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Beyond Styles and Intelligences:  
Understanding the Learning Processes of Engineering Students

Many engineering educators have noted that engineering students present some challenges in the classroom. A roomful of engineering majors is often noticeably different from a roomful of the general population. In an effort to understand this difference and develop teaching strategies that more effectively reach these students, engineering educators have made use of the concepts of learning styles and multiple intelligences. However, while useful, these approaches are both limited and limiting. Learning styles, best known through the Myers-Briggs assessment, are personality based, and personality is known to change over time or in response to variations in context. Multiple intelligences, a concept created by Howard Gardner, are innate talents. Gardner's approach has been important in recognizing and valuing different capabilities among students. However, both are narrow characterizations of students as learners; they look at only one piece of the complex process that learning actually is. Moreover, neither offers the student or the teacher any options or strategies. Learning styles and multiple intelligences "lock in" a reductive perception of the learner.

This paper discusses the expanded understanding of the learner available via the concept of learning patterns, which can be captured by an instrument called the Learning Combination Inventory (LCI). The LCI, developed by Christine Johnston and Gary Dainton of Let Me Learn™ and the Rowan University Center for the Advancement of Learning, is a survey that asks students to respond to statements about preferred ways of learning and expressing their learning (for example, they are asked whether they would rather write a paper or build a project, or whether they want explicit instructions before doing an assignment or would like to figure it on their own). Responses to the LCI statements, using a Likert scale ranging from Always to Never Ever, yield a profile of the extent to which an individual utilizes each of four learning patterns, which are associated with distinct approaches to learning, listed below with just a few of the characteristics:

- **Sequence** (organization, planning, order, structure)
- **Precision** (information, details, knowing for the sake of knowing)
- **Technical** (hands-on, practical)
- **Confluence** (risk, innovation, alternative views, freedom from rules)

All learners have at least one pattern that they Always or Almost Always use in a learning situation; depending on the individual, the other patterns may also be used first, used as needed, or perhaps even avoided if possible, or at a combination of these levels. It is not only important for teachers and students to know what the students' learning patterns are, but also important to know what the teachers' are. With this knowledge, both students and teachers can better understand and meet needs and expectations.

Of the four learning patterns measured by the LCI, engineering students at Rowan overwhelmingly (though not universally) use the technical pattern first. Out of a possible score of 35, most will score in the 30s. As a result, some hallmarks of these students are that they:

- Prefer to learn by doing
- Want practical relevance and despise busywork
- Prefer to work alone
- Keep knowledge in their heads rather than writing it down
- Are reluctant to express feelings
- Like to figure things out
- Want to get right to work
- Are not likely to read instructions
- Will seek assistance and further information only when needed
- Tend to be resistant to change

This paper discusses the theory behind the concept of learning patterns as well as the empirical research behind the LCI. Sample questions from the LCI and examples of student responses are presented. The richer understanding available from this approach, as opposed to that of learning styles and multiple intelligences, is explained, and applications of these insights to student learning in engineering courses are proposed. In particular, the paper focuses on how I have used the LCI in writing courses for engineering students, where the characteristics of the technical learner present considerable challenges.