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From the Editor

In the 26 volumes of the *Journal of Technology Education*, there has never been a special edition or third issue of an individual volume. It is with pleasure that *JTE* publishes this special edition, which focuses on two significant content analyses. Like all other articles that appear in *JTE*, these articles underwent blind review by members of the *JTE* Editorial Review Board.

The first article was written by John Wells (Virginia Tech) and focuses on the Mississippi Valley Technology Teacher Education Conference (MVTTEC). MVTTEC is the oldest, continuous conference within the field of technology and engineering education. As Wells points out in his article, the 100th meeting of the conference took place in 2013, which is quite an accomplishment for the field. In fact, the International Technology and Engineering Educators Association (ITEEA) only celebrated its 77th conference earlier this year. Included in Wells' analysis (see appendices) are the topics and coding schemes used to conduct the analysis of the conference. The content analysis provides a thorough examination of the conference and the conference themes that have helped to shape technology and engineering education.

The second article in this special edition was coauthored by Philip A. Reed (Old Dominion University) and James E. LaPorte (Millersville University and Virginia Tech), who served as the Editor of *JTE* from 1997-2010. Reed and LaPorte conducted a content analysis of the special interest sessions included in the ITEEA's annual conference between 1978 and 2014. As you will read in this article, the purpose of the content analysis was to highlight conference history, trends and issues, leadership, scholarly research, curriculum, and instructional methods. Reed and LaPorte document how the coding schemes were established to conduct their analysis.

Whether you are new or a veteran attendee of the MVTTEC and ITEEA conferences, you should find the content analyses presented here informative and illuminating.

Enjoy!

Chris Merrill

A Century of Professional Organization Influence: Findings from Content Analyses of MVTTEC Annual Meetings

John Wells
Virginia Tech

Investigating the content presented at annual national conferences is regarded by many as a valid means for revealing patterns within a given professional organization concerning their interests, issues, concerns, priorities, and research foci, which collectively present an opportunity to provide future direction for the organization. As a result, scholars across many different disciplines have conducted such investigations in an attempt to gain insights into their professional organizations (e.g., Berryman, 1982; Conger, 1997; Fetro & Droplet, 1991; Kiehn & Kimball, 2008; Price & Orman, 2001) and provide guidance based on the resultant patterns. Findings from such analyses of conference content are instrumental in documenting patterns relative to past trends within the field, organizational alignment with larger national trends, and using them to suggest future directions for professional organizations. This is particularly effective for investigating those professional organizations that have preserved conference content throughout a long history of annual meetings.

In the field of technology and engineering education, the Mississippi Valley Technology Teacher Education Conference, today referred to simply as the Mississippi Valley Conference (MVC) is the oldest continuous conference with an entire century of content available for analysis. From its inception, the intent of this conference was to engage in discussion and debate in order to "help in the solution of problems of great importance" by providing "an opportunity for the teachers and organizers of manual training to get together in close conference where they might exchange their views on questions of vital importance" to the profession (Bennett, 1937, pp. 502–503). The MVC marked its 100th meeting in the fall of 2013, presenting not only a significant historical milestone but also a unique opportunity for investigating the extent to which this individual conference may have influenced the profession as a whole. Specifically, the 2013 meeting afforded the opportunity to analyze 100 years [1] of discussion topics as a means for understanding the significance of the past century of meetings and for the profession to utilize those findings in envisioning a worthy path as they enter into their second century of existence. Such an analysis can reveal whether the conference played a significant leadership role in the midst of educational reform or was just an entity reacting

[1] The duration of the MVC spans 100 years (1909 to 2012), though the actual conference data covered 99 years of meetings.

to emerging professional issues with discussions simply reflecting the eclectic interests of its membership. Insight might also result from the unique conference venue whereby discussion topics are drawn from suggestions submitted by attending members, which in theory would reflect the majors concerns of the profession. Regardless of outcome, the intent for analyzing the past century of MVC discussion topics is to offer organizational insights that may prove valuable in guiding future directions for both the conference and profession writ large.

Method

The research conducted was a content analysis of the discussion topics as reflected in the presentation titles or descriptions listed on the agendas of the annual meetings of the MVC. As with any presentation of qualitative research, establishing the validity of results depends on the trustworthiness of the analytical approach used. To ensure the trustworthiness of results and therefore the validity of research, the methods used are presented in sufficient detail to demonstrate credibility, dependability, and confirmability (Guba, 1981; Patton, 2002). Data were limited to the available archived agendas, both in hard copy and digital formats, for meetings of the MVC between 1909 and 2012. For the purpose of maintaining historical continuity with and avoiding duplication of previous conference topic analyses, elements of both Bawden's 1929 Typical Groups of Topics approach and Lemons' 1988 quasi-objective and interpretive methods were considered, though neither were incorporated. Deliberately distinct from these earlier investigations in both intent and design, this research was designed to ascertain potential relationships between conference presentation topics and the directions of the field over the course of 100 years with consideration given to the contextual influence of major educational reform issues of the times. The research was guided by the following research questions (RQ) and sub-questions (S-RQ).

During the 100 year history of Mississippi Valley Conference meetings:

- RQ1: To what extent do relationships exist between presentation topics and the direction of the profession over time?
  - S1-RQ1: What major themes were reflected in the presentation topics included in conference agendas?
  - S2-RQ1: Between themes, what trends are revealed through comparison of conference topic foci?
  - S3-RQ1: Within themes, what trends are revealed through comparison of topics?
- RQ2: To what extent are there discernible alignments between discussion topics and issues driving the major educational reform movements?

Research Design

Some would argue that the format and conduct of the MVC opens itself to topics and discussions of particular concern to the individual presenters, which may or may not reflect the concerns of the profession at large. However, the conference presenter selection process is intentionally designed to invite leaders from the field possessing recognized expertise in a particular area to speak with authority on a given topic. Such leaders imbue their discussions with broad knowledge of the issues confronting both the profession and the educational system as a whole and in so doing establish subtle connections between them. It can therefore be hypothesized that the positions advanced by these leaders would have a detectable influence on the direction of both the conference itself and profession at large, and thus these agendas provide data from which relationships among variables may be deduced. To discern any meaningful relationships across presentation topics, content analysis provides a viable method for investigating the concepts embedded in the presentation titles and achieving valid interpretations of relationships among the data. Furthermore, content analysis affords researchers a robust, flexible method ideally suited for revealing subtle individual or collective structures such as beliefs, attitudes, and values (Carely, 1997; Huff, 1990; Kabanoff, 1996) through analyzing the occurrence of message characteristics concealed within text segments (Frey, Botan, & Kreps, 1999).

As defined by Shapiro and Markoff (1997), content analysis is "any methodological measurement applied to text (or other symbolic materials) for social science purposes" (p. 14), providing an acceptable analytical basis for investigating MVC presentation titles or descriptions listed on the agendas. Based on the research purpose and questions, the specific approach to content analysis chosen for this study followed a sequential quasi-mixed method, monostrand conversion research design (Teddlie & Tashakkori, 2006). In mixed methods research, quasi-mixed refers to when "only one type of data is analyzed and only one type of inference is made" (p. 18)—for example, qualitative data followed by a quantitative inference. Monostrand conversion design involves only one research strand in which data that were originally collected in one form (e.g., qualitative—text codes) are transformed into another (e.g., quantitative—frequency counts) in order to answer the research questions. Tabulation of coded text segments affords the researcher a means to identify, organize, index, and retrieve data with the intent to deduce meaningful patterns and relationships among the data. Specifically in this research, the initial qualitative approach was utilized as an emergent strategy for the coding of text segments followed by a quantitative approach to generate frequency data, which in turn were qualitatively examined and interpreted in an attempt to reveal epistemological or ideological mindsets, themes, topics, or similar phenomena. In this way, content analysis provides the degree of analytical flexibility necessary to deduce from these data the latent content and subtle meanings represented in the text. Central

to the selection of content analysis as a research design is recognition that in the analysis of latent content, independent coders will subjectively interpret that content based on their own mental schema. It is therefore important to make transparent the coding process and to demonstrate that "those judgments, while subjectively derived, are shared across coders, and the meaning therefore is also likely to reach out to readers of the research" (Potter & Levine-Donnerstein, 1999, p. 266).

Procedures

Although content analysis can vary in its implementation, five general phases recognized as methodological commonalities are followed in structuring the various approaches: composing research questions to guide the investigation, identification and collection of data, outlining and implementing a coding process, definition of applied categories, establishing trustworthiness, and analysis and interpretation of content based on coding results (Creswell, 2014a, 2014b; Holsti, 1969; Kaid, 1989; Miles & Huberman, 1994; Weber, 1990). The following is a discussion of the various phases followed in the conduct of this research.

Data identification and collection. Conference agendas contained data targeted for analysis in the form of presentation titles or descriptions. The agendas, archived at the University of Illinois, were collected by Life Chair Tom Erekson who delivered one half in hard copy format (1909–1995) via surface mail and the other in digital format (1996–2012) via email. A content analysis template was developed by the researcher for entering and organizing the agenda data by year, presentation titles or descriptions, and presenter names. Members of the research team entered data into the analysis template individually with follow up comparisons of all entries to ensure accuracy of data input.

Coding process. To ensure the quality of text analysis, especially with respect to latent content analysis, careful attention must be given to the development, implementation, assessment, and constant refinement of the coding scheme (Creswell, 2014a, 2014b). Adhering to a broadly referenced qualitative approach for coding data, agenda data were coded following the eight-step protocol (Table 1) suggested by Weber (1990).

Table 1
Weber's (1990) Eight-Step Coding Protocol

1.	Definition of recording units (e.g., text segments)
2.	Definition of coding categories (e.g., themes)
3.	Testing of coding on a text sample
4.	Assessment of the accuracy and reliability of the sample coding
5.	Revision of the coding rules
6.	Return to step 3 repeatedly until sufficient reliability is achieved
7.	Coding of all text (using refined codes)
8.	Assess the achieved reliability or accuracy

The text from all presentation titles or descriptions was segmented based on the meaning conveyed. Titles often contained segments with multiple meanings, each of which constituted a distinct text segment. Every text segment was assigned a term or phrase reflecting the meaning or meanings of the segment. Those sentences or descriptions relating to the same identified terms or phrases were considered unique text segments and labeled by a code accurately describing the meaning. Approximately 10% of the data were coded independently in this way by individual members of the research team, followed by a comparison and discussion (arbitration) of generated codes. A percent agreement of 53 was calculated as the intercoder reliability for this first coding attempt. The resultant refined coding scheme was then applied to a second similar-sized sample of the data for another round of independent analysis. Comparison and arbitration between the independent coders found the new coding scheme to demonstrate an acceptable level (83%) of intercoder reliability. The new coding scheme was then used to analyze and code another approximately 30% of the data. As before, arbitration was used to reduce and aggregate similar codes into themes and topics, resulting in yet another refinement of the coding scheme. The remaining 50% of the data were then independently analyzed using this refined coding scheme. The coders once more engaged in arbitration to further reduce overlap or redundancy and to achieve the final coding scheme. Using the final coding scheme, one last sweep of the entire data set was once again independently conducted by the researchers, followed again with arbitration on the coded text segments. The final arbitration revealed a total of 1,223 text segments with assigned codes with intercoder reliability approaching 85%. Frequency counts of the coded 1,223 segments were entered into JMP (SAS) software for statistical analysis.

Results

The agenda data reviewed for this research spanned the 104 years in which the 99 meetings of the MVC took place. Over this span of time only five conferences (1911, 1942–1945) were not held. Because the conference was originally designed to be held every other year, no meeting occurred in 1911. The data show there was also no meeting held in 1922, though two were held the following year in 1923 to make up for that missed meeting. An additional four conferences were missed between 1942 and 1945 as a result of World War II. Of the 99 conferences held, agendas for those held in 1919, 1920, 1924, 1933, 1934, 1960, and 1961 (7.07%) were not obtainable for inclusion in this study. The data collected and analyzed in this study were therefore drawn from only the 91 agendas made available to the researchers.

Findings

Review of the 91 conference agendas found a total of 819 presentations addressing a variety of issues. The coding process employed by the researchers was used to identify and organize presentation issues into 7 themes, 27 topics, and 126 subtopics. Figure 1 depicts the approach used in generating specific codes for unique text segments. A full listing of topics and subtopics for each theme, including their associated codes, is found in the Appendix (Tables A1–A7). Table 2, which presents the operational definitions for each theme along with an exemplar text segment demonstrating a meaningful fit with that

Figure 1. Illustrated mechanism for generating functional codes used in labeling unique text segments.

definition, serves to illustrate the framework applied (i.e., Weber's Step 2) in defining coding categories (themes) and the selection of text segments for inclusion into those themes.

Table 2
Explication of Coding Process

Theme	Operational Definition	Text Segment Exemplar
Teacher Preparation	Issues specific to expectations of preservice teacher graduates, the characteristics of university preparation programs, and the higher education faculty responsible for program delivery.	Teacher Expectations: *Cultivation of desirable personal traits; How can the teacher training institution help the prospective teacher cultivate desirable personal traits? (1926).*
Policy	Issues related to the perceived need for, or establishment of, policies regarding the future direction of teacher preparation programs at both state and national levels.	Perceived Need: *Accreditation for instructor training in industrial arts. Is there a need? (1950).*
Epistemology (theory of knowledge)	Issues addressing beliefs specific to the knowledge base or educational objectives underpinning the profession, including their implementation at the school level.	Educational Objectives: *Justification of industrial arts at the elementary and secondary schools: Is it really general or specialized education? (1970).*
Pedagogy	Issues explicitly targeting the study of pedagogical practices, inclusive of instruction and assessment, and the application of theory in practice.	Theory to Practice: *Problems in bridging the gap between theories and actual practices in industrial arts education (1957).*
Research	Issues involving the design, conduct or synthesis of empirical research.	Research Synthesis: *Recent and on-going faculty research in the conference: What are we researching? (1989).*
Conference Evaluation	Issues regarding the mission and influence of the Mississippi Valley Conference, past and present, or the forecasting of its future directions.	Conference Influence: *What the conference has meant to industrial arts in fifty years? (1963).*
Facilities	Issues addressing the design, organization, and management of school-based facilities.	Facilities Organization: *How should labs be organized to effectively teach technology to majors and to non-majors? (1997).*

As previously explained, the scheme used in coding the text drawn from the 819 presentation titles or descriptions generated a total of 1,223 coded text segments. Table 3 presents the resulting frequency counts and distribution of the coded text segments among the seven themes.

Table 3
Topic and Subtopic Frequency Counts and Distribution among Themes

Theme	No. Topic Codes	No. Subtopic Codes	Code Frequency Totals	Code Frequency % Total
Teacher Preparation	4	30	323	26
Policy	5	37	322	26
Epistemology	2	16	289	24
Pedagogy	4	11	145	12
Research	6	17	74	6
Conference Evaluation	2	11	52	4
Facilities	2	4	18	2

Analytical Treatment of the Data

The overall intent of this research was to discover potential relationships between MVC topics as well as (a) the direction of the field and (b) the major educational issues that arose during the 104-year timeframe. To address these relationships, two main research questions, RQ1 and RQ2, directed the analysis of data. RQ1 required three subquestions; the first subquestion was used to identify major themes, and the others were used to direct data analysis for comparisons between and within those themes.

Theme Identification

The major themes (S1-RQ1), as reflected in the conference agendas, were identified through the organization of tabulated frequency counts of coded text

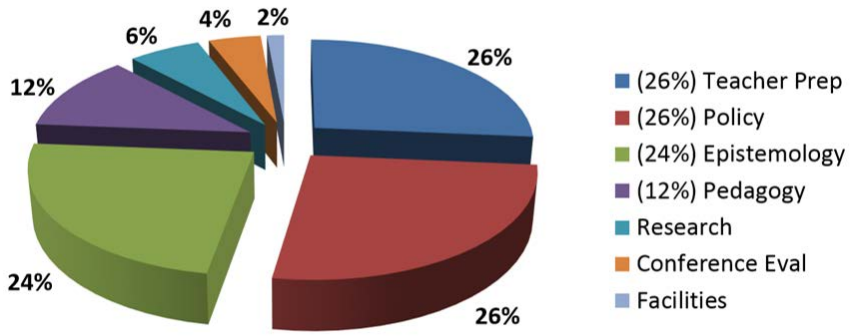

Figure 2. Percent frequency count by theme.

segments (Table 3). A comparison of frequency counts among the seven identified themes revealed relative rankings (Figure 2) by percent totals. As depicted in Figure 2, three themes (Teacher Preparation, Policy, and Epistemology) accounted for 76% of all discussion topics, with 12% attributed to one other theme (Pedagogy). Collectively, the three remaining themes (Research, Conference Evaluation, and Facilities) accounted for the final 12% of topics.

Main Theme Comparisons (S2-RQ1)

Eighty-eight percent of the 819 presented topics coded into four main themes—Teacher Preparation, Policy, Epistemology, and Pedagogy. Given that these four themes comprise the majority of topics addressed throughout the history of the MVC, comparisons between them over time reveal the more significant conference trends and suggested relationships among them. In order to present true relative comparisons among main themes, as well as subtopics within-theme, absolute data were converted to relative percentiles. In doing so, the statistical formula used in generating lines of best fit extrapolates the data in two directions, which results in the left axes for graphs shown in Figures 3 through 8 not representing an absolute percentage, but instead an approximation of the relative percent occurrence relationship. Furthermore, in some instances, extrapolation extends a line of best fit below zero. The overall result, based on relative percent occurrences, presents an accurate statistical comparison between the four main themes, as depicted in Figure 3 in which data analysis is reflected in lines of best fit.

First half century. When the MVC first began its meetings in 1909, Teacher Preparation was the primary focus of topic presentations (Figure 3), which is logical given the original intent of the conference. Except for the decades between about 1960 and 1980, this theme has remained relatively strong throughout the conference history. However, among the four main themes Teacher Preparation also demonstrated the greatest fluctuations with peaks and valleys occurring about every two decades for the first 80 years of the conference. Furthermore, it is interesting to note that the Teacher Preparation peaks and valleys during this time period were generally opposite to those observed for the other three themes (Policy, Epistemology, and Pedagogy) until beginning its steady rise in the mid-1970s. By comparison, these other three themes trended parallel to one another during the first 40 years, starting with a concurrent general peaking around 1930 and followed by a collective decline over the next 20 years. Around 1950, two of these themes, Policy and Epistemology, begin rising together well into the next century, whereas Pedagogy, those topics targeting issues of practice, declined and persisted at a low level until rocketing steeply upward at about 1990. It is of some interest to note that the peaks and valleys in Pedagogy issues over the first half century of the MVC trended inversely to those for Teacher Preparation issues, which one might interpret as an illogical and unexpected disassociation between the two. Policy issues on the other hand peaked early just before 1920 and then followed a slow gradual decline for nearly 30 years.

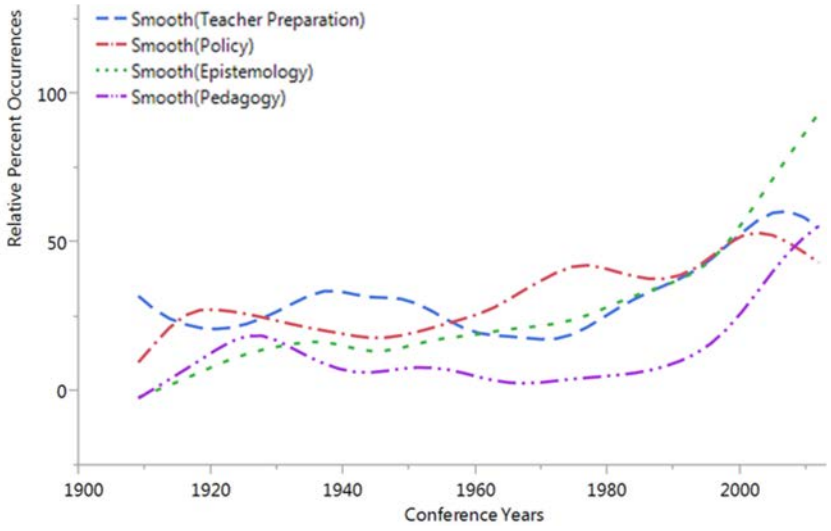

Figure 3. Main topic themes: Percent occurrence between-theme comparisons.

In the years just prior to and following the Second World War, the lines of best fit indicate a steady decline across all themes for about 10 years. This is understandable, not only because of this global event but also because no data exists for the conferences not held between 1942 and 1945.

Second half century. Toward the mid-1950s both Teacher Preparation and Pedagogy entered into a period of parallel decline, whereas interest in topics focusing on Epistemology and Policy issues began to rise rapidly, a rise that has elevated Epistemology to the dominant issue at the turn of the century. Beginning in the early 1970s and continuing for roughly 30 years, the focus on Teacher Preparation, Policy, and Epistemology issues soared together and eventually converged as equally strong topic areas by the late 1990s. At that point, both Teacher Preparation and Policy issues began to plateau as the MVC turned its attention almost singularly to epistemological issues. Of the four main themes, it is significant to point out that for roughly eight decades (late 1910s to late 1990s), the number of presentations addressing pedagogical issues (teacher practice, design of instruction, and assessment of learning) was consistently one of the lowest by comparison, suggesting that it was of relatively minor concern to the profession. However, upon entering the 21st century, we find a steep rise in attention paid to Pedagogy issues that parallels an equally rapid rise in MVC presentations devoted to Epistemology issues. The rapid increase in attention now being devoted to pedagogical issues is noteworthy in that it marks a historically fundamental shift in conference foci toward issues of classroom practice, which is particularly significant when considering the concurrent context of science, technology, engineering, and mathematics (STEM) education reform in the United States.

The between-theme comparisons among the four main conference themes depicted in Figure 3 expose relational patterns in the peaks and valleys over a 100-year period, as well as unique trends among certain individual themes. A more detailed discussion and interpretation of these relationships within the context of concurrent educational reform movements is addressed later by RQ2.

Within-Theme Comparisons (S3-RQ1)

Investigating the major topical categories within each of the four main themes provides an indication of the variations among the within-theme foci over time and the relative locus of the specific issues addressed. Figures 4, 5, 6, and 7 illustrate such foci variations within the Pedagogy, Epistemology, Policy, and Teacher Preparation themes respectively. The following discussions highlight the observed relationships among the within-theme variations for each of the four main themes (Figure 2), which are presented in reverse rank order by percent.

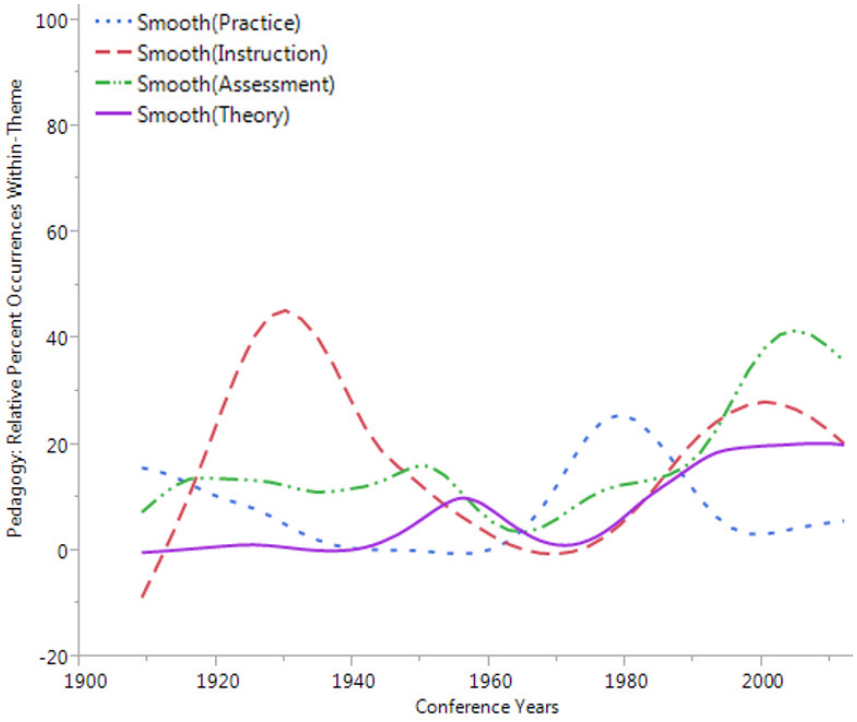

Figure 4. Pedagogy: Within-theme comparisons of relative percent occurrences.

Pedagogy: Within-theme comparisons. Of the four main themes, Pedagogy only accounted for 12% percent (Figure 2) of the total percent of topics presented. And from the degree of fluctuation depicted in Figure 4, at first glance, it might suggest there would be few relationships between the Pedagogy subtopics. However, on closer inspection, interesting relationships can be observed. In particular, there are parallel trends between the Assessment and Theory subtopics throughout almost the entire life of the conference. This might be construed as reflecting connections that underpin the natural relationship between learning theory and the corresponding assessment of student achievement based on that theoretical premise. The data also show an inverse relationship between Instruction and Practice subtopics. This inverse relationship is quite interesting and could imply that there is a significant lag between major periods of curricular development and the necessary concurrent development of the practices required for its implementation. Furthermore, for roughly 30 years, between 1920 and 1950, Instruction subtopics dominated the Pedagogy theme with a sharp peak at about 1930, but then they lost that dominance through an equally sharp decline over the next 30 years. In the late

1950s, data reveal a period of parallel trends among Instruction, Assessment, and Theory subtopics that continues to this day and all of which have an inverse relationship to the subtopic of Practice. The parallels among Instruction, Assessment, and Theory subtopics are to some extent logical when taking into consideration the context of significant and ongoing changes within the field of Technology Education throughout this timeframe (Herschbach, 2009). Of the four major Pedagogy subtopics, it is surprising to find that except for a spike in 1980, Practice was not one of the stronger subtopics of interest at the MVC.

Of particular interest over the past decade of conference meetings is the growing focus on the subtopic of Assessment (of student learning). Attention to assessment, as indicated by the relative percentage of presentations made that related to this topic, begins a steep and steady rise starting in the early 1990s. This trend has continued into the 21st century and today has currently reached a level double that of the previous high point nearly 50 years earlier. From a pedagogical practices perspective as operationally defined for this study (see Table 2), concerns related to assessment of student learning within the design of instruction is on the rise among those topics being selected for conference presentations. This trend is not surprising given the context of educational reform taking place at the turn of the century both within the technology education profession and in STEM education nationally (National Academy of Sciences, and National Academy of Engineering, & Institute of Medicine, 2007; National Governors Association, 2011; National Science Board, 1986, 2007, 2014).

Epistemology: Within-theme comparisons. The Epistemology theme accounted for 24% (Figure 2) of the total number of topic presentations. As operationally defined in Table 2, the Epistemology theme includes those presentation topics addressing beliefs specific to the knowledge base or educational objectives underpinning the technology education profession, including classroom implementation of that knowledge base or those educational objectives. All of the nearly 300 epistemological presentations were categorized into the subtopic of either Educational Objectives or Classroom Implementation. Within-theme data comparisons for these two subtopics (Figure 5) indicate a significant difference in focus throughout the entire conference history with the greatest attention clearly afforded to beliefs regarding Educational Objectives. Presentations addressing classroom implementation of knowledge base reflective of the profession has remained low throughout the Conference history with only a slight trending upward since the 1980s. The minimal attention paid the Classroom Implementation subtopic might reflect the continuous impact of foundational transitions in the field as it evolved from manual arts in 1909 to technology and engineering education in 2012. And the

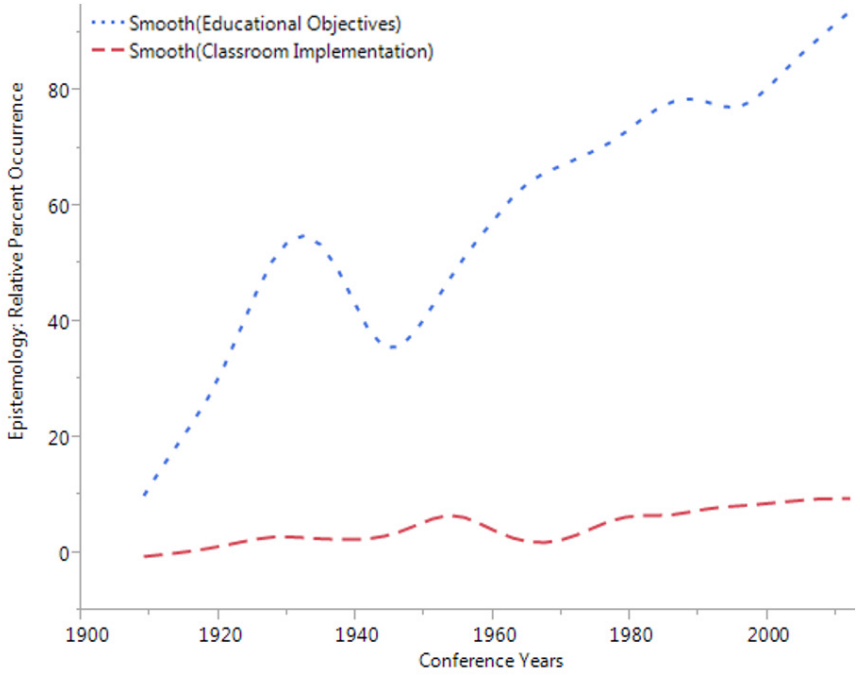

Figure 5. Epistemology: Within-comparisons of relative percent occurrences.

steep steady rise in attention paid to epistemological issues every year of the conference reflects a constant and growing concern about what fundamental educational objectives the profession should be targeting. In fact, the data show that among the four main topical themes, presentations related to epistemological issues are without question now the dominant focus at the MVC (Figure 3).

Policy: Within-theme comparisons. The number of presentations coded as addressing Policy issues accounted for 26% of the total (Figure 2) and were categorized into five distinct subtopics. Policy, as operationally defined in this study (Table 2), refers to issues regarding policies relevant to the future direction of teacher preparation programs. From this perspective, comparison of within-theme data analysis among the five subtopics generates an interesting display of the complex relationships that have played out over the century of MVC presentations (Figure 6). When the MVC began in 1909, the top two subtopics were those dealing with Teacher and Program issues, and the lowest three were those concerned with Legislation, State/National, and Forecasting.

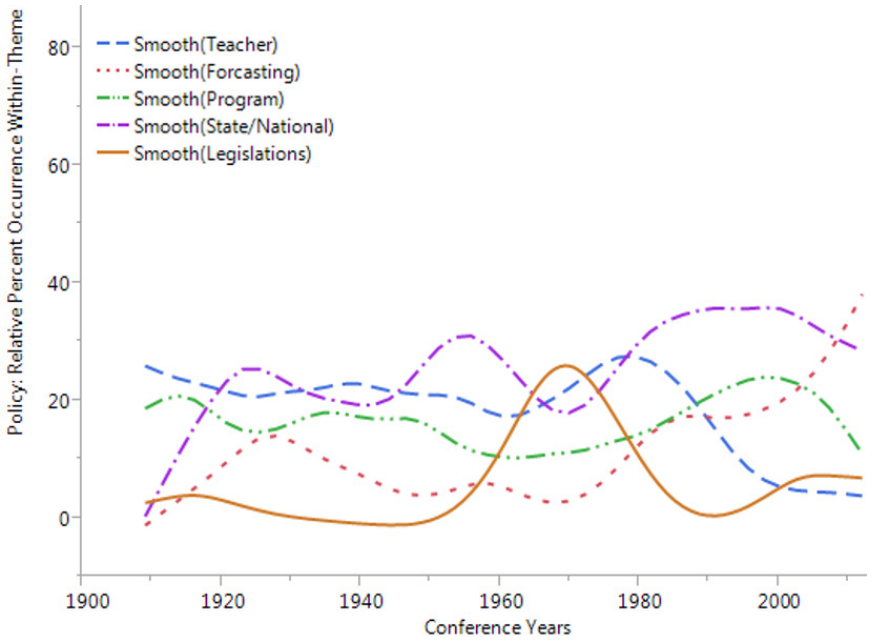

Figure 6. Policy: Within-theme comparisons of relative percent occurrences.

A century later, we find that State/National and Forecasting subtopics are now the two topical categories of highest concern and that in addition to Legislation, Program and Teacher subtopics are today now among the lowest three.

The Teacher and Program subtopics, referring respectively to those concerning subtopics such as qualification criteria, competencies, and recruitment and those concerning subtopics such as curriculum or content criteria, practitioner standards, and credit transfer (see Appendix, Table A1), were initially the two highest Policy subtopic categories and, throughout most of the conference history, demonstrated more closely aligned trend patterns than any of the others. Policy data indicate that these two subtopics gradually cycle through shallow highs with peaks around 1910, 1980, and between 1970 and 2000; lows with troughs occur in the mid-1920s and again around 1960. Across the conference years, both subtopics continually declined until falling to their all-time lows in 2012. Except for the spike in 1970, the Legislation subtopic (e.g., ADA, Smith Hughes, Vocational Education Act, Federal Aid; see Appendix, Table A1) cycled similarly to the Teacher and Program subtopics but at a much lower level. To some degree, logic can be attributed to the cyclical relationships among these three subtopics considering the influence legislation has on policy decisions.

There is also a close cyclical alignment of trends between the Policy subtopics of State/National, which addresses topical issues such as standards, accreditation, and administrative responsibilities, and Forecasting, which addresses topical issues such as statistical reports and surveys of the field (Appendix, Table A1). The relationship between these two subtopics begins in 1909 where each reflect policy issues of least concern for the conference. In the first decade of the MVC, there is a rapid rise in concern regarding both of these subtopics, with State/National becoming one of the dominant topical issues in the early 1920s. For the next 70 years, the relative percent occurrences for these two subtopics show parallel oscillations but with Forecasting consistently 5 to 10% lower. This relationship changes in the 1980s, and the percent of Forecasting topics escalates during the 2000s to become the dominant Policy subtopic by 2012. The conference period between 1980 and 2000 coincides at the national level with the name change in 1985 from Industrial Arts Education to Technology Education and the publication of the Standards for Technological Literacy in 2000. This is therefore an understandable pattern explaining why Forecasting and State/National are the two Policy subtopics of highest concern during this time period. In contrast, the data show that the Policy subtopics of lesser concern today are those addressing legislation, program, and teacher issues. It is important to note however that the data also indicate that the patterns for the Teacher and Program subtopics demonstrate an inverse relationship to those of Forecasting and State/National issues for which upward oscillations in relative percent occurrence of the former typically follows a peak in the latter.

Teacher preparation: Within-theme comparisons. The Teacher Preparation theme, as operationally defined in this study (Table 2), coded for issues specifically targeting the expectations of graduating preservice teachers, the characteristics of university preparation programs, and the criteria in higher

education for those faculty whose responsibilities were to deliver such programs.

By a single frequency count, Teacher Preparation had the greatest absolute number of coded topics (Table 3), accounting for 26% of the total, which is statistically equal to that of the Policy theme (Figure 6). Within-theme comparisons among the four Teacher Preparation subtopics (Figure 7) reveals wide variation in topical foci over the span of the conference years with data indicating that the subtopic of greatest concern centers on Program Characteristics (e.g., planning/redesign, curriculum/content evaluation, disciplinary focus/approach; see Appendix, Table A2). From the first conference meeting to the last, this subtopic has been by far the dominant category of attention among presentations related to Teacher Preparation. Although Figure 7 shows Program Characteristics maintains this dominance over the life of the MVC, as the century passes, it steadily plummets over time and oscillates with some regularity between highs and lows, approximately every 20 years beginning in the early 1950s.

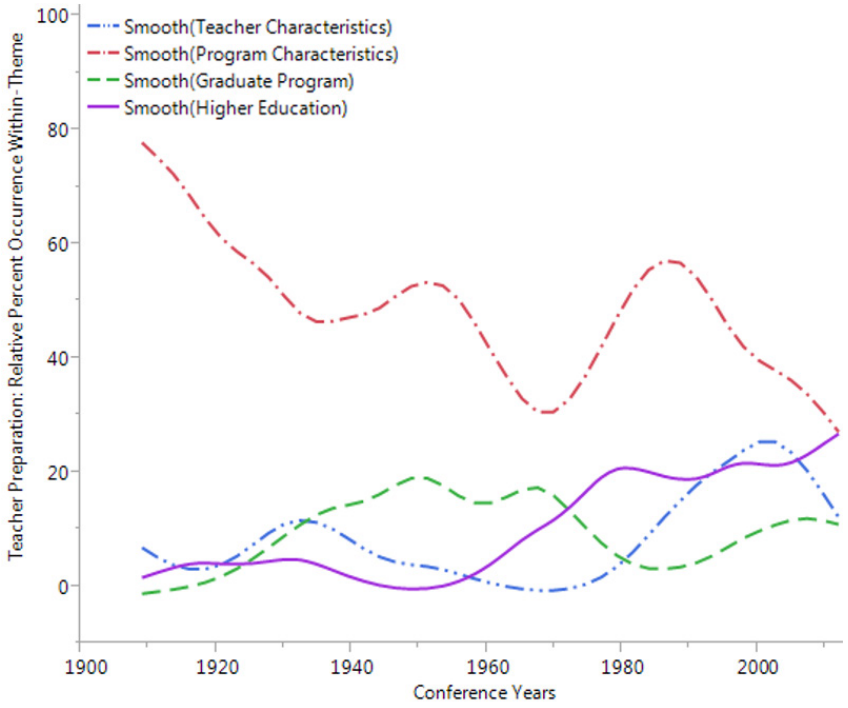

Figure 7. Teacher preparation: Within-theme comparisons of relative percent occurrences.

The proportionally high level of attention presenters paid to Program Characteristics decade after decade likely reflects the constant challenge of maintaining preparation programs that are contemporary and responsive to market demands.

Among the other three Teacher Preparation subtopics, Higher Education (e.g., faculty qualifications, evaluation, recruitment) and Teacher Characteristics (practitioner knowledge, dispositions, and scholarship) demonstrate similar occurrence patterns and change lead positions roughly every 40 years. Furthermore, for the first 50 conference years both of these subtopics maintained a comparatively low level of concern, with upward trends occurring between 1960 and 1970, followed by a steady downward trend at the turn of the century. Given the significance of such characteristics relative to the role of a classroom educator in promoting student learning, it seems somewhat counter intuitive that Teacher Characteristics, the practitioner knowledge expectations of preservice graduates, was not a more prominent presenter topic. This is perhaps not altogether surprising given the typical demographics of the industrial arts and technology educators both in the classroom and in higher education during this time (Wells, 2010; Zuga, 1994, 2001). Up until the turn of the century, the teacher preparation concerns of these educators was traditionally focused on the "doing" and much less on developing the theoretical or cognitive knowledge base that impacts the ability of a teacher to effectively convey content and practice (i.e., addressing the development of student higher order thinking skills; Bouhdili, 1996; Cajas, 2001; Glaser, 1991; Herschbach, 2009, pp. 185–273; Petrina, 2008).

Similar to Teacher Characteristics during the first five decades of the conference, the Higher Education subtopic was a consistently low occurrence topic in the Teacher Preparation theme. Upon entering the 1960s, the percent occurrence of presentations on this topic rapidly increased and rose to its all-time high in 2012. Following a somewhat inverse pattern to the topical trends seen in Higher Education is the subtopic of Graduate Programs. Data show (Figure 7) that, for about the first 15 years, the occurrence of presentation topics directed at graduate programs was the lowest of all subtopics. However, as an integral element of teacher preparation programs, attention to this subtopic steadily rose until, by the mid-1930s, the occurrence of presentations related to graduate programs became the second highest topic in the Teacher Characteristic theme, a position it maintained for about 30 years. Between 1970 and 1990, attention to graduate program issues declined sharply, but over the past 20 years focus on this subtopic has enjoyed a gradual rise. The recent rise in attention to graduate program issues may in some way be indicative of the national trend to close undergraduate technology education programs or merge these programs with others such as engineering and the pressure to focus instead on graduate education programs as a means for increasing externally funded

research (Akmal, Oaks, & Barker, 2002; Hoepfl, 1994; Volk, 1997; Wells, 2008).

Summary: Topical Relationships and Organizational Direction (RQ1)

Statistical comparisons between identified main themes and the subtopic categories within them bring to light interesting relationships among conference presentation issues and an opportunity for interpretation relative to the direction of the profession at large. Overall, main theme comparisons (Figure 3) indicate a strong relationship between topics focused on the preparation of technology education teachers and policies governing the future direction of programs preparing those educators. These two themes have consistently been the issues of most concern over the entire span of MVC meetings. The level of attention given these two themes steadily rose throughout the conference years to all-time highs at the turn of the century, with periodical changes in lead positions between the two every few decades. A closer inspection of the oscillations between these themes reveals a consistent inverse relationship that can be interpreted as policy informing the direction of preparation programs; a rise in policy topics always precedes a rise in teacher preparation topics.

As a theme of least concern initially, Epistemology was the only one that did not falter in its steady rise over time, and in the last decade, it has been clearly established as the top theme. Set within the context of a profession regularly struggling for professional identity (Herschbach, 2009), the need to establish a sound epistemological foundation for what today is known as Technology and Engineering Education was paramount for guiding that profession. The consistent increase in the prominence of epistemological-related presentations each decade of the conference is an unmistakable demonstration of how the MVC can be seen as providing the profession with direction.

Equally significant in its implications is the lack of attention given to pedagogical issues over the life of the conference (Figure 4). Specifically, for the first 80 years of the MVC, the Pedagogy theme (practices, instruction, assessment, and learning theory) remained the lowest of topical presentations. One might construe this lack of attention as a reflection of a myopic focus on programmatic structure and professional beliefs to the exclusion of developing the necessary practitioner knowledge base required for classroom implementation. The low attention to pedagogical issues at the MVC changed abruptly beginning in 2000 with a meteoric rise to a position now as a dominant topic. This sudden shift is likely a response to the change in pedagogical focus nationally at this time toward overtly emphasizing the need to attend to cognitive connections embedded in the design of instruction and an adequate level of teacher knowledge necessary for its implementation (Cochran-Smith & Lytle, 1999; Bransford, Brown, & Cocking, 2000; Donnovan & Bransford, 2005). That a focus on pedagogical issues is now a significant topical concern at

the MVC is another example of how this conference is influencing perspectives and providing professional direction.

The relationships summarized above did not develop in a vacuum and were strongly influenced not only by changes within the profession but equally by forces external to the profession. Specifically, the most significant external forces were the sequence of national educational reform movements arising throughout the past 100 years. Investigating the MVC agenda data in the context of such national educational reform provides an avenue for detecting discernible alignments between topics discussed and concurrent major educational issues during the past century.

Alignment of MVC Issues with National Education Reform Movements (RQ2)

It is beyond the scope of this research to address at a granular level the detailed extent of possible alignments between the MVC and the many educational reform issues arising over the course of a century. Therefore to gauge the extent of influence on directions taken by MVC, it must suffice to investigate potential alignments with only the most significant educational reform movements during this time. As reported at the 95th annual MVC (Wells, 2008, pp. 1–2), over the past 100 years in response to large societal changes, there have been three distinct educational reform movements in the United States: *Progressive*, *Equity*, and *Excellence* (Berube & Berube, 2007).

Progressive Movement Alignments

Beginning in the late1890s and extending into the 1940s, the *Progressive* educational reform movement, championed by John Dewey and his concept of activity-based learning in school to achieve social transformation, was aimed at achieving whole scale social reform through the promotion of a new liberal education curriculum grounded in a child-centered socially relevant educational philosophy (Ravitch, 2000). This was also a period of rapid industrial expansion that demanded from the educational system "a range of practical and functional subjects that would serve a useful purpose in the emerging industrial age" (Herschbach, 2009, p. 3). Recognizing the value of such practical work as an element of schooling, in 1904, progressive educators, such as Charles Richards, began openly advocating for industrial arts as an instructional approach that made learning content more relevant to students by embedding it in industry-related activities. Richards and other well-known reformers of the time, such as James Russell, Frederick Bonser, Lois Mossman, and Charles Bennett, continued promoting these progressive approaches well into the 1930s. The teaching and learning issues advocated for by these early leaders in our profession are reflective of the seminal educational philosophy and pedagogical preparation approaches of our field at the time (i.e., industrial arts). It comes as no surprise then to find a collective rise in presentations across all four major

MVC themes during the first 30 years of the conference that coincide directly with the timeframe of social reform in the *Progressive* movement (Figure 8). The data show that midway through this movement MVC, presenters were equally interested in the development of new teacher preparation programs, the epistemological basis of those programs, constructing the necessary policies to support them, and the pedagogical practices needed to implement these new progressive approaches. This interest remained elevated until the advent of the Second World War in the early 1940s and later with the launch of Sputnik in the late 1950s. These two epic global events introduced new social forces that ultimately painted education as a weak link in maintaining the United States as a world power militarily and technologically. As a result, there was a trend in education away from the child-centered curricula "to one that was designed to be much more teacher-centered, with an emphasis on science, mathematics, and foreign language content" (Wells, 2008, p. 2). Beginning in the postwar years and continuing throughout the 1950s, instruction in industrial arts took on an increasingly more technical approach where skill-building objectives were emphasized in lieu of social reconstruction objectives, an evolution that introduced significant curricular uncertainty within the profession (Herschbach, 2009, pp. 27–68). As Herschbach concluded (2009), this was a period of time in

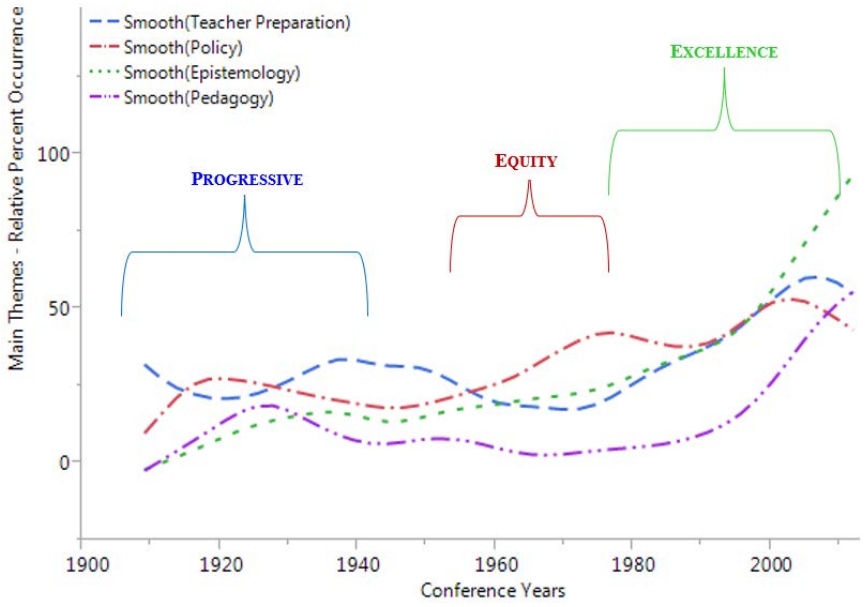

Figure 8. Alignment: Educational reform movements and main themes.

which the industrial arts profession was in turmoil with how to redefine itself in the context of social change and position itself as a viable school program. Throughout the 1940s and 1950s, the steady decline in MVC presentations addressing the four main themes (Figure 8) closely mirrors the postwar educational ambiguity and the educational transition period following the *Progressive* movement.

Equity Reform Movement Alignments

As the country entered the 1960s, a new civil rights era arose as the next large-scale societal force to dominate education in the United States, focusing on inequities within the educational system. Born from this was the *Equity* reform movement, which was intent on fulfilling the earlier goals of the *Progressive* movement by refocusing on the child and ensuring an equal education for all. This renewed focus on the child, the passing of key education legislation such as the Elementary and Secondary Education Act (ESEA, 1965), and new innovative programs to educate the poor brought about changes in American schooling that resonated well with an evolving industrial arts profession. Throughout the three decades of the *Equity* reform movement, the industrial arts profession entered into an extraordinary period of epistemological and theoretical transition (Figure 8) that ultimately led to a fundamental reorganization of industrial arts curricula—one where technological literacy would become the basis for instruction. The effect of this transition is very evident in the MVC agenda data, which show that beginning in the 1960s and continuing into the 1980s, there was a rapid rise in presentations addressing Policy theme topics and a steady though more gradual parallel increase in those dealing with Epistemological and Teacher Preparation theme topics (Figure 8). That policy topics dominated conference presentations is consistent with the intent of the MVC and reasonable given university teacher preparation programs were themselves the main curricular change agents. During this era of programmatic change, an emphasis placed on epistemological and teacher preparation issues would be expected and resulted in both eventually achieving an equally important level of attention to that of Policy.

Excellence Reform Movement Alignments

In the early 1980s, educational reform took on a renewed fervor following the release of *A Nation At Risk: The Imperative for Educational Reform* prepared by the National Commission on Excellence in Education (1983), which launched the *Excellence* reform movement. This third and most recent educational reform movement reestablished content at the core of curricular development and focused "all national education efforts on the teaching and learning of content as the corrective measure for solving the problems in schooling created by the first two movements. The content targeted represented a rather narrow band of the overall curriculum placing the primary emphasis on

science, technology and mathematics" (Wells, 2008, p. 3). It was during the *Excellence* reform movement that industrial arts transitioned in name, content, and practice to the field of technology education. As depicted in Figure 8, the top three MVC themes merged at a common high point in the mid-1990s, which directly aligns with the launch of a pivotal initiative by the profession aimed at establishing national standards for technological literacy. As evidenced in the main theme comparison of relative percent occurrences (Figure 8), at this time, issues related to epistemology, teacher preparation, and policy were paramount among the topics being discussed. Most notable from the data is the marked rise at the turn of the century in presentations of an epistemological nature and its climb to prominence as the dominant topic of concern at the MVC. Furthermore, the rise in epistemological topics was closely paralleled by an equally strong increase in topics focused on pedagogical issues. The steep rise in epistemological and pedagogical concerns being discussed at the conference during the first decade of the new century reflects a profession once more challenged to redefine itself in the midst of a new STEM education agenda that was sweeping through the educational system in the United States (Wells, 2008). Persisting with the content focus that defines the *Excellence* reform movement, the STEM education agenda continues to challenge technology education with competition from the disciplines of science, engineering, and mathematics for teaching technology content and practices. The impact of this new challenge is forcing change, both epistemologically and pedagogically, within technology education in order to maintain its viability as a program area in public education. Responsive to the demands for the profession to change once again, the MVC agenda data document the rise in epistemological angst, along with an equally significant increase in presentations now targeting pedagogical issues. Within the national STEM education fervor, these issues were not only of great concern within the technology education profession but equally so across all other disciplines struggling to address the national call for educational excellence.

Summary of Data Analyses

Thematically, the issues surrounding teacher preparation programs, the policies governing those programs, and their underpinning epistemology have historically been the dominant topics in conference presentations, with issues of a pedagogical nature steadily gaining prominence among them during the past 2 decades (Figure 3). The data also show that in the past 10 years two of the main MVC themes—Teacher Preparation and Policy—though still relatively high, have plateaued and are trending downward as issues of major concern. What is most striking to see however as the MVC completes its first 100 years is that Epistemology is now very much the dominate theme of the current decade, with Pedagogy demonstrating a parallel rise toward dominance. And inferred from an

extrapolation of the data, this trajectory is likely to continue into the foreseeable future.

Given that the mission of the MVC is centered on teacher education, it is of significance to note the lack of presentations addressing the analysis of practice from an applied theory perspective. Specifically missing are topics dealing with investigations into the connections between theory applied in practice, for improvement of teacher preparation methods or to validate the disciplinary pedagogy. Both science and mathematics education have addressed these connections between theory and practice quite well over the past 100 years or more, which they disseminate every 20 years or so in handbooks on research in education (Wells, 2010). More recently, investigations into the application of educational theory in practice have become an area of focus in the field of engineering education as well (Wells, et al., 2014; Williams, Gero, Lee, & Paretti, 2010).

Closely related to theory applied in practice is the issue of adequately developing requisite teacher knowledge specific to the technological–engineering design based learning approach that represents the signature pedagogy of technology education. Here as well is a critical preparation area missing at the MVC: adequately preparing tomorrow's technology educators with 21st century pedagogical knowledge and practices. For example, not discussed are investigations into how preservice students develop any one of the seven categories of teacher knowledge—Content Knowledge, General Pedagogical Knowledge, Curricular Knowledge, Pedagogical Content Knowledge, Learner Characteristics Knowledge, Knowledge of Educational Contexts, and Knowledge of Educational Ends (Shulman, 2003, p. 114)—as they progress through a technology education teacher preparation program. However, over the past 20 years, the agenda data indicate a sustained sharp increase in level of interest toward pedagogical issues (Figure 3). Capitalizing on this opportunity, the MVC could advance a substantive contribution to the profession in calling for presentations on topics such as the behavioral or cognitive premise of our practice, instructional strategies predicated on select theory, or the assessment of practice based on learning theories known to promote desired learning outcomes as a means for providing some direction that promotes maturation of the field.

Conclusions

A definitive answer to the question regarding the extent to which the MVC has been a guiding force for the profession would require a larger more thorough study of the content contained in the actual papers presented. In this analysis of agenda presentation titles or descriptions, it must therefore suffice to but infer from the latent content held within that text any relationships among topics or alignments to the major issues of the times. However, in response to the first research question, the data analysis did identify the most significant

relationships both between main themes and within their subtopical categories that produced discernible trends over the course of 100 years.

In main theme comparisons, there is a strong inverse relationship between Teacher Preparation and Policy in which a rise in policy trends precede and are therefore potentially informing Teacher Preparation. The Epistemology theme never falters in its path toward becoming the topical area of greatest concern today and providing a century of discussion that offered direction to the profession. Equally consistent though opposite to epistemological concerns was the lack of attention paid to Pedagogical issues throughout most of the MVC history. However, in the last decade, percent occurrence of presentations addressing pedagogical concerns has risen dramatically, which is an encouraging trend in attention to an area of such importance to the profession.

Significant trends are also seen from analyses of within-theme comparisons across all four main themes. In the Pedagogy theme, an inverse relationship exists between Instruction and Practice, hinting at the lag between curriculum development and the associated practices necessary for its implementation. Conversely, there are parallel trends between Assessment and Theory that allude to the profession's concerns regarding the underpinning connections between learning theory and the assessment of student achievement based on that theoretical premise. Comparing subtopics within the Policy theme shows the low level of concern seen early in the MVC history for State/National and Forecast issues and the high levels of concern for Teacher and Program issues had reversed by the turn of the century. A comparison of subtopics within the Teacher Preparation theme finds that Program Characteristics dominate the issues of concern though steadily trends toward having an equal emphasis to that of the other three subtopics. The dominance of program issues could well be attributed to a constant struggle for programs to remain contemporary and responsive to stakeholder needs. Other within-theme trends of significance are found in the surprisingly low attention paid to both Teacher Characteristics and Graduate Programs throughout the life of the conference. Furthermore, whether between or within main themes, correlations to national education reform movements are evident.

It is recognized that these research findings cannot provide an unequivocal connection regarding the impact of the MVC on the direction of the profession. However, what is clear from the data is that this particular conference has provided an exceptionally unique platform designed intentionally to be responsive to current educational reform and to utilize recognized scholars of the field in an overt attempt to exert influence on the direction of the profession.

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Appendix: Themes, Topics, Subtopics, and Codes

Table A1

Teacher Preparation Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Teacher Characteristics (TC)	
	Scholarship (Schlrshp)
	Practitioner Knowledge (PK)
	Dispositions (Dispo)
Program Characteristics (PC)	
	Planning/Redesign (PLRD)
	2 Year vs. 4 Year (2/4Yr)
	Grade Specific (GS)
	Approach (Aprch)
	Discipline Focus (DF)
	Development (Dev)
	Content Evaluation (CE)
	International Comparison (IC)
Graduate Programs (P)	
	Scholarship (Schlrshp)
	Leadership (Ldrshp)
	Structure/Organization (SO)
	Perceived Value (PV)
Higher Education (HE)	
	Faculty Preparation/Qualifications (FPQ)
	Faculty Professional Development (FPD)
	Institutional Responsibility (IR)
	Faculty Evaluation (FE)
	Faculty Demands/Rewards (FDR)
	Faculty Recruitment (FR)

Table A2

Policy Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Teachers (Tchr)	
	Recruitment (Recrut)
	Lab/Classroom Demands (LCD)
	Classification (Clas)
	Salaries (Sal)
	Entrance Requirements (ER)
	Subject/Trade Competencies (Cmpetnc)
	Qualification Criteria (QC)
	Alternative Licensure (AL)
	Itinerant/Peripatetic (Itin)
	Licensing Laws (LL)
Forecasting (FC)	
	Surveys of the Field (SoF)
	Statistical Reports (SR)
Programs (P)	
	Discipline Focus (DF)
	Demand (D)
	Credit Transfer (CT)
	Practitioner Standards (PS)
	Grade Specific (GS)
	Curriculum/Content (CC)
	Administration/Organization (AO)
State/National (S/N)	
	Accreditation (Acred)
	US Bureau/Dept. of Ed (DOE)
	Leadership Preparation (LP)
	Administrative Duties (AD)
	Standards (Stndrds)
	Professional Associations (PA)
	Finance (F)
	Diversity (D)

Legislation (Legis)	
	Smith Hughes (SH)
	American Disabilities Act (ADA)
	Gary Plan (GP)
	Vocational Education Act (VEA)
	Federal Aid/Funding—Perkins (FA)
	Occupational Safety & Health Admin (OSHA)
	Edu All Handicapped Students Act (EAHSA)
	National Reports (NR)
	No Child Left Behind (NCLB)

Table A3

Epistemology Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Educational Objectives (EO)	
	Discipline Focus (DF)
	Educational Reform (EF)
	School Infrastructure (SI)
	Curricular Alignment (CA)
	Needs Assessment (NA)
	Facilities Design (FD)
	Workforce Influence (WI)
	Career Preparation (CP)
Classroom Implementation (CI)	
	Content Selection (CS)
	Course Design (CD)
	School Guidance (SG)
	Field Experiences (FE)

Table A4

Pedagogy Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Practice (P)	
	Professional Development (PD)
	Standards of Practice (SoP)
Instruction (Instr)	
	Instructional Design (ID)
	Methods (Methd)
	Strategies (Strat)
Assessment (Asmnt)	
	Student Learning (SL)
	Teacher Practice (TP)
Theory (Thry)	
	Disciplinary Premise (DP)
	Theory to Practice (T to P)

Table A5

Research Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Focus/Scope (F/S)	
	Survey of the field (SoF)
	Identifying Future Research Areas (IFRA)
Methods (M)	
	Discipline Comparisons (DC)
	Program Evaluation (PE)
	Types (Typ)
Synthesis of Findings (Syn)	
	Review of Research (RR)
	Criteria—Institution/Program (IP)
	Student Choice (SC)
	Program Evaluation (PE)
	National Program Statistics (NPS)
Funding (Fnd)	
	Federal (Fed)
Graduate Studies (GrStd)	
	Topic/Focus (TF)
	Survey of the Field (SoF)
	Factors (Fact)
Researchers (Rschr)	
	Preparation (Prep)

Table A6

Conference Evaluation Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Reviews (Rev)	History (H)
	Purpose/Mission (P/M)
	Achievements (Achv)
	Influence (Influ)
	Membership (Mem)
Forecasting (Forca)	Goals & Roles (GR)
	Impact (Impat)
	Collaborations (Colab)
	Future Directions (FD)
	Name Changes (NC)

Table A7

Facilities Theme: Topics, Subtopics, Codes

Topics (Code)	Subtopics (Code)
Design (Dsgn)	Analysis of Design (AD)
Organization/Management (OM)	Real World applications (RWA)
	General (Gen)
	Tools and Supplies (TS)

A Content Analysis of AIAA/ITEA/ITEEA Conference Special Interest Sessions: 1978–2014

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Associations routinely hold annual conferences to aid with professional development and actively promote the ideals of their membership and the profession they represent. The American Industrial Arts Association (AIAA) was created in 1939 and has held an annual conference the past 76 years to further these goals (Starkweather, 1995). Throughout this period, the profession has gone through significant changes that include a paradigm shift from a focus on the products and processes of industry to a broader focus on technological literacy. The AIAA reflected this shift by changing the association name to the International Technology Education Association (ITEA) in 1985. More recently, the association adapted to the increasing focus on engineering education and changed its name again in 2010 to the International Technology and Engineering Educators Association (ITEEA). The ITEEA conference has run consistently throughout this period and remains a cornerstone professional event. Analysis of the detailed conference programs can highlight historical milestones, current status, and emerging trends within the profession to aid with conference planning and other professional activities.

Purpose and Approach

This content analysis was designed to highlight, among other topics, conference history, trends and issues, leadership, scholarly research, curriculum, and instructional methods. According to Silverman (1993), classic content analysis emphasizes a systematic, objective, quantitative description of content derived from researcher-developed categories. Contemporary forms, however, include both numeric and interpretive means of analyzing data (Julien, 2008). This study utilized both approaches. Initially, 22 conferences (1978–1999) were analyzed using a deductive process that produced frequency counts from categories predetermined by the researchers (LaPorte & Reed, 2000). The initial work was built upon by adding 15 conference programs (2000–2014), searching the initial categories, and using an inductive approach to produce frequency counts for additional categories derived from a careful reading of the programs.

Methods

This study focused only on the special interest sessions ($N = 5,639$) for the 1978–2014 ITEEA conferences. It did not include pre- and post-conference workshops, general sessions, meetings, meal functions, exhibits, or other activities. The study is limited to special interest sessions because they are standard in length, are vetted by the conference planning committee, make up the bulk of the conference program, and are of varying topics that formulate the basis for trend line analysis. Additionally, other conference activities often have a defined focus that does not provide such trends. These 37 years were a convenience sample since the researchers had the conference programs on hand, and the researchers also felt that the sample was broad enough to highlight the paradigm shift from industrial arts to technology education and the increased focus on engineering, among other trends. An official archive of ITEEA materials is maintained at Millersville University of Pennsylvania.

Initially, paper copies of conference programs were scanned with optical character recognition (OCR) software, and the resulting text files were edited with Microsoft Word and imported into Microsoft Access to form a searchable database. Electronic conference programs in portable document format (PDF) were obtained from the ITEEA starting in 2000, and these files were converted into Microsoft Word documents, cleaned, and imported into the Microsoft Access database. The database was designed with five fields for each interest session: year, sponsor, title, description, and presenters. The sponsor field describes the type of interest session (e.g., ITEEA, CTETE). Table 1 lists the session sponsors and includes name changes, acronyms, the number of sponsored sessions, and inclusive years of support.

Figure 1 illustrates the four major categories that were initially established for the 31 searchable topics during the deductive inquiry: new content organizers, old content organizers, individual topics, and topics concerning diversity. The seven old content organizers were based on historical course offerings in industrial arts or technology education. New organizers were based primarily on the *Jackson's Mill Industrial Arts Curriculum Theory* (Snyder & Hales, 1981) but also included an option for interest sessions that focused on production. More contemporary curriculum offerings based on the *Standards for Technological Literacy* (International Technology Education Association [ITEA], 2000) were later searched using the inductive approach described above.

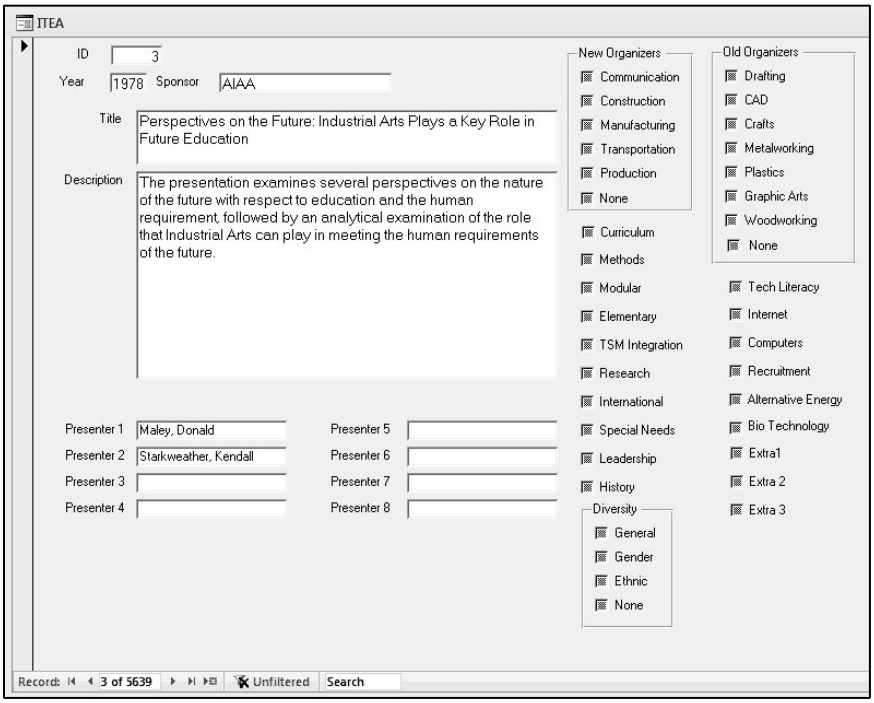

Figure 1. Fields, categories, and topics for each entry in the 1978–2014 ITEEA conference special interest session database.

The tagging for initial analysis for the years 1978–1999 was conducted by one researcher who read the session title and description to determine the primary focus. The researcher's interpretation of the presenters primary focus (as written in the description and title) can be a limitation of this method. If a session did not fit into one of the 31 topics, it was not tagged. Content interest sessions were tagged only once as one of the old content organizers or one of the new content organizers, not both. If the interest session did not fit any of the old or new content organizers, it was not marked in these classifications. In addition to content organizers, interest sessions could be tagged in 16 individual topics. Unlike the content organizers, however, interest sessions could be tagged more than once if their focus fit into several individual topics. The fourth classification section focused on diversity. Similar to the content organizers, interest sessions that focused on diversity could only be tagged in one of three topics. The three topics were gender, ethnicity, and general diversity.

Table 1
Session Sponsors

Acronym	Name(s)	Sponsored Sessions[a]	Inclusive Years
ACESIA	American Council for Elementary School Industrial Arts (later TECC, currently CC)	40	1978–1985
ACIAS	American Council of Industrial Arts Supervisors (later CS, currently CSL)	38	1978–1987
ACIASAO	American Council of Industrial Arts State Association Officers	27	1978–1986
ACIATE	American Council on Industrial Arts Teacher Education (later CTTE, currently CTETE)	42	1978–1986
AIAA	American Industrial Arts Association[b] (later ITEA, currently ITEEA)	898	1978–1985
AIACSA	American Industrial Arts College Student Association (later TECA, currently TEECA)	25	1978–1983
AIASA	American Industrial Arts Student Association (currently TSA)	16	1980–1988
CATTS	Center for the Advancement of Teaching Technology and Science (currently the STEM Center for Teaching and Learning)	22	2002–2007
CC	Children's Council of ITEEA (formerly ACESIA and TECC)	33	2011–2014
Commercial[c]	Too many to list.	220	1978–1997
CS	Council of Supervisors (formerly ACIAS, currently CSL)	66	1988–2010
CSL	ITEEA's Council for Supervision and leadership (formerly ACIAS and CS)	11	2011–2014
CTEA	Council of Technology Education Associations	12	1987–1992
CTETE	Council on Technology and Engineering Teacher Education (formerly ACIATE and CTTE)	29	2013–2014

CTTE	Council on Technology Teacher Education (formerly ACIATE, currently CTETE)	259	1983–2012
EbD	Engineering by Design	92	2008–2014
EPT	Epsilon Pi Tau	6	1979–2008
ICTE	International Conference on Technology Education	10	2007
International		73	1988–1992
ITEA	International Technology Education Association[d] (formerly AIAA, currently ITEEA)	2,804	1986–2010
ITEEA	International Technology and Engineering Educators Association (formerly AIAA and ITEA)	392	2011–2014
NAE	National Academy of Engineering	4	2006–2009
NASA	National Aeronautics and Space Administration	87	1991–2012
NSF	National Science Foundation	15	2004–2008
PATT	Pupils Attitudes Towards Technology	111	2000–2014
TECA	Technology Education Collegiate Association (formerly AIACSA, currently TEECA)	29	1984–2012
TECC	Technology Education for Children Council (formerly ACESIA , currently CC)	186	1987–2010
TSA	Technology Student Association (formerly AIASA)	29	1983–2014

[a]Total sponsored sessions listed (n = 5,576) do not equal total conference sessions (N = 5,639) due to the numerous sponsors of 1–2 sessions that are not listed here.
[b]Includes the AIAA sessions cosponsored with councils.
[c]Commercial sessions are those sponsored by companies during the normal conference program and run concurrent with other special interest sessions. This does not include pre- and post-conference workshops or sessions that companies held on the exhibit floor.
[d]Includes the ITEA sessions cosponsored with councils and the Technology Interest Group (TIG; four sessions in 2009).

A second researcher tagged the interest sessions for the years 2000–2014 using the same methodology for the original 31 topics. To aid in the reliability of tagging, the second researcher reviewed several years from the initial analysis, and one year that had been tagged by the initial researcher (1999) was blindly tagged by the second researcher and compared to the initial tags. This analysis revealed a reliability coefficient of .61, which is low but generally acceptable (Julien, 2008). Additionally, database query tools were used to search 17 other topics that emerged from reviewing conference programs.

Findings

The following findings are based on the tagging and queries of the ITEEA 1978–2014 conference special interest session database. Table 2 lists the conference locations, focus or themes, and the number of special interest sessions by year. Conference locations in the east, midwest, and plains appear to be well represented with few locations in or past the Rockies and no conferences outside of the continental United States. The frequency counts for each of the 48 categories and the mean number of presentations per year, as well as significant peaks, are presented in Table 2 within three categories: curriculum organizers, diversity, and individual topics. The initial curriculum categories (old and new) were collapsed and other curriculum content organizers were added, primarily to reflect the *Standards for Technological Literacy* (ITEA, 2000). Topics are listed alphabetically in Table 3, but many topics are combined below to highlight relevant relationships.

Curriculum Organizers

ITEEA special interest sessions that focused on curriculum packages, revision, theories, and the history of curriculum were by far the largest number of special interest sessions. These sessions may or may not have also been tagged in other fields depending on the primary focus of the session. Figure 2 illustrates the 1,533 special interest sessions that focus on curriculum. The mean of 41 sessions per year is almost one third of all conference special interest sessions per year, with the peak in 2009 (n = 92) representing well over half of the sessions that year. This category has a steady upward trend, and sessions since 2000 focus heavily on technological literacy, STEM, and elementary curriculum.

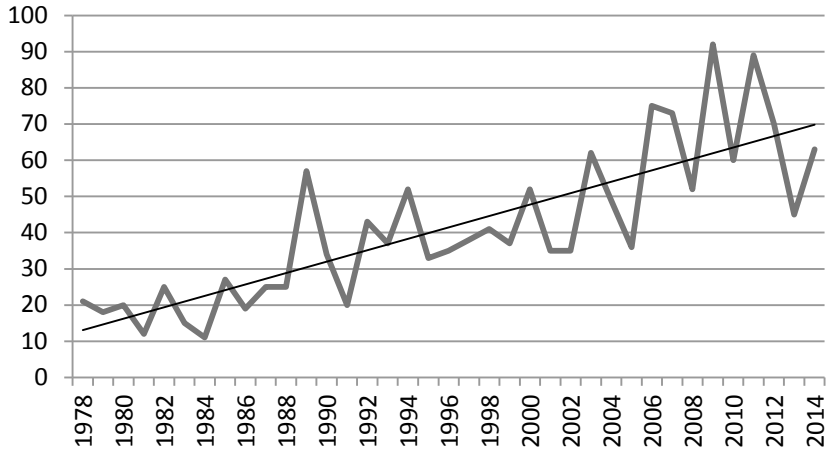

Figure 2. Curriculum special interest sessions with trend line.

Table 2
Conferences by Year

Year	No.	Location	Focus/Theme	Sessions
1978	40	Atlanta, Georgia	Industrial Arts: Youth's Gateway to the Future	136
1979	41	San Antonio, Texas	Industrial Arts—Preparation for Life in A Technological World	176
1980	42	St. Louis, Missouri	The Spirit of Progress	164
1981	43	Pittsburgh, Pennsylvania	The Golden Triangle of Industrial Arts: Industry-Culture-Environment	164
1982	44	Hartford, Connecticut	Industrial Arts: A Heritage of Technical Progress	166
1983	45	Milwaukee, Wisconsin	Interfacing Technology, Education, and the World	154
1984	46	Columbus, Ohio	Discovering, Reflecting, Interfacing Technology	100 (low)
1985	47	San Diego, California	Technology Reaching Out	184
1986	48	Kansas City, Missouri	Industry/Technology Education: Commitment to Excellence	132

Table 2, Continued

Year	No.	Location	Focus/Theme	Sessions
1987	49	Tulsa, Oklahoma	Technology Education: Teaching Tomorrow Today	132
1988	50	Norfolk, Virginia	Technosphere '88: A Technological Journey	119
1989	51	Dallas, Texas	Creating the Future: Implementing Curriculum Models	162
1990	52	Indianapolis, Indiana	Education and Technology: Racing into the Future Together	146
1991	53	Salt Lake City, Utah	Technology Education in the Space Age	152
1992	54	Minneapolis, Minnesota	Integrating Technology, People and the Environment	155
1993	55	Charlotte, N. Carolina	Technological Literacy for Life and Work	147
1994	56	Kansas City, Missouri	Technology Education: Preparing for the Global Community	202 (high)
1995	57	Nashville, Tennessee	Technology Education and the Multicultural Society	132
1996	58	Phoenix, Arizona	Technology Education: Educating the Next Generation	139
1997	59	Tampa, Florida	Managing Our Evolving Mission	129
1998	60	Fort Worth, Texas	Technology Education: The Frontier of the Future	129
1999	61	Indianapolis, Indiana	Technology Education: Creating A World Class Profession	146
2000	62	Salt Lake City, Utah	Innovation & Diffusion in Technology Education	158
2001	63	Atlanta, Georgia	Teaching Technology in A Virtual World	135
2002	64	Columbus, Ohio	Positioning Technological Literacy in the Mainstream of Education	136
2003	65	Nashville, Tennessee	Advancing Information and Knowledge Through Innovation	160

Table 2, Continued

Year	No.	Location	Focus/Theme	Sessions
2004	66	Albuquerque, New Mexico	Teaching Decision Making in A Technological World	160
2005	67	Kansas City, Missouri	Preparing the Next Generation for Technological Literacy	125
2006	68	Baltimore, Maryland	Living in a World with Smart Technology	171
2007	69	San Antonio, Texas	Technological Literacy: A Global Challenge	193
2008	70	Salt Lake City, Utah	Teaching TIDE With Pride!	162
2009	71	Louisville, Kentucky	Delivering the T & E in STEM	195
2010	72	Charlotte, N. Carolina	Green Technology: STEM Solutions for 21st Century Citizens!	162
2011	73	Minneapolis, Minnesota	Preparing the STEM Workforce	168
2012	74	Long Beach, California	Changing the Conversation: Improving P–16 Technology and Engineering	154
2013	75	Columbus, Ohio	Improving Technology and Engineering Education for All Students: A Plan of Action	133
2014	76	Orlando, Florida	Technology and Engineering: Bringing STEM to Life	161
			Mean =	152

Table 3
Analysis of Search Categories

Search Categories	Topic Totals	Yearly Mean	Peak Sessions	Peak Year(s)
Curriculum				
Agriculture	2	0.05	*	*
Biotechnology	59	1.60	5	2009
CAD	74	2.00	8	1985, 1987, 2000
Communication	184	5.00	14	2009
Construction	51	1.38	6	2010
Crafts	7	0.19	*	*
Curriculum	1,533	41.43	92	2009
Drafting	18	0.49	4	1980
Electricity/Electronics	80	2.16	7	1993
Energy & Power	120	3.24	17	1979
Engineering	505	13.65	56	2011
Graphic Arts	16	0.43	5	1981
Manufacturing	139	3.76	10	1985, 1994
Medical	12	0.32	2	2005, 2012
Metalworking	14	0.38	4	1982
Plastics	32	0.86	6	1981
Production	15	0.41	3	1979
Technology & Society	63	1.70	7	1983
Transportation	78	2.11	8	2009, 2014
Woodworking	53	1.43	7	1985
Diversity				
Ethnic	10	0.27	2	2007
Gender	84	2.27	10	2009
General	30	0.81	8	1995
Individual				
Accreditation	13	0.35	3	2004
Alternative Energy	83	2.24	11	1979, 2010
Computers	238	6.43	23	1985
Creativity	97	2.62	9	2003
Design Process	623	16.84	34	2010
Distance Learning	61	1.65	7	2001, 2002, 2006
Elementary	408	11.03	21	2011
Facilities	74	2.00	8	1989, 1994
Funding	159	4.30	11	1990
Hands-On	272	7.35	20	2009, 2011

Table 3, Continued

History	68	1.84	7	1982
International	312	8.43	26	1989
Internet	64	1.73	8	1996
Leadership	298	8.05	26	2012
Legislation	34	0.92	4	1993
Methods	538	14.54	42	2002
Modular	85	2.30	11	1993, 1994
Problem Solving	249	6.73	23	1992
Recruitment	66	1.78	4	1981, 1995, 2008, 2011
Research	540	14.59	32	2008, 2009
Robotics	94	2.54	9	1985
Special Needs	66	1.78	12	1982
Systems	147	3.97	11	1989, 1990
Technological Literacy	313	8.46	26	2011
TSM/STEM Integration	402	10.86	47	2014

*These categories did not have a significant peak of interest sessions (0 or 1 per conference).

There are a number of curriculum organizers for which trend-line analysis was not practical because there were so few sessions or the number of sessions dropped off completely. Historical organizers include crafts, graphic arts, metalworking, plastics, production, and woodworking. Sessions on crafts were inconsistent within this study's timeframe and included only seven total sessions. There were a handful of single sessions between 1979 and 1988 with the last session appearing in 1999. Graphic arts had a similar trend with the majority of sessions occurring between 1979–1983, and the last session appearing in 1994. There were 14 metalworking sessions, primarily between 1980–1986, with the last one in 1994. Sessions on plastics totaled 32 with the majority between 1978 and 1988 and the final one in 1992. Production appears to never have emerged as a curriculum organizer with only 15 total sessions spread out from 1978–2011. Woodworking sessions spanned 1978–1994 with a rapid drop after the 1994 peak.

New curriculum organizers with very limited representation include agriculture and medical technologies. The prefix *agri-* was searched across titles and descriptions to identify agricultural sessions that focused on "the growing of plants and animals for food, fiber, fuel, chemical or other useful products" (ITEA, 2000, p. 149). There was only one session in 1980 and one session in 2005 that met this definition. Clearly, this area has received almost no attention by presenters despite its focus in the *Standards for Technological Literacy* (ITEA, 2000) and agriculture's historical context of helping supply the raw

materials used by industry. There was a medical technology session in the years 1978, 1981, and 1995. Nine additional medical technology sessions occurred between 2002 and 2012, probably in response to its inclusion in the *Standards for Technological Literacy* (ITEA, 2000).

Despite increasing literature in the past 20 years concerning the implementation of biotechnology, there have only been 59 interest sessions that focused on this topic (Figure 3). The prefix *bio-* was searched across titles and descriptions to identify biotechnology-related sessions that focused on "any technique that uses living organisms (or parts of organisms) to make or modify products, to improve plants or animals, or to develop micro-organisms for specific uses" (U S. Congress, Office of Technology Assessment, 1988, p. 3). The initial session in 1981, Bio-Technology in Industrial Arts Education, was by Paul W. DeVore. The increase in presentations spanning 1992–2000 is likely due to the introduction of "bio-related" technologies in *A Conceptual Framework for Technology Education* (Savage & Sterry, 1990) and the establishment of a taxonomy for the study of biotechnology (Wells, 1994). The second increase in presentations starting in 2004 is likely due to the *Standards for Technological Literacy* (ITEA, 2000).

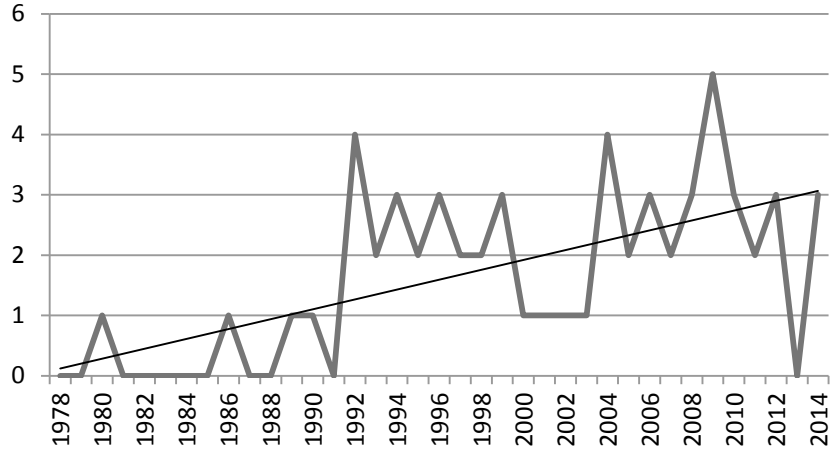

Figure 3. Biotechnology special interest sessions with trend line.

Special interest sessions with a primary focus on drafting (n = 18) or computer-aided design or computer-aided drafting (CAD; n = 74) are illustrated in Figure 4. There were a significant number of CAD presentations spanning 1984–1992 during the introduction of personal computers, after which the number of sessions became very sporadic. The spike of eight CAD sessions that occurred in 2000 was mostly comprised of sessions that focused on three-dimensional or parametric modeling. Overall, the number of sessions in this

category does not match the level of secondary course offerings in the United States that Sanders (2001) found, showing that drafting or CAD was the second most taught course in his national survey.

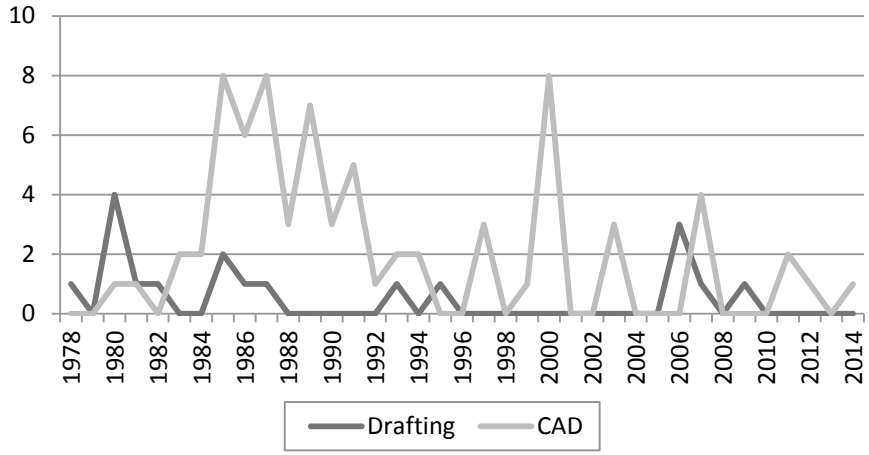

Figure 4. CAD and drafting special interest sessions with trend lines.

Curriculum content organizers based on the *Jackson's Mill Industrial Arts Curriculum Theory* (Snyder & Hales, 1981) are presented in Figure 5. All four areas have been sporadically represented throughout the time under study with communication having the most special interest sessions and construction the least. The sporadic nature of these content organizers may be due to other more specific yet related curriculum content organizers. For example, special interest sessions dealing with drafting, CAD, computers, the Internet, and graphic arts may have been counted under those topics and, depending on the primary focus, may not have also fit the communication category if the session focused on technical skill development or an activity as opposed to curriculum.

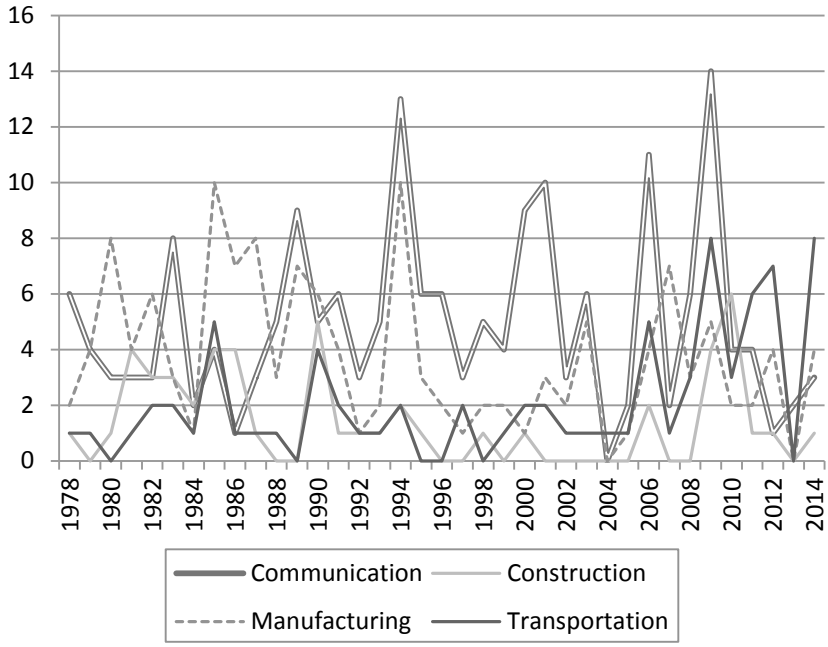

Figure 5. Communication, construction, manufacturing, and transportation special interest sessions.

The special interest sessions for electricity/electronics and energy and power, plotted in Figure 6, demonstrate several interesting trends. First, energy and power peaked in 1979, declined for over 10 years until 1996, and then averaged about four sessions annually over the last 8 years. Second, electricity/electronics has been sporadically presented, which is surprising given the proliferation of electronic devices over the past 20 years. However, this trend may be due to sessions in related topics (i.e., robotics) that may not have focused primarily on electricity/electronics curriculum. Finally, from 1984–2014, the trend lines for these two topics are very similar, almost mirroring each other at points.

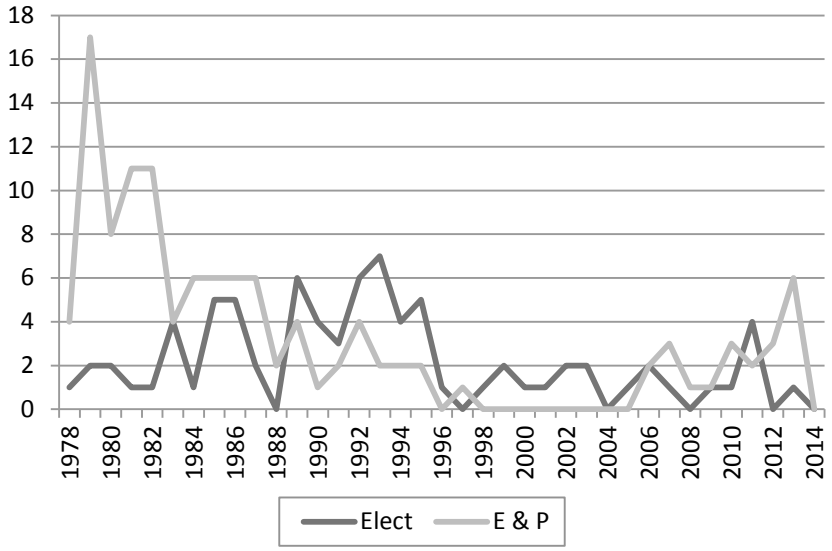

Figure 6. Electricity/electronics and energy and power special interest sessions.

Special interest sessions on engineering have increased significantly since 2000 (see Figure 7) with the number of sessions in 2007, 2011, and 2012 comprising almost one third of all special interest sessions. Early engineering sessions in the 1980s and 1990s frequently reference career and curricular connections to organizations such as the Society of Manufacturing Engineers (SME), Institute of Electrical and Electronics Engineers (IEEE), and the National Aeronautics and Space Administration (NASA). Although these early sessions briefly describe connections to engineering organizations and the term engineering is in the interest session title or description, it is often difficult to discern the depth of these connections. Beginning in 2000, however, the curriculum connections are much clearer because there are specific references to curriculums such as Engineering by Design (EbD), Engineering is Elementary (EiE), and Project Lead the Way (PLTW). Additionally, sessions from the National Center for Engineering and Technology Education (NCETE) as well as engineering sessions connected to key publications such as the *Standards for Technological Literacy* (ITEA, 2000) and *Engineering and Technology Education* (Custer & Erekson, 2008) have flourished since 2000. The themes for the 2009 and 2012–2014 conferences may have also influenced the number of engineering sessions because they each denote a focus on engineering (see Table 2). Overall, the number of special interest sessions on engineering is a reflection of broader professional trends leading up to and including the association name change to the ITEEA in 2010.

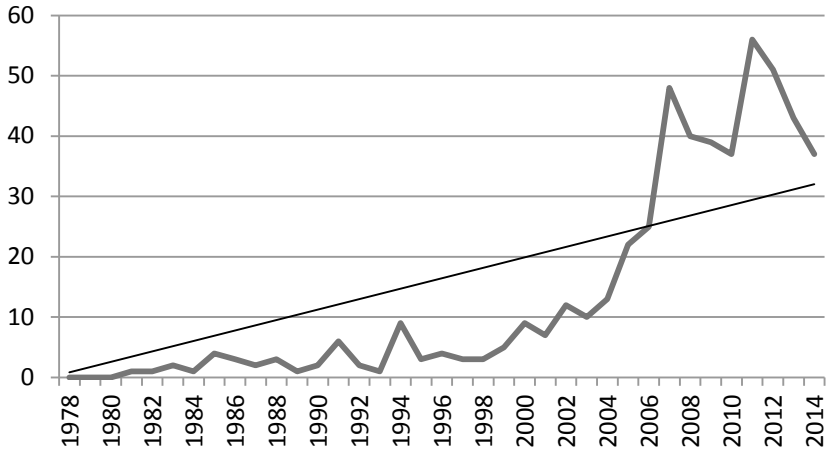

Figure 7. Engineering special interest sessions with trend line.

"Technology and society" has long been recognized as a key curriculum organizer (DeVore & Lauda, 1976; Anderson & Bensen, 1980) and encompasses an entire chapter (four standards, 20%) of the *Standards for Technological Literacy* (ITEA, 2000). However, Figure 8 illustrates that this topic has been sporadically presented during the period under review, including 11 years in which no technology and society special interest sessions were offered. This topic clearly has not been adequately presented (n = 63, mean = 1.70) given the amount of literature within the profession (e.g., DeVore & Lauda, 1976; Anderson & Bensen, 1980; Custer & Wiens, 1996; ITEA, 2000) as well as documents such as *Technically speaking: Why all Americans need to know more about technology* (National Research Council [NRC], 2002) from the National Academies and initiatives such as the National Assessment of Educational Progress Technology and Engineering Literacy (NAEP-TEL) assessment (National Assessment Governing Board, 2014).

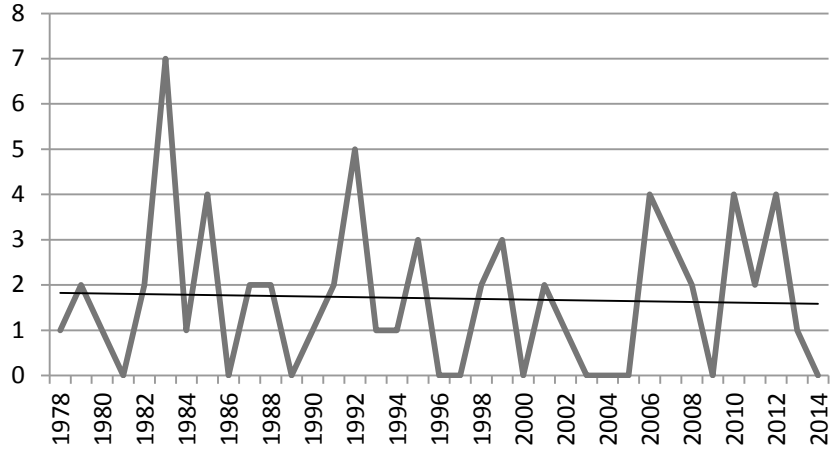

Figure 8. Technology and society special interest sessions with trend line.

Diversity

Special interest sessions with a primary focus on gender, ethnicity, culture, race, or equity were counted and are presented in Figure 9. General diversity sessions peaked in 1995 (n = 8), possibly due to the conference theme Technology Education and the Multicultural Society, but have otherwise been very sporadic. There was a higher interest in gender diversity in 1982, 1997, and 2007–2011. The peaks in 1982 and 1997 were initially thought to reflect a connection to the 1982 ACIATE and 1998 CTTE yearbooks (Maley & Starkweather, 1982; Rider, 1998), but a search across presenters did not show a correlation with yearbook contributors. The latest peak in special interest sessions focusing on gender (2007–2011) could not be attributed to conference themes or publications but is a positive trend. Finally, there have been 10 total special interest sessions that focus on ethnicity. It is clear that despite the 1993–1995 ITEA strategic goal to "enhance participation of minorities and women in technology" (Starkweather, 1995, p. 554), more attention is needed in all areas associated with diversity.

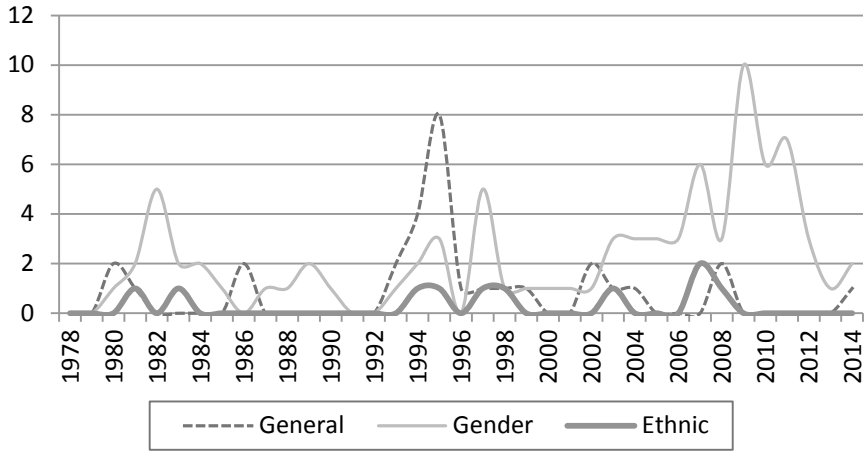

Figure 9. Diversity special interest sessions.

Individual Topics

Like curriculum topics, there are a number of individual topics for which trend line analysis is not practical because there are so few sessions or the number of sessions drops off completely. Special interest sessions focusing primarily on accreditation totaled just 13 sessions from 1996–2010. Most of these sessions focused on National Council for Accreditation of Teacher Education (NCATE) portfolio preparation or review. This is a very small number considering the importance of accreditation for teacher preparation programs. Financial implications, however, caused the ITEA/CTTE to suspend participation as a NCATE Specialized Professional Association (SPA) in 2010, which probably explains the abrupt end to accreditation special interest sessions.

Interest in alternative energy seems to correspond with energy crises, such as the one that occurred in the late 1970s and early 1980s (see Table 3). There was another small surge in presentations in 1994, perhaps driven by the Gulf War and a renewed awareness of our dependence on other countries for oil. A third peak occurred in 2010, perhaps due to the conference theme Green Technology: STEM Solutions for 21st Century Citizens! The overall number of alternative energy sessions is quite low, and in 14 years, not a single presentation on alternative energy was made. Considering the importance of energy to the global future and further development of technology, there is an insufficient amount of attention in this area.

Special interest sessions were considered to fit under the history category if they focused on the history of the profession and/or technologies. Presentations on history (n = 68) have been sporadic from year to year with an emphasis on history in the early years of this study. Perhaps this is due to the heavy focus on curricular content and STEM integration since the mid-1990s.

Teacher recruitment is another sparsely represented topic (n = 66), having just one session across a span of 17 years and 4 years with no sessions. The peak number of teacher recruitment sessions occurred in 1981 and 1995. Four presentations were made in each of these years. Considering that teacher shortage has been a persistent problem in the profession (Moye, 2009; Ndahi & Ritz, 2003), there have been very few special interest sessions on recruitment.

Robotics is a topic that has been the primary focus of 94 presentations since 1982, but these sessions have been very sporadic. There was a peak of nine sessions in 1985, and then from 1987–2000, there were few sessions, including 5 years with no sessions. Beginning in 2001, however, there has been a fairly consistent increase in robotics sessions, which corresponds to the recent high visibility of robotics through programs such as FIRST, VEX, and SeaPerch.

Respondents to Sanders (2001) national survey indicated that 22.9% of their students were special needs students, yet only 66 total special interest sessions focused on this area. Special needs interest sessions peaked in 1982 (n = 12) but quickly dropped to a total of seven for the entire decade of the 1990s. The high initial level was likely due to federal laws that mandated inclusion of special needs students. Overall, when considering the increasing awareness about addressing the needs of special populations, the number of interest sessions devoted to this topic is insufficient.

Special interest sessions that focused on teaching about computers or the Internet are illustrated in Figure 10. The number of interest sessions focusing on computers in technology education increased steadily until 1985, peaking at 21 sessions. Since then, the numbers have steadily decreased. The pioneering session on the Internet occurred in 1994. By 1996, the number peaked at eight interest sessions but has dropped to between 0 and 2 since 2008. It appears that computers and the Internet have become a regular part of our practice.

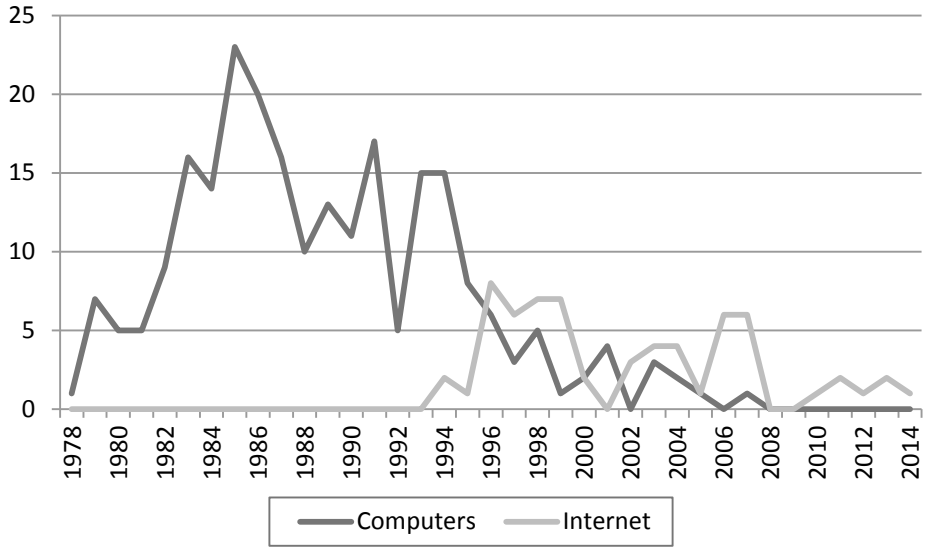

Figure 10. Computer and Internet special interest sessions.

Warner (2011) provides a compelling literature review documenting the history of design and creativity in technology education. Figure 11 illustrates the trends for creativity and design special interest sessions. Creativity has been fairly consistently represented but accounts for only 97 sessions. Perhaps the conceptual framework for design and creativity offered by Gemmill (2011) will increase the number of interest sessions on creativity in the future. Design, on the other hand, has had a significant number of sessions (n = 623) that have steadily increased over time. Hopefully, this trend will continue given technology and engineering education's history, pragmatic approach to teaching, and the heavy focus on design in the *Standards for Technological Literacy* (ITEA, 2000).

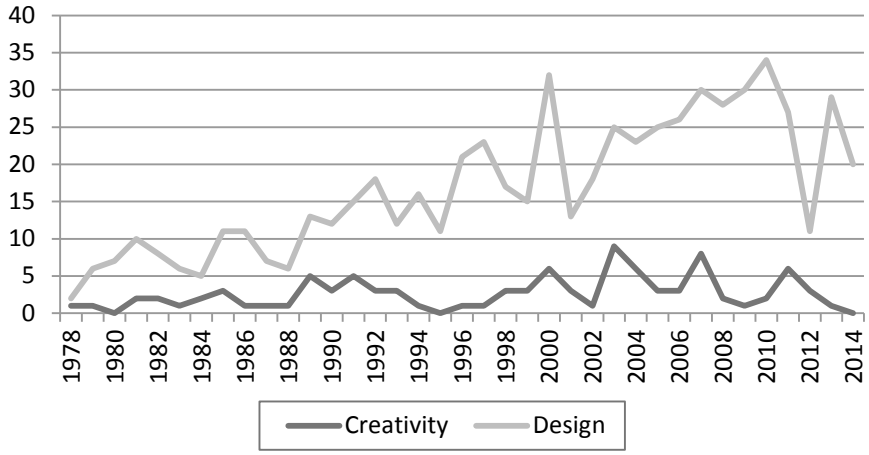

Figure 11. Creativity and design special interest sessions.

Elementary interest sessions were fairly consistent from 1978–1990, increasing until 1999 then leveling off to approximately 16 sessions per conference (Figure 12). The elementary council, represented as ACESIA, TECC, and CC in Table 3, has consistently provided leadership and has sponsored 259 sessions during the period under study. Additionally, the 1997 CTTE yearbook *Elementary School Technology Education* (Kirkwood & Foster, 1997) and the continued availability of elementary group membership in ITEEA may have positively influenced the number of elementary special interest sessions.

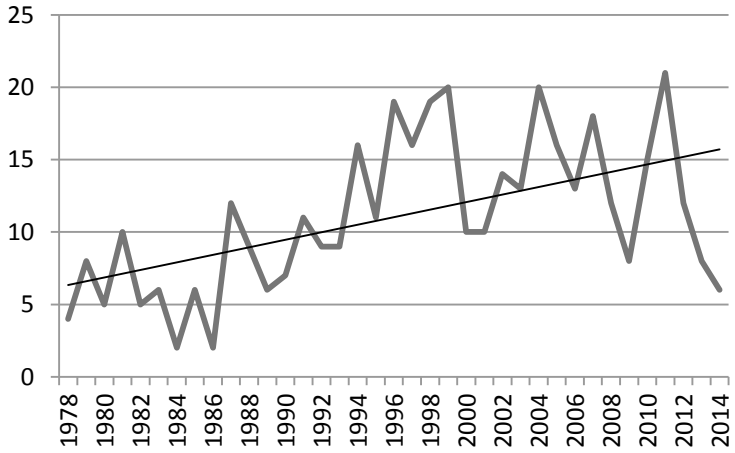

Figure 12. Elementary special interest sessions with trend line.

Three topics related to learning environments are illustrated in Figure 13: facilities, distance learning, and modular technology education. Facility sessions peaked during the conferences spanning 1989–1994, which may be the result of the four CTTE yearbooks released during that timeframe, each of which included a chapter on facilities (Liedtke, 1990; Wright & Komacek, 1992; Seymour & Shackelford, 1993; Wescott & Henak, 1994). Since that time, however, special interest sessions on facilities have dropped considerably.

Early special interest sessions on distance, online, distributed, and virtual learning focused on resources (i.e., NASA, Innovation Curriculum Online Network [ICON]) and learning communities. Sessions during the peak years of 2001–2008 began to focus more on delivery of undergraduate and graduate programs. Several sessions were delivered by contributing authors of the 54th CTTE yearbook *Distance and Distributed Learning Environments* (Havice & Havice, 2005).

The primary focus on modular technology education (MTE) occurred within the 1990s. Earlier MTE sessions were primarily related to informing participants on how to produce their own "instructional modules," but more recent sessions focused on commercially developed modular systems. The steady decline of sessions with none occurring since 2006 may indicate that MTE has become an accepted practice or that it is no longer a viable learning environment. More research is needed on this trend.

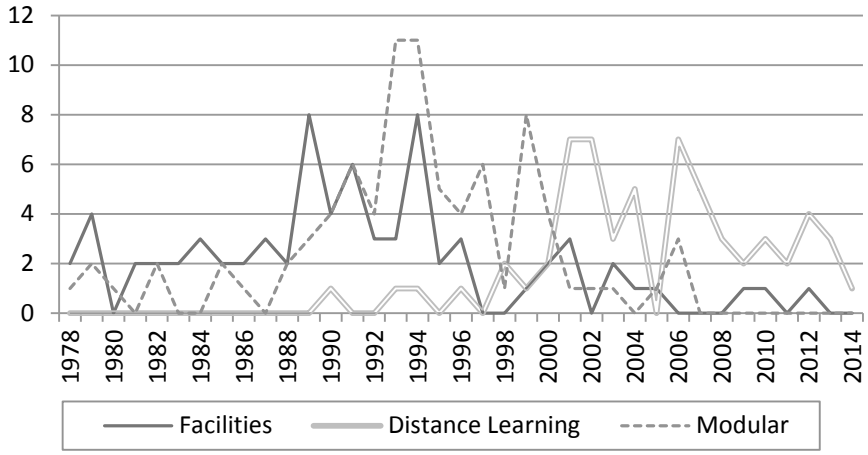

Figure 13. Facility, distance learning, and modular special interest sessions.

Special interest sessions with a primary focus on funding for facilities, programs, and material development inclusive of fundraising, legislation, and grants are plotted in Figure 14. Notable organizations from these sessions include the National Science Foundation (NSF), the United States Office of Education (USOE in the early years, currently U.S. Department of Education), NASA, and the Technical Foundation of America. Only 34 total sessions dealing with legislation were identified after searching the terms law, legislate, legislation, and lobby while discounting confounding terms (i.e., Ohm's Law). Legislative sessions have primarily addressed special needs students and funding (i.e., Carl D. Perkins). The number of sessions for both funding and legislation is very low considering that technology and engineering education is not a core discipline in the schools, thus making it more susceptible to funding and legislative changes.

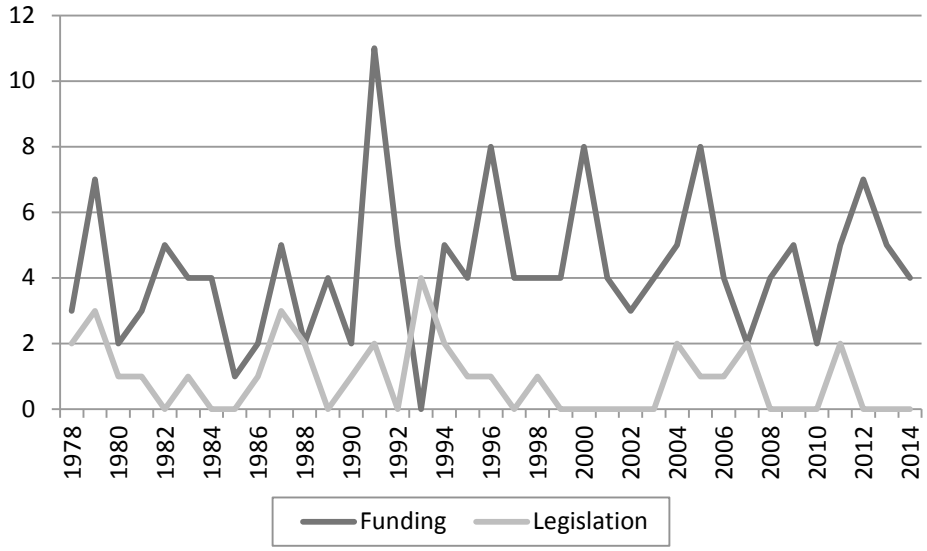

Figure 14. Funding and legislation special interest sessions.

Three topics related to instructional strategies are illustrated in Figure 15: problem solving, hands-on, and systems. All of these areas have been heavily presented. Sessions on problem solving or problem-based learning were selected if they focused on instruction not on solving problems of the profession (i.e., Wicklein, 1993). The increase in problem solving, hands-on, and systems sessions in the late 1980s and early 1990s may have been influenced by the research and experimentation work of Maley (1986) or the focus on technical research (Israel & Wright, 1987). An average of three to four sessions on systems have occurred since that time. At the same time, hands-on sessions have increased and problem-solving sessions have leveled off to approximately five per conference. A note of caution must be made about classifying these three topics. Problem solving and the systems approach have long histories within technology and engineering education (see Martin 1979, 1995; Schwaller & Kemp, 1988; Helgeson & Schwaller, 2003), but the term *hands-on* is a bit more amorphous in the literature. All three terms represent complex instructional strategies, and session presenters are limited in the length of their titles and descriptions (currently seven words for titles and 25 words for descriptions). Sessions were selected for these three categories by the researchers if their primary focus fit the category; however, the depth with which these complex topics were covered in the special interest session is very difficult to discern.

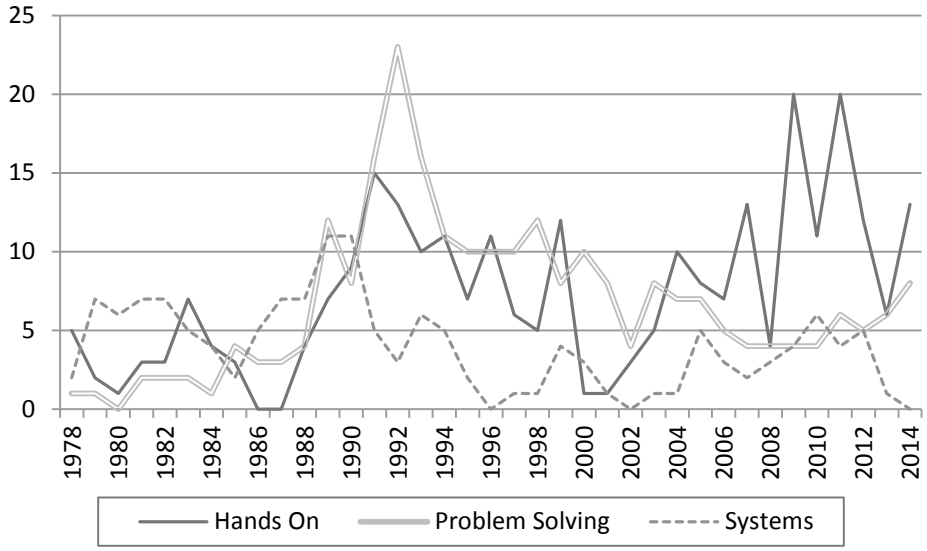

Figure 15. Hands-on, problem solving, and systems special interest sessions.

Very few international presentations were made until 1988, which is when the Pupil's Attitudes Towards Technology (PATT) conference was first co-located with the ITEA. The PATT conference was not co-located with the ITEEA from 1989–1998, which may explain the downward trend in international sessions during this period. A session was tagged as international if it focused on non-U.S. industrial arts or technology education, and sessions sponsored by PATT did not automatically mean they met this category. The peak in international sessions in 2000 is due in large part to co-locating the PATT-10 conference (Figure 16), and the peak in 2007 is due in large part to co-locating the PATT-17 and the release of the CTETE yearbook *International Technology Education* (Williams, 2006).

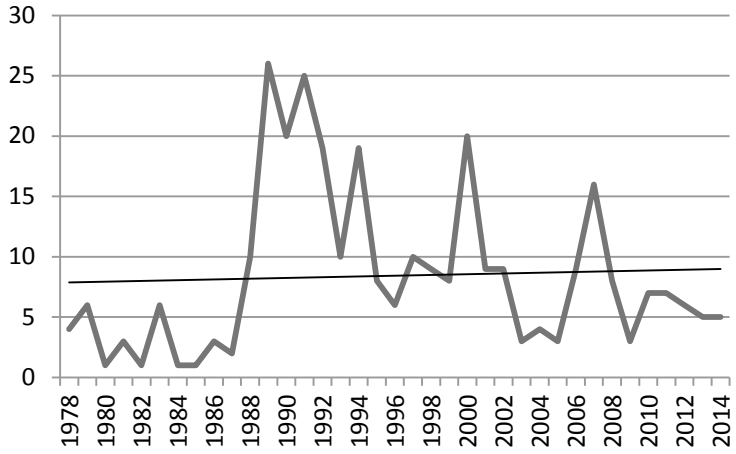

Figure 16. International special interest sessions with trend line.

Presentations focused on developing leadership or professionalism were rather sporadic until 2004. The increase since 2004 may be attributed to initiatives (i.e., 21st Century Leadership Academy, Administrative Strand in 2014) and STEM integration activities. Leadership may also be gauged by groups that sponsor special interest sessions. These session sponsors are listed in Table 1 by the acronym printed in the conference programs. Additionally, the sponsor's name is listed with information regarding previous and current names to help identify congruency across the conference programs. Lauda (1995) provides a detailed history of council changes as well as their focus within the association.

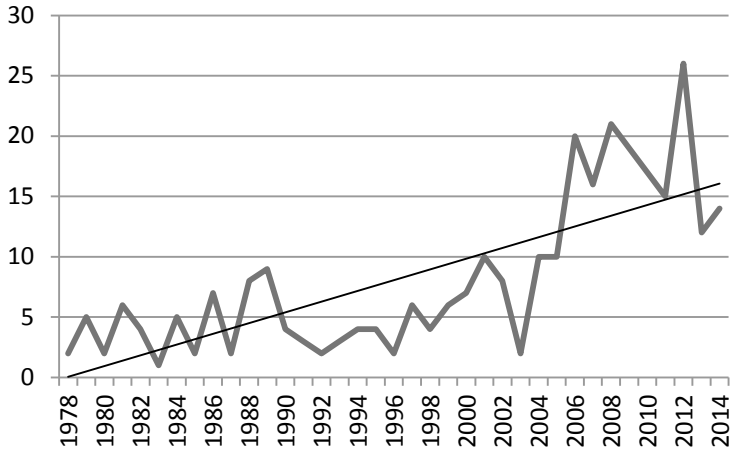

Figure 17. Leadership special interest sessions with trend line.

Another way to look at leadership is to determine who were regular presenters at the ITEEA conferences. The ITEEA 1978–2014 conference special interest session database was established to include up to eight co-presenters per session. These fields were used to identify the presenters with the greatest number of special interest sessions (Table 4).

Table 4
Greatest number of presentations, by presenter: 1978–2014

Presenter	Number of Sessions
William E. Dugger, Jr.	73
Mark E. Sanders	52
John M. Ritz	36
Michael Hacker	35
Marc J. de Vries	30
John G. Wells	30
Patrick N. Foster	29
Ray Shackelford	29
Donald Maley	27
Charles H. McLaughlin	27

Table 4, Continued

Patricia Hutchinson	26
Barry Burke	26
James Flowers	25
James E. LaPorte	25
Gerhard Salinger	25

Presentations on teaching methods have been a recurring theme at the ITEA conferences over the years (Figure 18). This seems in line with what might be expected for a conference sponsored by a professional education association. The surge in the early 2000s may be due to the release of the *Standards for Technological Literacy* (ITEA, 2000) or an increase in focus on STEM integration.

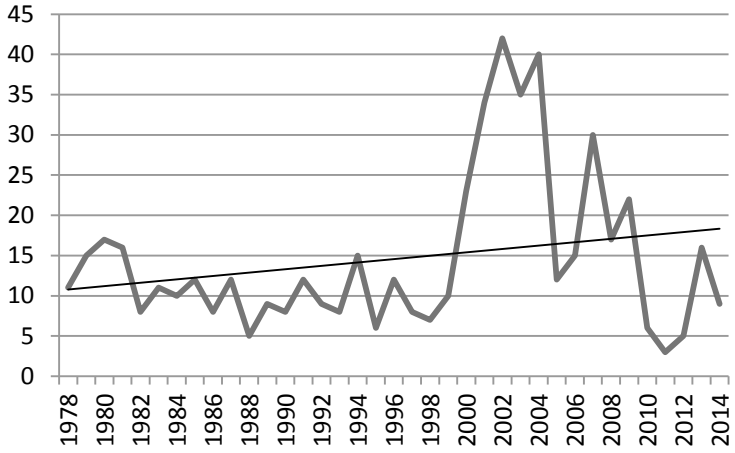

Figure 18. Teaching methods special interest sessions with trend line.

Overall, interest sessions on scholarly research (Figure 19) have increased since 1978 and reached a peak of 32 in both 2008 and2009. The increases in 1999–2000 are due in large part to the return of the PATT conference sessions. Additionally, we see another increase in 2005–2008 research sessions when the PATT conference themes explicitly focused on research. Additionally, the 2010 CTETE yearbook *Research in Technology Education* (Reed & LaPorte, 2010) may have impacted the number of research special interest sessions. The consistent increase may be due to a greater amount of funding opportunities to support research. Sessions directly sponsored by NSF or those that mentioned

research sponsored by NSF are also plotted in Figure 19 and support the notion of increased funding opportunities.

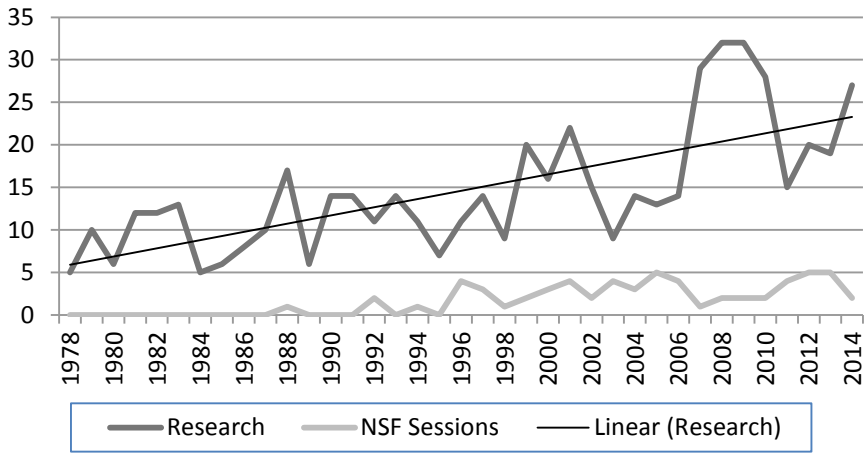

Figure 19. Research special interest sessions with trend line and NSF special interest sessions.

Despite technology education's inherent focus on technological literacy, the number of sessions prior to the release of the *Standards for Technological Literacy* (ITEA, 2000) was very small. There is a small spike when the association name changed from the AIAA to the ITEA in 1985. The larger spike in the early 1990s is likely a reflection of the CTTE yearbook *Technological Literacy* (Dyrenfurth & Kozak, 1991) and the theme of the 1993 conference, *Technological Literacy for Life and Work* (Table 2). Additionally, publications such as *Technically Speaking* (NRC, 2002) and *Tech Tally* (NRC, 2006) have increased the focus on technological literacy in the past 14 years. Sessions relating to these works and a large number of sessions on the ITEEA's Engineering by Design (EbD) curriculum have made technological literacy one of the most consistently offered topics of special interest sessions.

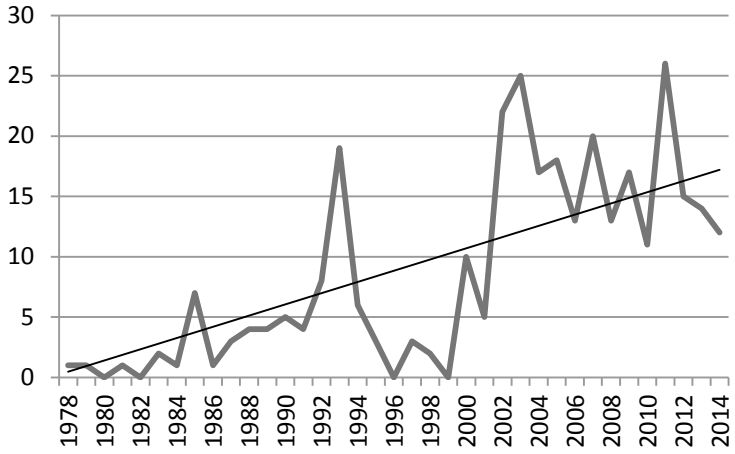

Figure 20. Technological literacy special interest sessions with trend line.

Special interest sessions were tagged TSM/STEM if the focus of the session was on integrating two or more science, technology, engineering, arts, or mathematics disciplines. The plot and trend line of interest sessions in Figure 21 highlight considerable growth. Early peaks in the 1990s are tied heavily to LaPorte and Sanders's (1993) Technology, Science, Mathematics (T/S/M) Integration Project and Loepp's (1999) Integrated Mathematics, Science, and Technology work at Illinois State University. Since 2007, every conference theme has focused on STEM integration, and the number of interest sessions has increased considerably. This is not surprising given the attention STEM education has received from politicians, corporations such as Exxon/Mobil, and influential organizations such as NSF and the National Academies.

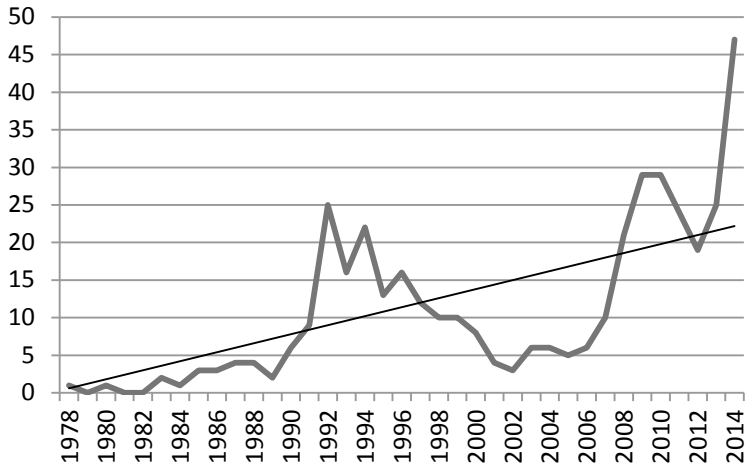

Figure 21. TSM/STEM/STEAM special interest sessions with trend line.

Summary and Conclusions

This content analysis was designed to highlight historical and apparent emerging trends from 37 annual conferences of the AIAA/ITEA/ITEEA spanning 1978–2014. Thirty-one categories were initially identified, and using a deductive approach, sessions were tagged if the primary focus fit one or more of these categories. An inductive approach was also used to search 17 additional topics using database query tools.

Based on the findings presented above, it appears the following topics have generally been consistently represented at the conferences: communication, creativity, hands-on, international, methods, problem solving, and systems. The focus on these topics over such a prolonged period indicates that conference organizers, presenters, and participants value these topics. The findings of this study also indicate a growing number of presentations on the following topics: biotechnology, curriculum, engineering, gender, design, distance learning, elementary, leadership, research, technological literacy, and STEM integration. These topics represent growth areas for the conference that may be a reflection of what is valued in technology and engineering education or education in general.

The findings of this content analysis also indicate a sporadic number of presentations in certain areas: alternative energy, construction, electricity/electronics, energy and power, history, manufacturing, robotics, technology and society, and transportation. Additionally, certain topics appear to be declining in number: accreditation, CAD, computers, crafts, drafting, facilities, graphic arts, the Internet, metalworking, modular, plastics, production, and woodworking. Inconsistent offering of some sessions or a decline in others

related to these topics may be caused by economic factors (i.e., accreditation and alternative energy) or because certain topics have become accepted practice (i.e., construction, the Internet, manufacturing, and transportation). A third possibility is that certain topics may have been subsumed under more contemporary titles, for instance, topics such as metalworking, plastics, and woodworking being included under the topic of materials science. More research into sporadic and declining special interest session topics is needed; however, conclusions are difficult to make from a session title and brief description.

Special interest session presenters are limited to the length of their session title and description (currently seven and 25 words, respectively). Some topics researched in this study fit one or more categories, whereas others did not fit any of the 48 categories. This may be because some topics have clear definitions in the literature (i.e., biotechnology) and others are amorphous (i.e., hands-on). Presenters are encouraged to provide clear titles and descriptions so that conference organizers, attendees, and researchers can better discern the session focus.

Trend line analysis was used in an attempt to establish connections to publications, professional practice, trends, and issues. Some topics were searched because they were recognized in the literature as important to the field but have not been well represented as AIAA/ITEA/ITEEA special interest sessions. These topics include agriculture, ethnicity, general diversity, legislation, medical, recruitment, and special needs. It appears that the ACIATE/CTTE/CTETE yearbook series and the PATT conference series do have some influence on special interest sessions. The conference theme, however, appears to have minimal influence, but the councils and collaborating organizations (i.e., TSA, NASA, NSF, and NAE) have varying degrees of influence resulting from grants, sponsored sessions, publications, and other activities. This analysis highlights the need for the ITEEA to work closely with the conference planning committee, councils, and other session sponsors to identify relevant special interest sessions needed by today's technology and engineering education professionals.

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