Combinations of Personal Characteristic Types and Learning Effectiveness of Teams

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***Abstract*—In software and IT systems engineering, personal characteristics are expected to impact performance and attitude. To clarify the optimal composition in a team of students in academic education, we researched the relationship between student personality characteristics and learning effectiveness of teams using the Five Factor and Stress theory (FFS). The results taken from a Project-based Learning (PBL) course at Waseda University showed that educational effectiveness is highest when a team consists of management and anchor types without leadership types. In addition to FFS, we are currently adopting the Five Factor Model (FFM), which is a well-accepted personal characteristic model, to dig deeper the relationship in different courses on IT systems and software development conducted at various universities. Preliminary results show that although individual characteristics are not strongly correlated to learning effectiveness, there are a few strong team correlations. As our future work, we plan to acquire more data and investigate relationship between FFS measurements and FFM ones in terms of learning effectiveness.**

Keywords—information system education; communication; coordination; five factor and stress theory (FFS); five factor model (FFM); software and systems engineering education; personal characteristics; project-based learning (PBL)

I. Five Factor and Stress theory (FFS) and Learning Effectiveness

In practical education courses in software and IT systems engineering, working in a team is an important learning method since actual software and IT system development projects are usually taken by teams. In previous studies such as [1], it is known that a moderately diverse team where members have different personalities reduces risks when developing software intensive business systems. In software and IT systems engineering, personal characteristics impact performance and attitude. Therefore, the combination of the each team member should also be important for IT systems and software development. However, the optimal composition in a team of students in academic education is still unclear.

In our study reported at the journal IEEE TETC [2], we researched the relationship between student personality characteristics and learning effectiveness of teams using the Five Factor and Stress theory (FFS) [4] based on our previous studies [4][5][6]. FFS theory emphasizes the personality characteristics in the team by mapping a person's personality onto a two-dimensional graph where the X-axis ranges from receptive to condensable, while the Y-axis ranges from preservative to diffusible.

We used FFS to measure personal characteristics and classified students enrolled in a controlled Project-based Learning (PBL) course at Waseda University into four types - leadership, management, tugboat, and anchor. Then knowledge and skills questionnaires were used to measure educational effectiveness. The results showed that educational effectiveness is highest when a team consists of management and anchor types without leadership types [2].

Moreover, we researched the relationship between educational effectiveness of a team in two controlled-PBL courses at Waseda University and the personal characteristics of the team members by using FFS. We confirmed that the optimal team composition depends on the purpose of the course [7].

II. Five Factor Model (FFM) and Leaning Effectiveness

FFS is a relatively minor theory so that it is not easy to confirm generality of the findings mentioned above in other environments such as different universities and courses. Thus, we are doing additional survey using the Five Factor Model (FFM), which is a major personality characteristic model. FFM is a hierarchical organization of personality traits in terms of five basic dimensions: Neuroticism, Extraversion, Openness to experience, Agreeableness, and Conscientiousness [8]. Studies using both natural language adjectives and theoretically based personality questionnaires support the comprehensiveness of the model and its applicability across observers and cultures [9].

In the additional survey, we are addressing the following research questions: Are individual student's personality characteristics related to individual learning effectiveness? Are the team personality characteristics related to learning effectiveness of teams? Is there a similar relationship between team personality characteristics and learning effectiveness in different courses? Does the relationship between team personality characteristics and team learning effectiveness depend on the style of the course such as discussion, practice or exercise?

To answer these RQs, we are analyzing various different lecture courses on IT systems and software development conducted at various universities. To measure the student's personality characteristic and learning effectiveness, we are employing the FFM questionnaire and the knowledge and skill questionnaire. Preliminary results presented at the conference IEEE/ACIS SNPD [9] show that although individual characteristics are not strongly correlated to learning effectiveness, there are a few strong team correlations. The interesting aspects of the team correlations may be related to the course style such as discussion, practice or exercise.

III. Future Prospects

We plan to acquire more data to clarify the common relationship between combined personality dimensions (for example, low Extraversion and high Openness) and learning effectiveness of teams in different lecture courses on software and IT system development. Team discussions are also under investigation [10].

Moreover, currently we are investigating relationship between FFS measurements and FFM ones in terms of learning effectiveness. The result is expected to form a unified theory to clarify the optimal composition in a team of students in academic education.

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