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Author
Dr. John R. Wright, Jr.
Ph.D., CSTM, CLSSGB, F.ATMAE
Millersville University

Dr. Walter W. Buchanan
Ph.D., J.D., P.E., F.ASEE, F.NSPE, F.ABET, F.IEEE
Texas A&M University

Joseph Robert Wright
CTM, CLSSGB
Drexel University

ATMAE
701 Exposition Place
Suite 206
Raleigh, NC 27615

www. atmae.org

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Is the Engineering Technology Profession Ready for a Name Change to Applied Engineering?

Keywords:
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JTMAE *PEER – REVIEWED RESEARCH PAPER*

Is the Engineering Technology Profession Ready for a Name Change to Applied Engineering?

Dr. John R. Wright, Jr. is a Professor, Coordinator for the Automation & Intelligent Robotics Engineering Technology (ARET) degree program, and the Interim Coordinator for the Applied Engineering & Technology Management (AETM) Nanofabrication Manufacturing Technology (NFMT) degree program in the Department of Applied Engineering, Safety & Technology at Millersville University of Pennsylvania. His research and teaching interests include semi-autonomous and autonomous mobile robotic development and control, industrial robotics/machine vision, humanoid robotics, programmable logic controllers, and systems integration. Dr. Wright has published and/or presented over 150 times in a variety of scholarly mediums including refereed journal articles, professional newsletter columns, refereed presentations, invited workshops, white papers, technical research reports, teaching-related publications, and local presentations and seminars. Dr. Wright has been very active with The Association of Technology, Management, and Applied Engineering (ATMAE) in promoting the development and recognition of applied engineering in industry and academia. He is a past chair of ATMAE's Board of Directors, an Charles W. Keith Award Recipient, an ATMAE Senior Fellow, a Certified Senior Technology Manager (CSTM), a Certified Lean Six Sigma Green Belt (CLSSGB), and has been recognized by Epsilon Pi Tau with a Distinguished Service Citation. Dr. Wright earned his BSIT and MS from Central Connecticut State University, and Ph.D. from Iowa State University.

Abstract

This paper focuses on whether better branding would be good for the field of "engineering technology," specifically if it would be better to call it "applied engineering." The stakeholders of the field were surveyed, and the majority felt that the field should be called applied engineering as engineering technology is confused with the term engineering technician. It was reported that most companies give the title "engineer" to four-year accredited engineering technology graduates. It was also found that most of those who were surveyed felt that the term "applied engineering" better described what these graduates did as opposed to the term "engineering technology," which would better be used for two-year associate degree engineering technology graduates. It was recommended that the rebranding of "engineering technology" to "applied engineering" be considered as industry has rarely used the job title "engineering technologist," and in 2020 - new Classification of Instructional Programs (CIP) codes will exist for the emerging field of applied engineering. Associate degree graduates were found to be typically called "engineering technicians." Most of those surveyed felt that industry/employers should be the ones to define what constitutes an engineer.

Introduction

A survey of the engineering technology community was conducted in 2017 to investigate the perceived major challenges of the profession. Members of the engineering technology Listserv were asked to participate in the study. The results of the survey were ultimately disseminated to both the American Society for Engineering Education (ASEE) Engineering Technology Division's (ETD) Executive Committee, and The Association of Technology, Management, and Applied Engineering's (ATMAE) Board of Directors (BoD) for strategic planning and development purposes regarding the field of engineering technology.

A Brief History of ET Education:

> "Formal engineering education in the United States was instituted by educators, not practitioners, and struggled to gain the support of practitioners (Grayson, 1980), even though the curriculum was still very much a hands-on endeavor. In the same period, European training was much more analytical. More emphasis was given to why things work, and application of mathematics and scientific principles were dominant (Bucciarelli, Coyle & McGrath, 2009). This theory-based approach is commonly referred to as engineering "science," whereas the hands-on, application-based approach is referred to as engineering "design" [or "applied engineering"]. It is the pursuit of balance between science and design that continues today" (Wright, Artharifar & Atwater, 2015).

The first two-year engineering technology program to be accredited by ABET was at the Franklin Institute of Boston in 1947 (Annual Report, 1984). The graduates were called "engineering technicians." In 1957 when the Soviet Union launched the first satellite, Sputnik, into space, the United States was concerned that we were behind the Russians in engineering and that more mathematics and science should be introduced into the engineering curriculum. To make room for this, fewer engineering courses with laboratory experiences were retained in the curriculum. When these graduates entered industry in the early 1960s, they were not ready for lab work, but this was not a huge problem as this was the height of the space race and many large aerospace companies such as Boeing and Martin had cost plus contracts with the government. At that time engineers could be brought up to speed over several months in company labs or through experience mentored on the shop floor.

Dr. Walter W. Buchanan is a Professor and Past Head and J.R. Thompson Endowed Chair Professor at Texas A&M University. He has served in professorial and administrative positions at Northeastern University, Oregon Institute of Technology, Middle Tennessee State University, University of Central Florida, and Indiana University-Purdue University Indianapolis, was an electronics engineer for the Naval Avionics Center, an engineering officer for the Navy, an aerospace engineer for the Boeing and Martin Companies, as well as an attorney for the Veteran's Administration. He is a Fellow and served on the Board of Directors of both the American Society for Engineering Education (ASEE) and the National Society of Professional Engineers (NSPE) and is a Fellow Member of the Institute of Electrical and Electronics Engineers (IEEE) and ABET. He is on the editorial board of the Journal of Engineering Technology, has authored or co-authored over 250 publications, and has been a principal investigator for NSF grants. Buchanan is a Past President of ASEE and has received the ASEE Distinguished Service Citation and Centennial Certificate, the ASEE James H. McGraw Award, and the ASEE Frederick J. Berger Award. He was selected as a Highly Accomplished Engineering Educator by ASEE Prism in 2005. Buchanan was a charter member of the Tau Alpha Pi Board of Directors and served as President in 2003. He holds a B.S.E and M.S.E. from Purdue University, and a B.A., J.D., and Ph.D. from Indiana University. He is a registered P.E. in six states and is a retired member of the Indiana State Bar.

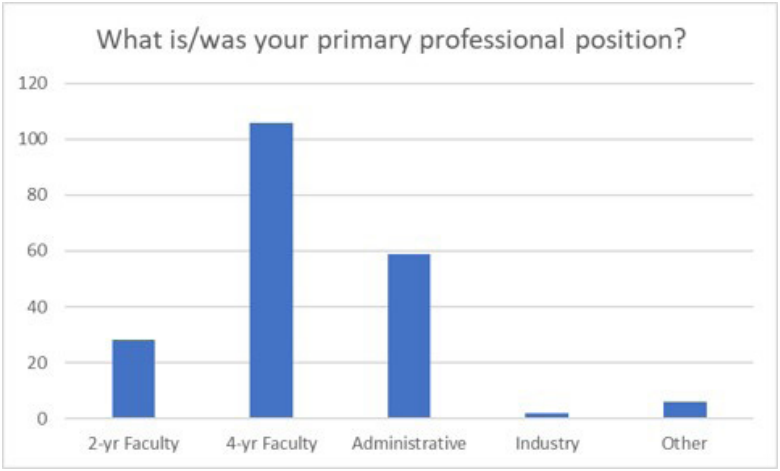
Even then, however, this was not the case with all companies and so there was a need for more "hands-on" graduates. Small to midsize companies required their engineers to be more practical and have range of skills that lie between the engineer and technician. As a result four-year engineering technology programs were developed and the first one accredited by ABET was at Brigham Young University in 1967 (Annual Report, 1984). At the time there was a debate on what to call these programs. One argument was to call them "Applied Engineering" and to call engineering programs "Engineering Science." Many engineering deans at the time did not like this idea and in the end, they won out. So in academia it was decided to call graduates of these four-year hands-on engineering programs "engineering technologists" and this position was endorsed by ABET. This, however, was never fully embraced by industry. Almost all the graduates were found to hold the title "engineer" in industry despite the marketing push by academics to brand them as technologists. In fact it was found that many of the companies later do not realize that these graduates came from an engineering technology program (Buchanan, 2018).

Survey Results:

A total of 24 questions were asked. The first five questions focused on demographic data of the responders. Critical to this paper was for the authors to be able to separate the respondents that were self-identified as members of ASEE's ETD. ATMAE members were also asked to self-identify themselves, but the survey clearly noted that those taking the survey were largely members of ASEE's ETD.

A total of 341 members of the engineering technology listserv participated in the survey. This constituted only 7.8% of the 4365 reported members in 2017. While this response rate is considered low, when filtered by self-identified ASEE ETD members, a 42.2% response rate was revealed. This is a significant response rate for a survey and is a substantial representation of the stakeholders directly involved with the development of the engineering technology field. A total of 201 of 476 ASEE ETD members (2017 data) participated in the study. As ATMAE self-identified members/respondents only constituted less than 5% of their 1100-member organization, this paper focuses on the filtered (ASEE ETD Self-identified Membership) survey results as this data represents a significant portion of the ASEE ETD membership. Figures 1-5 illustrate the demographic questions and responses from the membership.

Figure 1: Primary Profession



Joseph Robert Wright is a PhD Student and Graduate Research Fellow in the Department of Materials Science and Engineering at Drexel University. He received his B.A. in Physics with a concentration in Nanotechnology and B.S. in Applied Engineering & Technology Management with a concentration in Nanofabrication Manufacturing Technology from Millersville University. His research is centered on the mechanics and modeling of defects in pharmaceutical powder compactions. Joseph is a current member of ATMAE's Board of Directors, a Certified Technology Manager (CTM), and a Certified Lean Six Sigma Green Belt (CLSSGB).

Figure 2: Experience in Current Position

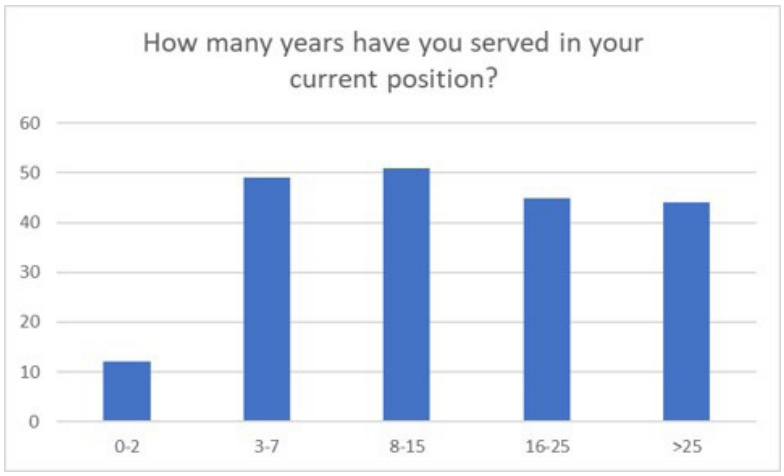


Figure 3: Education Earned

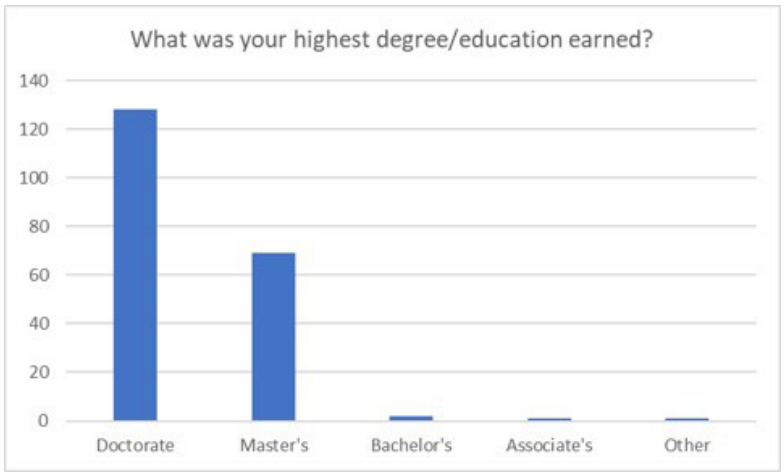


Figure 4: First Degree Earned

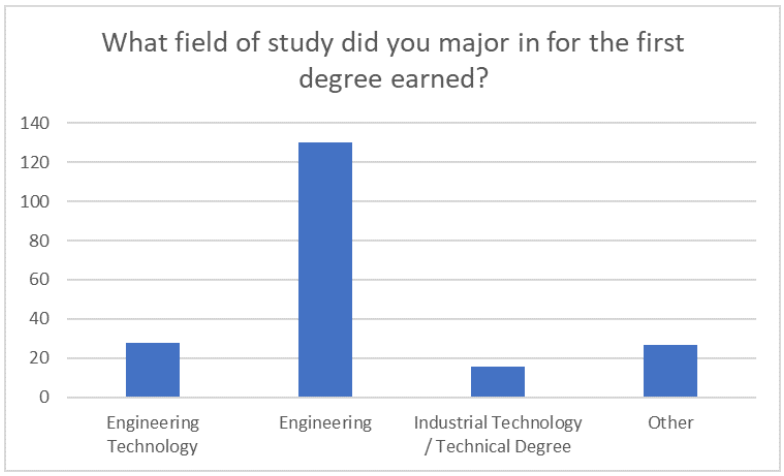
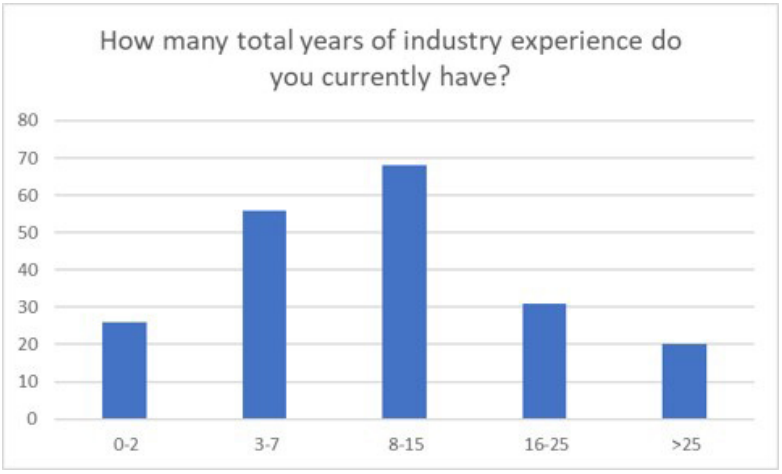


Figure 5: Total Years of Experience



The demographic data shown in Figure 1 reveals a survey population of faculty that prepare largely 4-year graduates of engineering technology degree programs (52.74%). These faculty appear to have a wide range of industrial experience with the majority stating they had achieved doctoral degrees (63.68%), depicted in Figure 3. A majority of respondents indicated earning their first degree in Engineering (64.68%), as observed in Figure 4.

Two questions asked the survey takers if they were members of ASEE ETD or ATMAE respectively. As reported earlier, the results were filtered to include ASEE ETD members only as such a small representation of ATMAE members (less than 5% of the ATMAE membership) had self-identified. If a respondent had self-identified as members of both organizations, their responses were included in this survey. The next three questions of the survey focused on the future concerns of the profession. Figures 6-8 depict the results.

Figure 6: Major Issue Facing the ET Profession

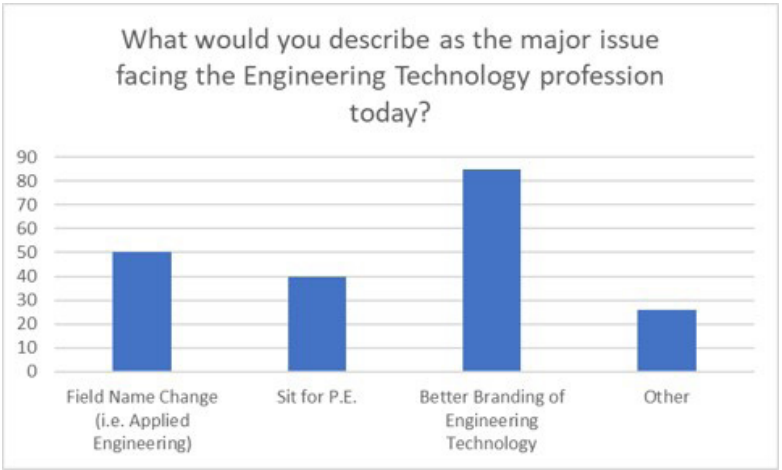


Figure 7: Institutional Priority

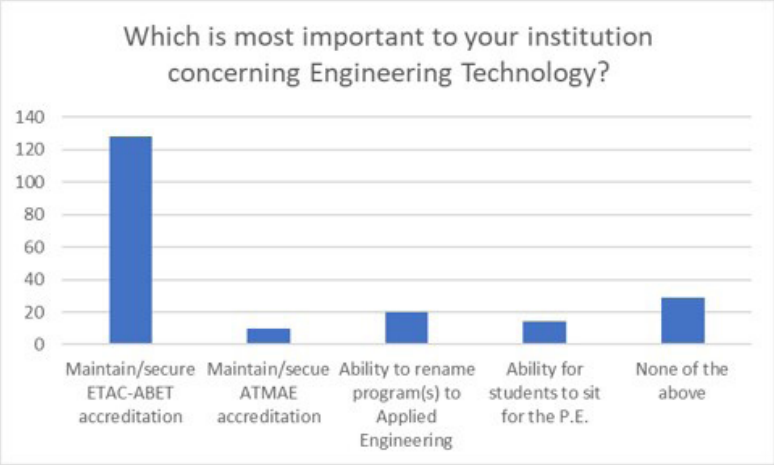
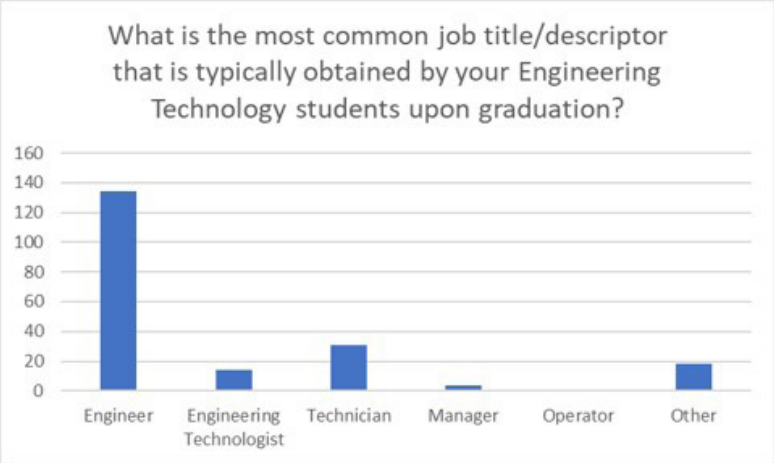


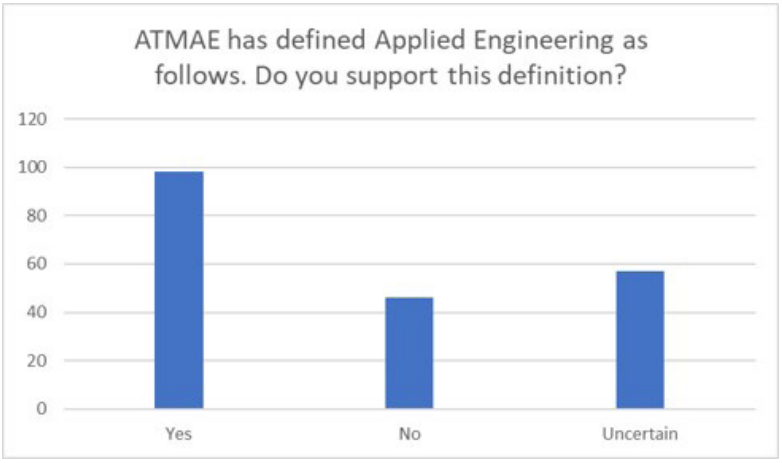
Figure 8: Most Comment ET Graduate's Job Title



Approximately 43% of respondents selected the need for better branding of "Engineering Technology" as their major issue facing the profession today, while an additional 24.88% stating a desire for a name change to "Applied Engineering." In total, approximately two-thirds (67.78%) of the ASEE ETD community feel that perception is an issue for their profession. The ability for engineering technology students to sit for the Professional Engineering (P.E.) exam as the top priority for the profession only mustered 6.97% (Figure 6).

Figure 7 shows that the faculty's institutions perceived top priority is to maintain ETAC-ABET accreditation (63.68%). Lastly, the most frequently reported job title for students that graduate engineering technology degree programs is that of "Engineer" (66.67%). Only 6.97% reported the use of engineering technologist as the most frequently award job title to their students by industry. The survey then asked a series of questions related to the emerging field of applied engineering. Figures 9-11 depict the results.

Figure 9: Support for ATMAE's Definition of Applied Engineering[2]



[2]Defined: Applied Engineering is the field concerned with the application of management, design, and technical skills for the design and integration of systems, the execution of new product designs, the improvement of manufacturing processes, and the management and direction of physical and/or technical functions of a firm or organization. Applied Engineering degreed programs typically include instruction in basic engineering principles, project management, industrial processes, production and operations management, systems integration and control, quality control, and statistics.

Figure 10: Support for ATMAE's Definition of Applied Engineering

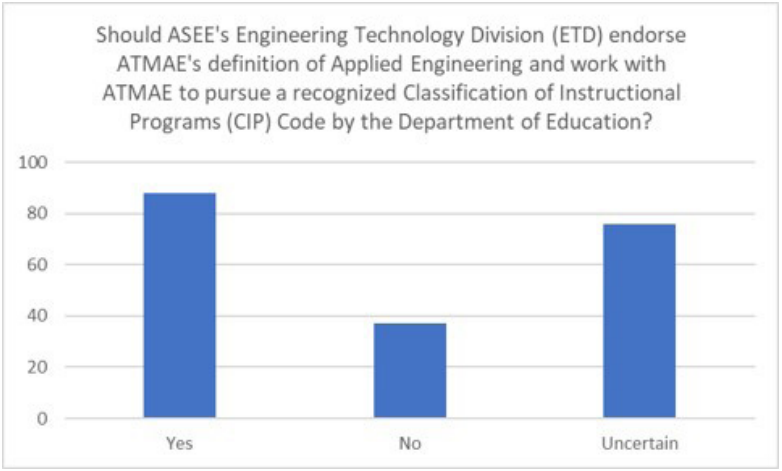
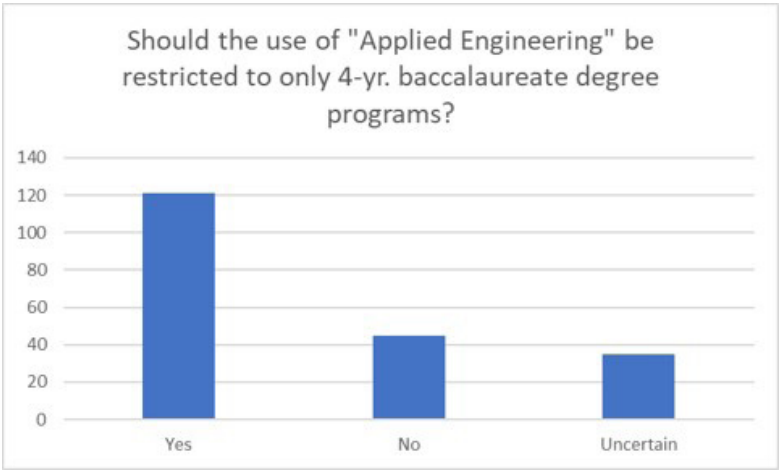


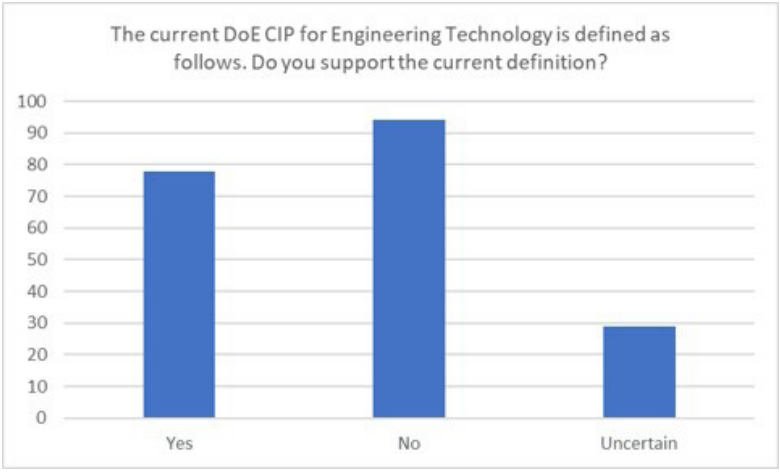
Figure 11: Should Applied Engineering be Limited to Baccalaureate Degrees



While 48.76% of the survey respondents support the ATMAE definition of applied engineering, 28.36% were uncertain, and 22.89% were unsupportive (Figure 9). In addition, 43.78% of survey takers had also supported endorsing ATMAE in their quest to obtain a new Classification of Instructional Program (CIP) code from the Department of Education in 2020 for applied engineering (Figure 10), and 60.20% of the member respondents felt that the field of applied engineering should be restricted to 4-year degree programs.

When respondents were asked about the current definition of engineering technology, the following data was recorded (see figures 12-14).

Figure 12: Support for Current Engineering Technology CIP Definition[3]



[3]Defined: Engineering Technology is the field concerned with the application of basic engineering principles and technical skills in support of engineers engaged in a wide variety of projects. Engineering Technology degreed programs typically include instruction in various engineering support functions for research, production, and operations, and applications to specific engineering specialties.

Figure 13. Support for Rebranding the Current Engineering Technology CIP Definition

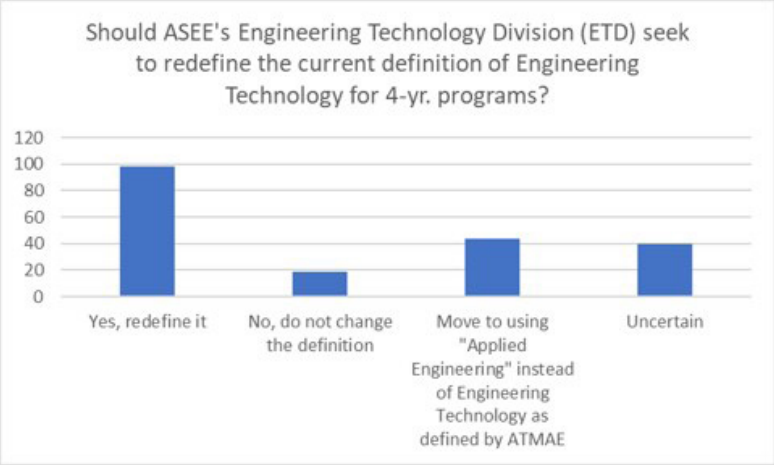
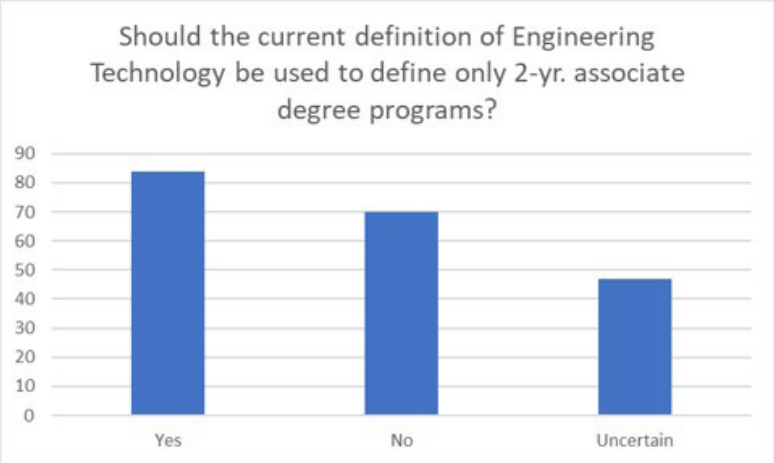


Figure 14. Support for Current Engineering Technology CIP Definition – Associate Degrees Only



Approximately 47% do not support the current CIP code definition for engineering technology. The majority (a combined 70.65%) appear to support redefining the profession with a new CIP code definition (48.76%) for engineering technology or moving to use ATMAE's definition of applied engineering (21.89%). The majority of respondents also felt that the current CIP code definition for engineering technology could be used to define 2-year associate degree programs in engineering technology.

The last section of the survey asked questions related to accreditation and the potential use of the term applied engineering in the rebranding of engineering technology. Figures 15-19 depict the results.

Figure 15. Support for ABET use of Applied Engineering

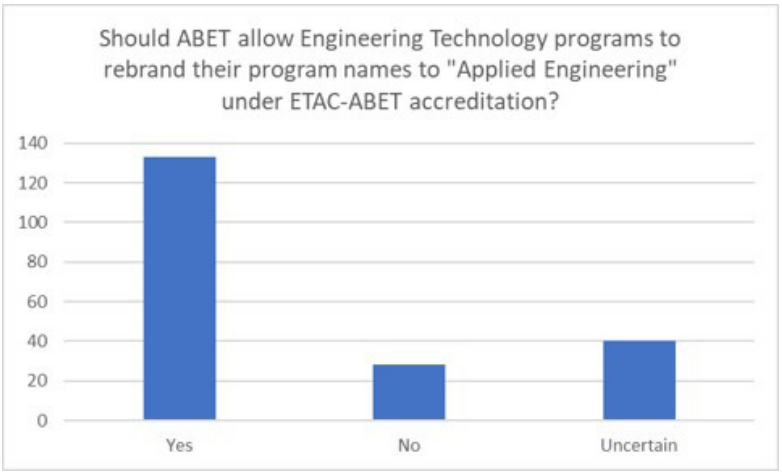


Figure 16. Support for the term "Technologist"

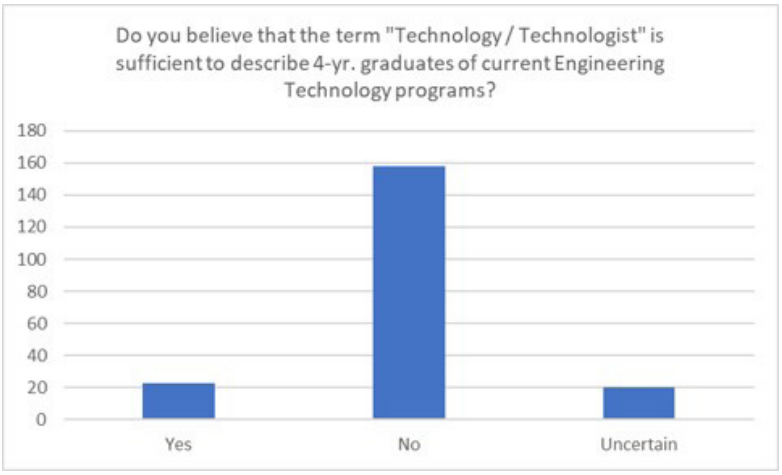


Figure 17. Are Engineering Technologists Actually Engineers?

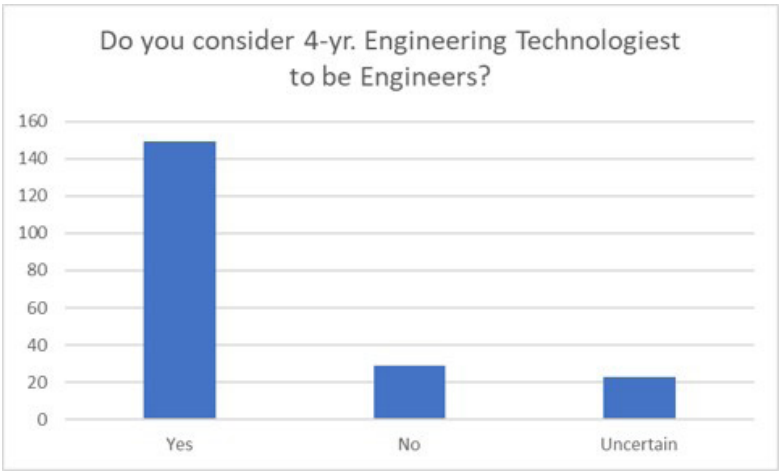


Figure 18. Who should define what is an Engineer?

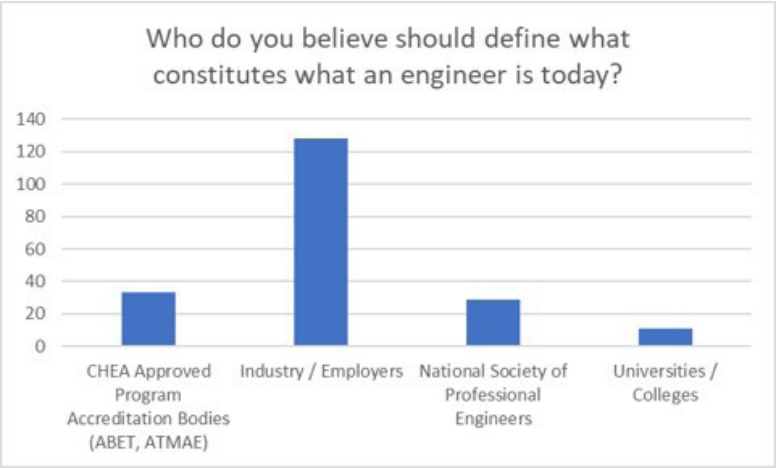
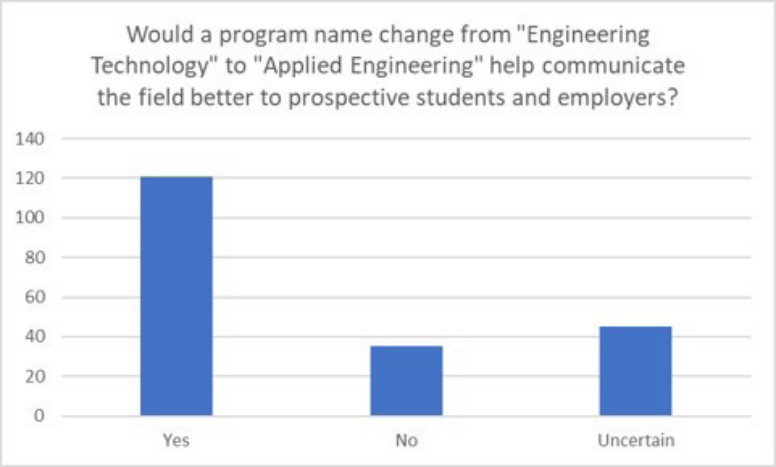


Figure 19. Would the use of Applied Engineering Help Communicate the Profession?



Approximately two-thirds of the survey takers felt that ABET should support the accreditation of applied engineering programs (ATMAE already accredits applied engineering degrees). 78.61% of respondents also felt that the term technologist is insufficient to describe a 4-year graduate of an engineering technology degree. When asked directly as to whether engineering technologists are considered to be engineers, the respondents (74.13%) stated in the affirmative. Further, the belief that industry defines who is an engineer is revealed in Figure 18. Lastly, the survey asked a direct question as to whether a program name change from engineering technology to applied engineering would help communicate the field better to prospective students and employers. 60.20% replied "yes."

Discussion/Conclusion:

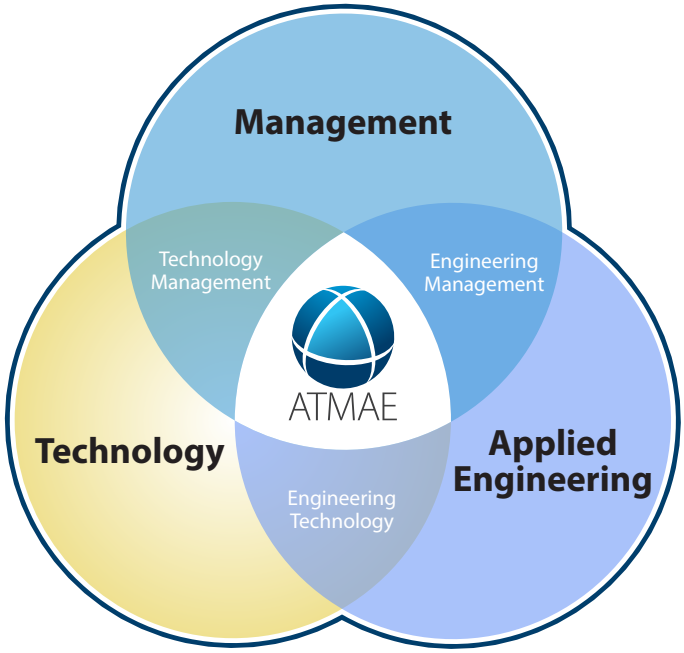
It appears that the results of the survey indicate that there has been a perception struggle within the engineering technology profession and community - one that can be dated back to the inception of the field when four-year engineering technology programs began to be offered. A 2012 article called "Engineering Technologists are Engineers" appeared in the Journal of Engineering Technology. In this article, Ronald Land discusses a survey that he conducted to industry professionals. The survey had 200 responses (173 came from companies with a history of both types of graduates serving in engineering roles) and summarized that, "for a very broad range of engineering companies operating across the full spectrum of engineering services and products, baccalaureate engineering technology graduates are

engineers. Moreover, these graduates function in many engineering roles equally as well as their contemporaries from engineering. In some roles, they perform even better" (Land, 2012, p. 38).

The struggle with professional perception also took place within the field of industrial technology for more than forty years. Industrial Technology four-year programs also developed practical engineers with a managerial element of coursework, and these programs were typically accredited by ATMAE. Industrial Technology programs evolved nearly simultaneously to engineering technology in an effort to develop a solution for the needed practical engineer, but from industrial education programmatic roots. Since 1967, the Association of Technology, Management and Applied Engineering (ATMAE, formerly the National Association of Industrial Technology, or NAIT) has sought to meet industry's workforce needs, and to provide professional development opportunities for its members to maintain the competitive edge in technology, management, and applied engineering (About ATMAE, 2019).

In 2009, ATMAE changed their name from the NAIT and began promoting and advocating for the emerging fields of applied engineering and technology management in addition to technology programs. The ATMAE Venn diagram shows the fields of study that ATMAE represents (Figure 20).

Figure 20. ATMAE Venn Diagram (Wright, 2017)



Recently, ATMAE petitioned for and was successful in gaining new CIP codes for these fields which will be recognized formally in 2020 by the Department of Education's National Center for Education Statistics (NCES). Applied Engineering will now join other traditional engineering fields with its own 14.0103 CIP code, but is defined to retain its practical bent. Two-year programs designated as Applied Engineering Technologies/Technician will also be recognized with a 15.001 code designation (See figure 21).

Figure 21. New 2020 CIP Codes

Applied Engineering 2020 CIP Code: 14.0103 (NEW)
A program that generally prepares individuals to apply mathematical and scientific principles inherent to engineering to the management and design of systems, execution of new product designs, improvement of manufacturing processes, and the management and direction of the physical or technical functions of an organization. Includes instruction in basic engineering principles, project management, industrial processes, production and operations management, systems integration and control, quality control, and statistics.

Applied Engineering Technologies / Technicians 2020 CIP Code: 15.001 (NEW)
A program that generally prepares individuals to apply basic engineering principles and technical skills in support of engineers engaged in the management and design of systems, execution of new product designs, improvement of manufacturing processes, and the management and direction of the physical or technical functions of an organization. Includes instruction in basic engineering principles, project management, industrial processes, production and operations management, systems integration and control, quality control, and statistics.

Engineering Technology programs now have the opportunity to accredit their programs under the newly recognized CIP codes secured by ATMAE starting in 2020 to better brand and define their profession. The results of this survey support the conclusion that four-year engineering technology graduates should be called "engineers," and that their degree should be called "applied engineering." Is the Engineering Technology profession ready for a name change?

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