# Articles

## Perceptions and Practices of Technology Student Association Advisors on Implementation Strategies and Teaching Methods

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Two of the most significant impacts on the industrial arts profession since the 1960s have been the gradual evolution of the technology education movement and the integration of the co-curricular student organization: the Technology Student Association (TSA). TSA began as the American Industrial Arts Student Association (AIASA) and has recently changed its name to reflect the new curricular emphasis on technology. In 1981, less than one-third of one percent of the students in industrial arts courses actually joined AIASA (Haynie, 1983). There were about 7 million industrial arts students, but only 21,600 were members of the student organization (Applegate, 1981). Currently there are about 6 million students in technology education courses of which 65,000 (about 1%) are members of TSA. These data indicate that TSA membership has tripled during the 1980s. This student organization is becoming an important facet of the technology education movement.

Research efforts on extracurricular activities have focused on the relationship of participation with students' emotional and academic development. Haensly, Lupkowski, and Edling (1986) studied the role of extracurricular activities as they relate to personal and social development, and to academic achievement. They concluded that extracurricular activities provide an important context for social, emotional and academic development. The positive effect of student organizations on academic performance was also supported by Camp (1987) who found that partic-

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ipation in vocational student organizations produced a positive contribution to student achievement.

Social and personal development is also enhanced by participation in extracurricular activities. Carter & Neason (1984) and Townsend (1981) found a relationship between vocational student organization participation and results on scales of personal development. Students who participated in vocational student organizations often had a higher socioeconomic status and higher self-esteem (Collins, 1977). Other research has shown that school activities are positively related to enhanced self-concept (Yarworth & Gauthier, 1978), increased social status among peers (Spady, 1970), and greater satisfaction with school (Nover, 1981).

These studies focused on determining the effect of student organizations on students' achievement and socialization. They clearly describe the positive effect of student organizations in this realm, however, no studies were found which examined the effect of student organizations on teacher-student interaction in a laboratory environment. With technology education in its infancy, it is important to determine the effects of co-curricular and extra-curricular activities and organizations on the total technology education program. This study sought to identify characteristics of technology education programs with a TSA component and the relationship between participation by a teacher's classes in co-curricular organizations and the teaching methods used by technology teachers.

## Methodology

*Sample*

The sample for this study consisted of TSA advisors in attendance at the 1989 National Technology Education Student Association Leadership Conference in Winston-Salem, North Carolina, June 19 - 25, 1989. Each school attending the conference was required to have at least one advisor in attendance. Though some schools brought more than one advisor, only one was required to complete the registration process for the entire school. The survey was conducted during registration while advisors waited in line. This approach insured maximum participation and resulted in the receipt of 102 usable response forms.

*Instrumentation*

A 33 item questionnaire was developed by the researchers for this study. Responses were recorded on mark-sense answer sheets. The first 9 items were designed to measure the characteristics of participant's technology education program and the ways in which they implement their student organization chapters. Specifically, items asked when and where TSA functions were conducted and assessed TSA advisors' perceptions of the change to technology education. Item 9 required advisors to select the term which best described the type of lab in which they teach from 6 choices.

The remaining 24 items were used to identify frequently used teaching methods and differences in methodologies as a function of implementation of the co-curricular approach. These items used a five point Likert scale: most frequently (A) to never (E). Missing responses were ignored in all cases except in Item 9 which used "no response" to indicate that the program was housed in an "integrated general (multipurpose) laboratory".

*Data Analysis*

The collected data were analyzed with SAS (Statistical Analysis System) software. Frequency and percent tables were generated for each item and correlations were conducted when there were apparent reasons to investigate relationships. For each item requiring a Likert response, numeric values from 5 (most frequently) to 1 (never) were assigned to the responses and a mean score was determined. These means were rank ordered for further investigation.

Two items were used as the basis of a second analysis to see if those teachers who had not originally favored the name change or those who teach in traditional (unit shop) labs used different methods and strategies more often than those who did favor name change or who teach in more contemporary (conceptually oriented) labs.

## Findings

Results of the survey were analyzed to describe the characteristics of technology education programs with a TSA component, describe and classify teaching methods, and determine if there were differences in the teaching methods used in programs which employed a co-curricular approach vs. those which implemented TSA on an extra-curricular basis.

*Characteristics of TE/TSA Programs*

The responses to Items 1 through 8 are shown in Table 1. All respondents claimed to have an active TSA chapter--which is also indicated by their attendance at the national TSA conference.

In Item 2, 72% of the advisors indicated that meetings and activities were held after school. Activity periods during the school day were used by 53% (Item 3), indicating that some teachers conduct TSA activities/meetings at both times.

**Table 1**
*Responses to Items 1 through 8*

| Item # | Stem | Yes # | Yes % | No # | No % | N A... # | N A... % |
|---|---|---|---|---|---|---|---|
| 1 | Active TSA chapter | 102 | 100 | 0 | -- | 0 | -- |
| 2 | Chapter meetings after school | 74 | 72.5 | 27 | 26.5 | 1 | 1.0 |
| 3 | Meetings in activity periods | 54 | 52.9 | 40 | 39.2 | 8 | 7.9 |
| 4 | Co-curricular approach | 36 | 35.3 | 62 | 60.8 | 4 | 3.9 |
| 5 | State adopted/approved course names | 90 | 88.2 | 8 | 7.8 | 4 | 3.9 |
| 6 | State adopted curriculum | 86 | 84.3 | 11 | 10.8 | 5 | 4.9 |
| 7 | Favored name change 5 years ago | 68 | 66.7 | 30 | 29.4 | 4 | 3.9 |
| 8 | Like new name now | 92 | 90.2 | 7 | 6.9 | 3 | 2.9 |

*Note:* Percentage values rounded to one decimal place.

Most of the advisors (88%) teach courses which are named in state adopted curriculum guides (Item 5). Additionally, 84% indicated that their curricula closely follow the state guidelines (Item 6).

Two items (7 and 8) asked about teachers' attitudes toward the name change to technology education. Item 7 asked if teachers favored the new name five years prior to the survey and Item 8 asked if they are now pleased with the change. Only 67% of the teachers favored the change in 1984, but 90% of them are currently satisfied that the new name represents our programs well. Chi-square testing found a significant difference: $X^2(5, N = 102) = 18.04, p < .01$. This indicates that a change in attitudes toward the new name had occurred over the five year period.

Unit laboratories (woods, metals, drawing, etc.) are still in use by half of the teachers. Ten percent of the teachers reported they use "manufacturing" labs, and another 12% use "communication" labs. Only 2% use "construction" labs and 1% use "transportation" labs. Other than unit labs, the most often used are multi-purpose labs, which were reported by 25% of the teachers.

*Teaching Methods*

The remaining items concerned implementation of various teaching strategies. A five point Likert scale was used to determine the relative frequency of use for each technique. Results on these 24 items appear in Table 2. The methods and strategies are rank ordered in the table by their mean scores-- the first items listed were reported by the most teachers. Results were analyzed to identify frequently used teaching methods. In many instances, when implementing technology education activities, several teaching methods are used. Therefore, data were analyzed to identify teaching method clusters.

**Table 2**
*Responses to Items 10 through 33*

| Ranking (Item #) | Stem | Weighted Mean | Responses A | B | C | D | E | NA |
|---|---|---|---|---|---|---|---|---|
| 1 (12) | Demonstrations | 4.32 | 42 41.2% | 53 52.0% | 6 5.9% | 0 -- | 1 1.0% | |
| 2 (13) | Lecture-demonstrations | 4.07 | 29 28.4% | 53 52.0% | 16 15.7% | 3 2.9% | 0 -- | 1 1.0% |
| 3 (17) | Individualized instruction | 4.05 | 33 32.4% | 42 41.2% | 26 25.5% | 1 1.0% | | |
| 4 (24) | Individual projects | 3.92 | 30 29.4% | 41 40.2% | 21 20.6% | 7 6.9% | 1 1.0% | 2 2.0% |
| 5 (10) | Lectures of 10 to 25 minutes | 3.67 | 21 20.6% | 30 29.4% | 43 42.2% | 4 3.9% | 1 1.0% | 3 3.0% |
| 6 (22) | Group projects | 3.64 | 18 17.6% | 42 41.2% | 32 31.4% | 7 6.9% | 3 2.9% | |
| 7 (21) | Lab experiments | 3.61 | 21 20.6% | 35 34.3% | 32 31.4% | 11 10.8% | 2 2.0% | 1 1.0% |
| 8 (14) | Discussion (teacher led) | 3.55 | 16 15.7% | 35 34.3% | 42 41.2% | 7 6.9% | 2 2.0% | |
| 9 (26) | Student designed or selected (free choice) project | 3.46 | 15 14.7% | 31 30.4% | 41 40.2% | 13 12.7% | 1 1.0% | 1 1.0% |
| 10 (25) | Teacher designed or assigned projects | 3.38 | 9 8.8% | 40 39.2% | 35 34.3% | 14 13.7% | 3 2.9% | 1 1.0% |

***Table 2 (cont.)***

| Ranking (Item #) | Stem | Weighted Mean | A | B | C | D | E | NA |
|---|---|---|---|---|---|---|---|---|
| 11 (31) | Computers used by students in lab. | 3.38 | 23 22.5% | 33 32.4% | 19 18.6% | 9 8.8% | 16 15.7% | 2 2.0% |
| 12 (32) | Computers used to prepare materials | 3.32 | 26 25.5% | 29 28.4% | 14 13.7% | 11 10.8% | 19 18.6% | 3 2.9% |
| 13 (18) | Small group discussion | 3.21 | 7 6.9% | 29 28.4% | 47 46.1% | 14 3.7% | 4 3.9% | 1 1.0% |
| 14 (33) | Computers for clerical chores | 3.21 | 24 23.5% | 21 20.6% | 20 19.6% | 13 12.7% | 18 17.6% | 6 5.9% |
| 15 (27) | Group designed/ selected projects | 3.19 | 7 6.9% | 33 32.4% | 35 34.3% | 22 21.6% | 3 2.9% | 2 2.0% |
| 16 (20) | Student peer tutors | 3.12 | 6 5.9% | 27 26.5% | 46 45.1% | 19 18.6% | 4 3.9% | |
| 17 (23) | Mass production project (Line production) | 3.12 | 9 8.8% | 29 28.4% | 38 37.3% | 17 16.7% | 9 8.8% | |
| 18 (16) | Traditional media | 3.10 | 4 3.9% | 23 22.5% | 55 53.9% | 15 14.7% | 3 2.9% | 2 2.0% |
| 19 (29) | Computers for presenting information | 3.08 | 12 11.8% | 33 32.4% | 22 21.6% | 17 16.7% | 16 15.7% | 2 2.0% |
| 20 (30) | Computers for demonstrations | 3.01 | 12 11.8% | 31 30.4% | 22 21.6% | 16 15.7% | 19 18.6% | 2 2.0% |
| 21 (28) | Discovery method | 2.93 | 8 7.8% | 21 20.6% | 37 36.3% | 24 23.5% | 10 9.8% | 2 2.0% |
| 22 (11) | Lectures of over 30 minutes | 2.68 | 6 5.9% | 15 14.7% | 32 31.4% | 38 37.3% | 11 10.8% | |
| 23 (15) | Seminar (student led) | 2.55 | 3 2.9% | 13 12.7% | 32 31.4% | 43 42.2% | 11 10.8% | |
| 24 (19) | Role Playing | 2.45 | 4 3.9% | 11 10.8% | 31 30.4% | 34 33.3% | 20 19.6% | 2 2.0% |

Demonstrations are still very popular methods of teaching as shown by the high percentage (93%) of teachers who use them frequently or most frequently. "Lecture-demonstrations" are also used by 80% of the teachers. There was a correlation of $r = .38, p < .0001$ between Items 12 and 13 (ranked 1st and 2nd).

The third highest ranking was received by Item 17, which found that individualized instruction was used frequently or more often by 74% of the teachers and nearly all of them (99%) use it at least sometimes. There was a correlation of $r = .32, p < .001$, between Items 20 (student peer tutors) and 17, which indicates that many of the same teachers who use individualized instruction also use peer tutors.

Items 10 and 11 (ranked 5th and 22nd) show that lectures, when used, tend to be short in length. In Item 14, most teachers reported that they use "discussion (teacher led, class participatory)" to some extent. The ranking for this item was 8th and it found that only 16% use discussion "most frequently," but a total of 91% use it at least "sometimes".

Small group discussions (Item 18) were used sometimes or more frequently by 82% of the teachers and ranked 13th. Role playing is used frequently by only 15% of the teachers, but an additional 30% use it sometimes (Item 19--ranked last at 24th). A correlation of $r = .52, p < .0001$, was found between Items 18 and 19, so many of the same teachers use both small group discussions and role playing activities.

Individual projects (Item 24) are still used frequently by 70% of the teachers and at least sometimes by 91%. In fact, 30% of the teachers use individual projects most frequently, so their popularity overall has waned little, if any. Individual projects ranked 4th in this survey; however, there were negative correlations between this item and two others: Item 23, mass production projects ($r = -.26, p < .009$), and Item 15, seminar ($r = -.31, p < .0015$). The highest positive correlation between this item and any others on the survey was a correlation of $r = .30, p < .002$ with Item 2 (teacher designed/assigned projects). Of those teachers whose programs are housed in unit labs, 41% use individual projects most frequently, but only 19% of the teachers in conceptually oriented labs choose this approach most frequently.

Group projects, promoted by most new curriculum efforts, have been used by many teachers as shown by their 6th place ranking (Item 22). A total of 90% of the teachers reported using group projects at least sometimes; 59% use them frequently. This item correlated positively with Item 23, mass production projects ($r = .59, p < .0001$); and Item 27, group designed/selected projects ($r = .32, p < .0009$).

Laboratory experiments (Item 21) ranked 7th and were used frequently by over half of the teachers. There were positive correlations between this item and first ranked Item 12, demonstrations ($r = .33, p < .0008$); Item 13 (ranked 2nd), lecture-demonstrations ($r = .35, p < .0003$); and Item 28 (ranked 21), discovery method ($r = .33, p < .0008$). Small group discussions and class discussions were also found to have a slight positive correlation with laboratory experiments.

Item 25 (ranked 10th) found that about half of the teachers (49%) use teacher designed/assigned projects frequently and a total of 83% use them sometimes. Student designed/selected (free choice) projects were reported to be used frequently by 45% of the teachers and ranked 9th in the survey (Item 26). In Item 27, 39% of the teachers reported that they use group designed/selected projects frequently to yield a ranking of 15th. There was a positive correlation of $r = .47, p < .0001$ between Items 26 and 27. Item 27 also correlated with Item 23, mass production ($r = .38, p < .0001$), and Item 22, group projects ($r = .32, p < .0009$).

Mass production (line production) projects (Item 23--ranked 17th) are used frequently by 37% of teachers and at least sometimes by 74%. Positive correlations were found between this item and five others: Item 14, discussion ($r = .34, p < .0005$); Item 18, small group discussions ($r = .39, p < .0001$); Item 19, role playing ($r = .44, p < .0001$); Item 22, group projects (see above); and Item 27, group designed/selected projects ($r = .38, p < .0001$). There was also a slight negative correlation between this item and Item 24, individual projects ($r = -.26, p < .009$), which indicates that teachers who have adopted this learning activity are somewhat turning their backs on the traditionally popular individual project.

The discovery method (Item 28--ranked 21st) was used frequently by 28% of teachers and sometimes by a total of 65%. The highest correlation found with this item was with Item 21, lab experiments ($r = .33, p < .0008$).

**Table 3**

*Correlations Between Items 29 through 33*

| Item No. | Stem (abbreviated) | 29 | 30 | 31 | 32 | 33 |
|---|---|---|---|---|---|---|
| 29 | Computers for presenting info. | -- | .91 | .81 | .73 | .60 |
| 30 | Computers for demonstrations | | -- | .85 | .78 | .61 |
| 31 | Computers by students | | | -- | .84 | .56 |
| 32 | Computers to prepare materials | | | | -- | .77 |
| 33 | Computers for clerical chores | | | | | -- |

*Notes:* All values rounded to two decimal places. All values significant beyond the .0001 level.

The last five items on the questionnaire concerned uses of computers in technology education. In Item 29 (ranked 19th), 44% of teachers claimed to use computers frequently for presenting information. In Item 30, 42% used computers frequently for demonstrations (rank = 20). Computers were used frequently by students for lab activities in the classes of 55% of the teachers (Item 31--ranked 11). Item 32 found that 54% of the teachers use computers frequently to prepare materials (rank = 12). In Item 33, nearly half of the teachers (44%) said they use computers for clerical chores, resulting in a ranking of 14th. There were several high positive correlations among this set of related items, and these are presented in Table 3. These findings indicate that roughly half of the technology education teachers have become very involved with computers, those who use computers employ them for multiple uses, and the rest of the teachers are generally not using computers for any of the applications studied here. No significant correlations were found between any form of computer utilization and any other factor or teaching strategies on this questionnaire.

*Co-curricular Differences*

Item 4 asked teachers if they used a co-curricular approach to implement their TSA organization. The co-curricular (in-class) approach was employed by only 35% of the respondents overall. Thus, the remaining 65% employ TSA on an extra-curricular (after school or activity period) basis only. This item showed some difference on the two derived subsets: among those who taught in modern labs, 41% used the co-curricular approach, but only 29% of those in traditional unit labs did. Of those who favored the name change 5 years prior to the survey 42% used this approach, but only 21% of those who opposed the name change use the co-curricular approach.

The answers to this item were also used to identify subgroups for comparison of teaching methods used by teachers incorporating the co-curricular approach and those that did not. Teachers who used the co-curricular approach showed differences on the use of six teaching methods. The co-curricular group used the short lecture (10 to 25 min.) more frequently than the extra curricular group $X^2(8, N\ 105) = 22.46, p < .013$, and they used individual projects less frequently $X^2(8, N = 105) = 21.89$, $p < .016$. Seminar $X^2(8, N = 105) = 16.02, p < .042$; Role play $X^2(8, N = 105) = 17.34, p < .027$; and Lab experiments $X^2(8, N = 105) = 17.72, p < .01$ all showed a significant increase in frequency with teachers who employed the co-curricular approach.

## Discussion

The characteristics of technology education programs reflect the curricular transition of our profession. Although about one-third of the teachers had opposed changing the name of industrial arts to technology education, currently 90% are pleased with the new name. The significant Chi-square value found indicates there has been a shift in attitudes since 1984. Half of the teachers reported their programs are housed in traditional unit labs (woods, metals, drafting, etc.). These labs are not as effective for implementation of technology based curricula as multipurpose and conceptually defined labs (manufacturing, communications, etc.). However, the most often reported conceptually defined labs were communications labs, which were only claimed by 12% of the teachers, and manufacturing labs used by less than 10%. Where they exist, construction and transportation courses must currently be housed in general purpose labs or force-fit into other sorts of labs because special construction and transportation labs were reported by only 2% and 1% of the teachers respectively. It is possible that the lack of appropriate facilities is making the curricular shift toward technology difficult. Even so, over 80% of the teachers reported that they teach courses named in state adopted curriculum guides and that their curricula closely follow those guides. So, despite facilities which may be inadequate in some ways, many teachers are trying to implement technology education in some fashion.

Typical teaching methods include demonstrations, lecture-demonstrations, and discussion. Individualized instruction is used frequently by over 74% of the teachers and sometimes by nearly all of them. Information is frequently presented via computers by almost half of the teachers (44%).

Student laboratory activities frequently employed include individual projects (70%), group projects (58%), lab experiments (55%), computer use by students (55%), and mass production projects (37%).

Though other vocational student organizations (i.e., FFA, VICA, and others) generally use the co-curricular (in class) approach, it is not universally accepted in technology education classes for TSA. There was evidence that teachers in unit labs and those who initially opposed the name change to technology education were less likely than their peers to use this technique. Even among the group of teachers who have seen the advantages of TSA for their students, and who advise active TSA chapters, only a little over a third use the co-curricular approach that has been so successful for other student organizations.

The results showed that the co-curricular approach altered the characteristics of the program over a number of items. Forty-one percent of the programs were housed in modern labs. Teachers implementing the co-curricular approach used short lectures more frequently and incorporated seminar, role play and lab experiments more frequently. Correlation analysis showed that these items were associated with small group discussion, class discussion, and discovery method among others.

The function of this difference is a change in the learning environment. Methods such as role play and seminar shift the emphasis of discourse from teacher-to-student to student-to-student interaction. According to Sternberg & Martin (1988, p. 569) student interaction is a necessary transition for developing problem solving skill. Costa (1984) associates methods such as seminar and role play with techniques that promote the development of thinking skills.

As facilities and curricula evolve in the 1990s, there will be many forces that will mold technology education. TSA organizations will certainly be one of those forces. This study characterized technology education programs with a TSA component and showed the effect of co-curricular organizations on the classroom environment. The influence that student organizations have on curricula and teaching methods should not be overlooked. When co-curricular TSA organizations are implemented, the organization becomes part of the education system and has the potential to alter the learning environment.

The relationship demonstrated here emphasizes the importance of developing a research paradigm to study the effect of TSA on technology education programs. Specifically, norms that define the characteristics of technology education programs with a TSA component should be established using this study as a base. Then, TSA variables (i.e. goals, activities, competitive events) should be analyzed to determine their effect on normed characteristics.

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