BESTEAMS Intermediate Personal Knowledge Module

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I. Introduction/Motivation For Module Instructor: This is one of three intermediate level BESTEAMS teamwork training modules for engineering students and faculty. The three modules address personal knowledge to improve learning, interpersonal effectiveness in the team setting, and project management.

Many psychologists and educators have studied how students learn and what pedagogical techniques assist this complex process. This module addresses differences in how the engineering student prefers to learn. The present module reinforces and extends information addressed in the Introductory Personal Knowledge Module, where students gained information about their learning styles using the Kolb Learning Style Inventory (LSI). Introducing the Felder-Silverman learning model, students will gain information about their strengths and weaknesses in the ways that they perceive and process new ideas and material. Felder, a chemical engineer and dedicated engineering educator, developed both the model and related assessment instrument that is particularly relevant to engineering and science students. The Index of Learning Styles (ILS) builds on several existing models of learning style, including one aspect of the Kolb Learning Style Inventory and the Myers Briggs Type Indicator (MBTI), and can be completed either online or on paper.

Why are learning styles important to both faculty and students? As discussed in detail in the introduction to the Introductory Module on Personal Knowledge, learning style preferences offer a non-judgmental, non-gender or racially based schema for understanding differences among class and teammates. In addition, learning styles can help individual students in understanding how they typically focus on information presented in class, how they tend to use or act on that information, and that they assimilate information at different rates. For instructors, knowing that students in the class have different learning styles can greatly impact how they “package” the information so that all of the students in their classes can succeed, not just the ones that have learning styles most similar to the instructor’s method of teaching.

This module provides the opportunity for students to gain more insight into their strengths and weaknesses as a learner beyond the dimensions covered in the Kolb material. Specifically, the ILS classifies students into the following learning style preferences:

1) Sensing versus Intuitive learners
2) Visual versus Verbal learners
3) Active versus Reflective learners
4) Sequential versus Global learners

Expected Outcomes of the Module:

As a result of implementing this module, students will

Module Part I (Slides 1 – 26):

- Gain insight into a four dimension model of learning style preferences that helps explain individual differences;
• Gain insight into how learning and communication style preferences influence the reception, delivery, and processing of technical information;
• Some students will realize that their way of learning is different than most engineering instructors’ teaching. Thus difficulty in learning engineering material may be more related to how the material is presented than their academic abilities.

Module Part II (Slides 27 – 33):
• Students will gain insight into how learning style preferences may impact team dynamics

II. Delivery Plan A: 50-minute class period option

A. Introduce the module and the objectives of the session (slides 1-3). This appeals to the Divergers of the group. You can use slide 3 as a group or an individual exercise (see III. A).

B. Review the Kolb Learning Styles (slides 4 – 6). If students were taught the BESTEAMS Introductory Personal Module, “Kolb Learning Styles,” they should be able to comment on the experience. Students may also respond to questioning on individual differences with mention of the Myers-Briggs Type Indicator (MBTI) instrument, which they may have completed in another context. The purpose of the introduction is to remind students that individual differences are to be expected and can be a source of strength in learning within the engineering environment.

C. Introduce the Index of Learning Styles (slides 7-9). These slides describe the ILS developed by R. Felder, a chemical engineering and well-known engineering education educator, as well as the ILS connection to the MBTI and the Kolb Learning Styles Inventory.

D. Student ILS Profiles (slide 10). At this point, refer students to the results they obtained by taking the ILS instrument. There are two options for students to complete the inventory needed for this module.

1. Option 1 asks them to go to the Felder website (http://www.engr.ncsu.edu/learningstyles/ilsweb.html) and complete the on-line and instantly scored version. Ask students to print out their results and bring them to class.

2. Option 2 is to download the paper-pencil version from the Felder website of the same inventory (http://www.ncsu.edu/felder-public/Learning_Styles.html) and have students complete it in class. Even if you select Option 1, you might want to have some copies of the paper-pencil inventory on hand for students who forget to do the on-line version.

E. Interpret the ILS Profile (slides 11-24). In this section you will describe the four dimensions measured by the ILS. Students should be able to check their rating on each dimension and consider the validity of their scores in terms of the anchoring preference points. Each preference pair is described, followed by suggestions on how to broaden the student’s learning style by engaging in “stretching” behaviors or trying on activities and techniques that are more comfortable to their learning styles opposites.

1. Description of the Active vs. Reflective learning preference continuum (slides 11 – 13).
2. Description of the Sensing vs. Intuitive leaning preference continuum (slides 14 – 17). Slide 15 includes an exercise designed for Kolb Converger type learners (see III. C). It would be appropriate to use this learning activity at this point in the module delivery. It is not unusual that a high percentage of engineering students would be classified as Convergers according to Kolb.


5. Description of the Inductive vs. Deductive learning style continuum (slide 24). Note: A fifth dimension or preference is also included in this learning style model (Inductive versus Deductive learners) but not assessed using the available inventories. The rationale for not including this aspect in the inventory is that the educational research literature strongly favors inductive learning (although most teachers teach with a deductive approach meaning presenting the principles or theories first, followed by applications or concrete examples, later). Furthermore, Felder reports that most engineering students in his experience prefer inductive approaches to learning. Thus Felder believes it is not necessary to test for this preference and instead urges engineering faculty to reconsider the traditional “theory first, practice second” approach to teaching. The reader is referred to Felder (1988) for a discussion of this issue and how to handle the common mismatch between student learning style preferences and the dominant engineering “teaching” style.

F. Exercise on the value of learning styles (slide 25). This is a good exercise to have students do in pairs. If you have not used any of the other exercises in this presentation it would be a good idea to do this one. You can also change this exercise to reach the students with who Kolb would classify as Accommodators (see III. D). Convergers may find this exercise challenging, too. You could suggest a learning task coming up in the course as the topic that students will need to learn.

G. Conclusion (slide 26). This is a summary of what students should remember from this module.

III. Addressing Learning Style Differences when teaching the module. If the instructor incorporates at least one aspect of each of the 4 Kolb learning preferences when teaching this module, all learning styles will be addressed thus increasing the likelihood of content mastery by more students.

A. Quadrant 1 (Divergers): Driven to learn by asking the question “why?” (In this case, “why is this information important to me?”)

Learning activity: Higher level/Socratic questions asked by the instructor. Split the group in two (left side, right side of the classroom). Ask one side to think about the first question and the other to think about the second.

Question 1: “Think about your favorite class that you have taken in engineering so far. Try and recall why you liked that class so well. Was it the material you learned, how the instructor presented it, the out of class assignments, working in teams?”
Without identifying the class itself, ask the students to share what characteristics they liked about their favorite class and why.

Question 2: “Think about the worst class you have had in engineering so far. Try and recall what made it so bad for you. For example, was it the material, how the teacher presented the material, something going on with you or your family?”

Without identifying the class itself, ask the students to share what characteristics they disliked about their worst class and why.

As an alternative to a group activity, you could present Slide 3 and ask each student to jot down answers to the questions. After about two minutes, solicit answers from the student audience.

Based on the discussion, reinforce:
We all learn differently: For some people, characteristics identified by some people as the best aspects of a class are seen by others as the worst features of one of their classes. Individuals have preferences in how they learn and as a result, how they approach new learning situations. The point of this module is to help students understand their own learning preferences so they can 1) maximize their own learning, and 2) recognize how their preferences may influence other learning activities such as how they participate in teams.

B. Quadrant 2 (Assimilators): Driven to learn by asking the question “What?” (In this case, what is the Felder Index of Learning Styles?)

1. Learning Activity: Administer in class the Felder Learning Style Inventory instrument or have students bring in their computer results. Put the four-dimensional model on the board.
2. Learning Activity: Follow with “lecturette” on learning styles using background reading materials and power point presentation slides provided.

C. Quadrant 3 (Convergers): Driven to learn by asking the question: “How?” (In this case, how can this material help me better understand myself or my abilities?)

Group class into the following groups: Sensors and Intuitives

Ask each group to discuss their favorite part of working on a team project. (For example, consider the following-- formulation of the project design, team dynamics, testing and experimentation, final report writing and presentation). Ask why they prefer these aspects of teamwork. Can they relate their preferences to their Felder preferences?

Ask each group to report out their observations to the entire class.

D. Quadrant 4 (Accommodators): Driven to learn by asking the question: “What if?” (In this case, what if I used this information about myself to my advantage in this course? What could I do to maximize my success?)

Learning activity: Ask students to reflect on a time when they had a lot of trouble learning a particular subject and recall what steps they took to learn the material. What if they had known about their Felder learning style preferences? How would that have made a difference? Could they have asked their instructor for a different kind of help?
Share reactions to the exercise at the beginning of the next class session.

Based on the discussion, reinforce:
Learning style preferences are not “right” or “wrong”…like being right or left handed, people see and experience the world differently. Knowing our own preferences (which are also our strengths) helps students know how they learn best and by extension, what ways of looking at the world they bring to the team learning experience.

IV. Delivery Plan B: 90+ minute class period. Add Learning Styles in Teams: Part II (slides 27–33).

A. Present additional slides on Felder preferences and team dynamics (slides 27-32).

B. Learning Activity: How learning new course material is influenced by learning style preference (slide 33).

Introduce a new concept or problem related to the material covered in the course. Have the class work on how they tackle learning this information a) on their own using their own learning style preferences as a guide for what might come easily to them and what aspects might be more difficult, and b) as a team considering again, what the team dominant learning styles are (e.g., the majority) and how these preferences may influence team learning and functioning, both positively and negatively.

Alternatively, have students actually learn the new course material or module on their own outside of class. Quiz them on the material and on their learning process (ask questions about their group interactions, what helped them and other members of the group most in mastering the material, what made this approach difficult, etc.).

V. Class Adaptation Strategies

A. Size: In larger classes, give the ILS as a “complete at home” exercise, but ask students to send you their learning style preferences so you can put together a portrait of the class as a whole. Depending on the distribution of preferences, ask students to take seat in the next class by selected dimensions of learning style preference (all the intuitives on one side, sensors on the other). Looking at the preferences of the class as a whole, ask one group to write a “teacher’s guide” on how to best teach the class. Ask the less common preference group to write a student’s survival guide based on the dominant preference. If time, discuss as a group or post “guides” to class website or on-line tutor.

B. Content: Link course content to learning styles if possible. If students are working on a common project, ask which learning styles are likely to prefer being involved in which aspects of the project (e.g., designing, working on the technology, human factors, construction, etc.). Will teams that lack members with certain preferences have difficulty getting parts of the project completed? What can they do to compensate?

C. Classroom Culture: Depending on academic culture, individual differences may be accentuated or minimized. Important message: it is OK to be different. Differences on teams are beneficial. Learning styles are independent of race and gender. Like being right or left handed, learning styles are a preference not an absolute (students can learn to use less preferred functions just like they can learn to use their non-dominant hand).
VI. Follow-up Materials:

Follow-up activities are vital to ensure that the module material is mastered. Adaptations of these options are encouraged—tailoring the material for your own students’ needs, your own teaching style, and the constraints of your course will ensure that the material is perceived as maximally relevant.

A. Homework: Refer students to the Felder webpage (http://www.ncsu.edu/felder-public/ILSpage.html) and have them pick out a paper on learning styles among engineering students to download and read. Summarize and critique to hand in.

B. Report writing: In the final report of the team, ask students to write a summary of team dynamics and interactions based on LSI types. Each individual can comment on the interactions from his/her point of view, then have the group write a summary paragraph looking at the whole (the whole is greater than the sum of its parts).

C. Exam or Quiz item: Ask the student to report his/her learning style and then comment on how their preferences have influenced their learning in this particular class. Or ask: “What suggestions can you make to me, the course instructor, on how to communicate information on (select topic) to someone with your learning style preferences?”

References:


R.M. Felder and L.K. Silverman, "Learning and Teaching Styles in Engineering Education." [Engr. Education, 78(7), 674-681 (1988).] The article that originally defined the Felder-Silverman learning styles model and identified teaching practices that should meet the needs of students with the full spectrum of styles. The paper on the Web site is preceded by a 2002 preface that states and explains changes in the model that have been made since 1988. (William Elgin Wickenden Award Paper, ASEE, June 1989)