Engineering Education and Personality Types

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Abstract

Many teachers believe that being fair means treating all students equally. If this translates into using the same approach with every student or treating students identically, then problems are likely to arise for many students who may feel left out because of teacher's choice of classroom activities biased by his or her own teaching style. Educators have been using the Myers-Briggs Type Indicator (MBTI) to develop teaching methods, and to understand both individual learning styles and differences in motivation. In this investigation, MBTI is used to infer not only in terms of type casting students but also on how to understand better their learning differences, strengths and weaknesses. Once the natural and healthy differences that exist in students are fully understood, teachers can appreciate that being fair really means providing equal opportunities for each student to learn in the manner that best suits his or her own natural learning style. This work can improve the degree of satisfaction and understanding among university teachers and students.

1. Introduction

The Swiss physician-psychologist Carl Jung had the insight that people could be identified by their different - and equally legitimate – preferences for functioning. Jung wrote in his memoir that he developed *Psychological Types* to explain how an individual functions within a society; it is precisely the interplay of inborn personality preferences with the temperament of a family or a nation that permeates his discussion of type. Naturally, this is not "rocket science"; therefore, it causes a great deal of debate among psychologists.

Myers [1] had the vision to apply that knowledge, determining how people take in information, make decisions, and communicate thoughts and feelings. The MBTI (Myers-Briggs Type Indicator) is based on the Jung's theory that people with different personality profile organize information and perceive the world in different ways. The theory of psychological type has the power to transform human relationships, particularly the teacher-student interaction. In fact, it can help to improve interpersonal dynamics, avoid misunderstandings, and explain motivation.

The MBTI is an instrument designed to measure four dimensions of an individual's personality:

Extraversion (E) and Introversion (I): Some people are oriented to a breadth-of-knowledge approach with quick action; others are oriented to a depth-of-knowledge approach reflecting on concepts and ideas. Jung calls these orientations extraversion and introversion.

Sensing (S) and Intuition (N): Some people are attuned to the practical, hands-on, common-sense view of events, while other are more attuned to the complex interactions, theoretical implications, or new possibilities of events. These two styles of information gathering, or perception, are known as sensing and intuition, respectively.

Thinking (T) and Feeling (F): Some people typically draw conclusions or make judgments objectively, dispassionately and analytically; others weigh the human factors or societal import, and make judgments with personal conviction as to their value. These two styles of decision-making are called thinking or feeling, respectively.

Judgment (J) and Perception (P): Finally, some people prefer to collect only enough data to make judgments before setting on a direct path to a goal, and typically stay on that path. Others are finely attuned to changing situations, alert to new developments that may require a change of strategy, or even a change of goals. These two styles are called the preferences for judgment or perception, respectively.

Summarizing, the MBTI sorts these four sets of preferences, one from each pair, to filter out a person's preferred type. Hence, a person's four preferences indicate which of the 16 personality types he or she fits, as shown in Table 1. Philosophically, this system of classification places an equal value on all 16 types, respects the differences among people, and explains their varying points of view.

It is this well-researched view of type theory that we would like to apply to our discussion of teaching and learning styles. To do so, we will discuss several approaches to teaching, and how type is related to each approach. We feel this is the best way to improve teaching effectiveness, because it explains

why teachers are sometimes pressured to teach in a way that does not suit their personality styles and how students are forced to learn in environments that do not suit their learning styles either. To understand this, it is necessary to look at a teacher's and student's preferred teaching and learning styles, as it will be discussed later in this article.

TABLE 1: **The 16 MBTI types**

ISTJ	**ISFJ**	**INFJ**	**INTJ**
ISTP	**ISFP**	**INFP**	**INTP**
ESTP	**ESFP**	**ENFP**	**ENTP**
ESTJ	**ESFJ**	**ENFJ**	**ENTJ**

2. Types and Learning Styles

This section addresses the issue of how learning style should be used at higher-level education. There have been numerous attempts to classify the fundamental ways in which learning styles differ. Based on the work of several educators, Tennant [2] observes that learning styles can be typically represented as polar opposites of a single dimension, so that a person is described as field dependent/independent, reflective/impulsive, convergent/divergent, analytic/holistic, and so on. These varied approaches to learning should not be seen as mutually exclusive, rather they support the reasonable expectation that people differ in their learning styles in a number of ways.

An ideal learner needs four different kinds of abilities: concrete experience abilities, reflective observation abilities, abstract conceptualization abilities and active experimentation abilities. That is, the perfect learners must be able to involve themselves fully, openly and without bias in new concrete experiences, they must be able to reflect on and observe these experiences from many perspectives, they must be able to create concepts that integrate their observations into logically sound theories, and they must be able to use these theories to make decisions and solve problems.

This model does not apply to every learning situation, that is, not every learning opportunity demands a balanced integration of concrete experience, reflective observation, abstract conceptualization and active experimentation.

We tend to teach, as we ourselves like to be taught; commonly we assume that our students can learn best by employing the same techniques that we used as students. However people differ significantly in the way in which they learn best; it is believed that these learning styles are related to personality types [3].

Learning style is a term that refers to an individual's characteristic and consistent approach to perceiving, organizing and processing information. The idea that people have different learning styles is enticing for educators. First, it highlights the importance of learning processes, as well as teaching techniques. Second, it is an egalitarian concept because it focuses on people's strengths and weaknesses, that is, learners become *different* rather than bad, poor, average, good and excellent. Because of this, it would be naïve to expect that teachers could easily design and deliver a course to fit the learning style needs of all their students.

As it turns out, there are very few ideal learners, and most of us develop a preference or strength in one of the poles of each dimension. For instance, in the classroom, extraverts are the ones likely to begin working on an assignment before the teacher has finished writing it on the board, because they tend to think while they speak rather than before they speak. In discussion, they may interrupt frequently, dumping their thoughts quickly for consideration. They may have trouble sitting still for long periods of time, such as when listening to a lecture or writing a paper, and they usually work better when allowed to take frequent, active breaks.

Introverts, however, are likely to do well when given long, uninterrupted periods of study. They may even work better when they can get away from the distractions of the classroom. They are less likely than extraverts to contribute frequently to discussions. But when they say something, it has generally been well thought out. Because they like to rehearse they answer before speaking, they may be slow to respond to questions about new material.

Table 2 contains a summary of findings that relate personality type to learning styles. For example, the table also indicates how the process of learning is fundamentally different for sensing and intuitive people. The findings in this table have implications for teacher training and grouping of students. Learning is most effective if different but complimentary qualities are applied and combined, the integration of different techniques avoids burnout and boredom.

3. Types and Learning Styles

We would certainly not suggest that instructors must always adapt to the learning styles of their students. This is not only impossible in a diverse classroom setting, but it also creates too much stress on the instructor. Certainly, an instructor can use an approach and modify it for those students who may feel disconnected. An instructor who makes use of a lot of discussions in the classroom, for example, could be aware of the difficulty that introverts might have with the approach and be supportive rather than punitive when introvert students are slow to become

involved in debates. Instructors can also use individual tutorials, and other opportunities to individualize their advice, to teach in a way that makes sense to a particular student. If instructors are careful to avoid reifying their approach by saying "this is how I teach because it is related to who I am", their students can only benefit.

Extraverted teachers tend to be more activity-oriented, while introverted teachers usually like to allow more time for reflection. Extraverted teachers are generally more comfortable with noise classrooms than their introverted counterparts, who like to maintain an atmosphere in which they (and their students) can "hear themselves to think". Effective teaching is achieved by combining explanation on basic principles, then their meanings with concrete facts and examples.

This means that optimal acceptance is accomplished by balancing general description conducive to a proper understanding of the basic idea, providing an intuitive understanding; as well as by giving examples on its realization showing how the principle works, that is, easily captured by a sensing person. Effective teaching is also significantly enhanced by the emotional strength of the teacher who is capable of captivating the feeling students. Table 3 relates some aspects of personality traits to teaching. The ideal teacher, then, is one who can diagnose learning styles and select, from an armory of skill and techniques, the appropriate strategy for enhancing learning.

TABLE 2: **Types and Learning Styles**

Extraversion (E)	**Introversion (I)**
Es usually learn best in an active environment, and have trouble sitting for long periods of time listening to a lecture or writing a paper. They often work best when they can interact in small groups, talk lessons over with a partner. **E**s tend to plunge into the activities without much forethought, relying on trial-and-error rather than anticipation to solve problems. **E**s like to talk their thoughts as they come.	**I**s usually learn best when working quietly and alone, read lessons over or write them out before discussion. They like to think through a problem before talking about it. **I**s should be given adequate time to formulate their responses before discussing it, and are more comfortable when they can prepare their responses in advance, as they like to keep thoughts inside until they are polished.
Sensing (S)	**Intuition (N)**
Ss prefer the concrete to the abstract and tend to learn best in step-by-step progression. They follow clear, specific instruction and are often frustrated when given vague directions or unclear assignments, and usually are better at summarizing material than analysing it. They like demonstrations, films and audiovisuals, have practical examples and hands-on exercises, as this requires actively engaging the senses.	**N**s prefer the abstract to the concrete and can become bored during drill or factual lectures. They thrive in classrooms situations that place a premium on imagination, but are sometimes careless about details. They welcome opportunities for brainstorming, and are able to see the big picture. They work best if they can see global patterns, incorporate new approaches, demonstrate originality.
Thinking (T)	**Feeling (F)**
Ts prefer classrooms in which instructors provide a clear rationale for assignments. **T**s like topics that help them understand systems or cause-and-effect relationships, develop logical criteria. **T**s tend to think syllogistically and analytically. **T**s work best if they can prepare outlines and state the objective first.	**F**s prefer assignments in which they can find a human angle or have emotional investments. **F**s are less concerned with logic, but with values, and they like situation where helping people is the main activity. They see competition as disharmonious, and like instruction with feeling involvement.
Judging (J)	**Perceiving (P)**
Js tend to seek closure. They are comfortable making decisions and once a decision is made they stick to it. **J**s tend to be well-organized, to meet deadlines, and usually prefer to work on one task at a time. They thrive in a structured classroom, with systematically organized lectures and exercises, like to follow a study schedule.	**P**s tend to resist closure. They prefer spontaneity so that they can explore things without preplanning. **P**s like to work on multiple tasks simultaneously and often work right up to, and even beyond the deadlines. They work best if they have independence and autonomy to complete the tasks.

4. Discussion

It seems reasonable to expect that students encompass a variety of personality traits. Regarding learning styles, there is no one best combination of characteristics, since each preference has its own advantages and drawbacks. Therefore, it is a fallacy to think that professors can devise a single teaching technique that always appeals to all students.

The majority of university faculty members fall further along the scale toward the introvert side than do the majority of university students [4]. Additionally, the same survey shows that the majority (65%) of faculty in universities is found to be intuitives (N), although sensing (S) types dominate applied fields such as Engineering and Business. In fact, INTJ and ISTJ are the most common types among university professors. By the way, the majority of Elementary and High School teachers are ESFJ.

As the **E-I** scale reflects natural interests and considering that most university students prefer **E** or extravertion (although most university professors prefer I or introvertion), the extravert students respond better to discussion in order to learn and generate ideas than simple hearing a lecture upon it. On the other hand, students who prefer **I,** probably learn best by working alone, as they need solitude to think best and will benefit little from discussions; the **I**s need to think things through before they talk.

With respect to the **S-N** preference scale, the **S-N** function also reflects basic learning difference in taking in information. Sensing individuals focus on details, whereas intuitives need to see the big picture. Sensing-type students deal easily with observations and memorization of facts, but often need help in learning how to generalize from them. They often do well in courses that emphasize memorization, but experience difficulty with tests that require hypothesizing and problem solving. They can be helped to deal more successfully with abstract concepts if the professor begins with the concrete and moves step-by-step to the abstract, or if several specific applications of the theory are presented.

Sensing students are interested most in learning what is practical and can be put to directly use; they do best when the professor's directions are concise and to the point. In contrast, intuitive peers prefer to rely on their grasp, and ability to apply general concepts and tend to shy away the learning of facts *per se*; they deal well with abstractions, symbols and theory, and prefer open-ended projects.

The **T-F** preference correlates least with academic success, though as one might predict most highly successful Science and Mathematics students, and faculty members surveyed scored higher on the thinking scale, whereas those attract to Liberal Arts and to people-oriented fields, such as Psychology and Nursing, scored higher on the feeling side. Feeling people do their best with interpersonal domains requiring social skills, such as school teaching, Social and Medical Science.

This might be seen as a surprise, since one would assume that thinking might have some kind of edge. Recall that both thinking and feeling are valid preferences and processes. However, it is known that thinking types concentrate on the content of the lecture message, on the other hand the feeling-oriented student is concerned with how the message is delivered.

Thinking people do best with the analytical and impersonal domains such as Mathematics, Engineering, technical and mechanical activities; this is associated with analytical thinking. It is also linked with better performance on tests of intelligence and other cognitive tests. These people are believed to structure material more effectively and form concepts more readily. They are more capable of dealing with a lack of clear direction (which is a feature of the adults as apposed to the child learner). Not surprisingly, students in Arts and Social Science tend to prefer feeling (**F**), whereas students in Engineering and Business are more likely to prefer thinking (**T**).

Similarly the **J-P** difference is instructive for teaching and learning. Most professors tend to prefer judging (63%) whereas students are split 50:50 between judging and perceiving preferences.

Judging types crave for closure; they want to make a decision and go for it. Perceiving types tend to put off decisions, appear to waste time looking for all the information; even after one decision is made, they might reopen the issue and reconsider it. In general, perceiving types do better on aptitude tests while judging types tend to get higher grades in academic courses, presumably owing to their ability to focus themselves to a task. In terms of learning styles, judging types are considered to learn best in an orderly fashion through lectures and textbooks, and like meeting deadlines. Perceivers are found to prefer to cram and do things at the last moment, since they view learning as an open-ended activity.

In conclusion, good professors should be able to broaden their repertoire of effective teaching techniques, and so be able to reach all students at least some of the time. They should also consider varying their teaching styles on occasion to motivate and establish common ground with those few students who have different traits to their own. One suggestion is to view the teacher as a leader such that the goal of any leader is getting people to do what the leader needs and wants them to do. In the case of education, this means getting students to learn and to achieve by being aware of one's own personality styles, and the

wisdom and diversity of the various types. The MBTI is neither a measure of teaching performance nor learning competence, it is only an indicator of preferences. This objection does not preclude the possibility of using MBTI to improve higher education practices though. As a rule of thumb MBTI provides insights for effective teaching and learning, and it can be usefully employed as a guide for understanding learning styles and improving teaching skills.

TABLE 3: **Types and Teaching Styles**

Extraversion (E)	**Introverts (I)**
E teachers give students choices and voice, are attuned to changes in students attention and comfortable with noisy classrooms. **E**s tend to positively evaluate students who are active, energetic, enthusiastic.	**I** teachers structure teaching activities, are attuned to the ideas they teach and comfortable with business-like atmosphere. **I**s tend to positively evaluate students who are thoughtful, reflective, introspective.
Sensing (S)	**Intuitive (N)**
S instructors emphasize facts, practical information, concrete skills, they usually ask for detailed and fact-oriented questions. **S**s are biased to students who are factual, practical, accurate.	**N**s instructors emphasize concepts, implications of facts, their questions call for synthesis and meaning. **N**s are biased to students who are conceptual, creative, insightful.
Thinking (T)	**Feeling (F)**
T educators talk from an objective base, they want students to focus on what he or she is doing or saying, they attend to class as a whole. **T**s incline for students who are logical, Precise, critical of their own work.	**F** educators seek dialogue, engagement, they encourage students to focus on interpersonal work, they attend to individuals or small groups. **F**s incline for students who are personable, positive, pleasant to work with.
Judging (J)	**Perceiving (P)**
J scholars are very orderly and stick to class plan with organized lectures, they like well-arranged classroom. **J**s tend to positively evaluates students who are task-focused, timely, organized.	**P** scholars are lax and less organized, they like as much activity-oriented work as possible. **P**s tend to positively evaluate students who are spontaneous, adaptable, easygoing.

References

[1] Myers, I.B., McCaulley, M.H., Quenk N. L. and Hammer A. L. (1998). *Manual: A Guide to the Development and Use of the Myers-Briggs Type Indicator*, 3rd edition, Palo Alto: Consulting Psychologists Press.

[2] Tennant, M. (1997). *Psychology and Adult Learning*. London: Routledge.

[3] Fairhurst, A. M. and Fairhurst, L. L. (1995). Effective Teaching Effective Learning. Palo Alto: Davis-Black Publishing.

[4] Provost. J.A. and Adams S. (1987). *Applications of the MBTI in Higher Education*. Palo Alto: Consulting Psychologists Press.