

Random Thoughts . . .

MEET YOUR STUDENTS

6. Tony and Frank

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Tony and Frank are second-year chemical engineering students. They knew each other in high school and have worked on homework and studied for tests together since they started college. Both of them got high averages in their first year and scored in the low 80s on the first stoichiometry test, but on the second test Tony got a 47 and Frank a 53, by far the lowest test grades either had ever received. The day after they got their tests back they met in the student lounge to start on the next homework assignment, which is where we find them.

Tony: "OK, look at Problem 1 . . . we got benzene and nitrogen coming in and we're cooling and condensing, so we'll probably have to . . ."

Frank: "I still don't know why Talbot took off 20 points in Problem 2. He had to see that I knew how to do it but I just ran out of time."

T: "Get a grip—it's only one test grade . . . I figured out that if we get somewhere in the high 80s or 90s on the next test and the final, with our homework grade figured in we can easily pull Bs and maybe even get up to . . ."

F: "F#\$%, Tony—there are bleeding bodies all over the place and you go into calculator mode! The point is that I knew that stuff cold and got trashed anyway—I could have come in knowing nothing, written pure garbage, and gotten the same lousy five points for that problem. I'm working my butt off here—I even spent three hours the day before the test tutoring Helen and those friends of hers who flunked the first test, and all I get for it is . . ."

T: "You sound like my girlfriend—'Don't get logical with me,' she says every time she's losing an argument. Look, we're in engineering, not psychology . . . an engineer designs something and either gets it right or wrong, and if it's wrong they don't give him partial credit and pat him on the back for how hard he worked and neither does Talbot . . . I'd rather have him any day than Sloan with all that touchy-feely group stuff he's always dumping on us in organic . . ."

F: "Yeah, well at least Sloan treats us something like human beings and not centrifugal pumps—all Talbot and most of these other professors want to do is tear us down and weed us out. I've been at this place for over a year now and I've never once had one of them except Sloan tell me I did a good job, even when I got the high grade in the class."

T: "Me either, but that's cool . . . I don't need gold stars—as long as

I know the rules and the rules make sense, no problem. Talbot's job is to get us ready to be chemical engineers, not to make us feel good, and if someone can't make the grade he should probably go into another field because . . ."

F: "I've been thinking about going into another field, to tell you the truth—I'm not sure I need three more years of these 10-hour assignments and all this grief from these stonefaces just so I can go out and separate benzene from nitrogen—fat lot of good *that* will do the world."

T: Come on, save the world on your own time—right now just stick a bandaid on that bleeding heart of yours and let's see if we can draw the flow chart for this one." (Frank starts to reply, shakes his head, and turns to begin work on Problem 1.)

Tony is a **thinker** and Frank is a **feeler**.^{*} Thinkers tend to base decisions primarily on objective reasoning and will stick to their opinions until they are proven wrong logically. People with a strong preference for thinking are often thought of as impartial and rational, tend to be more truthful than tactful, and often consider strong feelers indecisive and overly sentimental ("Stick a bandaid on that bleeding heart!"). Feelers are inclined to give more weight to subjective, personal considerations in making decisions and place great value on building consensus and maintaining harmony. People with a strong preference for feeling are often thought of as warm and empathetic, tend to be more tactful than truthful, and often consider strong thinkers insensitive and overly analytical ("At least Sloan treats us something like human beings and not centrifugal pumps!").

The fact that people have a preference for one judgment mode (thinking or feeling) says nothing about their ability in

^{*} Thinking and feeling are the two poles of the judgment or decision-making function in Carl Jung's theory of psychological type. The degree to which someone prefers thinking or feeling can be determined with the Myers-Briggs Type Indicator, a personality inventory based on Jung's theory.^[1] About 60% of the U.S. male population, 77% of male engineering students, 40% of the female population, and 61% of female engineering students show a preference for thinking.^[2] Thinking and feeling are not mutually exclusive categories but preferences that may be mild, moderate, or strong, and all people exhibit characteristics of both types to differing degrees. While Tony is a representative thinker and Frank a representative feeler, not all thinkers are just like Tony and not all feelers are just like Frank.

the other mode—feelers may be logical and decisive, thinkers may be sensitive and compassionate, and both types have strengths that make them equally capable of becoming excellent engineers and scientists. As engineering and science students, however, the two types have different needs and difficulties, which manifest themselves in almost every aspect of education.

Course content and instructional format • Most engineering and science students and professors are thinkers, and these subjects tend to be presented (incorrectly) as being free of subjective considerations. This distortion generally poses no problems to the thinkers, as long as the course material is well organized and accurately presented. On the other hand, the impersonal nature of most technical instruction may alienate feelers, inducing them to switch to what they perceive as more humanistic subjects when in fact they could have been highly successful as engineers and scientists. Since proportionally more women than men are feelers, this alienation can have particularly unfortunate effects on the retention of women in technical fields.

The comfort level of feelers in technical courses can be raised by (a) bringing out the social relevance of the course material—*e.g.*, applications to environmental or biological sciences or to anything related to quality of life, (b) addressing some nontechnical topics—ethics, writing and oral presentation, teamwork and leadership skills, etc., and (c) using student-centered instructional approaches like cooperative learning. While the thinkers in the class may grumble about that “touchy-feely stuff,” they will tolerate it if the instructor can explain its relevance to their career objectives—for example, by showing them one of the many published surveys of employers listing teamwork and communication skills at the top of their wish list for new engineers, or by citing research demonstrating the effectiveness of cooperative learning in promoting academic success and employability.^[2,3]

Instructional policies • Every course involves a large number of policies regarding attendance, lateness, homework, tests, group work on assignments (forbidden, optional, mandatory), etc. The dynamics of a course are dictated in large measure by the degree to which the students believe the policies are reasonable. If they don't believe it, their resentment can make the course a dreary and unproductive experience for everyone concerned.

Thinkers resent treatment they regard as arbitrary or unfair, but will adjust to almost any policy they consider rational and consistently administered. (“*As long as I know the rules and the rules make sense, no problem.*”) For example, they may protest bitterly if instructors test them on material in assigned readings that was never lectured on, but they will accept it (albeit grudgingly) if the instructors announce their intention to do so early in the course, explain why they are doing it, and always provide a clear picture of what the students will be held accountable for. (“You're responsible

for everything in this 485-page text” doesn't quite do it.) Feelers also benefit if the policies are made clear from the beginning, but their buy-in depends less on the logical rationale for the policies than on a sense that the policies are intended to help them in some way and that the instructor can be flexible when circumstances warrant it. Some instructors who equate supportive policies and flexibility with “spoon-feeding” or “hand-holding” may have trouble conveying this sense. Feelers among the students may find classes taught by these instructors particularly difficult and stressful.

Feedback and evaluation • Thinkers want to be evaluated on the basis of what they do, feelers want to be valued for who they are. Thinkers are quicker than feelers to criticize and better than feelers at taking criticism as long as it seems fair to them; feelers thrive on praise and tend to take criticism personally. Tony didn't like his low test grade but he can deal with it since the strongly critical Professor Talbot (probably a thinker himself) gave a fair test and graded it strictly but consistently, while Frank takes the low test grade as a personal rejection and reacts emotionally to it. More generally, Frank resents the fact that his professors never compliment his good work but are always ready to point out his mistakes.

The most effective devices for helping feelers are acknowledgment and praise. Feelers are strongly motivated to perform well for instructors who can address them by name, establish a personal rapport with them, and offer an occasional “nice work” when they come up with a good question or problem solution or test score. The thinkers also appreciate compliments as long as they are really based on good work and are not too effusive.

Epilogue: 15 years later • Tony and Frank both recovered from their initial setback in the stoichiometry course, did extremely well throughout the rest of the curriculum, went on to get PhDs in chemical engineering, and eventually joined the same faculty. Tony achieved international recognition for his research on heterogeneous catalysis and went on to become department head. He has done a great deal to help build the department's size and national reputation, although some of his faculty find him insensitive and unappreciative of their contributions. Frank does good research in environmental engineering but in his department he is better known as an outstanding teacher and advisor, and a large collection of students can usually be seen outside his office door waiting to talk to him. The two men still enjoy getting together frequently. Their arguments and insults have changed very little since they were sophomores.

REFERENCES

1. Lawrence, G., *People Types and Tiger Stripes*, 3rd ed., Center for Applications of Psychological Type, Gainesville, FL (1993)
2. Wankat, P., and F.S. Oreovicz, *Teaching Engineering*, McGraw-Hill, New York, NY (1993)
3. McKeachie, W., *Teaching Tips*, 9th ed., D.C. Heath, Lexington, MA (1994) □