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Is The Use of Psychological Types Relevant to Improving Engineers' Innovation Training?

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The National School in Industrial Engineering (ENSGSI, based in Nancy, France), prepares students for the management of innovative projects. This French school offers a three-year general engineering programme based both on Engineering Science and Management, as well as integrating active teaching and learning through hands-on experience. It has been engaged in a continuous set-up of its innovation training programme since its creation seventeen years ago. The research, whose preliminary elements will be presented in this paper, takes place within this continuing improvement process.

It starts with the observations made by the Engineering Science teachers in charge of tutoring the group of students working on a one-year innovative industrial project. They are faced with the difficulty of leading the students to test and apply to a large variety of innovation tools and methods to the project rather than focusing on a small number of them. They are conscious that all the methods and tools taught might not have a concrete application within the project. Yet, according to their experience, they find it difficult to understand why the students test so few: the students' lack of openness is a bit paradoxical as, on one hand, they ask for suggestions and direction whereas, on the other hand, they do not integrate them when they involve new testing methods. Closer observation suggests that the students' unwillingness cannot be ascribed to the fact that the methods ignored are neither more difficult to apply

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nor less relevant for the project. Hence the assumption that one method would fit better the student methods of collecting and using information; the choice of one tool/method rather than another one would seem to depend on cognitive personal preferences.

Through discussions, the scope of the study was expanded to take into account key elements of the pedagogical relationship: the tutor's cognitive preferences, those of the student and also group dynamics are factors that can determine the choice of methods. To investigate these elements we mobilise the Psychological types theory elaborated by the Swiss psychoanalyst and psychiatrist Carl Gustav Jung – and especially the MBTI ©, one of the most studied and reliable tool based on this approach. This tool is relevant as it can be applied both at an individual level and at a group level: it can be a common reference to evaluate the preferences of both teachers and students, as well as to analyse the group dynamics and the teacher-student relationship as well. Studies exist that point out links between someone's type and the capacity to create and innovate. Various concrete applications also exist to develop the innovative potential of individuals and groups. The limit of these studies and applications is that they do not take into account the engineering methods already used by the persons. From this point of view, our study can be seen as an original one. Moreover, the practical applications of types and innovations are not meant to be used in an academic context and to take into account the educational relationship between teachers and students.

The subject of our study is to understand how relevant an approach developed in Psychology can be in improving the learning and use of innovative tools and methods while taking into account the training context and the relationships. On this basis, our methodological choices will be oriented by three hypotheses: a) the engineering innovation tools and methods can be characterised from a typological point of view and this "type" influences their appropriation by students; b) a teacher's/monitor's personality type determines the way the tools and methods are presented to students; c) the typological approach can be of use in accompanying the project monitoring.

To test these hypotheses, our methodological framework includes: a) a questionnaire to ask third-year students what their personality type is and what are their two favourite innovation tools/methods amongst those taught; b) simultaneously, we will gather the innovation teachers of the school to see if they can achieve a consensus in determining what could be the typological description of each innovation tool/method - if a consensus is obtained, it will be compared with the students' questionnaire results c) the interactions between monitors and their groups of students will be observed during the early months of the innovative projects, when the main methodological choices are made; d) these observations *in situ* will be completed with semi-directive interviews using *explicitation* techniques with both monitors and students to better understand how cognitive preferences are involved in the choices. On the basis of all these results, a method to accompany innovation groups in a training perspective will be formulated, tested and improved according to the experiment feed-back.

During our study, we will have to be watchful of two issues. The first concerns our epistemological positioning as two of the authors are involved in the innovation training and in accompanying projects provided at the school, they will be both practitioners and researchers and will also work with colleagues. The second issue is ethical. Although the purpose of the typological approach is to describe someone's preferred way of functioning, it does not seek to lock people in their own preferences. We will have to be aware of this issue and make sure that what we propose will not lead teachers and students to please themselves in their own preferences, but to build on them for the acquisition of new knowledge and expertise. ■