or earlier, 31.7% stated between 1997 and 2005, and 7.3% entered the industry since 2006. In response to a separate question asking when they first submitted experience documentation to the MPCA, 50.1% stated 1996 or earlier or that they didn't recall ever submitting experience, 34.4% stated 1997-2005, and 15.0% stated either between 2006 and 2008 or that they were in the process of submitting official experience

documentation. These data show that many work in the industry prior to obtaining official certification. Survey results and statistics are represented in Appendix Four. A copy of the raw data is available from the author upon request.

Knowledge Questions

The survey assessed the knowledge level of SSTS professionals in two ways. Two general questions (#4 and #5) were asked of every respondent. Knowledge questions were also asked later in the survey of those that identified themselves as installers, designers and inspectors (of new or existing systems). These responses are discussed in more detail on page 47. 85.2% correctly identified the septic system with 36" of vertical separation as the system that best protects public health and the environment. 93.2% indicated that exposure to sewage and septic tank effluent can cause infectious disease in humans (74.4%) or can cause death in humans (18.8%). 6.8% of respondents either provided multiple answers or stated that sewage and tank effluent was usually safe to come into contact with humans. While the vast majority answered these questions correctly, further analysis is recommended to investigate similarities between those that answered these simple questions incorrectly.

Attitude Questions

Fifteen questions were asked to assess attitudes surrounding professional motivation, the extent to which respondents felt state and local policies affected the quality of the SSTS program, and how important it was for SSTS professionals to understand and experience multiple disciplines as they progressed on to design and inspection of systems.

Respondents were allowed to select all reasons that applied when asked why they were in the SSTS industry. The most popular response (68.1%) was that they liked working outdoors, followed by taking pride in protecting environmental health (63.4%). Being self-employed was the next most popular reason (53.6%). 49.9% indicated they take pride in protecting the health of their customers. Roughly one in five indicated that they work for a family business. Further analysis is recommended to investigate the difference in knowledge and practice levels between those that did or did not select pride in protecting the environment or public health, as those who selected these options may have a higher motivation to learn and implement best management practices in the design, installation and inspection of septic systems.

When asked to rank the value of each component of SSTS professional preparation (pre-certification courses and exams, required experience, and continuing education), respondents identified the pre-certification courses and exams as the most important (average score 1.39, with 1.00 being most important, 2.0 being somewhat important, and 3.00 being least important). Required experience received an average response of 1.55, and continuing education an average response of 1.98. All three components of SSTS professional preparation were considered somewhere between "most" and "somewhat" important.

Questions 10-12 tested the universality of attitudes identified during the three focus groups. 69.5% of respondents felt that it was very important or important for professionals to hold multiple endorsement categories to be considered an expert. 83.9% felt that it was very important or important for SSTS designers to install septic systems before they design them. 80.7% felt that it was very important or important for septic

system inspectors to design and install SSTS before they inspected them. These results strongly support the attitudes echoed in the focus groups and point toward the need for a change in the way designers and inspectors become fully certified to conduct their job tasks.

Respondents also strongly aligned with the focus groups in their feeling that new septic system professionals should have guaranteed access to a qualified mentor. 91.3% of respondents indicated that this was either “very important” or “important,” with an average response of 1.65 on a scale between 1 and 4. When asked if someone should make sure that new professionals have access to opportunities to complete their required experience, 66.0% answered yes. 12.4% answered “I don’t know.” Those that answered yes to this question were asked to identify who should take on the role of ensuring access to these opportunities. The responses were split with 32.2% choosing local units of government, 29.6% choosing the MPCA, 15.1% selecting a professional organization, and 12.3% selecting the University of Minnesota.

Triangulated focus group opinions were also verified to some degree when respondents were asked how well the MPCA currently differentiates between good and bad mentors and whether or not it should. The average response of 2.57 is closer to “poorly” on a scale between “very well” (1) and “not well at all” (4). The average response to whether the MPCA should differentiate between good and bad mentors was 1.9, very near “important.”

The last three attitude/feeling questions had to do with local permitting and inspection programs across the state. On a scale of 1-4 (strongly agree, agree, disagree, strongly disagree), the average response to the belief that differences in local programs

influence SSTS professionals' practices was 1.73. 11.1% of respondents either disagreed or strongly disagreed. The average response to the belief that tough and thorough local programs result in high quality septic system installations and decreased risks to public health was 1.80. 13.5% indicated they disagreed or strongly disagreed. The average response to the belief that there should be a uniform SSTS program across the state was 1.79. 19.3% indicated that they disagreed or strongly disagreed to this statement, while 44.7% strongly agreed with this statement. The average response to each of these three questions was between strongly agree and agree, which suggests that SSTS professionals recognize a standard state code and thorough local programs as powerful tools to affect their behavior in the field and control the quality of SSTS installations.

Experience with their Mentor

A separate section of the survey asks respondents to answer a set of questions based on their encounter with a mentor to submit required documentation for SSTS certification. Roughly two-thirds of respondents answered the questions about their formal mentoring relationships. Certain respondents answered some but not all of these questions. If they had not yet acquired a mentor or did not recall working with a mentor for documentation purposes, they were asked to skip this section and respond to similar questions of a more general nature about receiving on-the-job training from someone other than a formal mentor. This was done for two reasons. First, many of the professionals working before 1996 were not required to submit official experience plans. Secondly, focus group participants identified that on-the-job training often takes place outside the realm of officially required experience. Research indicates that both formal

and informal mentoring relationships support favorable outcomes (Ragins, Cotton, and Miller, 2000), thus data from both sections are of value to this study.

69.9% of respondents who answered questions about working with their formal mentor indicated that their mentor was on the job with them "all" or "most" of the time. Further analysis is recommended to determine if there are knowledge or practice gaps in those that answered "some," "little," or "none" of the time, as research has identified that meeting frequency is associated with greater apprentice satisfaction (Wanberg in Hezlett, 2005).

When asked to describe their mentor's behavior, respondents were given options ranging from "all of the time" to "none of the time." They were asked to what extent their mentor:

- showed them the correct way to do things;
- criticized them when they did something wrong;
- complimented them when they did something right;
- corrected them when they did something wrong;
- provided them with other resources to help them do a better job;
- taught them practices they later found to be incorrect.

Additional questions asked respondents to identify the extent to which their mentor instilled a high level of confidence and taught tasks or concepts that helped them prevent mistakes in later work.

The author proposes the creation of a "mentor score" based on mentor presence and the bulleted items above. An "apprentice learning score" could be derived from confidence building and mistake reduction questions. This complex analysis is recommended to evaluate if certain mentor behaviors improved apprentices' encounter

with their mentor. The results of this analysis could be included in recommended mentor guidance documents.

When asked how respondents obtained their mentor, the three most frequent answers were “someone at work provided me with a mentor” (30.7%), “I found a certified person to provide mentorship for me” (30.5%), and “A local unit of government performed mentoring duties for me” (21.8%). Only 8.3% of respondents indicated that they traveled outside of their core work area to complete required experience. 13.8% reported paying their mentor or accepting a reduced wage while completing their experience.

Approximately 40% of respondents answered yes to a question asking if they had received on-the-job training from someone other than an official mentor. Respondents who answered yes were asked to describe their informal mentor’s behavior in the same fashion asked of the previous section. Confidence building and mistake prevention were also assessed. Results can be found in Appendix Four.

Specific Endorsement Questions

Installers

411 respondents indicated that they were certified as an installer and all 411 respondents completed questions in the installer section. Three basic questions were asked of installers to assess their knowledge level. 92.9% correctly identified that a watertight septic tank was critical to the proper functioning of a septic system. 94.4% correctly responded that preventing compaction in and around the soil treatment area can increase the longevity of a septic system.

When asked to rank the practices they followed to ensure a watertight tank installation, most responsed “checking the tank for cracks and rejecting it if cracks exist” (83.4% of responses) and “using mastic and/or boots at tank penetrations” (61.4%). 29.7% indicated that “applying bedding below tank, building sewer, and supply pipe” was the first or second most important practice; 7.4% indicated that a hydrostatic test was the first or second most important practice; and 5.4% of respondents indicated a pressure or vacuum test was the first or second most important practice.

When asked to select all practices commonly followed to prevent compaction around a soil treatment area, 90.2% of installers indicated they “mark the area with flags to route equipment away from the soil treatment area.” 90.8% indicated that they use “tracked equipment instead of wheeled equipment.” 67.9% actually “delay the installation if the soil meets or exceeds the plastic limit.”

When asked how installers know where to set the floats to ensure a proper pump cycle, only 2.2% indicated that “the manufacturer settings are adequate.” Virtually all indicated that they calculate this setting.

29.5% of installers reported they had been required to improve or redo their work at least once. 69.7% reported that they have never been required by an inspector to improve or redo their work.

Designers

322 respondents indicated that they are certified designers and 319 completed some portion of the designer section. Three basic questions were asked of designers to assess their knowledge level. 95.9% correctly identified that depth to the limiting condition was the most important factor in determining the appropriate type of septic

system. 94% of respondents correctly indicated that landscape features influence the design of a septic system. Surprisingly, only 78.4% of respondents correctly identified the way that soil texture most affects the design of a septic system (the size of the soil treatment area). This is a fundamental concept for SSTS design and should have been answered correctly by a higher percentage of respondents. Further analysis is recommended to identify if there are significant differences in the attitudes or practices of those that answered these questions incorrectly.

In assessing the practices of designers, 60.3% identified that they conduct three or more soil observations to correctly determine which type of system they will design. 31.1% indicated that they conduct one or two soil observations. 33.9% of designers admitted that competition from other designers has influenced the type of system that they have designed.

75.7% of designers stated that they have never been required to change a design or been denied a permit because a local unit of government stated that they had chosen the incorrect type of system.

Inspectors

229 respondents indicated that they were certified inspectors. They were asked to complete only one section based on what type of inspections they most frequently conduct, new or existing systems. However, 77 respondents answered both sections. Though the piloted survey did result in improved and clear instructions for this section, it is true that many respondents conduct both types of work and either insisted on or inadvertently did not follow instructions when completing both sections. By subtracting the 77 respondents that answered both sections from the 315 total responses, we do

approach the 229 that should have filled out one of these sections (238 respondents answered only one of these sections). All responses were used in the following analysis.

New System Inspectors

154 respondents completed the section about inspecting new systems. Their knowledge was assessed with two questions. 93.5% correctly responded that the depth to the limiting condition is the most important factor in determining the appropriate type of septic system. 97.4% responded that preventing compaction in and around the area of the soil treatment area can increase the lifespan of a septic system. Further analysis is recommended to determine if there are significant differences in the attitudes or practices of those that answered these questions incorrectly.

Interestingly, in assessing these professionals' practices, only 21.7% of new system inspectors indicated that they have never denied a permit or required a change in design based on an incorrectly chosen system type. 39.8% indicated that they have done so rarely. 36.4% reported that they "sometimes" have done so.

No more than 69.5% of new system inspectors selected any single best practice offered when asked to "select all practices you follow when conducting a new system inspection". This suggests high variability among the practices of new system inspectors. The most popular practices selected were "ensuring the soil treatment area and reserve soil treatment area are marked with flags and/or string to divert construction equipment" (69.5%) and "ensuring that the soil does not meet or exceed the plastic limit" (69.5%). 55.2% reported that they "lift inspection pipes to ensure they are secured". 49.4% reported conducting a jar test to ascertain the use of clean sand. 25.3% responded that

they “request delivery records from the installer to ascertain the use of clean sand and rock.”

Only 6.5% of new system inspectors stated that they never require installation contractors to redo their work, which contrasts with the 69.7% of installation contractors that reported never being required to redo or improve their work. 53.6% reported doing this rarely. 39.1% stated that they require installation contractors to redo their work “sometimes.”

Existing System Inspectors

161 respondents completed the section about inspecting existing systems. Their knowledge was assessed by asking two questions. 96.3% of respondents correctly indicated that that the depth to the limiting condition was the most important factor in determining appropriate system type. 94.4% correctly reported that a watertight septic tank is critical to the proper functioning of a septic system.

In assessing these professionals’ practices, 67.5% reported that they always obtain all septic system records available at the local unit of government before conducting an inspection. 21.7% reported doing this frequently. No one reported never obtaining available records. When asked to choose the most important practice in determining the treatment media depth when inspecting for vertical separation, 73.4% indicated that they probed “the area to determine this depth.” Only 6.9% stated that they “use a laser to assist in making this determination.” 9.8% indicated that they simply “reference existing design records.”

11.9% of existing system inspectors admitted to passing a system that might have been non-compliant due to “extenuating circumstances.” Another 6.9% answered “I

don’t know” to this question. If we assume that those answering “I don’t know” did so because they were not comfortable truthfully answering a question that clearly asks if they knowledgably did something illegal, then we ascertain that 18.8% of inspectors have at some point in their career provided a certificate of compliance to a failing septic system.

Recommendations and Discussion

Recommendations to the SSTS Advisory Committee

It is clear from the data that changes made in the last rule revision were in line with the feelings of the onsite audience. Broadening experience requirements for installers and designers to include the observation of additional specialty areas within the SSTS industry was a step in the right direction. The enforcement history background check was also a positive step, as 88% of survey respondents felt that it was important or very important for the MPCA to differentiate between high and low quality mentors and numerous qualitative responses pleaded for a stop to fraudulent reporting.

There is potential conflict in revising the existing program. Changes made to one area of concern are likely to counteract or worsen another area of concern. An example would be addressing a popular concern that inspectors, though often having no practical installing or design experience, can act as a mentor to aspiring installers or designers. A recommendation may be to eliminate this provision. However, another popular concern was that there is already limited access to qualified mentors, primarily due to the competition argument. Eliminating the ability of inspectors to act as mentors would also limit access to the source of about 20% of SSTS professional mentors. Another example would be to take the recommendation to increase requirements for mentors (which should reduce fraudulent reporting), but this will increase the barrier to entry by reducing the pool of eligible and willing mentors.

The mentoring workgroup discussed what recommendations it should present to the SSTS advisory committee. There is evidence that the current program does not meet the needs of SSTS professionals and there is evidence that the current program has not been implemented to operate at its optimal level. Do we reinvent the way SSTS professionals are prepared? Or do we make subtle changes to try and improve the program we have? The workgroup had differing opinions about the best way to move forward, but consensus was reached by not eliminating the prospect of a later recommendation for more significant changes to the manner SSTS professionals are prepared. Before going to that extreme, however, the workgroup agreed that improving the existing program within its current framework is the appropriate next step. The recommendations were to level the playing field by bringing inspector requirements up to par with other SSTS endorsement categories, and to optimize program results by providing accurate information to the entire SSTS community. Emphasizing mentoring relationships beyond the context of current requirements is another way to improve SSTS professional competence without making changes to program requirements.

Perhaps some of the most compelling evidence that something is awry between what SSTS professionals feel is right and what actually exists has to do with the relative ease with which one can become fully certified as a SSTS inspector. These individuals wield significant power in the SSTS industry through approving system designs, determining system compliance, and providing mentorship to any aspiring SSTS practitioner.

Questions ten through twelve of the survey were crafted to tested the universality of attitudes identified during three focus groups held in spring, 2008 (See Figure 2). 69.5% of respondents felt that it was very important or important for professionals to hold multiple endorsement categories to be considered an "expert." This number was higher (77.9%) among new system inspectors. 83.9% of all respondents felt that it was very important or important for SSTS designers to install septic systems before they design them (74.6 % of new system inspectors answered this way). 80.7% felt that is was very important or important for septic system inspectors to design and install SSTS before inspecting them (66.0% of new system inspectors agreed). These results strongly support the attitudes portrayed in the focus groups and point towards the need for a change in the way both designers and inspectors become fully certified to conduct their job tasks.

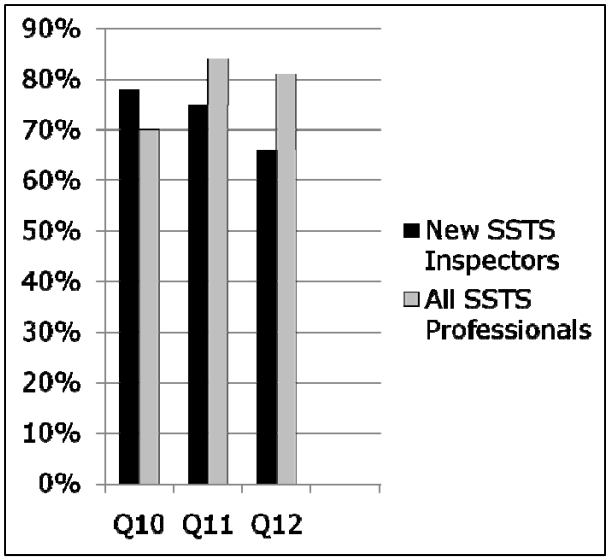


Figure 2: Response data for Questions 10 - 12 for new system inspectors and all respondents

The 2008 introduction of the observation requirement will broaden experience requirements and moves the industry in a positive direction. Now is the time to follow through with that notion and level the playing field across all endorsement categories in the industry.

To this end, the mentoring subcommittee recommended that a revision to Minnesota Rules Chapter 7083 be adopted to bring full certification requirements for

SSTS inspectors in line with the rest of the industry's endorsement categories. The proposed change to 7083.1050 subp. 5 Item C follows (addition underlined):

> An applicant for certification as a basic inspector must have co-completed with a mentor a minimum of 15 inspections of Type I, II, or III systems, as defined under parts 7080.2200 and 7080.2300 with a flow of 2,500 gallons per day or less, <u>with a minimum of one aboveground system inspection, and a minimum of one belowground system inspection. An applicant must observe five soil evaluations, system designs and management plans being developed. An applicant must also observe five system installations, and five service or operational instances, with mentorship not required.</u> No additional experience is required to qualify for the advanced inspector certification.

The MPCA was consulted about the possibility of instituting this change, and certification staff reluctantly accepted this change. The language was added to the most recent rule revision, which is currently in process. An Administrative Law Judge has determined that this change is "necessary and reasonable" (Luis, 2010). Moreover, none of the 332 public comments recorded throughout the rule revision process disagreed with this significant change (MPCA, 2010).

Secondly, and as importantly, we must explore incentives for mentors and write guidance for both mentors and apprentices. Incentives may include, but not be limited to, offering a private model for mentorship, encouraging retiring SSTS professionals to provide mentorship, or identifying and encouraging those with broad SSTS experience to act as mentors by perhaps awarding them with a "master" title or creating a distinct title for those holding endorsements in multiple specialty areas.

The written guidance for those participating in the experience program must define the purpose and context of this program. It must identify what is expected of an

apprentice and define the value of gaining experience while identifying the steps in acquiring a mentor. This guidance should also discuss how to provide sound mentorship. It should include a checklist of critical activities where a mentor's presence is required and discuss how to limit liability as a business that provides mentorship.

One addition to the experience program since 2008 was the introduction of the concept of observation as a part of the requirements. The expectations of an observational event should be defined in this written guidance, and aspiring practitioners should be encouraged to observe a variety of SSTS practitioners.

Discussion

Future Work and Research Implications

Mentoring vs. Required Experience

Minnesota's program for reporting experience in the SSTS industry is a minimum requirement intended to force those new to the industry to seek guidance from others with more experience. A distinction between officially required experience and a more omnipresent sense of everlasting, "on-the-job training" was identified throughout this evaluation. Both formal and informal experiences offer significant potential:

(a) The potential to improve this programmatic requirement rests in the outcome of discussions about the appropriate role of government, the adequate prioritization of limited state resources in its oversight, the availability of adequate resources and instructions for those seeking experience and those providing mentorship, and the ability to implement this program equitably across the state.

(b) The potential to improve and cultivate informal mentoring relationships to create a culture of experiential learning is, however, boundless, and achieving such

potential is up to those that work, regulate, educate, and supply the SSTS industry.

Discussions are taking place that could drastically affect the way in which aspiring SSTS professionals gain competence. The Minnesota Onsite Wastewater Association has been approached by a group of SSTS professionals focused on improving the preparation of SSTS professionals to meet the increasingly technical future needs of this industry. They have suggested replicating field conditions and creating a demonstration-based technical school model. It is the author's recommendation that those involved in the education and regulation of the SSTS industry pay very close attention to this process, and support its intentions to migrate increased emphasis of SSTS professional preparation from the classroom to the field.

While survey respondents ranked the precertification coursework and exams as having the highest value in professional preparation, they also attribute confidence-building and mistake avoidance to their mentoring experiences and on-the-job training. The interrelated and synergistic effect of both classroom and experiential learning is inescapable. However, changes to SSTS professional preparation requirements should be carefully reviewed to ensure that change is not introduced for the sake of change itself. The current method of SSTS professional preparation integrates field work and classroom training. It has evolved and adapted to meet the needs of SSTS professionals over the past 35 years. It is important to recognize that accumulated program value could be lost by making drastic changes for subtle reasons. In the absence of data suggesting that program reinvention is crucial to demonstrating value for SSTS professionals, it may be prudent to follow a model of slow and directed evaluation-based responses focused on

addressing immediate concerns; namely that more experiential learning is a valid endeavor worth investing in.

Along the spectrum of valuable educational methods in the SSTS industry, there must be a balance between experiential learning on one end, and appropriately controlled delivery of curriculum on the other. The nature of septic system work is individual and small-team based, where the most realistic experiential learning is obtained through a one-on-one relationship with a mentor in the field. This mentor/protégé relationship will likely result in behavior changes on the part of the protégé, for better or worse.

Classroom training provides a controlled environment where the concepts, regulations, and standards of practice expected of SSTS professionals can be delivered to every aspiring SSTS professional. This education and testing is necessary to demonstrate that each individual is aware of the issues, challenges, and tempting shortcuts that exist in the real world. Without a classroom-based reality check, formal and informal mentoring relationships are likely to promulgate poor behaviors as well as positive ones. In between the classroom and the field is a realm of controlled field learning events during which practical procedures can be demonstrated by experts and learners can observe and participate in exercises intended to develop skills.

Emphasizing controlled demonstrations and informal mentoring relationships beyond the context of current requirements is a cost-efficient and effective way to deliver quality experience. This requires the commitment of hundreds of highly experienced and qualified septic professionals to invest in the future of the SSTS industry and to put the industry, in some ways, before themselves. Some incentive may be necessary to encourage this type of behavior, but it is not impossible. Both providing mentorship and

demonstrating on-the-job training could and should count for a portion of one's continuing education requirements. The Minnesota Onsite Wastewater Association, with its member base and stated goals, is in an ideal position to emphasize this effort, coordinate local field experience, and facilitate positive mentoring relationships.

Conduct Quality Assurance on SSTS Professionals

The framework of the SSTS program in Minnesota lends itself to classroom and experiential learning throughout one's career. However, regulators cannot depend entirely on good training and mentoring to ensure adequate performance, as there are over 3000 SSTS professionals currently certified in Minnesota, and the administration of SSTS permitting and inspection programs is decentralized to the local scale. Approximately 200 local programs exist in Minnesota, each responsible for implementation of an ordinance that can be more, or even less restrictive than Minnesota Rules Chapters 7080 – 7083 in certain cases.

A cadre of inspection professionals experienced in all aspects of the industry is crucial to perform the necessary oversight that will reinforce positive behaviors and correct unacceptable practices among private contractors. Likewise, it is not prudent to depend on training and mentoring alone to ensure new system inspectors perform adequate oversight. Periodic quality assurance of local inspectors is logical and necessary.

The attitudes of survey respondents provide evidence that SSTS professionals believe there is a link between local program requirements and professional practices:

- 88.9% agree or strongly agree that differences in local programs influence professionals' practices

- 86.5% agree or strongly agree that tough and thorough local programs result in high quality septic systems and decreased public health risks
- 80.7% agree or strongly agree that there should be a uniform SSTS program across the state of Minnesota.

Given the fact that less than one-third of responding SSTS installers reported ever having to improve or redo their work and that 60.1% of responding SSTS inspectors either rarely or never require SSTS installers to redo their work, one could question the adequacy of current levels of quality control. Conversely, one could argue this evidence suggests that quality work is being completed and the need for quality control is overstated. There is evidence, however, that inconsistencies in local program operations affect how SSTS professionals behave. Additional evidence suggests that certain local programs disregard critical industry concepts and allow inadequate SSTS design and installation. In addition to education and experiential learning, appropriate oversight and quality assurance of SSTS contractors and local officials is critical for the continued improvement of SSTS professional practices.

Doing More with the Existing Data

With an underlying assumption that good mentors will teach apprentices well, resulting in an improved long-term skill level of aspiring practitioners, it would be interesting to analyze the responses of specific groups of respondents. Defining cohorts by their responses to questions that identify the quality of their mentor, focus on their ability to learn from their mentor, and identify their current level of competence (a combination of knowledge and practice indicators) would provide useful insight into the characterization of mentor skills and practices.

By using evidence from the survey results of how these various groups responded to the knowledge, attitude, and practice questions, it is conceivable that one could measure to what extent the mentoring relationship (mentoring practices and apprentice activities) affects respondents stated practices. The following table of variables and possible correlation outcomes could be tested against a hypothesized correlation regression:

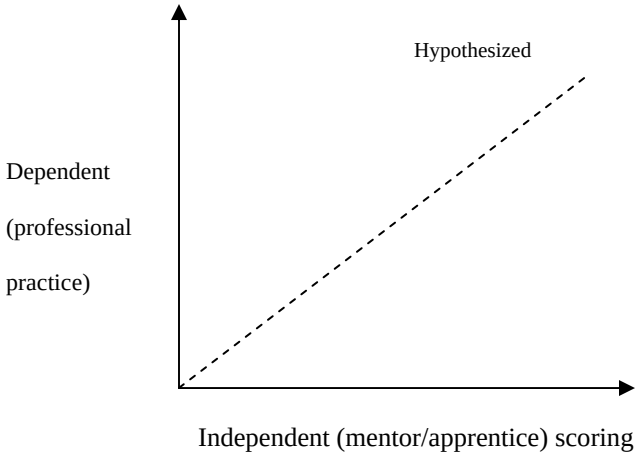
	Table 3. Variables and Descriptions for Data Analysis		
	Independent Variables		Dependent Variable
Suggested Metric Title	**A**: Mentorship Indicator (Likert-scaled score)	**B**:Apprentice Indicator Learning/Knowledge Score (Likert-scaled score)	**C**: Professional Practice Score (Likert-scaled score)
Related research question	What was the quality of mentor?	How did the apprentice learn from mentor?	How does one behave without mentor?
Description of metric value	Closeness to characteristics determined to be indicative of good mentoring.	Knowledge of field practices not covered in course work and accounting of mistakes made in early career.	Knowledge and demonstration of best and necessary skills

The relationship of A:C

High/High	High/Low
Low/High	Low/Low

The relationship of B:C

High/High	High/Low
Low/High	Low/Low



The relationship of AB:C

HighHigh/High	HighHigh/Low	LowLow/High	LowLow/Low
HighLow/High	HighLow/Low	LowHigh/High	LowHigh/Low

The hypothesized regression suggests that as the indicators of the mentor relationship improve, the respondents' stated practice improves as well.

There are three additional cohorts of installer/designer/inspector practitioners that future research could investigate using the quantitative data resulting from the survey responses: non-mentored practitioners (pre-1996), recently mentored practitioners (mentored since 2006) and mentored practitioners (those mentored between 1996 and 2005). It may be of further interest to the SSTS industry to further examine differences in the mentorship and apprentice indicators, and professional practice scores by region and tenure. Correlations between these scores and their drivers may accurately define the impact of mentoring relationships over time and introduce possible explanations for their variability.

Strengths and Limitations

The strengths of this evaluation include the fact that the topic is highly relevant and is being discussed at the state policy level. It attempts to build a framework for research that can further investigate the entire preparation of onsite practitioners in Minnesota. By creating links between course training, student performance, field training, continuing education and professional skill level, it is more likely that recommended changes to the current requirements will have real and positive effects on Minnesota's onsite treatment system industry. Conducting program evaluation will help to achieve higher quality system design, installation, and inspection to improve public and environmental health conditions throughout portions of Minnesota not served by centralized wastewater treatment facilities.

Through the use of both qualitative and quantitative data from multiple sources, the reliability and validity of reported results should be high enough to pose strong recommendations rooted in a deeper understanding of how mentoring can and does affect professional competence.

The constraints of this evaluation currently include the fact that I am intimately involved with the industry. As a program coordinator for the Onsite Sewage Treatment Program at the University of Minnesota, I am involved in the development of curriculum for SSTS courses and in policy discussions surrounding the future of the SSTS industry in Minnesota. The fact that this is a purposive study and that potential biases may affect the results must be clearly identified early on and accounted for through additional external review.

Another key constraint is the fact that the metrics developed and used in this study are unique to this study, which can draw criticism about the methods used for development. A response is that this study is unique and no standard measurements currently exist. It has been my goal to clearly describe all methods to create a replicable assessment. Other constraints included a tight project budget and limited support from partnering organizations. The mentoring workgroup consists of volunteers. The MPCA and the University of Minnesota contribute in-kind support, but have limited access to capital resources for external completion. Graduate level work is the only likely avenue for this work to continue.

Conclusion

Triangulated results from three focus groups indicate that SSTS professionals value experiential learning, but share concerns about the manner in which aspiring

practitioners are prepared. Focus group results informed the development of a survey instrument and were confirmed by a random sample of 1100 SSTS professionals with various levels of certification. Dillman's Total Design Method proved to be a valuable tool in obtaining a probability sample with a confidence level of .95. Data about the knowledge, attitudes and practices of SSTS professionals were analyzed to prepare recommendations about the mentoring program. The study found that the current program was not implemented equitably across the industry and lacks clear guidance for both mentors and apprentices. SSTS professionals value a combination of classroom and experiential learning. Emphasizing controlled demonstrations and informal mentoring relationships beyond the context of current requirements and introducing additional quality assurance measures may be the most practical ways to address programmatic shortcomings and improve the public health and environmental benefits that result from consistent, high-quality SSTS design, installation, and inspection practices.

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Appendix One: Focus Group Script, Informed Consent, and Session Notes

Focus Group Script

Adapted for use from: Goldenkoff, Robert. *Using Focus Groups*, in Wholey, Hatry and Newcomer (eds.), Handbook of Pratical Program Evaluation, 2nd edition, Jossey-Bass, San Francisco, 2004 pp. 340-362.

The play list of your favorite radio station, the packaging of your food, the content of political campaigns, the ending of Hollywood movies, and even the replacement for advice columnist Ann Landers- these are all results of focused discussions.

Forgive me for reading out loud, but this is my first time hosting a focus group. We are not here to develop a consensus, draw up a plan, or decide any course of action. We are here to informally discuss the way you have been trained to work in the SSTS industry. Ultimately, I want to host a conversation that allows you to share your views in a nonthreatening, nonjudgmental environment.

I want to tell you all how much we appreciate your participation in this discussion. I am Nick, and will be moderating our discussion tonight. Also with me is Dave. As a part of my Masters Degree, our program is studying how to improve the ways that you all are prepared to participate in the SSTS industry. Specifically, we want you to tell us the ways how well your preparation has met your needs and how it might help future students become better contractors.

We are interested in your personal opinions. There are no right or wrong answers. Feel free to share your ideas regardless of others thoughts. We are just as interested in negative thoughts as we are in positive ones.

We will host this discussion on a first name basis. Of course, your comments are confidential, and no names, identities or likenesses will be attached to any comments in the final report.

You may have noticed the tape recorder. We're recording this discussion to not miss any valuable comments. This makes our analysis more accurate, and we ask that only one person speak at a time and that you each speak loud and clearly.

Finally- we should go on for 60-90 minutes. We won't take a formal break, but feel free to use the restroom or grab a drink; try not to disturb the group.

1. Let's get started by having each of you introducing yourself and describing your experience as an apprentice.

How did you complete your experience?

What job activities did their instruction best prepare you for?

Do you see it as a positive or negative experience?

Do you feel it reduced/minimized mistakes you would have made as a rookie?

2. For those of you with a positive experience, what is it that you respected about your mentor?

e.g. Building confidence, increasing efficiency, helping you solve on OTJ problems?

3. For those of you having a negative experience, what is it that bothered you about your mentor?

4. For the mentors that are here; how do you train your apprentices? Is your training style mostly Observation, Demonstration, or simply to sign off completed work?

Do you discuss key issues and how to avoid problems?

Do you attempt to build confidence?

Do you think you are welcoming new competition?

How do you see your role?

5. As many of you know, there is a new rule requirement for mentorship and for gaining experience. Do you see these criteria as an improvement in this program?

6. Of the five preparatory and compliance inducing requirements, rank the effect on your professional development of Training, Testing, Experience, Continuing Education, and your Local Permitting and Inspection Program.

Informed Consent Form

CONSENT FORM
SSTS Experience Program Evaluation

You are invited to be in a research study about the quality of the experience program administered by the MPCA. You were selected as a possible participant because of your attendance at a General Continuing Education workshop hosted by the Onsite Sewage Treatment Program of the UMN Water Resources Center. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Nicholas Haig and the Onsite Sewage Treatment Program

Background Information

The purpose of this study is to determine the extent to which one's apprenticeship improves their professional capacity.

Procedures:

If you agree to be in this study, we would ask you to do the following things:
Participate in a 60-90 minute tape recorded focus group.

Risks and Benefits of being in the Study

The study has one minimal risk: an accidental loss of testimony that could be linked to your person. This is extremely unlikely, as data linking you to your comments will be kept secure and only used for data analysis, after which, will be destroyed.

The benefits to participation are: This is a part of a formative evaluation meant to improve the quality of the SSTS Licensing Program.

Compensation:

You will receive a complimentary dinner as gratitude for your contribution to this research.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be

IRB Code # 0807E38726
Version Date: 2/2008

1 of 2

stored securely and only researchers will have access to the records. Tape recordings will be kept for analysis and destroyed upon research submittal.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota or the Minnesota Pollution Control Agency. If you decide to participate, you are free to not answer any question or withdraw at any time with out affecting those relationships.

Contacts and Questions:

The researcher conducting this study is: Nicholas Haig. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact them at 1985 Buford Ave, 173 McNeal Hall, St. Paul, MN 55108. 612-625-9797, haigx003@umn.edu. *Advisor: Jim Anderson, 612-625-0279.*

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

Signature:_____ Date: _____

Signature of Investigator:_____ Date: _____

2/14/08: Detroit Lakes Focus Group #1

Please refer comments, corrections or questions to:
Nick Haig 612-625-9797
haigx003@umn.edu

Attendees at the February 14th and 15th, 2008 OSTP Course # 602 were asked to consider participating in a 60-90 minute discussion after the workshop session to assist our team in evaluating the effectiveness of professional preparation in the SSTS industry, particularly the experience program. It can be reasonably assumed that all Continuing Education Workshop participants are certified professionals, with a wide range of specialization.

Data from the initial interest sign-up forms confirmed that interested parties came from a number of different backgrounds that included each of the available specialty endorsement areas and different numbers of years in the industry. Nine individuals signed up for the discussion. Eight participated.

After reading the introductory script, the moderator asked each of the participants to introduce themselves and explain the situation surrounding their acquisition of their Required Experience. Each participant was allowed time to discuss their personal experience with the required experience program and was asked about positive and negative aspects of such a requirement.

Two of the participants were currently in the process of accumulating their experience requirements. Half of the participants either completed their experience plan after 1996 or are in the process of completing it now. The other half completed their experience requirement from previous work experience in 1996 when the licensing and registration program became mandatory. Four participants reported receiving required experience from private contractors. Three reported receiving required experience from local governmental inspectors. Two participants strictly referred to experience informally, as they never submitted an official experience plan to the State of Minnesota. Two participants had provided mentoring to aspiring practitioners in the past.

On a positive note, the entire group recognized the purpose of an experience requirement and acknowledged the benefits that can result from having a good mentor.

Some members mentioned that having help early in their career was helpful in preventing later mistakes and developing bad on-the-job habits. No participant disagreed. A number of clear benefits from working with someone more knowledgeable were identified. Participants collectively agreed that the purpose of required experience was not to learn how to use heavy or field equipment. More so, it was to learn the nuances and tricks of each job; how to make connections truly watertight for installers, how to work and communicate with the homeowners effectively as a system designer. All agreed that on-the-job training from someone whose work they respected has been, is, or would be helpful in becoming a better SSTS professional. Reinforcement of taught beliefs and the building of confidence were cited as the top reasons why good mentors create good practitioners.

One participant received affirming nods from the rest of the group when he mentioned that obtaining multiple endorsements has provided him with a deeper understanding of the industry. Six of the participants indeed held multiple endorsements. Discussion after that comment revealed that most participants believed that those designing systems should install systems first, and that those inspecting systems should have previously installed and designed prior to being permitted to inspect systems. System maintenance was not discussed at this point.

One participant pointed out that having designed systems in the past was critical to becoming a good system inspector. An additional participant reiterated this point. The group collectively acknowledged that a broad understanding of the industry is critical to successful SSTS inspections. Anecdotes critical of local programs and inspections followed. There was a collective acknowledgement that good and bad local SSTS programs exist.

One participant provided interesting insight in how poor local programs negatively affect the contractors in the field trying to do things correctly. Two examples were discussed. In one instance, local programs do not conduct inspections. This negatively affects contractors by eliminating the need to be licensed. It was pointed out that it is impossible to compete with those providing similar services as unlicensed professionals. The other example highlighted that in certain parts of the state, mounds are not installed, even though they should be according to MR 7080. This negatively

affects building contractors that want to follow MR 7080, private inspectors that refuse to inspect certain systems, and homeowners that often need a certificate of compliance to sell their home- required by a mortgage company or buyer, not the local unit of government.

Concerns about the experience program typically included the logistics of the experience program. Competition, responsibility for others, time involved and liability were all repeatedly cited as barriers to providing mentoring and acknowledged as the key reasons why existing professionals are not interested in providing mentoring to aspiring practitioners. The two participants currently fulfilling their experience program requirements identified hardship in acquiring the required amount of experience. They both cited cost of gaining experience in lost time was a factor in how long their experience was taking.

The possibility of having a bad mentor also came up in discussion. While one participant commented that he learned what his poor mentor was doing wrong from working with an additional mentor that did things correctly, he agreed that bad mentorship can result in the teaching of poor habits detrimental to the SSTS industry. Others pointed out that there is “a lot” of cutting corners out there. Most of the participants were aware of required experience events that never took place or did not include appropriate or the intended supervision. Both private contractors and local programs were accused of providing poor mentorship.

When asked to rank the effectiveness of the 5 program elements intended to improve professional competency (Pre-Certification Courses, Exams, Experience, Continuing Education and the Local Permitting and Inspection Program), the group unanimously claimed that the Pre-Certification courses were the most beneficial. Five participants ranked the experience program as the second most important aspect of professional preparation.

When discussing suggestions for improving the experience program, a few ideas came up. The mediator asked the group whether a mentor-matching program may improve access for aspiring professionals to acquire experience. About ½ of the group felt that some linking of new professionals to mentors could be helpful. A number of problems with that idea were highlighted, however. These include identifying willing

mentors within a geographical region that would mentor future competitors. One participant identified that the state limits who can teach courses accredited for education, and that they should limit the people that can provide the equally important on-the-job training. When the idea of scheduled, accredited hands-on training experiences was raised, the group unanimously supported this idea. Details were not discovered, but significant support existed for controlled, real-life, accredited on-the-job training.

The focus group adjourned at around 6:30 PM and the group went out to dinner.

2/21/08 Two Harbors Focus Group #2

Please refer comments, corrections or questions to:
Nick Haig 612-625-9797
haigx003@umn.edu

Attendees at the February 21st and 22nd, 2008 OSTP Course #603 were asked to consider participating in a 60-90 minute discussion after the workshop session to assist our team in evaluating the effectiveness of professional preparation in the SSTS industry, particularly the experience program. It can be reasonably assumed that all Continuing Education Workshop participants are certified SSTS professionals, with a wide range of specialization.

Data from the initial interest sign-up forms confirmed that interested participants came from three backgrounds; septic system installers, designers and inspectors. All participants had at least 10 years of experience in the industry. Seven individuals signed up for the event. Six participated.

After reading the introductory script, the moderator asked each of the participants to introduce themselves and explain the situation surrounding their acquisition of their required experience. Each participant was allowed time to discuss their personal experience and was asked about the positive and negative aspects of such a requirement.

This group was not ideal for this type of discussion due to the fact that three participants worked for the same company, and two worked for the same local unit of government, reducing the broadness of perspective of the entire group. Only one of the

participants submitted a formal experience plan to the Minnesota Pollution Control Agency (MPCA), the other five were grandfathered in as existing professionals when the rules changed in 1996. Two of the participants have provided mentoring for aspiring practitioners.

While most of the participants had not participated in the official experience program, all recognized value in on-the-job training and were probed to discuss how they learned to do their job aside from course work. The three primary sources of on-the-job training were identified as product distributors, co-workers and other contractors. Two participants said that they were highly dependent on themselves to do the work correctly. One of them agreed that when he had "two sets of eyes", he felt much more comfortable with soils identification. Talking about what they saw was helpful in building confidence about the system choice.

Product distributors were identified as positive sources of hands-on training. One participant spoke highly of a company representative with a vested interest in that product working well, and valued their input as the installation took place.

The three participants that worked for the same company most highly valued their co-workers opinions when difficult situations arose. One of them noted how grateful they were to have someone at each job in the beginning of their career to provide guidance throughout the job. Time in the truck as well as on the site discussions all assisted in better septic system designs and installations.

Other contractors were identified as sources of hands-on training by system inspectors and design/build contractors. The "small world" of the industry has provided for open communication between contractors who freely offered tips and tricks for tank setting, distribution logistics and other difficult tasks associated with system installation, such as how to handle situations in which the building drain was too low for an in-ground septic system installation. One inspector pointed out that he felt his responsibility was to share good practices between the contractors he regularly saw. These discussions ranged from proprietary product choices to in the field practices.

Adjustment was a common theme observed by the mediator throughout this discussion. The changes in the industry over the past 40 years were identified as an "evolution" in which the systems designed and installed have improved. Bottomless ring-

tanks, straight pipe discharges, and poorly manufactured distribution boxes were commonplace into the early 1990's. Orangeburg and clay pipes were gradually replaced by plastics. Participants spoke of product distributors', local programs' and contractors' growing pains as they collectively learned what did and did not work in terms of effluent acceptance and treatment.

The group reached consensus when discussing what level of experience new contractors should be required to attain. All participants felt that all system designers should work with installers before preparing their own designs. All participants felt that all system inspectors should have a history of designing and installing before being allowed to inspect systems. One participant highlighted that someone may be "booksmart" but "dumber than a box of rocks," when it came to job completion. This sentiment was received well by the group and other participants agreed that most of the mistakes that are happening are a result of a lack of experience.

To no surprise, when asked to rank the effectiveness of the four program elements intended to improve professional competency (pre-certification training and exams, required experience, continuing education and the local permitting and inspection program), five participants indicated that experience was the most critical factor. The sixth participant qualified his answer by emphasizing that knowledge must be attained first, but that practical experience was the critical factor in preparing a practitioner for success.

The group agreed with a state requirement to gain experience prior to becoming a fully licensed professional, but most did not feel that the current program meets the needs of professionals. The fact that acceptable experience can vary greatly in quality was one reason that the group argued for some method of uniformity to assure that all new practitioners have gone through similar, acceptable on-the-job training.

One participant proposed a state-run experience program that provided designs, installations and system maintenance to low-income or elderly homeowners. This type of program, he argued, could help aspiring practitioners gain on-the-job training while putting septic systems into the ground for those that cannot afford required upgrades.

Another idea that came up was enforcing a requirement for aspiring practitioners to work for a summer with an existing crew installing septic systems. Participants

appreciated the intention of this idea, but questioned how that person would be compensated. Another participant mentioned that more intensive experience was okay, but that it had to happen in another region due to fear of competition.

The focus group adjourned at 6:30 PM and the group went out to dinner.

03/11/08 Willmar Focus Group #3

Please refer comments, corrections or questions to:
Nick Haig 612-625-9797
haigx003@umn.edu

Attendees at the March 11th and 12th, 2008 OSTP Course #604 were asked to consider participating in a 60-90 minute discussion after the workshop session to assist our team in evaluating the effectiveness of professional preparation in the SSTS industry, particularly the experience program. It can be reasonably assumed that all Continuing Education Workshop participants are certified SSTS professionals, with a wide range of specialization.

Data from the initial interest sign-up forms confirmed that interested participants came from four fields of specialization; septic system installers, designers, inspectors (private and public) and maintainers. 2/3 of the participants hold multiple endorsement category licensure. All participants had at least 7 years of experience in the industry. Nine individuals signed up for the event and all nine participated. Two additional people that were not available to participate provided written feedback that is not included in this write-up, but as an appendix.

After reading the introductory script, the moderator asked each of the participants to introduce themselves and explain the situation surrounding their acquisition of their required experience. Each participant was allowed time to discuss their personal experience and was asked about the positive and negative aspects of such a requirement.

This group was ideal for this type of discussion due to the fact that the participants represented both public and private organizations, multiple endorsement categories, different years of experience, and different regions of the state. However, only

three of the participants submitted a formal experience plan to the Minnesota Pollution Control Agency (MPCA). The other six had met their mentoring requirement before 1996 and were grand-fathered in as existing professionals when the rules changed in 1996. Eight of the participants have provided mentoring for aspiring practitioners.

While most of the participants had not participated in the official experience program, all recognized value in on-the-job training and were probed to discuss how they learned to do their job aside from course work. Four of the participants had over 27 years of experience in the SSTS industry. The three participants that worked for local units of government all indicated that they learned necessary inspection activities from local practitioners, the people whose work they were inspecting. One practitioner identified that he had learned "right along with" his local inspector. Both he and his local inspector went on to provide mentorship to others. The local inspectors all identified the importance of relationship-building with the practitioners they inspected.

Seven of the participants indicated that they had previous experience in the trades before they focused activities in the onsite industry. The primary sources of on-the-job training for these individuals were significantly different than the two that did not identify experience in the trades. Those experienced in the trades were more likely to identify themselves or family members as significant influences of their work competency. Two of these participants said that they were highly dependent on themselves to do the work correctly and specifically identified the importance of a good reputation and the responsibility of contractors to fix problems that resulted from their mistakes. All participants responded that they learned best practices from other contractors as they became competent in their SSTS field, regardless of whether or not they submitted an official experience plan.

The types of mistakes that focus group participants identified in their SSTS career included the installation of sagging pipes, the design and installation of systems too deep, and the installation of systems that froze at a later date. It could not be determined whether the likelihood of making one of these mistakes or one's willingness to correct the mistake after it was discovered had anything to do with the completion of an experience program. The group had a difficult time determining the difference between the effect of official experience requirements and the effect of on-the-job training. The fact that most

participants did not submit official experience documentation made it difficult to focus the discussion around officially submitted experience. It will be important in further research to distinguish between on-the-job training and officially submitted experience.

There was a wide range of what official mentoring meant to various participants.

One individual who identified himself as a designer-I that has mentored over 10 apprentices introduced his process for accepting mentors. He insisted on meeting the person face to face, having them submit an official request, having that person visit different system types before working, and then insisting that the person follow the job through from the design to the inspection. Other participants indicated that their mentor was not even on the site when they were acquiring their experience, either because they were on vacation, or the mentor felt confident in his/her apprentice's competence. This wide variety of what is considered acceptable experience should be focused on in further research.

There was a discussion about the variety of quality across different local programs. One striking comment towards the end of discussion was that there are local inspectors out there that "don't know what they are doing". This comment received affirmation from the group, as if everyone knew someone or somewhere where the local program was widely criticized. The group reached consensus when discussing what level of experience new practitioners should be required to attain. Most participants felt that all system designers should work with installers before preparing their own designs. Most participants felt that all system inspectors should have a history of designing and installing before being allowed to inspect systems. One participant went as far to say that inspectors should have a full season's worth of hands on experience before being allowed to inspect systems. A local inspector objected to this proposal and claimed that it was not practical for local government employees. However, all agreed that most of the mistakes that are happening are a result of a lack of hands-on experience.

The discussion surrounding local program challenges led to a related discussion about the existence of poor practitioners. One participant identified, "There are people out there who will cheat. People who cheat should be identified and punished." One participant told a story about how savvy homeowner's know to "shop" for contractors,

either for a passing inspection on a bad septic system or a less expensive system through poor design choices. This was identified as a problem that could be addressed through a strong and consistent workforce, an accurate and competent local program, and a supportive and well-led state program. Participants did acknowledge the existence of those three characteristics in the state, but mostly highlighted their inconsistencies across the entire state.

To wrap up and refocus the discussion, the moderator asked participants to rank the effectiveness of the four SSTS program elements intended to improve professional competency and reduce the types of issues that emerged throughout the discussion (pre-certification training and exams, required experience, continuing education and the local permitting and inspection program). Five participants identified required experience as the most critical element to improving competency and reducing problems in the industry. Two participants identified pre-certification training, and two identified strong local permitting and inspection programs.

It is interesting to note that while earlier in the discussion, some participants didn't seem to think the fact that they never submitted an official experience plan to the MPCA negatively affected their professional development. However, most of the responses that rated experience as the most critical factor came from such participants. The clear message was that the experience program does not meet its goals, but professionals do learn on-the-job in one way or another. The challenge for future research will be how to separate officially required experience, which can be controlled, from on-the-job training, which cannot. Further, it is the challenge of the mentoring work group to facilitate the development of an experience program that helps practitioners gain the necessary skills to conduct business (public or private) in a manner that sufficiently protects consumers, the environment, public health, and the decentralized wastewater treatment industry.

The focus group adjourned at 7:30 PM and the group went out to dinner.

Appendix Two: Dillman Survey Methodology Materials

Pre-letter:

UNIVERSITY OF MINNESOTA

Onsite Sewage Treatment Program
Water Resources Center
University of Minnesota
Extension

Room 173 McNeal Hall
1985 Buford Avenue
St. Paul, MN 55108

800-322-8642
Fax: 612-624-6434
http://septic.umn.edu

2/03/09

{first_name} {middle_initial} {last_name}
{address1}
{city}, {state_code} {zip_code}

Dear {first_name} {last_name},

In the next several days you will receive a survey questionnaire from the University of Minnesota's Water Resources Center. The purpose of this study is to collect and report SSTS industry professionals' opinions about certain aspects of the pre-certification process, namely the apprenticeship/mentoring requirement. You are invited to be a part of this research because you work in the SSTS industry and were randomly selected among all potentially certified SSTS Installers, Designers, and Inspectors.

I am writing to let you know ahead of time that you will be receiving this survey in the mail, so please watch for it and return it as soon as possible. The research study is important because it will help the State Advisory Committee make recommendations to the Minnesota Pollution Control Agency to improve new professionals' experience with the certification process. I hope you will take the time to complete our survey. It should take you less than 30 minutes and all postage will be paid.

Thank you for your time and consideration. It is only with the generous help of people like you that this research can be successful.

Sincerely,

Nick Haig
UMN Water Resources Science M.S. Candidate

P.S. A $2 bill will be enclosed with the survey as a token of our thanks. Plan to treat yourself to a coffee or snack while you are taking the survey. The $2 is yours to keep whether or not you return the survey.

Letter accompanying survey instrument:

UNIVERSITY OF MINNESOTA

Onsite Sewage Treatment Program
Water Resources Center
University of Minnesota
Extension

Room 173 McNeal Hall
1985 Buford Avenue
St. Paul, MN 55108

800-322-8642
Fax: 612-624-6434
http://septic.umn.edu

February 10th, 2009

Dear Survey Recipient,

Last week you received a letter inviting you to participate in a research study conducted by the University of Minnesota. The purpose of this study is to collect and report SSTS industry professionals' opinions about certain aspects of the pre-certification process, namely the apprenticeship/mentoring requirement. This study is only possible with help from people like you. We are sending this survey to a limited number of randomly selected SSTS Practitioners, so each response is very important.

You can participate in the study by filling out this survey and returning it in the postage paid envelope. You can also take this survey electronically if you wish. **Your participation in this study is voluntary and completely confidential. All responses will be anonymous and no personal information will be entered as study data- only group summaries will be reported**.

Please consider taking part in this research that will assist the SSTS Advisory Committee in providing recommendations to the Minnesota Pollution Control Agency about improving the apprenticeship/mentoring program in Minnesota. If you have any questions about the study please call me at 612-625-9797. If you would like to take this survey electronically, please reach me via email at: haigx003@umn.edu . Thank you for your commitment to the improvement of the SSTS Program.

Sincerely,

Nick Haig
UMN Water Resources Science M.S. Candidate

P.S. A $2 bill is enclosed as a token of our thanks. Treat yourself to a coffee or snack while you take the survey.

Reminder Postcards #1 and #2:

February 19th, 2009

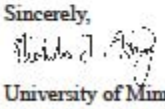
Last week you received a survey by mail and an invitation to participate in a research study about the SSTS Mentoring Program.

If you have already filled out the survey and returned it, please accept my sincere thanks.

If you plan to participate in the study this is a friendly reminder.

If you did not receive the survey questionnaire, or if it was misplaced, please call me at 612-625-9797 and leave your name so I can mail you another survey. Thank you for your time.

Sincerely,



University of Minnesota Water Resources Center
612-625-9797: haigx003@umn.edu

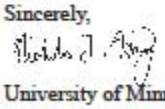
February 27th, 2009

This final postcard is a reminder to those planning to participate in the survey study about the SSTS Mentoring Program. Study results are more reliable when more people participate.

If you have already filled out the survey and returned it, please accept my sincere thanks.

If you did not receive the survey questionnaire, or if it was misplaced, please call me at 612-625-9797 and leave your name so I can mail you another survey. I hope you will consider participating in this study. Thank you for your time.

Sincerely,



University of Minnesota Water Resources Center
612-625-9797: haigx003@umn.edu

Appendix Three: Survey Instrument

SSTS Mentoring Program Questionnaire

Winter, 2009

Water Resources Center

University of Minnesota

Driven to Discover℠

Do you work on septic system designs, installations, or inspections?

___ YES (Please continue with survey)

___ NO (Thank you for your time, but our survey focuses on design, installation and inspection practitioners. Please return survey in the prepaid envelope.

Instructions:

Please read each question entirely and select the answer that best matches your opinion. Certain questions allow multiple responses, while others are limited to one response—please refer to the prompts at the end of each question if you are unclear about whether or not to mark multiple answers.

1. Background Questions:

1. What endorsement categories do you hold and when did you obtain them? (choose all that apply)

Endorsement Category	1996 or earlier	1997 - 2005	2006 - 2008	Currently Restricted
Installer	☐	☐	☐	☐
Designer	☐	☐	☐	☐
Inspector	☐	☐	☐	☐
Pumper/Maintainer	☐	☐	☐	☐

2. When did you begin working in the SSTS Industry? (choose one)
   - ☐ 1996 or earlier
   - ☐ 1997-2005
   - ☐ 2006-Present

3. Why are you in the SSTS Industry? (choose all that apply)
   - ☐ I enjoy being self-employed
   - ☐ I take pride in protecting the health of my customers
   - ☐ I like working outdoors
   - ☐ I take pride in protecting the health of Minnesota's environment
   - ☐ I don't have any other options
   - ☐ It is a family business
   - ☐ Other: _____

4. Which septic system BEST protects public health and the environment? (choose one)
   - ☐ A septic tank to an in ground soil treatment with 36" vertical separation
   - ☐ A septic tank to a mound with 18" vertical separation
   - ☐ A septic tank to a seepage pit with no vertical separation
   - ☐ All of these systems protect public health and the environment
   - ☐ None of these systems protect public health and the environment

5. What statement best describes human exposure to sewage and septic tank effluent? (choose one)
   - ☐ Sewage and septic tank effluent is always safe to come into contact with humans
   - ☐ Sewage and septic tank effluent is usually safe to come into contact with humans
   - ☐ Sewage and septic tank effluent can cause infectious disease in humans
   - ☐ Sewage and septic tank effluent can cause death in humans

6. How important is the proper design, installation and inspection of a septic system to protect the health of people near the system? (choose one)
   - ☐ Very important
   - ☐ Important
   - ☐ Of little importance
   - ☐ Not important

7. How well do you think MN Rules Chapter 7080-7083's design, installation and inspection requirements protect public health and the environment? (choose one)
   - ☐ Very well
   - ☐ Adequately
   - ☐ Poorly
   - ☐ Not well at all

2. Professional Preparation Questions

8. When did you submit your experience documentation to the Minnesota Pollution Control Agency (MPCA) for the first time? (choose one)
   - ☐ 1996 or earlier
   - ☐ 1997-2005
   - ☐ 2006-2008
   - ☐ I am in the process of completing my first required experience documentation
   - ☐ I do not recall ever submitting official experience documentation

9. Rank, in order of importance, the value of each component of the SSTS Program's professional preparation: (choose one box per line)

Preparation Component	Most Important	Somewhat Important	Least Important
A. Pre-Certification Course and Exams	☐	☐	☐
B. Required Experience Component	☐	☐	☐
C. Continuing Education	☐	☐	☐

10. To be considered an expert, how important is it for septic system professionals to hold multiple endorsement categories (Installer, Designer, Inspector, Pumper/Maintainer)? (choose one)
    - ☐ Very important
    - ☐ Important
    - ☐ Of little importance
    - ☐ Not important

11. How important is it that system designers install systems before they design systems? (choose one)
    - ☐ Very important
    - ☐ Important
    - ☐ Of little importance
    - ☐ Not Important

12. How important is it that system inspectors install and design systems before they inspect systems? (choose one)
    - ☐ Very important
    - ☐ Important
    - ☐ Of little importance
    - ☐ Not important

13. How well does the current Experience Program differentiate between high and low quality mentors? (choose one)
    - ☐ Very well
    - ☐ Adequately
    - ☐ Poorly
    - ☐ Not well at all

14. How important is it for the MPCA to differentiate between high and low quality mentors? (choose one)
    - ☐ Very important
    - ☐ Important
    - ☐ Of little importance
    - ☐ Not important

15. How important is it that new septic system professionals have guaranteed access to a qualified mentor? (choose one)
    - ☐ Very important
    - ☐ Important
    - ☐ Of little importance
    - ☐ Not important

16. Should someone make sure that all new septic system professionals have access to opportunities to complete their required experience? (choose one)
    - ☐ Yes
    - ☐ No (skip to #18)
    - ☐ I don't know (skip to #18)

17. If yes, who should make sure that new professionals have access to opportunities to complete their Experience Program? (choose one)
    - ☐ Local Units of Government
    - ☐ Minnesota Pollution Control Agency
    - ☐ University of Minnesota
    - ☐ Professional/Trade organization, such as the Minnesota Onsite Wastewater Association
    - ☐ Other _____

3. Local Permitting and Inspection Questions

	Strongly Agree	Agree	Disagree	Strongly Disagree
18. I believe that differences in local permitting and inspection programs influence septic system professionals' practices. (choose one)	☐	☐	☐	☐
19. I believe that tough and thorough local programs result in high quality septic system installations and decreased risks to public health. (choose one)	☐	☐	☐	☐
20. I believe that there should be a uniform SSTS program across the state of Minnesota (choose one)	☐	☐	☐	☐

4. Working With Your Official Mentor Questions

For the next questions, please think about your individual encounter with your mentor. If you had more than one, please refer to the mentor that signed off on the greatest number of experience instances. If you have not yet obtained a mentor or do not remember working with a mentor to prepare and submit your experience documentation, please skip to #33.

21. How often was your mentor on the job with you? (choose one)
    - ☐ All of the time
    - ☐ Most of the time
    - ☐ Some of the time
    - ☐ Little of the time
    - ☐ None of the time

22. Please choose the options that best describe your mentor's behavior:	All of the time	Most of the time	Some of the time	Little of the time	None of the time
A. My mentor showed me the correct way to do each specific task. (choose one)	☐	☐	☐	☐	☐
B. My mentor criticized me when I did something wrong. (choose one)	☐	☐	☐	☐	☐
C. My mentor complimented me when I did something correctly. (choose one)	☐	☐	☐	☐	☐
D. My mentor corrected me when I did something wrong. (choose one)	☐	☐	☐	☐	☐
E. My mentor provided me with other resources to help me do a better job (showed me examples or other sources of information). (choose one)	☐	☐	☐	☐	☐
F. My mentor taught me practices that I later found to be incorrect.	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Disagree	Strongly Disagree
23. My mentor instilled a high level of confidence that I maintain in my current work. (choose one)	☐	☐	☐	☐
24. My mentor taught me tasks or concepts that helped me to avoid making mistakes in later work. (choose one)	☐	☐	☐	☐

25. Overall, how satisfied were you with your mentor? (choose one)
- ☐ Very satisfied
- ☐ Somewhat satisfied
- ☐ Somewhat unsatisfied
- ☐ Very unsatisfied
- ☐ I didn't have a mentor

26. Please rate the difficulty of documenting your Experience Plan and submitting it to the MPCA. (choose one)
- ☐ Very easy
- ☐ Fairly easy
- ☐ Fairly difficult
- ☐ Very difficult

27. How did you obtain your mentor? (choose one)
- ☐ Someone at work provided me with a mentor
- ☐ A local unit of government performed mentoring duties for me
- ☐ I found a certified person to provide mentorship for me
- ☐ A professional organization helped me find a mentor
- ☐ Other: _____

28. Where did you complete your required experience? (choose all that apply)
- ☐ In my core work area
- ☐ I traveled outside my core work area

29. Did you have to pay your mentor or accept a reduced wage while you were obtaining your required experience? (choose one)
- ☐ Yes
- ☐ No
- ☐ I don't know

30. What about the mentoring program was MOST valuable to your development as a practitioner?

31. What about the mentoring program was LEAST valuable to your development as a practitioner?

32. How could the mentoring program be changed to improve the hands-on training experience of new practitioners?

5. Other On-the-Job Training Questions

33. Have you received on-the-job training from someone BESIDES an official mentor? (choose one)
- ☐ Yes
- ☐ No (skip to Section 6)

34. How often was this person (or people) on the job with you? (choose one)
- ☐ All of the time
- ☐ Most of the time
- ☐ Some of the time
- ☐ Little of the time
- ☐ None of the time

35. Please choose the options that best describe this person's (or peoples') behavior:

	All of the time	Most of the time	Some of the time	Little of the time	None of the time
A. Those that provided me with on-the-job training showed me the correct way to do each specific task. (choose one)	☐	☐	☐	☐	☐
B. Those that provided me with on-the-job training criticized me when I did something wrong. (choose one)	☐	☐	☐	☐	☐
C. Those that provided me with on-the-job training complimented me when I did something correctly. (choose one)	☐	☐	☐	☐	☐
D. Those that provided me with on-the-job training corrected me when I did something wrong. (choose one)	☐	☐	☐	☐	☐
E. Those that provided me with on-the-job training provided me with other resources to help me do a better job (showed me examples or other sources of information). (choose one)	☐	☐	☐	☐	☐
F. Those that provided me with on-the-job training taught me practices that I later found to be incorrect.	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Disagree	Strongly Disagree
36. Those that provided me with on-the-job training instilled a high level of confidence that I maintain in my current work (choose one)	☐	☐	☐	☐
37. Those that provided me with on-the-job training taught me tasks or concepts that helped me to avoid making mistakes in subsequent work (choose one)	☐	☐	☐	☐

38. Overall, how satisfied were you with your other sources of on-the-job training? (choose one)
- ☐ Very satisfied
- ☐ Somewhat satisfied
- ☐ Somewhat unsatisfied
- ☐ Very unsatisfied

39. If you did not submit official experience documentation, please explain why.

6. Specific Endorsement Questions

If you hold multiple endorsement categories, please answer all questions that apply.

Please answer the questions in the following sections based on your certification with the MPCA:

Installers or those working towards becoming an installer, please answer questions 40- 45

Designers or those working towards becoming a designer, please answer questions 46 – 51

New System Inspectors or those working towards becoming a new system inspector, please answer questions 52 – 56

Existing System Inspectors or those working towards becoming an existing system inspector please answer questions 57 - 61

Installers, please answer questions 40-45:

40. True or False: A watertight septic tank is not critical to the proper functioning of a septic system. (choose one)
    - ☐ True
    - ☐ False
    - ☐ I don't know

41. True or False: Preventing compaction in and around the soil treatment area can increase the longevity of a septic system. (choose one)
    - ☐ True
    - ☐ False
    - ☐ I don't know

42. Rank the TWO most important practices that you follow to ensure that septic tank installations are watertight (write 1 next to the most important and 2 next to the second most important).
    - _____ Check tank for cracks before installation and reject if tank is cracked
    - _____ Apply bedding below tank, building sewer, AND supply pipe
    - _____ Check the plastic limit of soil around the septic tank
    - _____ Use of mastic and/or boots at tank penetrations
    - _____ Pressure or vacuum test each tank after installation
    - _____ Fill tank with water and run a hydrostatic test
    - _____ Other _____
    - ☐ I do not follow any of these practices

43. Select all the practices that you commonly follow to prevent compaction around a soil treatment area. (choose all that apply)
    - ☐ Mark the area with flags and/or string to route construction equipment away from soil treatment area
    - ☐ Use tracked excavation equipment instead of wheeled equipment
    - ☐ Delay installation if soil meets or exceeds the plastic limit
    - ☐ Use a soil penetrometer to classify the soil
    - ☐ Other _____
    - ☐ I do not follow any of these practices

44. How do you know where to set the floats to ensure the correct pump cycle? (choose one)
    - ☐ The manufacturer settings are adequate
    - ☐ Calculate the gallons per inch in the pump tank and refer to the designer's recommended dose to set the float distance
    - ☐ This is the homeowner's responsibility
    - ☐ Other: _____

45. Has an inspector ever required you to improve or redo your work? (choose one)
    - ☐ Yes
    - ☐ No
    - ☐ I don't remember

Designers, please answer questions 46-51:

46. True or False: The depth to the limiting condition is the most important factor in determining the appropriate type of septic system (trench, mound, or at-grade). (choose one)
    - ☐ True
    - ☐ False
    - ☐ I don't know

47. True or False: Landscape features influence the design of a system (choose one)
- ☐ True
- ☐ False
- ☐ I don't know

48. Select the MOST important practice that you follow to determine which type of septic system you will design. (choose one)
- ☐ Determine the system type based on types of systems installed nearby
- ☐ Conduct one or two soil observations (borings or pits)
- ☐ Conduct three or more soil observations
- ☐ Consult the USDA Soil Survey
- ☐ Other _____
- ☐ I do not follow any of these practices

49. In what way does the soil texture MOST affect the design of a septic system? (choose one)
- ☐ The type of system to be designed (trench, mound, or at-grade)
- ☐ The size of the septic tank
- ☐ The size of the soil treatment area
- ☐ None of the above

50. How much does competition from other designers influence the type of system (trench, mound, or at-grade) that you design? (choose one)
- ☐ Significantly
- ☐ Somewhat
- ☐ Not much
- ☐ Not at all

51. How often has a local permitting agency denied you a permit or required a change in your design because they stated that you chose the incorrect system type (trench, mound, or at-grade)? (choose one)
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Frequently
- ☐ Often

Inspectors- please choose ONE set of questions to answer:

Answer questions 52-56 if you primarily inspect new systems
Answer questions 57-61 if you primarily inspect existing systems.

52. True or False: The depth to the limiting condition is the most important factor in determining the appropriate type of septic system (trench, mound, or at-grade). (choose one)
- ☐ True
- ☐ False
- ☐ I don't know

53. How often have you denied a permit or required a change in design based on an incorrectly chosen system type (trench, mound, or at-grade)? (choose one)
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Frequently
- ☐ Often

54. True or False: Preventing compaction in and around the soil treatment area can increase the lifespan of a septic system. (choose one)
- ☐ True
- ☐ False
- ☐ I don't know

55. Select all practices that you follow when conducting a new system inspection (choose all that apply).
- ☐ Ensure that soil treatment area and reserve soil treatment area are marked with flags and/or string to divert construction equipment away from soil treatment areas.
- ☐ Ensure that soil does not meet or exceed the plastic limit
- ☐ Lift inspection pipes to ensure they are secured
- ☐ Request delivery records from installer to ascertain the use of clean sand and rock
- ☐ Perform a jar test to ascertain the use of clean sand
- ☐ I do not follow any of these practices

56. How often do you require installation contractors to redo their work? (choose one)
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Frequently
- ☐ Often

Existing system inspectors, please answer questions 57-61.

57. True or False: The depth to the limiting condition is the most important factor in determining the appropriate type of septic system (trench, mound, or at-grade). (choose one)
- ☐ True
- ☐ False
- ☐ I don't know

58. Do you obtain all septic system records available at the local unit of government before conducting an inspection? (choose one)
- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Frequently
- ☐ Always

59. True or False: A watertight septic tank is not critical to the proper functioning of a septic system. (choose one)
- ☐ True
- ☐ False
- ☐ I don't know

60. Which ONE practice do you most commonly follow to determine the treatment media depth when inspecting for vertical separation? (choose one)
- ☐ I use a laser to assist in this determination
- ☐ I probe the area to determine this depth
- ☐ I reference existing design records
- ☐ Other _____
- ☐ I do not follow any of these practices

61. Because of extenuating circumstances, have you ever passed a system that might have been non-compliant? (choose one)
- ☐ Yes
- ☐ No
- ☐ I don't know

Thank you for your participation! Please return the completed survey in the business reply envelope. Your response will help us assess and improve the SSTS Program. If you have questions about the survey, please contact:

Nick Haig, Lead Investigator, 612-625-9797
University of Minnesota
1985 Buford Avenue
173 McNeal Hall
St. Paul, MN 55108

4017

Appendix Four: Survey Results

SSTS Mentoring Program Questionnaire
Final Results
Summer, 2009

Question Code	Data Type
G	Gateway
C	SSTS Certification
A	Practitioner Attitude
K	Practitioner Knowledge
E	Mentor Relationship
P	Practitioner Practice

Water Resources Center
University of Minnesota
Driven to Discover℠

G: Do you work on septic system designs, installations, or inspections?

543___ YES (Please continue with survey)

55 ___ NO (Thank you for your time, but our survey focuses on design, installation and inspection practitioners. Please return survey in the prepaid envelope.

Instructions:

Please read each question entirely and select the answer that best matches your opinion. Certain questions allow multiple responses, while others are limited to one response—please refer to the prompts at the end of each question if you are unclear about whether or not to mark multiple answers.

1. Background Questions:

C: 1. What endorsement categories do you hold and when did you obtain them? (choose all that apply)

Endorsement Category	1996 or earlier	1997 - 2005	2006 - 2008	Currently Restricted
Installer	**227**	**135**	**37**	**12**
Designer	**166**	**118**	**20**	**18**
Inspector	**86**	**94**	**34**	**15**
Pumper/Maintainer	**39**	**31**	**08**	**06**

C: 2. When did you begin working in the SSTS Industry? (choose one)

- ☐ 1996 or earlier 328
- ☐ 1997-2005 170
- ☐ 2006-Present 39

9 error

A: 3. Why are you in the SSTS Industry? (choose all that apply)

- ☐ I enjoy being self-employed 291 (53.6%)
- ☐ I take pride in protecting the health of my customers 271 (49.9%)
- ☐ I like working outdoors 370 (68.1%)
- ☐ I take pride in protecting the health of Minnesota's environment 344 (63.4%)
- ☐ I don't have any other options 12 (2.2%)
- ☐ It is a family business 124 (22.8%)
- ☐ Other: _____ 110 (available upon request)

K: 4. Which septic system BEST protects public health and the environment? (choose one)

- ☐ A septic tank to an in ground soil treatment with 36" vertical separation 459 (85.16%)
- ☐ A septic tank to a mound with 18" vertical separation 22
- ☐ A septic tank to a seepage pit with no vertical separation 0
- ☐ All of these systems protect public health and the environment 20
- ☐ None of these systems protect public health and the environment 13

25 provided multiple answers

K: 5. What statement best describes human exposure to sewage and septic tank effluent? (choose one)

☐ Sewage and septic tank effluent is always safe to come into contact with humans	0
☐ Sewage and septic tank effluent is usually safe to come into contact with humans	12
☐ Sewage and septic tank effluent can cause infectious disease in humans	396
☐ Sewage and septic tank effluent can cause death in humans	100
	24 provided multiple answers

A: 6. How important is the proper design, installation and inspection of a septic system to protect the health of people near the system? (choose one)

Avg. 1.12

☐ Very important	487
☐ Important	41
☐ Of little importance	3
☐ Not important	0
	2 provided multiple answers

A: 7. How well do you think MN Rules Chapter 7080-7083's design, installation and inspection requirements protect public health and the environment? (choose one)

Avg. 1.37

☐ Very well	356
☐ Adequately	166
☐ Poorly	6
☐ Not well at all	3
	1 provided multiple answers

2. Professional Preparation Questions

C: 8. When did you submit your experience documentation to the Minnesota Pollution Control Agency (MPCA) for the first time? (choose one)

☐ 1996 or earlier	249
☐ 1997-2005	181
☐ 2006-2008	46
☐ I am in the process of completing my first required experience documentation	33
☐ I do not recall ever submitting official experience documentation	17
	5 provided multiple answers

A: 9. Rank, in order of importance, the value of each component of the SSTS Program's professional preparation: (choose one box per line)

	Preparation Component	1 Most Important	2 Somewhat Important	3 Least Important
Avg. 1.39	A. Pre-Certification Course and Exams	**351**	**147**	**29**
Avg. 1.55	B. Required Experience Component	**309**	**151**	**63**
Avg. 1.98	C. Continuing Education	**174**	**194**	**154**

A: 10. To be considered an expert, how important is it for septic system professionals to hold multiple endorsement categories (Installer, Designer, Inspector, Pumper/Maintainer)? (choose one)

Avg. 2.12

☐ Very important	159
☐ Important	208
☐ Of little importance	122
☐ Not important	39

A: 11. How important is it that system designers install systems before they design systems? (choose one)

Avg. 1.75

☐ Very important	260
☐ Important	183
☐ Of little importance	63
☐ Not Important	22

A: 12. How important is it that system inspectors install and design systems before they inspect systems? (choose one)

Avg. 1.77

☐ Very important	258
☐ Important	168
☐ Of little importance	82
☐ Not important	20

A: 13. How well does the current Experience Program differentiate between high and low quality mentors? (choose one)

Avg. 2.57

- ☐ Very well 25
- ☐ Adequately 261
- ☐ Poorly 137
- ☐ Not well at all 86

A: 14. How important is it for the MPCA to differentiate between high and low quality mentors? (choose one)

Avg. 1.90

- ☐ Very important 141
- ☐ Important 319
- ☐ Of little importance 44
- ☐ Not important 18

A: 15. How important is it that new septic system professionals have guaranteed access to a qualified mentor? (choose one)

Avg. 1.65

- ☐ Very important 248
- ☐ Important 234
- ☐ Of little importance 30
- ☐ Not important 16

A: 16. Should someone make sure that all new septic system professionals have access to opportunities to complete their required experience? (choose one)

- ☐ Yes 346 (66.03%)
- ☐ No (skip to #18) 113
- ☐ I don't know (skip to #18) 65

A: 17. If yes, who should make sure that new professionals have access to opportunities to complete their Experience Program? (choose one)

- ☐ Local Units of Government 113
- ☐ Minnesota Pollution Control Agency 104
- ☐ University of Minnesota 43
- ☐ Professional/Trade organization, such as the Minnesota Onsite Wastewater Association 53
- ☐ Other _____ 15 (available upon request)

3. Local Permitting and Inspection Questions

		1 Strongly Agree	2 Agree	3 Disagree	4 Strongly Disagree
Avg. 1.73	A: 18. I believe that differences in local permitting and inspection programs influence septic system professionals' practices. (choose one)	**203**	**262**	**54**	**4**
Avg. 1.80	A: 19. I believe that tough and thorough local programs result in high quality septic system installations and decreased risks to public health. (choose one)	**192**	**262**	**57**	**14**
Avg. 1.79	A: 20. I believe that there should be a uniform SSTS program across the state of Minnesota (choose one)	**234**	**188**	**79**	**22**

4. Working With Your Official Mentor Questions

For the next questions, please think about your individual encounter with your mentor. If you had more than one, please refer to the mentor that signed off on the greatest number of experience instances. If you have not yet obtained a mentor or do not remember working with a mentor to prepare and submit your experience documentation, please skip to #33.

E: 21. How often was your mentor on the job with you? (choose one)

- ☐ All of the time 163
- ☐ Most of the time 102
- ☐ Some of the time 58
- ☐ Little of the time 39
- ☐ None of the time 15

(219 did not answer)

E: 22. Please choose the options that best describe your mentor's behavior:	1 All of the time	2 Most of the time	3 Some of the time	4 Little of the time	5 None of the time
A. My mentor showed me the correct way to do each specific task. (choose one) Avg. 1.89	175	112	54	24	11
B. My mentor criticized me when I did something wrong. (choose one) Avg. 3.03	82	63	77	61	88
C. My mentor complimented me when I did something correctly. (choose one) Avg. 2.46	92	122	80	44	32
D. My mentor corrected me when I did something wrong. (choose one) Avg. 1.70	224	80	40	15	14
E. My mentor provided me with other resources to help me do a better job (showed me examples or other sources of information). (choose one) Avg. 2.47	103	108	86	40	37
F. My mentor taught me practices that I later found to be incorrect. Avg. 4.37	4	5	45	128	189

	1 Strongly Agree	2 Agree	3 Disagree	4 Strongly Disagree
E: 23. My mentor instilled a high level of confidence that I maintain in my current work. (choose one) Avg. 1.68	172	157	33	10
E: 24. My mentor taught me tasks or concepts that helped me to avoid making mistakes in later work. (choose one) Avg. 1.71	143	191	28	5

E: 25. Overall, how satisfied were you with your mentor? (choose one)

- ☐ Very satisfied 231
- ☐ Somewhat satisfied 103
- ☐ Somewhat unsatisfied 23
- ☐ Very unsatisfied 9
- ☐ I didn't have a mentor 9

C: 26. Please rate the difficulty of documenting your Experience Plan and submitting it to the MPCA. (choose one)

- ☐ Very easy 91
- ☐ Fairly easy 222
- ☐ Fairly difficult 45
- ☐ Very difficult 9

E: 27. How did you obtain your mentor? (choose one)

- ☐ Someone at work provided me with a mentor 114 30.73%
- ☐ A local unit of government performed mentoring duties for me 81 21.83%
- ☐ I found a certified person to provide mentorship for me 113 30.46%
- ☐ A professional organization helped me find a mentor 4 1.08%
- ☐ Other: _____ 53 14.29% (available upon request)

E: 28. Where did you complete your required experience? (choose all that apply)

- ☐ In my core work area 363
- ☐ I traveled outside my core work area 33

E: 29. Did you have to pay your mentor or accept a reduced wage while you were obtaining your required experience? (choose one)

- ☐ Yes 52
- ☐ No 315 83.55%
- ☐ I don't know 10

E: 30. What about the mentoring program was MOST valuable to your development as a practitioner?

270 responses, available upon request

E: 31. What about the mentoring program was LEAST valuable to your development as a practitioner?

184 responses, available upon request

E: 32. How could the mentoring program be changed to improve the hands-on training experience of new practitioners?

212 responses, see attached document.

5. Other On-the-job Training Questions

E: 33. Have you received on-the-job training from someone BESIDES an official mentor? (choose one)

- ☐ Yes 239 39.97%
- ☐ No (skip to Section 6) 359

E: 34. How often was this person (or people) on the job with you? (choose one)

- ☐ All of the time 48
- ☐ Most of the time 75
- ☐ Some of the time 67
- ☐ Little of the time 35
- ☐ None of the time 7

E: 35. Please choose the options that best describe this person's (or peoples') behavior:

		1 All of the time	2 Most of the time	3 Some of the time	4 Little of the time	5 None of the time
Avg. 1.84	A. Those that provided me with on-the-job training showed me the correct way to do each specific task. (choose one)	102	83	32	8	4
Avg. 2.90	B. Those that provided me with on-the-job training criticized me when I did something wrong. (choose one)	56	38	58	36	40
Avg. 2.51	C. Those that provided me with on-the-job training complimented me when I did something correctly. (choose one)	45	74	72	25	11
Avg. 1.72	D. Those that provided me with on-the-job training corrected me when I did something wrong. (choose one)	121	71	27	7	3
Avg. 2.46	E. Those that provided me with on-the-job training provided me with other resources to help me do a better job (showed me examples or other sources of information). (choose one)	60	66	60	26	15
Avg. 4.09	F. Those that provided me with on-the-job training taught me practices that I later found to be incorrect.	8	6	34	94	86

		1 Strongly Agree	2 Agree	3 Disagree	4 Strongly Disagree
Avg. 1.61	E: 36. Those that provided me with on-the-job training instilled a high level of confidence that I maintain in my current work (choose one)	109	110	12	3
Avg. 1.61	E: 37. Those that provided me with on-the-job training taught me tasks or concepts that helped me to avoid making mistakes in subsequent work (choose one)	107	113	13	1

E: 38. Overall, how satisfied were you with your other sources of on-the-job training? (choose one)

- ☐ Very satisfied 134
- ☐ Somewhat satisfied 89
- ☐ Somewhat unsatisfied 6
- ☐ Very unsatisfied 2

E: 39. If you did not submit official experience documentation, please explain why.

41 responses, available upon request

6. Specific Endorsement Questions

If you hold multiple endorsement categories, please answer all questions that apply.

Please answer the questions in the following sections based on your certification with the MPCA:

Installers or those working towards becoming an installer, please answer questions 40- 45

Designers or those working towards becoming a designer, please answer questions 46 – 51

New System Inspectors or those working towards becoming a new system inspector, please answer questions 52 – 56

Existing System Inspectors or those working towards becoming an existing system inspector please answer questions 57 - 61

Installers, please answer questions 40-45: 411 Responses

K: 40. True or False: A watertight septic tank is not critical to the proper functioning of a septic system. (choose one)

☐ True	27	
☐ False	382	92.94%
☐ I don't know	2	

K: 41. True or False: Preventing compaction in and around the soil treatment area can increase the longevity of a septic system. (choose one)

☐ True	387
☐ False	22
☐ I don't know	1

P: 42. Rank the TWO most important practices that you follow to ensure that septic tank installations are watertight (write 1 next to the most important and 2 next to the second most important).

_____ Check tank for cracks before installation and reject if tank is cracked	248 marked #1	44 marked #2
_____ Apply bedding below tank, building sewer, AND supply pipe	19 marked #1	85 marked #2
_____ Check the plastic limit of soil around the septic tank	1 marked #1	5 marked #2
_____ Use of mastic and/or boots at tank penetrations	53 marked #1	162 marked #2
_____ Pressure or vacuum test each tank after installation	9 marked #1	12 marked #2
_____ Fill tank with water and run a hydrostatic test	9 marked #1	17 marked #2
_____ Other _____	8 marked #1 or #2 (upon request)	
☐ I do not follow any of these practices	3	

P, K: 43. Select all the practices that you commonly follow to prevent compaction around a soil treatment area. (choose all that apply)

☐ Mark the area with flags and/or string to route construction equipment away from soil treatment area	371
☐ Use tracked excavation equipment instead of wheeled equipment	373
☐ Delay installation if soil meets or exceeds the plastic limit	279
☐ Use a soil penetrometer to classify the soil	17
☐ Other _____	12 (upon request)
☐ I do not follow any of these practices	1

P, K: 44. How do you know where to set the floats to ensure the correct pump cycle? (choose one)

☐ The manufacturer settings are adequate	9
☐ Calculate the gallons per inch in the pump tank and refer to the designer's recommended dose to set the float distance	390
☐ This is the homeowner's responsibility	0
☐ Other: _____	5

P: 45. Has an inspector ever required you to improve or redo your work? (choose one)

☐ Yes	119	29.53%
☐ No	281	69.73%
☐ I don't remember	3	

Designers, please answer questions 46-51: 319 Responses

K: 46.True or False: The depth to the limiting condition is the most important factor in determining the appropriate type of septic system (trench, mound, or at-grade). (choose one)

☐ True	305
☐ False	13
☐ I don't know	

K: 47. True or False: Landscape features influence the design of a system (choose one)

☐ True	300	
☐ False	18	
☐ I don't know	1	

P: 48. Select the MOST important practice that you follow to determine which type of septic system you will design. (choose one)

☐ Determine the system type based on types of systems installed nearby	2	
☐ Conduct one or two soil observations (borings or pits)	98	
☐ Conduct three or more soil observations	190	
☐ Consult the USDA Soil Survey	0	
☐ Other _____	5	
☐ I do not follow any of these practices	1	
	19 marked multiple answers	

K: 49. In what way does the soil texture MOST affect the design of a septic system? (choose one)

☐ The type of system to be designed (trench, mound, or at-grade)	59	
☐ The size of the septic tank	0	
☐ The size of the soil treatment area	247	78.41%
☐ None of the above	1	
	8 marked multiple answers	

P: 50. How much does competition from other designers influence the type of system (trench, mound, or at-grade) that you design? (choose one)

☐ Significantly	16	5%
☐ Somewhat	27	
☐ Not much	63	
☐ Not at all	207	

P: 51. How often has a local permitting agency denied you a permit or required a change in your design because they stated that you chose the incorrect system type (trench, mound, or at-grade)? (choose one)

Avg. 1.35

☐ Never	231	75.74%
☐ Rarely	63	
☐ Sometimes	7	
☐ Frequently	0	
☐ Often	0	
	9 marked multiple answers	

Inspectors- please choose ONE set of questions to answer:

Answer questions 52-56 if you primarily inspect new systems.	154 Responses
Answer questions 57-61 if you primarily inspect existing systems.	161 Responses

K: 52.True or False: The depth to the limiting condition is the most important factor in determining the appropriate type of septic system (trench, mound, or at-grade). (choose one)

☐ True	144	
☐ False	8	5%
☐ I don't know	2	

P: 53. How often have you denied a permit or required a change in design based on an incorrectly chosen system type (trench, mound, or at-grade)? (choose one)

Avg. 2.24

☐ Never	31
☐ Rarely	57
☐ Sometimes	52
☐ Frequently	2
☐ Often	1

K: 54. True or False: Preventing compaction in and around the soil treatment area can increase the lifespan of a septic system. (choose one)

☐ True	149
☐ False	2
☐ I don't know	1

P: 55. Select all practices that you follow when conducting a new system inspection (choose all that apply).

☐ Ensure that soil treatment area and reserve soil treatment area are marked with flags and/or string to divert construction equipment away from soil treatment areas.	107	about 69%
☐ Ensure that soil does not meet or exceed the plastic limit	107	about 69%
☐ Lift inspection pipes to ensure they are secured	85	about 55%
☐ Request delivery records from Installer to ascertain the use of clean sand and rock	39	about 25%
☐ Perform a jar test to ascertain the use of clean sand	76	about 50%
☐ I do not follow any of these practices	5	

P: 56. How often do you require installation contractors to redo their work? (choose one)

☐ Never	9	
☐ Rarely	74	54%
☐ Sometimes	54	
☐ Frequently	1	
☐ Often	0	

Existing system inspectors, please answer questions 57-61.

K: 57. True or False: The depth to the limiting condition is the most important factor in determining the appropriate type of septic system (trench, mound, or at-grade). (choose one)

☐ True	154
☐ False	4
☐ I don't know	2

P: 58. Do you obtain all septic system records available at the local unit of government before conducting an inspection? (choose one)

☐ Never	0
☐ Rarely	1
☐ Sometimes	16
☐ Frequently	34
☐ Always	106

K: 59. True or False: A watertight septic tank is not critical to the proper functioning of a septic system. (choose one)

☐ True	8
☐ False	152
☐ I don't know	

P: 60. Which ONE practice do you most commonly follow to determine the treatment media depth when inspecting for vertical separation? (choose one)

☐ I use a laser to assist in this determination	10
☐ I probe the area to determine this depth	105
☐ I reference existing design records	14
☐ Other _____	14
☐ I do not follow any of these practices	0

P: 61. Because of extenuating circumstances, have you ever passed a system that might have been non-compliant? (choose one)

☐ Yes	19	about 12%
☐ No	130	
☐ I don't know	11	

Thank you for your participation! Please return the completed survey in the business reply envelope. Your response will help us assess and improve the SSTS Program. If you have questions about the survey, please contact:

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4017