Use of Personality Profiles in forming Laboratory Groups in Two Electrical and Computer Engineering Courses

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Abstract

The new engineering criteria emphasize the importance of teamwork in all engineering programs and give us a challenge in the absence of guidelines to form highly functional teams. This study presents the results of the investigation that measures the effects of using personality profiles in forming laboratory groups. Two courses with laboratory components were chosen to run this experiment for two semesters. The performances of the groups were evaluated by giving them anonymous surveys at the end of the semesters.

Introduction

The undergraduate population in the Electrical and Computer Engineering department is diverse and groups of minorities and international students constitute approximately 30% of the population. There are no guidelines as to how to form the laboratory groups such that the improved interaction between group members will positively affect the group performance. There

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are also conflicting results on placing a single minority student in a group of white males in an effort to integrate them to the majority. The effect of gender composition in teams and the effect of female/male ratio in organizations on the performance of Integrated Project Teams have been investigated [1]. It was observed that teams with even gender breakdown performed better than the teams with a single female member. We have been looking into team performance in our courses ever since some core courses in the curriculum were paired up with problem laboratories. Problem laboratories presented us a challenge because students had to communicate and work with one another in the absence of instruments or computers. Initially, we used the grades to form the groups making sure that every group contained an A student while observing a uniform distribution of women and minorities in the groups. At the end of the semester, course evaluation forms which contained additional questions to check the group performance, did not give us any positive feedback on group cohesion and performance when compared with randomly formed groups.

The extensive use of psychological type in work setting, education and career counseling [2] gave us the idea of applying personality profiles while forming our problem laboratory groups. Jung's comprehensive theory that relates to psychological type is the belief that everyone uses four basic processes or functions which are called sensing(S), intuition (N), thinking (T) and feeling (F). These four processes are used with the attitudes of introversion (I) and extraversion (E) and the orientations to the outside world as judgment (J) and perception (P).

Isabel Myers developed the following work expectations for the eight preferences [2]:

Extraverts (E):	Work interactively with a succession of people, or with activity outside the office or away from the desk.
Introverts (I):	Work that permits some solitude and time for concentration
Sensing Types (S):	Work that requires attention to details and careful observation.
Intuitive Types (N):	Work that provides a succession of new problems to be solved.
Thinking Types (T):	Work that requires logical order, especially with ideas, numbers or physical objects.
Feeling Types (F):	Work that provides service to people and a harmonious and appreciative work environment.
Judging Types (J):	Work that imposes a need for system and order.
Perceptive types (P):	Work that requires adapting to changing situations, or where understanding situations is more important than managing them.

All of these qualities would be used in analyzing a complex system by a team of four students,

some more so than the others. Intuitive-thinking (NT) types will usually have an advantage and find the requirements of the problem laboratory matching their expectations.

While forming our groups, we borrowed from Spranger's views on temperament [3] and paired the types as follows:

- NF values religiosity (ethics)
- NT values theoretical (science)
- SP values Aesthetic (Artistry)
- SJ values Economic (Commerce)

Students were asked to do the on-line test [4] which gave them four letters (E or I, S or N, T or F, J or P) and they e-mailed their four letters to the instructor who formed groups with either all of them having same temperaments (SJ) or all of them having different temperaments (NF, NT, SJ, SP). The instructors also paid attention to extravert/introvert balance in groups and chose two of the group members from the extraverts and the other two from the introverts. The placement of women and minorities in groups followed the recommendation given in [1].

Experiment I

In the first part of the experiment, all ten laboratory sections of the ECE 301 Linear Systems course were examined with a total of 42 groups of different temperaments and 31 groups of same temperaments. The results are summarized below.

1. Students were not informed of what type of groups they were placed in and asked the question "the people in my group have the same temperament as I do" to which they replied with a "yes" or "no". 70% of the students in different groups responded correctly that their group members were different and 61% of the students in all SJ groups responded correctly that they were the same as their partners.

2. One of the indicators of group cohesion is to continue the discussion on the course material among the group members outside the laboratory. They were asked the question "My partners and I had technical discussions about Linear Systems outside the laboratory" to which they replied with a "yes" or "no". 28 % of the students in different groups and 20% of the students in all SJ groups replied positively.

3. During problem laboratories, role playing was encouraged and students were asked to rotate the roles of "leader", "communicator" and "recorder". At the end of the semester, they were asked the question "Based on these three roles, which one would you say fits you the most?" The groups with different temperaments produced 39% leaders and 39% communicators whereas the all SJ groups produced 32% leaders and 47% communicators.

The remaining survey questions with respect to the group performance did not produce significant differences between the two types of groups. About 80% of the students in both groups showed a preference towards being placed in a group than forming their own groups. Objectives of the problem laboratory were also assessed by the survey instrument and on the average, 87% of the students responded “agree” or “strongly agree” to the related questions.

Experiment II

In the second part of the experiment, we looked at a different course which had a hardware laboratory component. ECE 200 Introduction to Electrical and Computer Engineering Laboratory was the setting where students worked in pairs. In this experiment, we tried to observe the relationship of different and same temperaments with one another as we formed the combinations of the available temperaments in a given semester.

Figure 1 shows the distribution of temperaments among ECE 200 sophomores. Consistent with the distribution of temperaments in the Electrical and Computer Engineering population nationwide, the sensing-judging (SJ) type is the most common one. This allowed us to form several groups with SJ as one of the temperaments. Figure 2 shows the distribution of the groups formed.

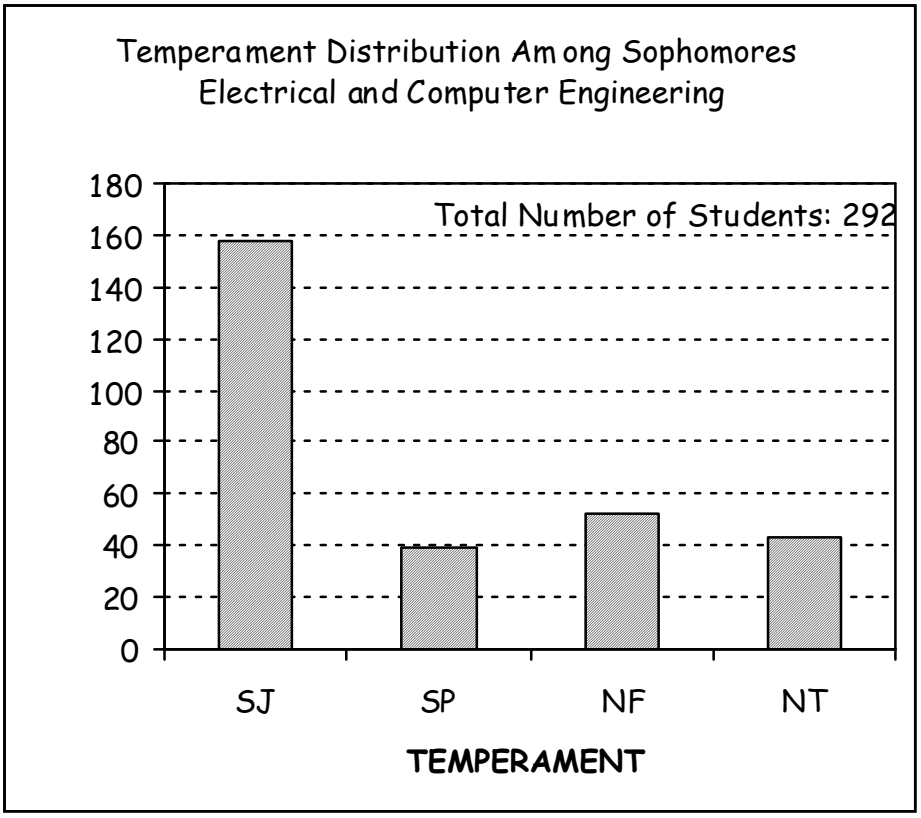

Figure 1: Distribution of temperaments

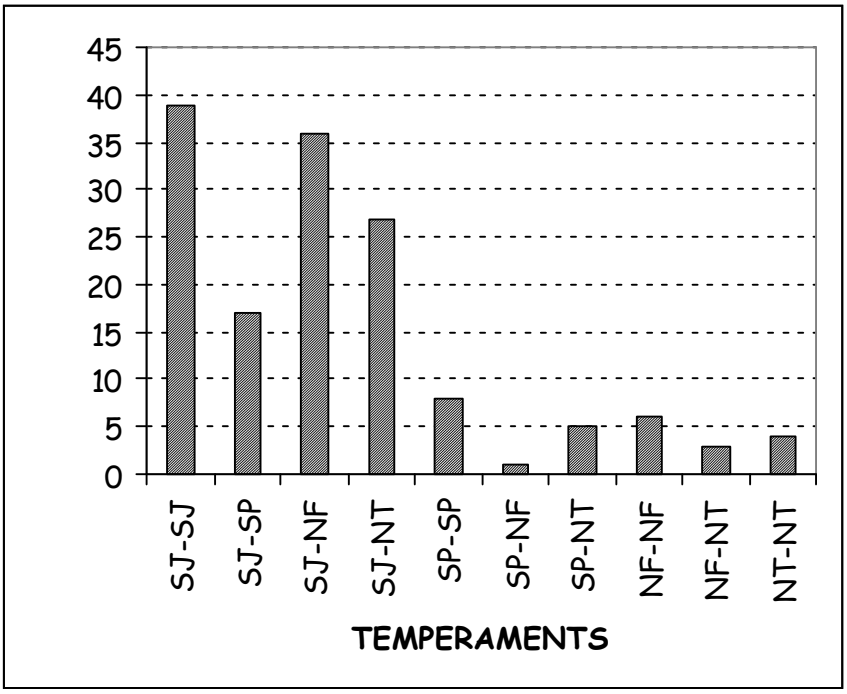

Figure 2: Distribution of the groups

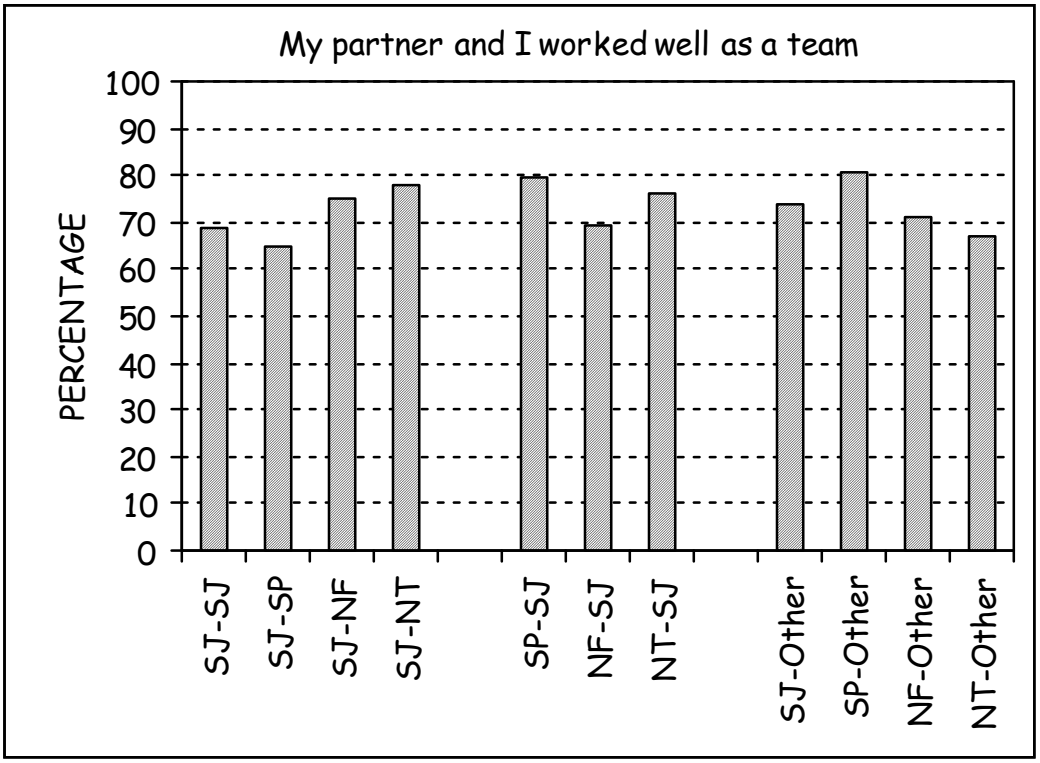

Figure 3: Survey question on team performance

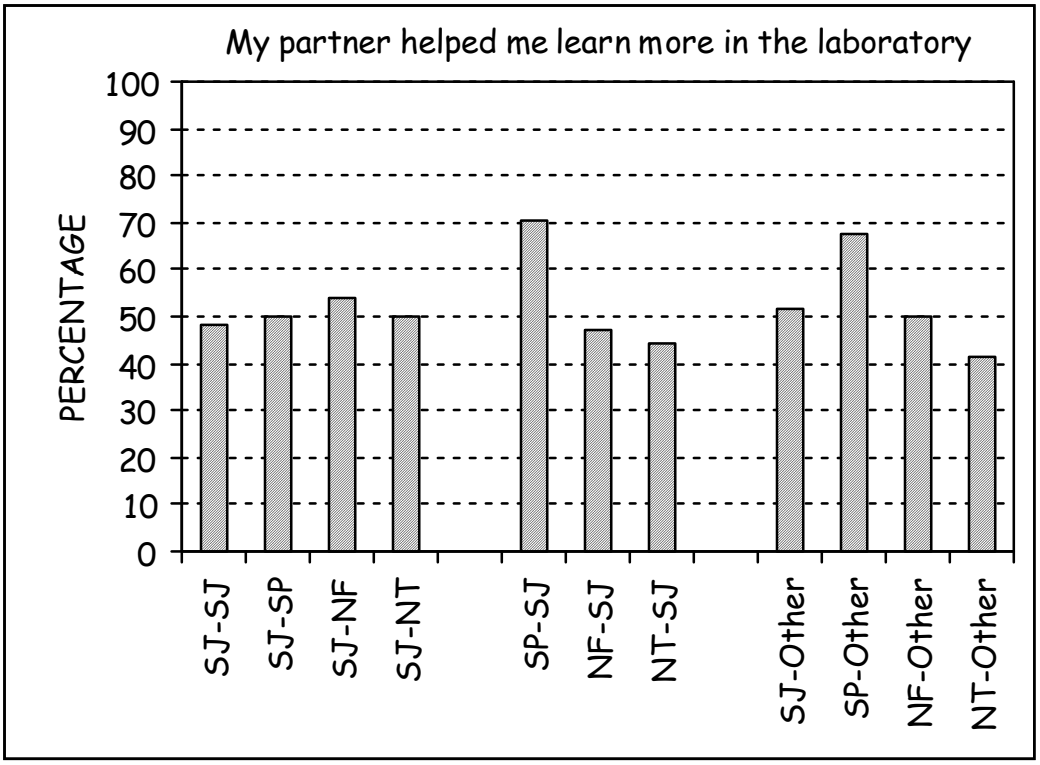

Figure 4: Survey question on team cohesion

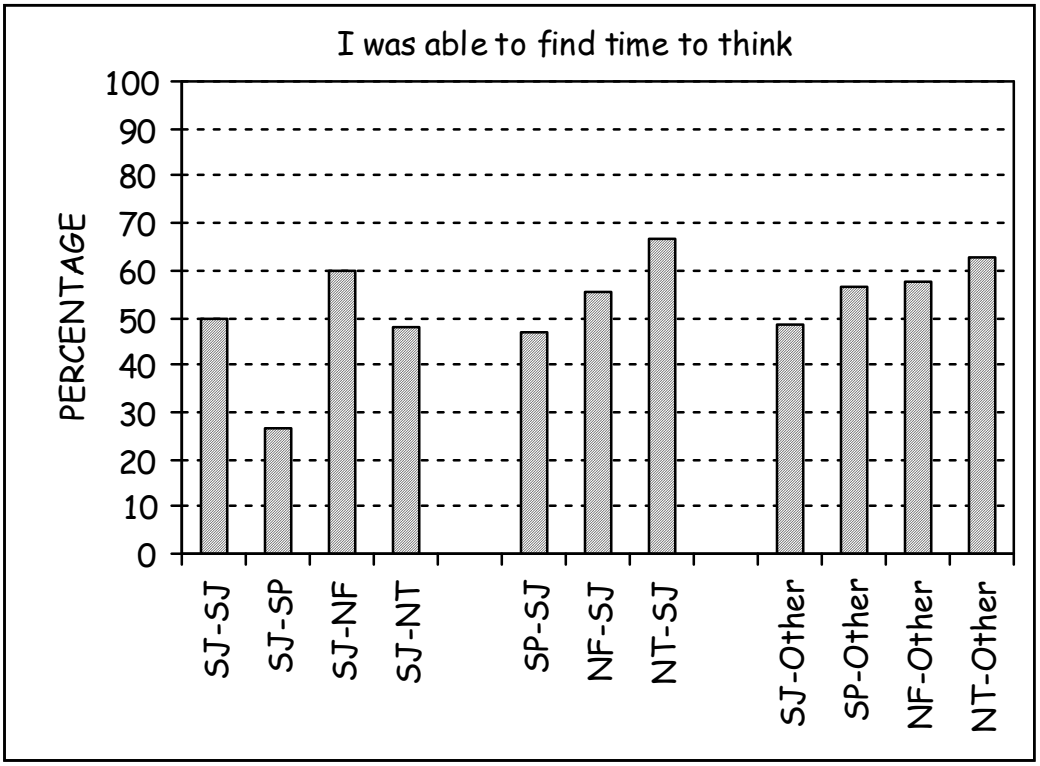

Figure 5: Survey Question on Student Satisfaction

The responses to survey questions on performance, team cohesion and student satisfaction were summarized in Figures 3, 4 and 5 respectively.

The second part of the experiment showed us a temperament (SP) which gave different results than other temperaments. In terms of learning experience, they benefited the most, in terms of team performance, they gave the highest marks. Their partners however, did not share this enthusiasm, especially SJ's. Figure 5 shows that only 27% of the SJ's in SJ-SP teams had time to think. SP temperaments are rare in engineering and although they are very creative, their incapacity to carry things into conclusion quickly while processing the given information using sensing at times gets in the way of solving engineering problems where judgment is exercised more than perception.

A winning combination was the SJ-NT pair. They both gave high marks on the performance of the team and NT's had plenty of time to think.

Conclusions

The use of personality profiles in putting the teams together showed us that the functionality of the teams depended on the temperaments of the team members and some combinations were better than the others. The distribution of temperaments among the Electrical and Computer Engineering students at North Carolina State University remained about the same during the last four years with SJ as the dominant temperament followed by NT. The goal of this study was not to come up with a successful recipe given the consistent distribution of temperaments but rather gain insight into team building and using all temperaments in complementary ways to increase the functionality of the teams.

Bibliography

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