

Applications of the Myers-Briggs Type Indicator in Engineering and Technology Education--Part II

**Charles F. Yokomoto, Roger Ware
Indiana University-Purdue University Indianapolis**

Abstract

This paper presents a broad historical perspective of the Myers-Briggs Type Indicator (MBTI) and its application to the teaching/learning process in engineering and technology education. While the instrument has been found to be most useful in the areas of learning styles, retention, and facilitating teamwork, it has also found use in understanding individual differences in retention issues, writing, problem solving, and interpersonal communications.

1. Introduction

At the 1998 ASEE Annual Conference, E. Dendy Sloan¹ delivered an elegant address on the introduction of the Myers-Briggs Type Indicator (MBTI)² to the engineering and technology teaching community. He mentioned how Katherine Briggs and Isabel Briggs Myers began development of the instrument in the early 1940s, based on the description of psychological types described by Swiss psychologist Carl G. Jung³ in 1921 and how a consortium of seven universities, led by Mary McCaulley⁴ of the Center for Applications of Psychological Type and the University of Florida, did a study of personality types of engineering and technology majors. He then discussed how it can be used to understand a mismatch between the personality type of typical engineering professor and the typical engineering student. This paper is the result of requests that the ERM Division received for a continuation of Sloan's presentation, focusing on the ways that the instrument can be used in engineering and technology education. In this paper, we will continue the discussion of its use along the following lines:

- The psychological foundations of the instrument
- A few examples of the ways that the MBTI has been used in engineering and technology education
- Ways you can use the instrument
- Flexibility of the instrument
- How to get started
- Statements of caution

2. A Very Brief Review of the Instrument

The MBTI is a forced choice instrument that assesses healthy, conscious human personality type through the identification of a person's self-reported preferences on four bipolar scales.

These are scales that can be thought of as representations of dichotomies such as being left-handed or right-handed, dominant right-eyed or left-eyed, conservative or liberal, etc. Our preferences on each of the scales help define ourselves, and they describe who we are and how we prefer to learn.

2.1. The Four Scales of the Instrument

Extroversion (E) Versus Introversion (I). Extroversion describes a preference for directing your mental energies to the outer world of people and objects, and introversion describes a preference for directing your mental energies to the inner world of thoughts and reflections. Thus, extroverts tend to be action oriented and trust trial-and-error learning, while introverts (I) tend to be reserved and prefer to reflect before acting. Extroverts are described as sociable, external, extensive, and interacting, and they desire a breadth of experiences, while introverts are said to be territorial, internal, and intensive, and they prefer a depth of experiences, being able to concentrate for long periods of time. Each individual uses both extroversion and introversion, but generally, one is preferred.

Sensing (S) Versus Intuition (N). Sensing describes a preference for perceiving, or gathering information, with the five senses, placing trust in factual realities, and intuition describes a preference for perceiving through the mind, placing trust in ideas and possibilities. Thus, sensing types are said to be sensible and realistic, and they place trust in their experiences and a wisdom of the past, and intuitive types are said to be imaginative, speculative, and ingenious, and they trust hunches, possibilities, and inspiration. Each individual uses both sensing and intuition, but generally, one is preferred.

Thinking (T) Versus Feeling (F). Thinking describes a preference for evaluating, or judging, your perceptions on the basis of impersonal, logical objectivity, and feeling describes a preference for evaluating your perceptions on the basis of interpersonal empathy and personal values. Thus, thinking types are said to be objective, evaluative, logical, and firm, and they tend to prefer policies, principles, and justice. Feeling types are said to be subjective, empathetic, persuasive, humane, and appreciative, and they tend to value social values, harmony, and positive strokes. Each individual uses both thinking and feeling, but generally, one is preferred.

Judgment (J) Versus Perception (P). Judgment describes a preference for things being planned and scheduled, working steadily toward closure, and perception describes a preference for things being open-ended, remaining open to changes. Thus, judging types are said to like things settled, decided, and planned, and perceptions types are said to like things open-ended and flexible, and they like options and the freedom to adapt as they go. Each individual uses both judgment and perception, but generally, one is preferred.

2.2. Forming Personality Types from the Four Scales

The four scales, each with two poles, result in sixteen different personality types, each indicated by a set of four letters, such as ISTJ, ENFP, ENTJ, etc. The ISTJ personality is one who favors introversion (I), sensing (S), thinking (T), and judgment (J). People who have the ISTJ

personality type tend to be dependable, diligent, logical and realistic, and they enjoy working in areas where individual drill and practice in conventional thought requiring the systematic logical assessment of practical realities lead to accomplishments. While all types can demonstrate diligence and dependability, these traits are more pronounced in the ISTJ type. Furthermore, this personality type is dominant in typical populations of engineering students, and even casual reflection on the kinds of learning that engineering students must master allows us to understand why this is so. The ENFP personality is the opposite of the ISTJ and favors extroversion (E), intuition (N), feeling (F), and perception (P). They tend to be enthusiastic and imaginative, flexible and helpful, and they enjoy working where insightful imagination and broad general knowledge can lead to accomplishments. The ISTJ personality type is drawn to engineering and business in large numbers, and the ENFP, is drawn to areas such as counseling and art.

The sixteen types are described in a variety of publications^{9, 11, 12}. For general reading on the MBTI and its applications in teaching and learning, we recommend references eight through twelve, and for specific applications of the MBTI in engineering and technology education, we recommend references twelve through sixteen and eighteen through thirty-two. Some of the applications include problem solving¹⁴, writing¹⁵, retention^{16, 18, 19, 25}, ethics²⁶, and attitudes toward innovation and creativity²⁹.

2.3. Foundations

What makes the MBTI stand out from the crowd of learning styles assessment instruments is that it is backed with a considerable range of resources for use in the academic community, the business community, and the counseling community. Not only is it used in research, but it is a highly researched instrument with reliability and validity studies being continuously conducted and reported². Here are several points that contribute to its solid reputation.

- The MBTI is a well-respected personality assessment instrument in the psychological and counseling communities. Its basis is the works of Swiss psychologist Carl G. Jung, and interested users are able to obtain a deeper understanding of personality type by reading his writings.
- Consulting Psychologists Press, Inc., its publisher, publishes a catalog with a wide array of books and monographs on its theory, interpretations, and applications.
- The Association of Psychological Type (APT), a professional association that promotes the ethical use of the MBTI, has special interest groups in cross cultural aspects, counseling and clinical aspects, education, health and psychological aspects, marriage and family, management and organizational development/business/careers, personality and social psychology, psychometrics and validity, religion, theory, history, and other instrument.
- APT sponsors a biannual international conference that draws practitioners from many areas of applications of the instrument and publishes the Journal of Psychological Type (JPT), a reviewed journal on works related to the MBTI.
- The Center for Applications of Psychological Type (CAPT) in Gainesville, FL, was established to promote applications and research. They publish a catalog of resource materials for research, education, and workshop leaders, including a comprehensive

bibliography of papers written on research conducted with the MBTI, many of which cannot be found through an ERIC search.

3. How the MBTI Has Been Used in Engineering and Technology Education

The MBTI can be used in a wide range of areas because of its ability to model, in a very elementary sense, human cognition. In engineering and technology education, it has been used as a guide in the design and delivery of instruction, as a research instrument, and as a coaching tool. It is used in a variety of areas, including problem solving, communication skills and styles, facilitating groups, management and leadership, counseling, interpersonal skills and styles, and writing. Here are some examples of papers published on applications of the MBTI in engineering and technology education.

- A study of the correlation between performance on problem solving exams and solving homework problems by Yokomoto and Ware¹¹ showed that the correlation is higher for intuitive (N) types when the exam uses a conceptual framework and higher for sensing (S) types when the exam problems are "just like the homework."
- A study of the quality of writing in a technical writing course by Held and Yokomoto¹² showed that judgment (J) types did significantly better than perception types.
- A study of retention and persistence by Rosati¹³ showed that success in the first year and completion of the program after five years favors students who favor introversion (I), thinking (T), and judgment (J), somewhat confirming the results of Schurr and Ruble¹⁴ who found that judgment (J), followed by introversion (I), were the best predictors of performance after two years at a Midwestern university. Additional information about retention in engineering can be found in¹⁵.
- McCaulley⁷ presented data that showed that introverted types were most attracted to agricultural engineering (83% I, 17% E) and least attracted to industrial and systems engineering (54% I, 46% E); sensing types were most attracted to agricultural engineering (75% S, 25% N), industrial and systems engineering (64% S, 34% N), and mechanical engineering (64% S, 36% N) and least attracted to aerospace engineering (28% S, 72% N) and nuclear engineering (30% S, 70% N); thinking types were most attracted to nuclear engineering (77% T, 23% F) and aerospace engineering (69% T, 31% F) and least attracted to industrial and systems engineering (50% T, 50% F) and mechanical engineering (54% T, 46% F); and judging types were most attracted to chemical engineering (79% J, 21% P) and least attracted to agricultural engineering (50% J, 50% P). These results can be helpful in counseling students in the selection of a major.

4. Ways You Can Use the MBTI in Engineering and Technology Education

There are several ways that you can use your knowledge of the MBTI personality model in engineering and technology education. Some of the applications may require you to satisfy your campus guidelines for research with human subjects.

Learning the type make-up of your classes. By assessing the personality types in your class and determining the distribution of types for comparison with any of several data bases³⁴, you will find out if your students are more like the general public or like the ISTJ engineering and

technology stereotype. You will probably find out that you have a diversity of preferred learning styles in your class and that they are not all like you or the stereotype.

Developing your instructional materials to appeal to the different types . You can develop your instructional materials and exercises to appeal to different types by understanding how different personality types prefer to learn and learn best. You can address the scales separately or use one of the combinations described in Section 4. You can also reinforce information that a person might ignore by treating it as unimportant, such as the sensing type's tendency to ignore concepts and the intuitive type's tendency to ignore procedures.

Helping students select an engineering major . You can use personality type to help counsel students in the selection of an engineering major or in switching majors. As mentioned earlier, results reported by McCaulley⁴ demonstrated that feeling types were more attracted to industrial engineering than aerospace engineering, and sensing types were more attracted to agricultural engineering and civil engineering than nuclear engineering. Using this knowledge, the authors were able to help an ESFP student choose industrial engineering, the engineering discipline that attracts the largest percentage of feeling types, over electrical engineering as a major.

Understanding behaviors in the classroom and laboratory . You can use knowledge of type to understand differences among the students in your class, such as why some students turn equipment on without careful checking (E types) and why some hesitate to turn it on without excessive checking (I types), and you can understand why some students speak up quickly and why some hesitate excessively

Counseling students with personal problems . Counseling students with personal problems can be aided with knowledge of type. For example, if a student seems to not be able to get work done, knowing whether a student is a perception type or a judgment type can help you narrow down the problem. If a student is hampered in doing work by peer pressure to go to social events, knowing the person's preferences on the E-I scale and the J-P scale can be a major assistance.

Coaching students . You can coach students on ways to improve learning and testing by using your knowledge of personality type and learning styles to ask the right questions. For example, you can help students understand why they need to take notes and review them in some classes by knowing if they are extroverted or introverted.

Conducting research . You can conduct small experiments to investigate the effect of personality type on a wide range of aspects of the teaching/learning process.

As you can see, you can use knowledge of type in a wide range of activities, and the way that you choose to apply the instrument may very well be a function of your type.

5. Flexibility of the MBTI

The MBTI's scales can be used in different ways off differing degrees of complexity. Here are

several of the more popular ways.

- Each of the four scales can be used separately, using a knowledge of learning style behaviors attributed to each of the four scales. The E-I and J-P scales can be used to plan the classroom environment.
- Whole type, such as ESTJ, INFP, ENTP, etc., can be used, where the subtle differences between the types are used. We do not recommend this approach since it would require excessive planning to incorporate all sixteen types into your planning.
- The cognitive pairs, ST, SF, NT, and NF, can be to help you write your course notes and deliver instruction by giving you clues as to the different ways that students are processing your information.
- The temperament pairs, SP, SJ, NF, and NT, can be used in determining how your students will work, for the temperaments affect how individual prefer to work, helping you to understand why some students leave things to the last minute (SP), why some prefer a rigid schedule (SJ), why some are intellectual perfectionists (NT), and why some thrive on positive strokes (NF). This model is described in detail by Keirsey^{14, 35}.

Needless to say, these variations can also be used in classroom research in teaching and learning.

6. Getting Started With the MBTI

For those who wish to get started with the MBTI, here are some suggestions to assist you.

- Read several of the references that have been recommended earlier in this article.
- Locate faculty on your campus who have experience with the instrument. If there are none in your school or unit, inquire among faculty members in psychology, sociology, education, counseling, adult education, organizational development and leadership, business, or continuing education.
- Attend faculty development workshops on the use of the instrument. These workshop will not qualify you to administer the instrument, but you may meet other faculty members who can administer the instrument for you and perhaps collaborate with you.
- Attend training programs conducted by the Association of Psychological Type or other related organizations. You are expected to be a qualified user in order to purchase the instrument and to administer it.
- Find out if the Association of Psychological Type has a chapter in your city. They may have monthly meetings on the use of the instrument.
- Check with your office that is responsible for overseeing research with human subjects to see if you need to clear classroom research using the MBTI with them.

7. Statements of Caution

A person's first introduction to the MBTI can leave false impressions if a superficial description is given. To guard against this from happening as you read this paper, we include these statements of caution.

- A person should be given the sole right to determine if his or her MBTI scores is acceptable.
- A person's scores on the MBTI should not be use as labels.
- A score near the center of the scale does not necessarily indicate talented use of both preferences, nor does it necessarily indicate conflict between opposite preferences.
- A strong preference for a particular attitude or function does not indicate that it necessarily used well, only that it is strongly preferred. It is reasonable to expect, though, that a preferred and valued function will be used often and hence should be well developed.
- A strong preference on a particular scale does not mean that the corresponding preference on the opposite end of that scale is undeveloped. For example, a person with a very strong preference for extroversion may have developed the ability to turn psychic energies inward in reflection.
- A person with a particular type may be able to use a learning style attributed to his or her opposite type and use it quite well. It is very interesting to find an ENFP type, for example, the type that is very commonly attracted to counseling psychology, journalism, and art, who is as capable as any INTJ, the type that tends to have the highest grades in engineering and is commonly drawn to engineering research. It is equally interesting to find an successful engineering student with an INTJ personality type who is does volunteer work with the homeless and the elderly.
- Personality type is much more dynamic than the static scales that comprise its model.
- Do not use the MBTI in ways beyond your training and understanding.
- Do not interpret the model to be more factual than intended or to be more general than intended.

8. Concluding Remarks

The Myers-Briggs Type Indicator is a versatile personality assessment instrument and is probably the best-selling instrument of its kind. It is useful as a learning styles instrument and as a research instrument in classroom assessment. It helps us to understand the teaching/learning process, and it helps us counsel students according to their personality type, their expectations, and their beliefs. However, it is a highly professional instruments, and we must be professional in its use. It is supported by the writings of Carl G. Jung and an enormous amount body of writings on its validity, reliability, construct, and applications. Anyone interested in an instrument that helps us learn about individual differences in the engineering and technology classroom is encouraged to look into it.

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CHARLES F. YOKOMOTO

Charles Yokomoto holds the rank of Professor of Electrical Engineering at IUPUI. He received the BSEE, MSEE, and PhD degrees from Purdue University. His current interests are in the area of assessment of learning outcomes, coaching, learning styles, problem solving, and personal heuristics. He has chaired the School of Engineering and Technology's outcomes assessment committee for the past four years and served on the campus Program Review and Assessment Committee since the 1994-95 academic year. He has presented papers on outcomes assessment at the 1998 Frontiers in Education Conference and the 1998 Rose-Hulman Best Assessment Processes in Engineering Education II, and he will be presenting another paper at the 1999 ASEE Annual Conference. In the area of learning styles, he has been using the Myers-Briggs Type Indicator (MBTI) in research and classroom applications and has published extensively in that area of teaching and learning. In the field of

electrical engineering, his research interests are in the area of computer-aided network design, optimization, and design centering.

ROGER WARE

Roger Ware is an Associate Professor of Psychology at Indiana University-Purdue University at Indianapolis (IUPUI). He received his degrees from the University of Louisville and the University of Kentucky. He has used the Myers-Briggs Type Indicator in his classes in group dynamics, in his consulting activities in industrial organization and human resources development, and in his research in individual differences. He has been published in the Journal of Psychological Type, the Journal of Personality Assessment, and Psychological Reports.