

Professional Development Needs of Idaho Technology Teachers: Teaching and Learning

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ABSTRACT

This study's purpose was to identify the teaching and learning professional development needs of [state] secondary technology teachers. Teachers' perceived level of importance and competence for 35 teaching and learning items were used to calculate mean weighted discrepancy scores (MWDS). Approximately 63% (n=46) of [state] secondary technology teachers participated in the study. The MWDS analysis indicated that the highest rated perceived training needs in the teaching and learning area were "Utilize Computer Numerical Control (CNC) software and applications", "Teaching students to think critically and creatively", "Motivating students to learn", "Integration of science standards into the CTE curriculum", and "Teaching problem-solving & decision-making skills". Individuals involved with teacher preparation and in-service training can use the findings to inform the development of pre-service curriculum and in-service educational offerings.

Introduction and Theoretical Framework

As a result of low achievement scores in academic subject matter by American students, policy makers at the federal and state levels have placed a priority on reforming the nation's educational system (Gordon, 2008). Federal legislation such as *No Child Left Behind* and the *Carl D. Perkins Career and Technical Education Act of 2006* has placed an emphasis on higher standards of achievement, specifically in mathematics and science. Because of the reform effort, secondary teachers are being held to high levels of accountability in order to best prepare students for postsecondary education and the workforce.

Technology education provides students with contextual learning experiences through the integration of academic subject matter such as math, science, and literacy (Gordon, 2008). These learning experiences have been found to improve students' achievement in math and science (Chiasson & Burnett, 2001; Parr, Edwards, & Leising, 2006; Ricketts & Duncan, 2006). Parr, Edwards and Leising (2006) found that a math-enhanced agricultural power and technology curriculum and aligned instructional approach significantly affected ($p < .05$) student performance on a mathematics placement test used to determine a student's need for mathematics remediation at the postsecondary level. As the technology education profession aligns with reform efforts; such teachers need to be aware of current legislative requirements,

workplace standards, and relevant curriculum concepts to employ in their instructional practices within the classroom. In fact, Boser and Daugherty (1994) argued that advancing the profession forward required providing teachers with, "...updated information on curriculum, methodology, and technology to allow them to make philosophical and programmatic changes that augment technology education" (p.4). One method to provide information to technology education teachers is through professional development activities.

Recent research has emphasized that professional development activities must assist teachers in understanding subject matter, learners and learning, and teaching methods (Duncan, Ricketts, Peake, & Uessler, 2006; Daugherty, 2009). However, to best increase teachers' levels of instructional competency, professional development activities should meet the needs of the teachers (Munby, Russell, & Martin, 2002). Instructional competency refers to the pedagogical knowledge and skills needed for the successful practice of teaching (Watts, 1982). This study sought to determine perceived pedagogical professional development needs of [state] secondary technology teachers as they relate to the activities involved with teaching and learning.

Knowles (1970) noted that the teacher is the most important variable in the classroom for student achievement. In this era of accountability, the outcomes of the classroom are a reflection of teachers' competency. As students, teachers, schools, curricula, legislation, and times change; providers (universities) of teacher education training must re-evaluate the content they distribute to pre-service and in-service teachers (Ricketts, Peake, Duncan, & Uessler, 2005). Therefore, determining what teachers need, as determined by a plethora of outcomes required by technology education teachers, and providing them with timely knowledge and skills can have directive, positive outcomes.

Two principles of adult learning theory framed this study. The first, developed by Baker and Trussell (1981), stated that the discrepancy between theory and application can be reduced by determining what is needed by the practitioner (i.e., application). Findlay (1992) in support of this theory concluded:

...the gap between theory and practice could be eliminated by reducing theory to what was needed to perfect the practice (teaching). The prospective teacher would then be trained to reach competence in each of the tasks in order to cope with whatever situation may be encountered in the school of the real world (p. 28).

Conceptually, professional development is important for the improvement of teacher practice. The identification of priorities for professional development of secondary teachers focuses the theory on what is most important.

The second guiding adult learning principle is articulated within the work of Knowles (1980; 2005). Adult learners will have a high level of motivation for learning what they perceive as relevant to their needs. Conversely, adults will be disengaged from learning activities that are not perceived as needed and relevant (Knowles, 1980). Adults should be an active participant in the planning process of their learning activities and experiences (Knowles, 1980). Daugherty (2009), Gordon (2004), Guskey (2003), and Layfield and Dobbins (2002) have substantiated the

importance of active engagement and collaboration between the professional development provider and the teacher. Daugherty (2009) surmised, “The design (professional development) should be a collaborative venture between professional development providers and the teachers so as to account for the particular contexts within which teachers operate” (p.22). Furthermore, for professional development to be most beneficial, Munby, Russell, and Martin (2002) concluded activities should meet the needs of the teachers to best improve their level of competency.

A powerful tool for identifying CTE professional development needs, and at the same time engaging the teacher (adult learner) in the process, is the Borich Needs Assessment model (1980). This model utilizes a descriptive survey and evaluates the “perceived level of importance” and “perceived level of competence” of teachers in regards to a given set of items identified by previous research (Garton & Chung, 1996; Joerger, 2002; Layfield & Dobbins, 2002; Duncan et al., 2006).

Professional development needs research using the Borich Needs Assessment model has been conducted primarily in the agricultural education discipline (Duncan et al., 2006; Joerger, 2002; Layfield & Dobbins, 2002; Edwards & Briers, 1999; Garton & Chung, 1996, 1997). For the items related to teaching and learning, previous agricultural education research utilizing the Borich Model identified the following perceived professional development needs of secondary teachers:

- motivating students to learn;
- classroom management/student discipline;
- using the internet as a teaching tool;
- teaching students problem solving skills;
- using computers in classroom teaching;
- using multimedia equipment in teaching;
- teaching recordkeeping skills; and
- assisting students to increase critical thinking skills (Duncan et al., 2006; Edwards & Briers, 1999; Garton & Chung, 1996, 1997; Joerger, 2002; Layfield & Dobbins, 2002).

Using a different methodology, Mundt and Connors (1999) through the Delphi technique found the most pressing pre-service and in-service needs of secondary agricultural educators as classroom management/student discipline and time/organizational management.

The body of research literature addressing the professional development needs of secondary CTE teachers in content areas other than agricultural education is limited but growing. In the area of business and marketing education; Kitchel, Cannon and Duncan (*in press*) used a modified version of the Borich model to survey teachers and determine perceived professional development needs concerning teaching and learning at both the pre-service and in-service levels. It was found that perceived pre-service training priorities should address motivating students to learn, using productivity software, and teaching students to think critically/creatively. The highest perceived in-service needs were identified as teaching students to think

critically/creatively, designing/developing digital-age learning assessments, and motivating students to learn (Kitchel, Cannon, & Duncan, *in press*).

Crews and Bodenhamer (2009) found classroom management, curriculum development, computer application skills, student motivation, and instructional strategies as the most needed pre-service business education teaching needs as identified by in-service teachers. The research findings of Wichowski and Heberley (2004) indicated dual enrollment, integration of academics, reading programs, career clusters, and technical skill updating as the highest priority professional development needs for practitioners as identified by state CTE directors. Classroom management, curriculum development, and working with special populations were identified by novice CTE teachers as professional development needs with particular importance (Ruhland & Bremer, 2002). Heath-Camp and Camp (1990) found systems-related problems such as inadequate orientation, equipment, and supplies; student related problems such as lack of motivation and undesirable behavior; and personal struggles with self-confidence, time management, and organizational skills as areas of concern for beginning CTE teachers.

Although limited, research related to professional development for teachers within the field of technology education does exist. Daugherty (2009) described three effective components to professional development: “(a) hands-on activities, (b) teacher collaboration, and (c) instructor credibility” (p. 20). Bybee and Loucks-Horsley (2000) indicated there to be four important aspects of professional development for technology teachers: the development of technology skills; the learning about how to teach technology; the motivation and tools for the teacher’s continual learning; and the opportunity for long-term professional development that supports standard-based reform. Compton and Jones (1998) found that technology education teacher professional development should center on the conceptualization of technology education, pedagogy, and technological practice. As for specific in-service topics for technology education teachers, Boser and Daugherty (1994) reported that faculty of institutions which offered technology education teacher preparation identified the following topics: “robotics, principles of technology, CAD, integrated academics or mathematics, science, and technology integration, CNC, desktop publishing” (p. 9). The previous research, in conjunction with this current study, provides information to [state] administrators, the state technology education program manager, university technology education teacher preparation faculty, and school district administrators. This information should be a component in the professional development planning process.

Research Objectives

The purpose of this study was to determine the teaching and learning in-service needs of [state] secondary technology education teachers. More specifically, the following objectives guided this research:

1. Describe [state] secondary technology teachers’ perceived importance of specific teaching and learning duties/tasks;
2. Describe [state] secondary technology teachers’ perceived level of competence of specific teaching and learning duties/tasks; and

3. Determine perceived in-service needs of [state] secondary technology teachers in the specific area of teaching and learning.

Methodology and Procedures

The research reported in this study comprised a portion of a larger project which sought to determine the professional development priorities for [state] secondary CTE educators in the specific constructs of teaching and learning, and program management. Because of the amount of data which was collected, the researchers determined that the information from the project would best be disseminated by CTE program area and by construct. A descriptive research design with the survey method was used for the study. Data was collected from [state] technology education teachers employed during the spring term of 2009.

This study's 59-item survey instrument was modeled after similar instruments used by Duncan et al. (2006), Joerger (2002), and Garton and Chung (1996) which were all based on the Borich Needs Assessment Model (1980). The instrument design allowed teachers to rate items on two distinct Likert-type scales; perceived level of importance (1 = Not Important, 2 = Little Importance, 3 = Somewhat Important, 4 = Important, 5 = Very Important) and perceived level of competence (1 = Not Competent, 2 = Little Competence, 3 = Somewhat Competent, 4 = Competent, 5 = Very Competent). The individual items were statements regarding duties/tasks involved with being a CTE educator. Of these, 35 items were specific to teaching and learning (ie. motivating students to learn, classroom management, organizing teaching laboratories, teaching gifted and talented students, use of multimedia equipment in teaching, etc.). The teaching and learning items for this instrument were determined by a review of previous studies and the assistance of CTE teacher educators.

The instrument was reviewed for face, content, and construct validity by a panel of experts in CTE. The panel was comprised of secondary CTE teachers and university faculty engaged in CTE teacher preparation. In addition, the instrument was piloted with a small group of pre-service CTE teachers. The data collected from this process contributed to the final version of the survey instrument.

[state] secondary technology education teachers comprised the population of the study (N = 73). Because of the advantage of time, cost, and efficiency; an online survey format was selected for implementation (Puig, 2002; Shannon, 2002). The survey research was conducted in May and June of 2009. Dillman's (2007) method was used to increase the response rate. An initial invitation to participate was sent via email to secondary technology education teachers identified by the [CTE state division]. Follow-up prompts for participation were delivered at two and four week intervals. In all, 63.0% (n=46) of [state] technology education teachers participated in the study.

Excel™ and Statistical Package for the Social Sciences (SPSS) software were used to analyze the collected data. Mean weighted discrepancy scores (MWDS) were calculated for each item using the item's importance and competence ratings. More specifically, the MWDS is calculated by subtracting each respondent's competence rating score from the importance rating (*discrepancy score*), multiplying that number by the mean importance rating of the item across

cases (*weighted discrepancy score*), and then calculating the average of all weighted discrepancy scores, which is the *MWDS* (Borich, 1980; Joerger, 2002). An analysis of the *MWDS* values then served to identify in-service teaching and learning needs of [state] secondary technology education teachers.

Non-response bias is a concern when the data does not represent every subject within the population (Miller & Smith, 1983; Lindner, Murphy, & Briers, 2001; Radakrishna & Doamekpor, 2008). Procedures suggested by previous research were used to evaluate non-response bias (Lindner, Murphy, & Briers, 2001). A statistically significant difference was found on the importance ratings between early respondents and late respondents. No statistical difference was found between early and late responders for competence rating. Radhakrishna and Doamekpor (2008) concluded that if no significant difference is found between early and late respondents, then the findings from the sample may be representative of the population. That was not the case with the importance ratings. Lindner et al (2001) suggested that "...differences should be described and limitations in generalizing should be noted" (p. 52). Trochim and Donnelly (2008) discussed generalizability and the role of the "*Proximal Similarity Model*". The Proximal Similarity Model addresses generalizability not from a statistical perspective, but rather from a theoretical one that looks for similar contexts that one could logically infer a study's findings. Because of the statistical significant difference between early and late responders' importance ratings, the generalizability of the findings should be limited to the respondents of the study and those from the population with similar characteristics as these respondents.

Findings

The technology education teachers who participated in this study were predominately male ($n = 41, f = 91.3$). Almost half of the respondents had over 20 years of teaching experience ($n = 21, f = 45.7$), and a traditional teacher education program was the dominant form of professional preparation (Table 1).

Table 1

Demographic Characteristics of [state] Technology Teachers

		<i>n</i>	%
Gender:	Female	4	8.7%
	Male	42	91.3%
Teaching Experience	0 (just completed teacher training)	0	0.0%
	1-2 years	5	10.9%
	3-5 years	6	13.0%
	6-10	5	10.9%
	11-20	9	19.6%
	>= 20	21	45.7%
Training ¹	Traditional Undergraduate University Program	41	48.2%

Graduate Certification beyond Bachelors degree	13	15.3%
Combined Undergraduate and Graduate Program	14	16.5%
Substitute Teaching Leading to Full-time Teaching Position	3	3.5%
Occupational Certification (work experience plus course work)	11	12.9%
Alternative Certification (ABCTE ² , Peace Corps, etc.)	1	1.2%
No Formal Teacher Training	2	2.4%

¹Survey allowed participants to select all the listed options they felt applied, thus, overall total count exceeds participation count.

²American Board for Certification of Teacher Excellence.

Objective One: Describe [state] secondary technology teachers' perceived importance of specific teaching and learning items

Technology education teachers rated 35 item statements concerning teaching and learning on two distinct scales, importance and competence. The importance ratings are displayed in Table 2. Teaching proper safety attitudes in the classroom and teaching proper safety attitudes in the lab were the highest rated statements in relationship to importance.

Table 2

Importance Ratings of Teaching and Learning Construct Items for [State] Secondary Technology Teachers (n=46)

Topic	<i>M</i> ¹	<i>SD</i>
Teaching proper safety practices in the lab	4.89	0.38
Teaching proper safety attitudes in the classroom	4.89	0.39
Teaching problem-solving & decision-making skills	4.81	0.45
Teaching students to think critically and creatively	4.79	0.46
Motivating students to learn	4.76	0.48
Classroom management	4.65	0.60
Organizing and supervising teaching laboratories	4.63	0.61
Assessing and evaluating student performance	4.57	0.65
Utilize drafting/CAD software	4.51	0.72
Integrating life skills into the curriculum	4.40	0.80
Integration of technology standards into the CTE curriculum	4.39	0.95
Use multimedia equipment in teaching	4.30	0.81
Developing performance based assessment instruments	4.28	0.93
Utilize Computer Numerical Control (CNC) software and applications	4.26	0.77
Use non-computer technology in teaching	4.20	0.83
Use digital tools to facilitate student learning, creativity, and innovation	4.17	0.89
Integration of math standards into the CTE curriculum	4.13	0.93
Integration of science standards into the CTE curriculum	3.98	1.00
Teaching gifted and talented students	3.98	0.92
Promote and model digital citizenship and responsibility	3.93	1.07
Teaching using experiments	3.91	0.90
Teaching learning disabled students	3.89	0.94

Integration of reading standards into the CTE curriculum	3.85	1.06
Use digital tools for face-to-face instruction	3.83	1.03
Design & develop digital-age learning experiences	3.83	0.89
Integration of writing standards into the CTE curriculum	3.81	1.04
Utilize productivity software (word processing, spreadsheets, presentation software)	3.81	0.95
Embedding graduation standards into the CTE curriculum	3.79	1.08
Use digital tools for blended instruction	3.74	1.09
Utilize graphic design & publishing software	3.68	1.09
Design & develop digital-age learning assessments	3.62	1.11
Use digital tools for on-line instruction	3.23	1.29
Utilize website development software	3.19	1.26
Utilize database software (e.g., MS Access)	2.93	0.93
Develop applications through programming languages	2.70	1.17

¹Response Scale of 1=Not Important, 2=Little Importance, 3=Somewhat Important, 4=Important, 5=Very Important.

Objective Two: Describe [state] secondary technology teachers' perceived level of competence of specific teaching and learning items

Table 3 provides the perceived level of competence by [state] secondary technology teachers. They perceived themselves as most competent in teaching proper safety attitudes in the classroom and least competent with developing applications through programming languages.

Table 3

Perceived Competence Ratings of Teaching and Learning Construct Items for [State] Secondary Technology Education Teachers (n=46)

Topic	<i>M</i> ¹	<i>SD</i>
Teaching proper safety attitudes in the classroom	4.55	0.62
Teaching proper safety practices in the lab	4.52	0.66
Teaching problem-solving & decision-making skills	4.37	0.74
Organizing and supervising teaching laboratories	4.24	0.85
Classroom management	4.24	0.77
Use non-computer technology in teaching	4.17	0.84
Utilize drafting/CAD software	4.13	0.97
Assessing and evaluating student performance	4.11	0.73
Utilize productivity software (word processing, spreadsheets, presentation software)	4.02	1.13
Integrating life skills into the curriculum	4.00	0.93
Motivating students to learn	4.00	0.76
Teaching students to think critically and creatively	4.00	0.70
Use multimedia equipment in teaching	3.98	0.97
Integration of technology standards into the CTE curriculum	3.93	0.93
Use digital tools to facilitate student learning, creativity, and innovation	3.87	0.88

Developing performance based assessment instruments	3.83	0.84
Use digital tools for face-to-face instruction	3.81	1.01
Teaching using experiments	3.68	1.02
Teaching gifted and talented students	3.66	0.76
Integration of math standards into the CTE curriculum	3.62	1.01
Promote and model digital citizenship and responsibility	3.58	1.18
Utilize graphic design & publishing software	3.54	1.19
Design & develop digital-age learning experiences	3.48	1.03
Use digital tools for blended instruction	3.47	1.08
Integration of science standards into the CTE curriculum	3.43	0.95
Teaching learning disabled students	3.38	0.80
Integration of writing standards into the CTE curriculum	3.34	0.98
Integration of reading standards into the CTE curriculum	3.34	0.98
Embedding graduation standards into the CTE curriculum	3.28	1.04
Design & develop digital-age learning assessments	3.21	1.04
Utilize Computer Numerical Control (CNC) software and applications	3.19	1.14
Use digital tools for on-line instruction	3.15	1.30
Utilize database software (e.g., MS Access)	2.98	1.14
Utilize website development software	2.68	1.20
Develop applications through programming languages	2.04	1.07

¹Response Scale of 1=Not Competent, 2=Little Competence, 3=Somewhat Competent, 4=Competent, 5=Very Competent.

Objective Three: Determine perceived in-service needs of [state] secondary technology teachers in the specific area of teaching and learning

In-service need is represented by the mean weighted discrepancy score (MWDS) as reported in Table 4. The highest rated perceived teaching and learning training need was “Utilize Computer Numerical Control (CNC) software and applications” (MWDS = 4.45), followed by “Teaching students to think critically and creatively” (MWDS = 3.75), “Motivating students to learn,” (MWDS = 3.62), “Integration of science standards into the CTE curriculum” (MWDS = 2.25), and “Teaching problem-solving & decision-making skills” (MWDS = 2.20).

Table 4

Teaching and Learning Priority In-Service Areas for [state] Secondary Technology Education Teachers

Topic	Rank	MWDS ¹
Utilize Computer Numerical Control (CNC) software and applications	1	4.45
Teaching students to think critically and creatively	2	3.75
Motivating students to learn	3	3.62
Integration of science standards into the CTE curriculum	4	2.25
Teaching problem-solving & decision-making skills	5	2.20
Integration of math standards into the CTE curriculum	6	2.16
Assessing and evaluating student performance	7	2.14

Classroom management	8	2.13
Integration of technology standards into the CTE curriculum	9	2.00
Teaching learning disabled students	10	1.99
Integration of reading standards into the CTE curriculum	11	1.97
Embedding graduation standards into the CTE curriculum	12	1.93
Developing performance based assessment instruments	13	1.91
Teaching proper safety practices in the lab	14	1.85
Organizing and supervising teaching laboratories	15	1.81
Integration of writing standards into the CTE curriculum	16	1.78
Integrating life skills into the curriculum	16	1.78
Develop applications through programming languages	18	1.76
Utilize drafting/CAD software	19	1.73
Teaching proper safety attitudes in the classroom	20	1.67
Utilize website development software	21	1.63
Promote and model digital citizenship and responsibility	22	1.40
Use multimedia equipment in teaching	23	1.37
Design & develop digital-age learning assessments	23	1.37
Teaching gifted and talented students	25	1.27
Design & develop digital-age learning experiences	26	1.25
Use digital tools to facilitate student learning, creativity, and innovation	27	1.24
Use digital tools for blended instruction	28	1.04
Teaching using experiments	29	0.92
Utilize graphic design & publishing software	30	0.40
Use digital tools for on-line instruction	31	0.28
Use non-computer technology in teaching	32	0.18
Use digital tools for face-to-face instruction	33	0.08
Utilize database software (e.g., MS Access)	34	-0.13
Utilize productivity software (word processing, spreadsheets, presentation software)	35	-0.81

¹Mean Weighted Discrepancy Score.

Conclusions and Recommendations

This study surveyed [state] secondary technology education teachers, and it was part of a larger project to identify professional development needs for all CTE secondary teachers in the state with the exception of agricultural education (agricultural education was not surveyed because researchers in this discipline were conducting a separate in-service needs assessment). Even though the highest rated item as determined by the MWDS was specific to technology education, the vast majority of items were non-content specific. Future research in the assessment of professional development needs of technology education should use this instrument as a guide in the development of survey items. Experts in technology education should be consulted in the determination of the appropriate items.

Teachers with more than 10 years of experience comprised 65% of the respondents or 41% of the total population. Thus, the perceived professional development needs are skewed toward the perceptions of the most highly experienced teachers. Teachers with more experience

are generally older, and as Knowles, Holton, and Swanson (2005) have theorized have different learning needs than younger adult learners with less experience

Findings from this study are consistent with those of other professional development researchers. “Teaching students to think critically and creatively” (ranked 2), “Motivating students to learn” (ranked 3), and “Teaching problem-solving & decision-making skills” (ranked 5) are items that previous research has shown to be priority areas for professional development of CTE teachers (Garton & Chung, 1996, 1997; Joerger, 2002; Duncan, et al., 2006; Kitchel, et al., in press). The top rated need as rated by secondary technology education teachers, “Utilize Computer Numerical Control (CNC) software and applications”, is a content specific need and unique to curricula found in programs such as technology education. Boser and Daugherty’s (1994) study of institutions with technology education teacher preparation programs also identified CNC as a professional development priority.

These findings should be used as a component of the in-service planning process. Input from other CTE stakeholders such as school district administrators, university teacher preparation faculty, the state technology education program manager, and state CTE staff should also be considered when planning professional development activities. Daugherty (2009) developed guidelines for effective professional development activities for secondary technology education teachers: “(a) hands-on activities, (b) teacher collaboration, and (c) instructor credibility” (p. 20). The findings from this study complement Daugherty’s (2009) work and together, provide direction and guidance for technology education professional development in [state].

The top in-service priority, “Utilize Computer Numerical Control (CNC) software and applications”, demonstrates the desire by technology education teachers to provide students with learning experiences which will prepare them with technical skills for the competitive global economy. Using CNC software and applications in the classroom and laboratory provide students with a contextual learning experience, thus enhancing skills necessary for post-secondary education and entry into the workforce. Those involved with professional development in [state] should implement activities which will help secondary teachers to effectively use and apply CNC software and applications.

Two of the top rated in-service needs, “Teaching students to think critically and creatively” and “Teaching problem-solving & decision-making skills”, are complimentary to each other. Critical and creative thinking skills are needed by students as they prepare for education beyond high school or entry into the workforce. Problem-solving and decision-making skills are enhanced by critical and creative thinking. Strong critical thinking skills, problem-solving, and decision-making skills are vital for successful career experiences.

Hunter (1995) concluded that motivation is an important aspect of student learning. Providing in-service activities which will help teachers to develop learning activities which generate and build student interest strengthens the experience and heightens student achievement. The scope of this study was the identification and ranking of in-service needs as they relate to a set of tasks/duties related to teaching and learning. Further research should be conducted to disseminate motivation theory and to determine pre-service and in-service activities

that will provide teachers with the tools to take advantage of each student's motivation. Professional development activities related to student motivation can also be used to address classroom management issues. Well planned classroom and laboratory learning experiences lead to a peak in student motivation (Hunter, 1995). In turn, students will be actively engaged in the learning process resulting in fewer classroom management/student discipline problems (Reardon & Derner, 2004; Pogrow, 2009).

This study joins a growing list of CTE research which has utilized the Borich Needs Assessment Model. By using thoroughly researched survey methodology and taking advantage of web technology, the researchers were able to conduct this study in a manner that efficiently used limited time and financial resources. Researchers in other CTE content areas can use the methodology of this study, as well as previous studies to guide the methodology for future professional development needs assessment.

Professional development of teachers is an important component of the national CTE research agenda (Lamberth et al., 2008). The findings of this study contribute to the identification of perceived in-service needs/priorities of technology teachers in [state] and may inform the professional development activities provided to technology educators in other states. Providing in-service activities deemed as important and needed, can lead to more effective teachers, thereby enhancing the educational experience of technology education students, and ultimately advancing the technology education forward.

Limitations of this study must be considered in a discussion of the conclusions and recommendations. As discussed in the methodology section, a significant difference was found between early and late responders' importance ratings. Because of this, generalizations should be limited to the respondents of the study and those from the population with similar characteristics as these respondents. Furthermore, a more in depth analysis, comparing the MWDS of the respondents to this survey with future studies is needed to overcome this limitation.

Just as experience should be considered as a limitation, so should teacher certification training. Almost half of the respondents received their teacher certification training through a traditional undergraduate university program. However, a significant number of [state] technology education teachers received training through alternative routes such as the occupational certification. This trend in [state] will continue to grow as school districts seek the valuable career experience which older candidates provide. This too, should be more thoroughly analyzed to determine similarities and differences in perceived professional development needs.

This was not a direct survey; the researchers did not ask the question, "What do you believe is your most important in-service need?" There is value to asking this question, and future researchers should ponder this question when developing professional development needs assessment instruments. However, others will ask, "How do they (the teachers) know what they need?" This instrument is an attempt to develop an objective tool for teachers. It should be used as piece of the process, not the sole determining factor when planning professional development activities for [state] technology education teachers.

Even though there are limitations, this instrument can serve as a foundational piece for future in-service needs assessment. Further modifications are welcomed in crafting a tool which effectively and efficiently provides information to those involved with professional development planning whether at the state or local school district level. This is especially important with the scarce resources available for CTE programming.

REFERENCES

- Baker, R. A. & Trussell, S. T. (1981). Administrative model for the incorporation of performance-based instructional modules into university education professional development program. (Research Series No. 5). Auburn, AL: Auburn University, Center for Vocational and Adult Education.
- Barrick, R. K., Ladewig, H., & Hedges, L. (1983). Development of a systematic approach to identifying technical in-service needs of teachers. *The Journal of American Association of Teacher Educators in Agriculture*, 24(1), 13-19.
- Borich, G. D. (1980). A needs assessment model for conducting follow-up studies. *Journal of Teacher Education*, 31(1), 39-42.
- Boser, R., & Daugherty, M. (1994). In-service activities for Technology Education: The role of colleges and universities. *Journal of Technology Education*, 6(1).
- Bybee, R. W., & Loucks-Horsley, S. (2000). Advancing technology education: The role of professional development. *The Technology Teacher*, 60 (2), 31-34.
- Chiasson, T. C., & Burnett, M. F. (2001). The influence of enrollment in agriscience courses on the science achievement of high school students. *Journal of Agricultural Education*, 42(1), 60-70.
- Compton, V., & Jones, A. (1998). Reflecting on teacher development in technology education: Implications for future programmes. *International Journal of Technology and Design Education*, 8(2), 151-166.
- Crews, T. B., & Bodenahmer, J. (2009). Preparing student teaching interns: Advice from current business educators. *Delta Pi Epsilon Journal*, LI(1), 43-55.
- Daugherty, J. L. (2009). Engineering professional development design for secondary school teachers: A multiple case study. *Journal of Technology Education*, 21(1), 10-24.
- Dillman, D. A. (2007). *Mail and Internet Surveys: The Tailored Design* (2nd ed.). Hoboken, NJ.: John Wiley.
- Duncan, D. W., Ricketts, J. C., Peake, J. B., & Uessler, J. (2006). Teacher preparation and in service needs of Georgia agriculture teachers. *Journal of Agricultural Education*, 47(2),

24-35.

Edwards, M. C., & Briers, G. E. (1999). Assessing the in-service needs of entry-phase agriculture teachers in Texas: A discrepancy model versus direct assessment. *Journal of Agricultural Education*, 40(3), 40-49.

Findlay, H. J. (1992). Where do secondary vocational agriculture teachers acquire professional agricultural education competencies? *Journal of Agricultural Education*, 33(2), 28-33.

Fullan, M., & Steigelbauer, S. (1991). *The meaning of educational change* (2nd ed.). New York, NY: Teachers College Press.

Garton, B. L., & Chung, N. (1996). The in-service needs of beginning teachers of agriculture as perceived by beginning teachers, teacher educators, and state supervisors. *Journal of Agricultural Education*, 37(3), 52-58.

Garton, B. L., & Chung, N. (1997). An assessment of the in-service needs of beginning teachers of agriculture using two assessment models. *Journal of Agricultural Education*, 38(3), 51-58.

Gordon, H.R. D. (2008). *The History and growth of career and technical education in America* (3rd ed.). Long Grove, IL: Waveland Press.

Gordon, S. P. (2004). *Professional development for school improvement*. Boston: Pearson.

Guskey, T. (2003). What makes professional development effective? *Phi Delta Kappan*, 84, 748-750.

Hansen, J. W. & Lovedahl, G. G. (2004). Developing technology teachers: Questioning the industrial tool use model. *Journal of Technology Education*, 15(2), 20-32.

Heath-Camp, B., & Camp, W. (1990). What new teachers need to succeed. *Vocational Education Journal*, 65(4), 22-24.

Hunter, M. C. (1995). *Motivation theory for teachers*. Thousand Oaks, CA: Corwin Press.

Joerger, R. M. (2002). A comparison of the in-service education needs of two cohorts of beginning Minnesota agricultural education teachers. *Journal of Agricultural Education*, 43(3), 11-24.

Kitchel, Cannon, & Duncan (*in press*). Professional development priorities of [state] business teachers: An examination of a set of competencies associated with teaching and learning. *Delta Pi Epsilon Journal*.

Knowles, M. S. (1970). *The modern practice of adult education*. New York: Association Press.

- Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy*. Chicago, IL: Follett Publishing Company.
- Knowles, M. S., Holton, E. F., & Swanson, R. A. (2005). *The adult learner: The definitive classic in adult education and human resource development* (6th ed.). Boston, MA: Elsevier.
- Lambeth, J. M., Elliot, J., & Joerger, R. M. (2008). The national Career and Technical Education research agenda. *Techniques*, 83(7), 52-55.
- Layfield, K. D., & Dobbins, T. R. (2002). In-service needs and perceived competencies of South Carolina agricultural educators. *Journal of Agricultural Education*, 43(4), 46-55.
- Lindner, J. R., Murphy, T. H., & Briers, G. E. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education*, 42(4), 43-53.
- Miller, L. E., & Smith, K. (1983). Handling non-response issues. *Journal of Extension*, 21(5), 45-50.
- Munby, H., Russell, T., & Martin, A. K. (2002). Teachers' knowledge and how it develops. In V. Richardson, (Ed.), *Handbook of research on teaching*, (4th ed., pp. 877-904). Washington, DC: AERA.
- Mundt, J. P., & Connors, J. (1999). Problems and challenges associated with the first years of teaching agriculture: A framework for preservice and in-service education. *Journal of Agricultural Education*, 40(1), 38-48.
- Parr, B., Edwards, C. & Leising, J. (2006). <http://pubs.aged.tamu.edu/jae/pdf/Vol47/47-03081.pdf>
- Pogrow, S. (2009). *Teaching content outrageously: How to captivate all students and accelerate learning*. San Francisco, CA: Jossey-Bass.
- Puig, M. (2002). *Advantages and disadvantages of online research*. Retrieved May 8, 2009, from <http://www.sysurvey.com/tips/goodbadugly.htm>.
- Radhakrishna, R., & Doamekpor, P. (2008). Strategies for generalizing findings in survey research. *Journal of Extension*, 46(2).
- Reardon, M. & Derner, S. (2004). *Strategies for great teaching: Maximize learning moments*. Chicago, IL: Zephyr Press.
- Rhodes, C., Stokes, M., & Hampton, G. (2004). *A practical guide to mentoring, coaching, and peer-networking: Teacher professional-development in schools and colleges*: Glasgow, Scotland: Bell & Bain Ltd.

- Ricketts, J.C. & Duncan, D.W. (2006). Science achievement of high school students in complete programs of agriscience education. *Journal of Agricultural Education* 47(2), 48-55.
- Ricketts, J.C., Peake, J.B., Duncan, D.W., & Uessler, J. (2005). Teacher preparation and in service needs associated with management of the total program of agricultural education in Georgia. *Journal of Southern Agricultural Education Research* 55(1), 46-59.
- Ruhland, S. K., & Bremer, C. D. (2002). Professional development needs of novice career and technical education teachers. *Journal of Career and Technical Education*, 19(1), 18-31.
- Shannon, D. M. (2002). Using electronic surveys: Advice from survey professionals. *Practical Assessment, Research, and Evaluation*, 8(1).
- Trochim, W. M. K., & Donnelly, J. P. (2008). *The research methods knowledge base* (3rd ed.). Mason, OH: CENGAGE Learning.
- Wash, S., Lovedahl, B., & Paige, W. (2000). A comparison of traditionally and alternatively certified technology education teachers' professional development and receptivity to change. *Journal of Industrial Teacher Education*, 37(2), 31-46.
- Wichowski, C. P., & Heberley, G. (2004). *A summary report on priorities in CTE professional development*: Association for Professional Development in Career and Technical Education.