LEARNING STYLES

Students preferentially take in and process information in different ways: by seeing and hearing, reflecting and acting, reasoning logically and intuitively, analyzing and visualizing, steadily and in fits and starts. Teaching methods also vary. Some instructors lecture, others demonstrate or lead students to self-discovery; some focus on principles and others on applications; some emphasize memory and others understanding.

When mismatches exist between learning styles of most students in a class and the teaching style of the professor, the students may become bored and inattentive in class, do poorly on tests, get discouraged about the courses, the curriculum, and themselves, and in some cases change to other curricula or drop out of school. Professors, confronted by low test grades, unresponsive or hostile classes, poor attendance and dropouts, know something is not working. They may become overly critical of their students (making things even worse) or begin to wonder if they are in the right profession. Most seriously, society loses potentially excellent professionals. To overcome these problems, professors should strive for a balance of instructional methods (as opposed to trying to teach each student exclusively according to his or her preferences.) If the balance is achieved, all students will be taught partly in a manner they prefer, which leads to an increased comfort level and willingness to learn, and partly in a less preferred manner, which provides practice and feedback in ways of thinking and solving problems which they may not initially be comfortable with but which they will have to use to be fully effective professionals.

This site contains resources for a model of learning styles generally referred to as the Felder-Silverman model. The model was originally formulated by Dr. Felder in collaboration with Dr. Linda K. Silverman, an educational psychologist, for use by college instructors and students in engineering and the sciences, although it has subsequently been applied in a broad range of disciplines.

Assessment of learning style preferences

The Index of Learning Styles is a self-scoring questionnaire for assessing preferences on four dimensions of the Felder-Silverman model.

Descriptions of learning styles. A four-page handout that briefly explains the learning style preferences obtained using the Index of Learning Styles.

Publications related to the Felder-Silverman Learning Style Model

1. 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 model and identified teaching practices that should meet the needs of students with the full spectrum of styles. The paper is preceded by a 2002 preface that states and explains changes in the model that have been made since 1988.

2. R.M. Felder, "Reaching the Second Tier: Learning and Teaching Styles in College Science Education," *J. College Science Teaching, 23*(5), 286-290 (1993). An updated presentation of the Felder-Silverman model.

3. R.M. Felder and E.R. Henriques, "Learning and Teaching Styles in Foreign and Second Language Education," *Foreign Language Annals, 28*(1), 21-31 (1995). Application of the F-S learning style

model to language education.

4. R.M. Felder and J.E. Spurlin, "Applications, Reliability, and Validity of the Index of Learning Styles." *Intl. Journal of Engineering Education, 21*(1), 103-112 (2005). A validation study of the *Index of Learning Styles*.

5. T.A. Litzinger, S.H. Lee, J.C. Wise, and R.M. Felder, "A Psychometric Study of the Index of Learning Styles." *J. Engr. Education, 96*(4), 309-319 (2007). Reliability, factor structure, and construct validity of the *Index of Learning Styles*.

Publications related to learning styles in general and other learning style models

1. R.M. Felder and R. Brent, "Understanding Student Differences." *J. Engr. Education, 94*(1), 57-72 (2005). An exploration of differences in student learning styles, approaches to learning (deep, surface, and strategic), and levels of intellectual development, with recommended teaching practices to address all three categories.

2. R.M. Felder, "Matters of Style." *ASEE Prism, 6*(4), 18-23 (December 1996). Principles and applications of four learning style models (Felder-Silverman, Kolb, and models based on the Myers-Briggs Type Indicator and the Herrmann Brain Dominance Instrument). The paper concludes that the choice of a model is almost irrelevant: teaching designed to address all dimensions on any of the models is likely to be effective, and all of the models lead to more or less the same instructional approach.

3. R.M. Felder, "Are Learning Styles Invalid? (Hint: No!)." *On-Course Newsletter*, September 27, 2010. A response to claims that no evidence justifies taking learning styles into account when designing instruction.

4. R.M. Felder, G.N. Felder, and E.J. Dietz, "The Effects of Personality Type on Engineering Student Performance and Attitudes." *J. Engr. Education, 91*(1), 3-17 (2002). The Myers-Briggs Type Indicator was administered to 116 sophomore engineering students, whose progress through the curriculum for the next two years was monitored. Type differences in various academic performance measures and attitudes were generally consistent with the predictions of type theory. Active and cooperative learning improves the performance of MBTI types (extraverts, sensors, and feelers) found in previous studies to be disadvantaged in the engineering curriculum.

5. R.M. Felder, "A Longitudinal Study of Engineering Student Performance and Retention. IV. Instructional Methods and Student Responses to Them." *J. Engr. Education, 84*(4), 361-367 (1995). Instructional methods designed to reach the full spectrum of learning styles, as applied in an ongoing longitudinal study of engineering students.

6. R.M. Felder, G.N. Felder, and E.J. Dietz, "A Longitudinal Study of Engineering Student Performance and Retention. V. Comparisons with Traditionally-Taught Students." *J. Engr. Education, 87*(4), 469-480 (1998). Performance and attitude differences between students taught with an active/cooperative learning model and students taught with a traditional instructor-centered model.

The subsequent references focus on individual dimensions of student differences.

7. R.M. Felder, "Meet Your Students: 1. Stan and Nathan." *Chem. Engr. Education, 23*(2), 68-69 (Spring 1989). The sensing learning and the intuitive learner.
8. R.M. Felder, "Meet Your Students: 2. Susan and Glenda." *Chem. Engr. Education, 24*(1), 7-8 (Winter 1990). The sequential learner and the global learner.
9. R.M. Felder, "Meet Your Students: 3. Michelle, Rob, and Art." *Chem. Engr. Education, 24*(3), 130-131 (Summer 1990). Three different approaches to learning (deep, surface, and strategic), and the conditions that induce students to take a deep approach.
10. R.M. Felder, "Meet Your Students: 4. Jill and Perry." *Chem. Engr. Education, 25*(4), 196-197 (Fall 1991). The judger and the perceiver on the Myers-Briggs Type Indicator.
11. R.M. Felder, "Meet Your Students: 5. Edward and Irving." *Chem. Engr. Education, 28*(1), 36-37 (Winter 1994). The extravert and the introvert on the Myers-Briggs Type Indicator, and to a good approximation, the active learner and reflective learner on the Index of Learning Styles.
12. R.M. Felder, "Meet Your Students: 6. Tony and Frank." *Chem. Engr. Education, 29*(4), 244-245 (Fall 1995). The thinker and the feeler on the Myers-Briggs Type Indicator.

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Return to Dr. Felder's home page

LEARNING STYLES AND STRATEGIES

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ACTIVE AND REFLECTIVE LEARNERS

- Active learners tend to retain and understand information best by doing something active with it--discussing or applying it or explaining it to others. Reflective learners prefer to think about it quietly first.
- "Let's try it out and see how it works" is an active learner's phrase; "Let's think it through first" is the reflective learner's response.
- Active learners tend to like group work more than reflective learners, who prefer working alone.
- Sitting through lectures without getting to do anything physical but take notes is hard for both learning types, but particularly hard for active learners.

Everybody is active sometimes and reflective sometimes. Your preference for one category or the other may be strong, moderate, or mild. A balance of the two is desirable. If you always act before reflecting you can jump to things prematurely and get into trouble, while if you spend too much time reflecting you may never get anything done.

How can active learners help themselves?

If you are an active learner in a class that allows little or no class time for discussion or problem-solving activities, you should try to compensate for these lacks when you study. Study in a group in which the members take turns explaining different topics to each other. Work with others to guess what you will be asked on the next test and figure out how you will answer. You will always retain information better if you find ways to do something with it.

How can reflective learners help themselves?

If you are a reflective learner in a class that allows little or no class time for thinking about new information, you should try to compensate for this lack when you study. Don't simply read or memorize the material; stop periodically to review what you have read and to think of possible questions or applications. You might find it helpful to write short summaries of readings or class notes in your own words. Doing so may take extra time but will enable you to retain the material more effectively.

SENSING AND INTUITIVE LEARNERS

- Sensing learners tend to like learning facts, intuitive learners often prefer discovering possibilities and relationships.
- Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitors like innovation and dislike repetition. Sensors are more likely than intuitors to resent being tested on material that has not been explicitly covered in class.

- Sensors tend to be patient with details and good at memorizing facts and doing hands-on (laboratory) work; intuitors may be better at grasping new concepts and are often more comfortable than sensors with abstractions and mathematical formulations.
- Sensors tend to be more practical and careful than intuitors; intuitors tend to work faster and to be more innovative than sensors.
- Sensors don't like courses that have no apparent connection to the real world; intuitors don't like "plug-and-chug" courses that involve a lot of memorization and routine calculations.

Everybody is sensing sometimes and intuitive sometimes. Your preference for one or the other may be strong, moderate, or mild. To be effective as a learner and problem solver, you need to be able to function both ways. If you overemphasize intuition, you may miss important details or make careless mistakes in calculations or hands-on work; if you overemphasize sensing, you may rely too much on memorization and familiar methods and not concentrate enough on understanding and innovative thinking.

How can sensing learners help themselves?

Sensors remember and understand information best if they can see how it connects to the real world. If you are in a class where most of the material is abstract and theoretical, you may have difficulty. Ask your instructor for specific examples of concepts and procedures, and find out how the concepts apply in practice. If the teacher does not provide enough specifics, try to find some in your course text or other references or by brainstorming with friends or classmates.

How can intuitive learners help themselves?

Many college lecture classes are aimed at intuitors. However, if you are an intuitor and you happen to be in a class that deals primarily with memorization and rote substitution in formulas, you may have trouble with boredom. Ask your instructor for interpretations or theories that link the facts, or try to find the connections yourself. You may also be prone to careless mistakes on test because you are impatient with details and don't like repetition (as in checking your completed solutions). Take time to read the entire question before you start answering and be sure to check your results

VISUAL AND VERBAL LEARNERS

Visual learners remember best what they see--pictures, diagrams, flow charts, time lines, films, and demonstrations. Verbal learners get more out of words--written and spoken explanations. Everyone learns more when information is presented both visually and verbally.

In most college classes very little visual information is presented: students mainly listen to lectures and read material written on chalkboards and in textbooks and handouts. Unfortunately, most people are visual learners, which means that most students do not get nearly as much as they would if more visual presentation were used in class. Good learners are capable of processing information presented either visually or verbally.

How can visual learners help themselves?

If you are a visual learner, try to find diagrams, sketches, schematics, photographs, flow charts, or any other visual representation of course material that is predominantly verbal. Ask your instructor, consult reference books, and see if any videotapes or CD-ROM displays of the course material are available. Prepare a concept

map by listing key points, enclosing them in boxes or circles, and drawing lines with arrows between concepts to show connections. Color-code your notes with a highlighter so that everything relating to one topic is the same color.

How can verbal learners help themselves?

Write summaries or outlines of course material in your own words. Working in groups can be particularly effective: you gain understanding of material by hearing classmates' explanations and you learn even more when you do the explaining.

SEQUENTIAL AND GLOBAL LEARNERS

- Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."
- Sequential learners tend to follow logical stepwise paths in finding solutions; global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

Many people who read this description may conclude incorrectly that they are global, since everyone has experienced bewilderment followed by a sudden flash of understanding. What makes you global or not is what happens before the light bulb goes on. Sequential learners may not fully understand the material but they can nevertheless do something with it (like solve the homework problems or pass the test) since the pieces they have ɔsorbed are logically connected. Strongly global learners who lack good sequential thinking abilities, on the other hand, may have serious difficulties until they have the big picture. Even after they have it, they may be fuzzy about the details of the subject, while sequential learners may know a lot about specific aspects of a subject but may have trouble relating them to different aspects of the same subject or to different subjects.

How can sequential learners help themselves?

Most college courses are taught in a sequential manner. However, if you are a sequential learner and you have an instructor who jumps around from topic to topic or skips steps, you may have difficulty following and remembering. Ask the instructor to fill in the skipped steps, or fill them in yourself by consulting references. When you are studying, take the time to outline the lecture material for yourself in logical order. In the long run doing so will save you time. You might also try to strengthen your global thinking skills by relating each new topic you study to things you already know. The more you can do so, the deeper your understanding of the topic is likely to be.

How can global learners help themselves?

If you are a global learner, it can be helpful for you to realize that you need the big picture of a subject before you can master details. If your instructor plunges directly into new topics without bothering to explain how they relate to what you already know, it can cause problems for you. Fortunately, there are steps you can take that ıay help you get the big picture more rapidly. Before you begin to study the first section of a chapter in a text, skim through the entire chapter to get an overview. Doing so may be time-consuming initially but it may save you from going over and over individual parts later. Instead of spending a short time on every subject every night, you might find it more productive to immerse yourself in individual subjects for large blocks. Try to relate the subject

to things you already know, either by asking the instructor to help you see connections or by consulting references. Above all, don't lose faith in yourself; you will eventually understand the new material, and once you do your understanding of how it connects to other topics and disciplines may enable you to apply it in ways that most sequential thinkers would never dream of.

- Click here for more information about the learning styles model and implications of learning styles for instructors and students.

- Click here to return to Richard Felder's home page.

INDEX OF LEARNING STYLES (ILS)

The *Index of Learning Styles* is an on-line instrument used to assess preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style model formulated by Richard M. Felder and Linda K. Silverman. The instrument was developed by Richard M. Felder and Barbara A. Soloman of North Carolina State University.

The ILS may be used at no cost for non-commercial purposes by individuals who wish to determine their own learning style profile and by educators who wish to use it for teaching, advising, or research. Consultants and companies who wish to use the ILS in their work may license it. (Click below on "Frequently Asked Questions" for details.)

ILS users should be aware of two important points:

1. The ILS results provide an indication of an individual's learning preferences and an even better indication of the preference profile of a group of students (e.g. a class), but they should not be over-interpreted. If someone does not agree with the ILS assessment of his or her preferences, trust that individual's judgment over the instrument results.

2. A student's learning style profile provides an indication of possible strengths and possible tendencies or habits that might lead to difficulty in academic settings. The profile does **not** reflect a student's suitability or unsuitability for a particular subject, discipline, or profession. Labeling students in this way is at best misleading, and can be destructive if the student uses the label as justification for a major shift in curriculum or career goals. (A learning style preference also does not serve as an excuse for a bad grade on the student's last physics test.)

The following items are available for viewing and downloading.

- Frequently asked questions. Responses to frequently asked questions about the ILS, including questions about its origin, reliability and validity, availability for use in teaching and research, and how businesses may license it.

- ILS questionnaire. A 44-item questionnaire that can be submitted and automatically scored on the Web.

- Descriptions of the learning styles. A four-page handout that briefly explains the instrument results.

- Descriptions and validation studies of the ILS.

  (1) "Applications, Reliability, and Validity of the *Index of Learning Styles*," by R. Felder and J. Spurlin.

  (2) "A Contribution to Validation of Score Meaning for Felder-Soloman's *Index of Learning Styles*," by M. Zywno.

  (3) "A Psychometric Study of the *Index of Learning Styles*," by T. Litzinger, S. Lee, J. Wise, and R. Felder.

Adobe Acrobat Reader is needed to access these files. It can be downloaded free from www.adobe.com.

- Peer review of the Index of Learning Styles in MERLOT (Multimedia Educational Resource for Learning and

Online Teaching).

- "Learning and Teaching Styles in Engineering Education," *Engr. Education, 78*(7), 674-681 (1988). The ticle that originally defined the Felder-Silverman model and identified teaching practices that should meet the needs of students with the full spectrum of styles. The paper is preceded by a 2002 preface that states and explains changes in the model that have been made since 1988.

- "Understanding Student Differences." *J. Engr. Education, 94*(1), 57-72 (2005). An exploration of differences in student learning styles, approaches to learning (deep, surface, and strategic), and levels of intellectual development, with recommended teaching practices to address all three categories.

- "Are Learning Styles Invalid? (Hint: No!)." *On-Course Newsletter*, September 27, 2010. A response to claims that no evidence justifies taking learning styles into account when designing instruction.

- Additional information and references on learning styles.

- Richard Felder's home page. Links to Dr. Felder's education-related papers, columns in *Chemical Engineering Education*, handouts for students, and information about workshops.

Richard Felder's Responses to
Frequently Asked Questions about the ILS

Click on your selection.

1. *How do I get my results? Can you (RF) send them to me?*
2. *Why do I get an error message when I submit the questionnaire?*
3. *I don't understand my results. Can you explain what they mean?*
4. *Here are my results. Based on them, can you suggest good ways for me to study or good careers for me to pursue?*
5. *How did the ILS originate, and what is its theoretical basis?*
6. *What is known about the reliability and validity of the ILS?*
7. *May I build a link to the ILS on my web site?*
8. *May I use the ILS in my research?*
9. *How should I cite the ILS or the short paper "Learning Styles and Strategies" in reference lists?*
10. *May I administer the ILS to my college students, employees, or clients?*
11. *May I administer the ILS to my pre-college students? If not, then what can I administer to them?*
12. *May I get the scoring key for the questionnaire and/or the code for the web-based version?*
13. *May I get copies of my students' profiles when they complete the questionnaire?*
14. *What does it mean if I could have answered most of the questions either way?*
15. *Why isn't the inductive-deductive dimension assessed on the ILS?*
16. *Why "visual-verbal" and not "visual-auditory-kinesthetic"?*
17. *Since we see written words, why are they not included in the visual category?*
18. *Does anyone but me see the results when I submit the questionnaire?*
19. *Is there a teaching styles inventory that parallels the ILS?*
20. *Where can I find out more about the learning style dimensions assessed on the ILS?*

- *How do I get my results? Can you (RF) send them to me?*

  When you check answers to all 44 items on the questionnaire and click on "Submit," your learning style profile should immediately be returned on your computer. The results are not stored, copied, or sent to anyone but you, and neither Dr. Felder nor anyone else can send them to you. If you don't get them automatically, either you made a mistake in filling out the questionnaire or you are accessing an obsolete version (see next question).

  Return to list of questions.

- *Why do I get an error message when I submit the completed questionnaire?*

  If you complete the questionnaire on-line and try to submit it and you get a message that the file cannot be found or the address is invalid, you're probably either accessing an obsolete version of the instrument or your pop-up blocker is keeping the instrument from functioning properly. To get to the right version, go to

  http://www.ncsu.edu/felder-public/ILSpage.html

  select the web-based version of the instrument, complete and submit it. A form showing your learning style profile should be returned immediately. If you know you are accessing the most recent version of the instrument, try turning off your pop-up blocker and completing and submitting the form once more.

Return to list of questions.

- *I don't understand my results. Can you explain what they mean?*

  The four scales of the ILS, the two opposite categories of each scale, and study tips for people in each category are outlined in a short document entitled Learning Styles and Strategies. For much more information, check the references at Learning Styles References. If your score on, say, the active(A)-reflective(R) scale is 1 or 3 on the A side, it means you have a mild preference for active rather than reflective learning. If you score 5 or 7 on the A side, you have a moderate preference for active learning, and if your A score is 9 or 11 you have a strong preference for active learning.

  Return to list of questions.

- *Here are my results. Based on them, can you suggest good ways for me to study or good careers for me to pursue?*

  Study tips for students with different learning style preferences are offered in Learning Styles and Strategies, and you can get many more ideas at Learning Styles References.

  Learning styles are not good guides to choosing college majors or careers. They are preferences, not reliable indicators of strengths and weaknesses. The fact that you have a preference for sensing says nothing about how good or bad you are at intuitive skills--or for that matter at sensing skills--and people with every possible learning style have succeeded brilliantly in every possible career. A much better way to choose a career is to identify something you're good at and love to do, and then find a way to do it for a living.

  Return to list of questions.

- *How did the ILS originate, and what is its theoretical basis?*

  The Index of Learning Styles was created in 1991 by Richard M. Felder, a chemical engineering professor at North Carolina State University, and Barbara A. Soloman, then the coordinator of advising for the N.C. State First-Year College. The four learning style dimensions of the instrument were adapted from a model developed in 1987 by Dr. Felder and Dr. Linda K. Silverman, an educational psychologist then at the University of Denver. The first version of the instrument was administered to several hundred students and the data were subjected to a factor analysis. Items that did not load heavily on one and only one item were replaced with new items to obtain the current 44-item version of the instrument. The ILS was installed on the World Wide Web in 1996. It gets close to a million hits per year and has been translated into Spanish, Portuguese, Italian, German, and several other languages.

  Click here to view "Learning and Teaching Styles in Engineering Education," the 1988 article that defines the Felder-Silverman learning styles model, with a 2002 preface outlining and explaining changes that have been made in the model since 1988.

  Return to list of questions.

- *What is known about the reliability and validity of the ILS?*

  Three studies have examined the independence, reliability, and construct validity of the four instrument scales. The authors conclude that the ILS meets standard acceptability criteria for instruments of its type.

  1. R.M. Felder and J.E. Spurlin, "Applications, Reliability, and Validity of the *Index of Learning*

Styles," *Intl. J. Engr. Education, 21*(1), 103-112 (2005).

2. M. Zywno, "A Contribution to Validation of Score Meaning for Felder-Soloman's *Index of Learning Styles,*" *Proceedings, 2003 ASEE Annual Conference,* American Society for Engineering Education, June 2003.
3. T.A. Litzinger, S.H. Lee, J.C. Wise, and R.M. Felder, "A Study of the Reliability and Validity of the Felder-Soloman *Index of Learning Styles,*" *Proceedings, 2005 ASEE Annual Conference,* American Society for Engineering Education, June 2005.

Adobe Acrobat Reader is needed to access these files. It can be downloaded free from www.adobe.com.

Return to list of questions.

- *May I build a link to the ILS on my web site?*

  You are welcome to do so.

Return to list of questions.

- *May I use the ILS in my research?*

  Yes. (See next question for information on how to cite it.)

Return to list of questions.

- *How should I cite the ILS or the short paper "Learning Styles and Strategies" if I refer to them in publications?*

  If you use the ILS and/or publish anything related to the ILS or data obtained with it, please cite

  Felder, R.M., and Soloman, B.A. (n.d.).

  in the text and include the bibliographic listing

  Felder, R.M., and Soloman, B.A. (n.d.). *Index of Learning Styles*. Retrieved from http://www.ncsu.edu/felder-public/ILSpage.html

  To reference "Learning Styles and Strategies," cite

  Felder, R.M., and Soloman, B.A. (n.d.).

  in the text and include the bibliographic listing

  Felder, R.M., and Soloman, B.A. (n.d.). Learning styles and strategies. Retrieved from http://www.ncsu.edu/felder-public/ILSdir/styles.htm

Return to list of questions.

- *May I administer the ILS to my college students, employees, or clients?*
- *May I get the scoring key for the questionnaire?*

  The ILS is available at no cost to students and faculty at educational institutions to use for non-commercial purposes, and also to individuals who wish to determine their own learning styles. While Dr. Felder has chosen to provide open access to the web-based instrument, he relies on the integrity of other users to help cover the expense of maintaining it.

  If you are affiliated with an educational institution and wish to administer the ILS at no cost to your students, advisees, or educational research subjects, click here to access a certification form.

If you are affiliated with an organization other than an educational institution or you are in business for yourself and wish to administer the ILS to your colleagues, employees, or clients, or if you are with an educational institution and wish to administer it to anyone for a fee, click here to apply for a license.

Return to list of questions.

- *May I administer the ILS to my pre-college students? If not, then what* can *I administer to them?*

  The ILS was developed for use by college students and has only been validated for people of college age and older. Obviously, the instrument can only provide meaningful results for subjects who understand the questions: questions such as "*When I solve math problems* ***(a)*** *I usually work my way to the solutions one step at a time;* ***(b)*** *I often just see the solutions but then have to struggle to figure out the steps to get to them*," and "*When I am learning a new subject, I prefer to* ***(a)*** *stay focused on that subject, learning as much about it as I can;* ***(b)*** *try to make connections between that subject and related subjects*." Many older high school students might relate to those questions, but it would be a rare junior high school student and an even rarer elementary school student who could provide meaningful answers. In short, the younger the student, the less appropriate the ILS. If you're still interested in using it, you should scroll up to the response to the previous question.

  Two assessment instruments have often been used for pre-college students. The first is the *Dunn and Dunn Learning Style Inventory*, which has a version designed for Grades 3 and 4 and another version for Grades 5-12. It can be obtained from Price Systems, Inc.. The second instrument is the *Murphy-Meisgeier Type Inventory*, which is designed to assess Myers-Briggs Type Indicator preferences for children in Grades 2-8 (ages 7-13). It can be obtained from the Center for Applications of Psychological Type and other organizations that distribute the MBTI.

  Return to list of questions.

- *May I get copies of my students' profiles when they complete the questionnaire on the Web?*

  Sorry--the questionnaire is not set up to do that. If you wish to collect responses, you will either have to ask the respondents to print out and hand in their profiles or make arrangements to secure the scoring key or the computer code for the instrument under the terms outlined in the previous question.

  Return to list of questions.

- *What does it mean if I could have answered most of the questions either way?*

  Imagine each dimension of the ILS as a two-pan scale, with each pan representing one of the two categories of the dimension (for example, sensing and intuiting), and weights in a pan representing skills associated with that category. If you have a preference for sensing, it means you have more weights in the sensing pan than the intuitive pan, and conversely if you have a preference for intuition.

  Some people have a *strong* preference for one category, say, sensing, over the other (they have *many* more weights in the sensing pan than in the intuitive pan). Those people will choose the sensing alternative on most of the 11 questions on the ILS that have to do with the sensing/intuitive dimension, and they will get a high score (9 or 11) for sensing. (The score is the difference between sensing responses and intuitive responses.) Others for whom the preference for sensing still exists but is not as strong will choose a few intuitive responses. They will get an intermediate score (5 or 7) for sensing.

  Still others who prefer sensing are closely balanced (nearly equal weights on both pans). In situations that

call for behaving like a sensor or like an intuitor, they are almost equally likely to go either way. On the ILS, these individuals will end up choosing some sensing alternatives and almost as many intuitive alternatives and end up with a low score (1 or 3) for sensing. So, if you find that you have a hard time answering many questions that relate to a particular dimension, it just means that you are fairly well balanced on that dimension.

It is important to remember that if you have a preference for one category it doesn't mean anything about how strong or weak you are at the other category (or at the first category, for that matter). One person with a preference for sensing may not be particularly skilled at either sensing or intuition (few weights in the sensing pan, even fewer in the intuitive pan). Another may have many skills in both categories (many weights in the intuitive pan, even more in the sensing pan). Both of these individuals would look alike on the ILS. *Since people must function well in each category to be successful in work and in life, the goal for teachers should be to help equip students with both sensing skills and intuitive skills.* For more information about how to do this, read "Reaching the Second Tier."

Return to list of questions.

- *Why isn't the inductive-deductive dimension of the original learning styles model assessed on the ILS?*

  Since Drs. Felder and Silverman developed the model on which the ILS is based, Dr. Felder has come to believe that while inductive and deductive are indeed different learning preferences and different teaching approaches, the "best" method of teaching--at least below the graduate school level--is inductive, whether it be called problem-based learning, discovery learning, inquiry learning, or some variation on the same theme. On the other hand, the traditional college teaching method is deductive, starting with "fundamentals" and then proceeding to applications.

  The problem with inductive presentation is that it isn't concise and prescriptive--you have to take a thorny problem or a collection of observations or data and try to make sense of it. Many or most students would say that they prefer deductive presentation, as in "Just tell me exactly what I need to know for the test, not one word more or less." Dr. Felder does not want instructors to be able to give the instrument to students, find that the students prefer deductive presentation, and use that result to justify continuing to use the traditional deductive instructional paradigm in their courses and curricula. He has therefore omitted this dimension from the instrument.

  To view descriptions and comparisons of different inductive teaching methods with suggestions for implementing them effectively, click here.

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- *Why "visual-verbal" and not "visual-auditory-kinesthetic"?*

  Visual and auditory learning both have to do with the component of the learning process in which information is perceived through the senses, while "kinesthetic" learning, being the only remaining category, lumps together both information perception (touching, tasting, smelling) and information processing (moving, interacting with others, etc.). The perception-related aspects of kinesthetic learning are at best marginally relevant to higher education and so are neglected in the learning styles model. The processing components of the kinesthetic modality are included in the active/reflective learning style category. The next question addresses the verbal-auditory distinction.

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- *Since we see written words, why are they not included in the visual category?*

  "Visual" information clearly includes pictures, diagrams, charts, plots, animations, etc., and "auditory" information clearly includes spoken words and other sounds. The one medium of information transmission that is not clear is written prose. It is perceived visually and so obviously cannot be categorized as auditory, but it is also a mistake to lump it into the visual category as though it were equivalent to a picture in transmitting information. Cognitive scientists have established that our brains generally convert written words into their spoken equivalents and process them in the same way that they process spoken words. Written words are therefore not equivalent to real visual information: to a visual learner, a picture is truly worth a thousand words, whether they are spoken or written. Making the learning style pair visual and verbal solves this problem by permitting spoken and written words to be included in the same category (verbal). For more details about the cognition studies that led to this conclusion, see

  R.M. Felder and E.R. Henriques, "Learning and Teaching Styles in Foreign and Second Language Education."

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- *Does anybody but me see the results when I submit the questionnaire?*

  No. Your response data and your learning style profile are not stored or sent to anyone other than you and cannot be recovered once you have received the profile.

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- *Is there a teaching styles inventory that parallels the ILS?*

  None has been developed. If teachers look at the list of recommended teaching strategies in "Learning and Teaching Styles in Engineering Education," they should be able to judge the extent to which they are addressing the needs of students with different learning styles.

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- *Where can I find out more about the learning style dimensions assessed on the ILS?*

  Go to

  Resources in Science and Engineering Education

  and click on the link to "Learning Styles." You will find several articles that provide information on the Felder-Silverman learning styles model that forms the basis of the ILS.

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