Getting Practical with Learning Styles in "Live" and Computer-based Training Settings

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Abstract

Learning styles are relatively-stable characteristic behaviors that indicate how students prefer to learn. To maximize student learning, it is important for instructors to address learning styles when designing their lessons. What does the research say about learning styles? What should instructors do to factor learning styles into traditional lessons? What should be done differently with respect to learning styles when designing computer-based training software? This summary paper answers these questions. In this presentation, through discussion and demonstration, participants will be given practical suggestions for addressing learning styles in both traditionally-delivered lessons and computer-based training applications.

Keywords: learning styles, cognitive styles, learning preferences, computer-based training, instructional design

Introduction

This summary paper describes what the research says about learning styles, suggests how instructors can factor learning styles into their traditional lessons, and presents what should be done with respect to learning styles in computer-based training applications.

Learning styles, also known as cognitive styles or learning preferences, are characteristic behaviors that indicate how students prefer to learn. Learning styles tend to be relatively stable over time, in other words are predictable, but are not static in that there can be some variation from day-to-day, week-to-week, and as one ages (Ayersman, 1993; Davidson & Savenye, 1992; Guild & Garger, 1985; Price, 2004). To maximize student learning, it is important for instructors (used as a general term that includes teachers, instructors, professors, lecturers…) to address the variety of learning styles when designing and delivering their lessons.

Some of the numerous learning style categorizations and preferences include:

- concrete thinkers who prefer details, specifics, structure, and organization versus abstract thinkers who like to think about things, analyze, and visualize (Butler, 1986; McCarthy, 1987)

- active learners who like to try things first versus reflective learners who prefer to first watch and reflect on things (McCarthy, 1987)
- holists who, for example, like to understand the overall idea first and then learn details versus serialists who like to work step-by-step to gradually learn the whole idea (Ellis, Ford & Woods, 1993; Geisert & Dunn, 1991)

- visually-based versus text-based versus audio-based activities (Ayersman, 1993; Enochs, Handley & Wollenberg, 1986; Suits & Lagowski, 1994)
    - Simply put, individuals have different media preferences. Note that some references refer to these as right-brained versus left-brained activities. However, the original research was flawed. In reality, both halves of the brain are involved in processing both visual and text-based material. Ayersman (1993) stated, "Both sides of the brain are necessary to reach higher-ability levels in certain skill areas such as language."
- sociological factors such as introversion, extroversion, and working alone, in pairs, in groups, or with or without an authoritative or collegial adult (Enochs, Handley & Wollenberg, 1986; Hoffman & Waters, 1982)
- environmental considerations (Ayersman, 1993; Billings & Cobb, 1992; Dunn & Bruno, 1985; Geisert & Dunn, 1991; Ross, Drysdale & Schulz, 2001)
    - There are preferences for differing amounts of light and sound in the room.
    - Learning position preferences can vary greatly. Choices include learning in a hard chair, in a soft chair, on a pillow, on a carpet, and lying on one's back.
    - Some learners perform better when the room temperature is cold or cool while others like it warm.
    - There can be differences in performance simply from food or drink being present or not.
    - Mobility can be important for learners who like to get up and move around periodically.
    - The time of day can have an impact. As stated by Dunn and Bruno (1985), "No matter when a teacher is teaching, it is the wrong time of day for at least one-third of that class."

Research has not concluded that there is only one way to categorize students with respect to learning styles. In other words, research has supported many learning style classification systems.

Learning Style Research

For learning styles in general, research has shown that:
- Each learning style is equal in terms of overall achievement (Ayersman, 1993; Butler, 1988; Davidson & Savenye, 1992; Guild & Garger, 1985). However, depending on the material taught and how it is taught, one specific learning style can be better than another (Crosby & Iding, 1997; Davidson & Savenye, 1992).
- Matching learning style with the instructional design can lead to increased achievement and better attitudes (Ayersman, 1993; Carlson, 1991; Dunn & Bruno, 1985; Geisert & Dunn, 1991; Miller, 2005; Price, 2004; Ross & Shultz, 1999; Shivers, Nowlin & Lanouette, 2002; Smith & Renzulli, 1984; Suits & Lagowski, 1994; Takacs, Reed, Wells & Dombrowski, 1999; Yung-Bin, 1992).
    - For example, learners who prefer a structured approach to learning and to use their senses, such as sight and sound, tend to learn effectively with those types of instructional strategies. Students who prefer to learn by experimenting or by using intuition, common sense, or imagination should be taught with lessons and activities that encourage those preferences.
    - Note that effective learning can still occur when the student's preferred learning style does not match the instructional design. Most students have learned how to learn from a variety of instructional approaches. This does not imply that their learning is as effective as possible.
    - There is some value in occasionally mismatching learning style with instructional design. This can help students learn to adapt to other instructional styles. However, mismatching can be harmful to both teachers and students if done over extended periods of time (Smith & Renzulli, 1984).

- Conversely, some studies have shown no differences in test scores when matching learning styles with instructional strategies (Billings & Cobb, 1992; Carlson, 1991; Davidson-Shivers, Nowlin & Lanouette, 2002; Ellis, Ford & Woods, 1993; Miller, 2005; Steele, Palensky, Lynch, Lacy & Duffy 2002; Suits & Lagowski, 1994). There are numerous explanations for this. For example, it may be that most students adapt to the nature, context, and difficulty of the task and can learn effectively from a variety of methods (Ayersman, 1993; Butler, 1986; Ross, Drysdale & Schulz, 2001; Smith, 2004; Takacs, Reed, Wells & Dombrowski, 1999). Other factors could depend on how well the learning style assessment tool matches the context in which it is used and how accurately students assess themselves (Miller, 2005; Price, 2004).
- Within each learning style categorization and preference, students generally fall somewhere along the continuum between two opposite extremes. Few students are found at the extremes (McCarthy, 1987).
- Learning style is only one of the variables affecting learner achievement. Other factors, such as the quality and content of a course can be more important (Engleberg, Schwenk & Gruppen, 2001).

With respect to computer-based training (CBT) applications, students who are more likely to have problems are those who cannot easily concentrate, cannot stay with a task until it is completed, do not pay attention to details, have poor memories for facts, and have poor reading skills (Dunn & Bruno, 1985; Enochs, Handley & Wollenberg, 1986; Hoffman & Waters, 1982; Ross & Shultz, 1999). However, these students would likely have problems with other types of instructional presentations. It can be argued that many of these students would benefit most from well-designed CBT lessons (Ayersman, 1993; Fitzgerald, 1990). For example, the ability of students to proceed at their own pace and to review as much and as often as they wish in CBT lessons can help students who have trouble concentrating or not staying with tasks until completion. CBT lessons with a variety of media can help students remember details and facts as well as learners with poor reading abilities.

Getting Practical with Learning Styles

From a practical perspective, instructors will not be able to individually address all of the learning style categorizations in each lesson they teach. The issue is what should be done for students who have some difficulties with an instructional strategy. If students are not learning effectively in the way they are taught, they should be taught in the way they learn best. The instructional design must revolve around how the students learn rather than the instructor's preferred teaching approach. There are a number of strategies that instructors can use to teach students in the way they learn best:

- Conduct a learner analysis, through questions and observations, to determine the student's learning styles, motivational factors, and interests (Fenrich, 2005). From a practical perspective, if the instructor's time is limited, the instructor should assume that there is significant variation among the students and that the instructor's teaching (and learning) style preferences will not be the same as all of the students.
- Include a variety of instructional activities (Ayersman, 1993; Takacs, Reed, Wells & Dombrowski, 1999) so that each student is likely to have a preferred activity some of the time. As Magoulas, Papanikolaou, and Grigoriadou (2003) said, "No single instructional strategy is best for all students."
  - For example, lessons throughout a course or in a CBT application could include theoretical approaches, drill and practice, simulations... Instructors can get ideas by watching others teach. Creators of CBT materials should view lessons created by others. This will likely give both "good" and "bad" ideas.

- The planned instructional activities must include interactivity (Ghaoui & Janvier, 2004; Takacs, Reed, Wells & Dombrowski, 1999), defined as active learner participation in the learning process. This is essential for effective learning. Learners retain more if they see, hear, and do something than if they just see and hear something than if they just see or just hear something. "Live" lessons and CBT applications have the potential of enabling learners to "see, hear, and do". In CBT applications, interactivity can take the form of learners answering questions that require thinking, students being actively involved with a simulation or an educational game, providing feedback, utilizing the learner's existing knowledge and experience, students making comments and annotations, learners modifying the computer program, and/or students discussing the content in pairs or groups of three (Fenrich, 2005).
- Different question types and questioning techniques help provide variation.
- Note that serialists tend to do much better than holists in typical CBT programs (Geisert & Dunn, 1991). So, also include activities that holists prefer. For example, allow students to see the whole idea at the beginning of the lesson. This can be done in a detailed overview. Similarly, learners who prefer to learn material sequentially tend to learn better from typical CBT programs than learners who prefer thinking in abstract ways (Ross, Drysdale & Schulz, 2001; Ross & Shultz, 1999). Abstract thinkers can be supported through variety, overviews, learner control of pace and sequence, motivating them, meaningful and relevant content, and enabling them to work with others.
- Use different instructional strategies to teach the varied learning outcomes of the different learning domains. The learning domains are verbal information where students learn skills such as stating, listing, describing, and naming, intellectual skills including discriminating, identifying, classifying, demonstrating, generating, originating, and creating, psychomotor skills entailing tasks such as making, drawing, adjusting, and assembling, and attitudes including learners making choices (Dick & Carey, 1990).

When teaching verbal information:
- Organize the material into small easily retrievable chunks.
- Link new information to knowledge the learner already possesses. For example, use statements such as "Remember how" or "This is like..." Linking information helps the learner to store and recall the material.
- Use memory devices like forming images or using mnemonics for new information. For example, the musical notes of the treble clef staff lines can be remembered with the mnemonic Every Good Boy Deserves Fudge.
- Use meaningful contexts and relevant cues. For example, relating an example to a sports car can be relevant for some learners.
- Have the learners generate examples in their minds, "do" something, such as create a song or game, with the information, or apply the knowledge to the real world. If the student only memorizes facts then the learning will only have minimal value.
- Avoid rote repetition as a memorization aid. Rote repetition has minimal effectiveness over time.
- Provide visuals to increase learning and recall.
(Fenrich, 2005)

When teaching intellectual skills:
- Link new knowledge to previously learned knowledge. This can be explicitly done (e.g., the bones in your feet are comparable to the bones you have learned about in your hands) or implicitly done (e.g., compare the bones in your feet to other bone structures you have learned about).
- Use memory devices like forming images or mnemonics for new information. For example, help students remember rules by using rhymes such as "i before e except after c".

Remember that rules often have exceptions. Learners need to be told about the exceptions.
- Use examples and non-examples that are familiar to the student. For example, when classifying metals, iron and copper are examples while glass and plastic are non-examples.
- Use discovery-learning techniques. For example, let students see the consequences of decisions they make. This can be done very effectively in CBT applications.
- Use analogies that the learners know. However, be careful that learners do not over-generalize or create misconceptions.
- Provide for practice and immediate feedback.

(Fenrich, 2005)

When teaching psychomotor skills:
- Provide directions for completing all of the steps.
- Provide repeated practice and feedback for individual steps, then groups of steps, and then the entire sequence.
- Remember that, in general, practice should become less dependent on written or verbal directions.
- Consider visuals to enhance learning.
- Consider job aids, such as a list of steps, to reduce memory requirements. This is especially important if there are many procedures or if the procedures are infrequently used.
- After a certain point, allow learners to interact with real objects or do the real thing. How much can students learn about skydiving while standing on the ground?
- Note that some psychomotor skills involve other learning domain classifications. For example, when learning how to drive a standard transmission car, many of the skills are psychomotor. However, deciding when to shift gears is an intellectual skill. Also, note that the required proficiency level can affect the instructional strategy. There is a significant difference between imitating a skill and automatically doing a skill.

(Fenrich, 2005)

When teaching attitudes:
- Try to show a human model. The students should easily relate to the model. For example, it may be better if the model is of the same race and socio-economic class. For practical reasons, instructors can use video clips to show human models.
- Show realistic consequences, such as through a simulation, to appropriate and inappropriate choices.
- Instructors can use role-playing to reinforce the attitudes taught.
- Remember that attitudes taught "live" or through computer technology are not guaranteed to transfer to the real world. If appropriate and possible, consider also arranging for practice opportunities to make the choice in real life.
- Note that it can be difficult to test whether the attitudes taught have transferred to real situations. For example, learners may not behave as they naturally would if they know that they are being observed. If learners have not voluntarily permitted observations to be made then the instructor must determine whether it is ethical to make the observations.

(Fenrich, 2005)

• Use instructional strategies, such as simulations and discovery-learning techniques, that go beyond basic teaching methods, as is appropriate. A pitfall of some instructors is that they only teach in the way they were taught. As Emile Chartier said, "Nothing is more dangerous than an idea, when it is the only one you have."
• Include a variety of media, as is appropriate for learning, so that all students can learn from media they prefer.

- For example, some students prefer visuals while others prefer to read text. If instructors include both, they are likely to reach more students (Enochs, Handley & Wollenberg, 1986). This is particularly easy to do with CBT applications and computer-managed presentations (e.g., as can be done with PowerPoint®).
  - Instructors can reach most learners by providing both visual and text-based content.
  - Learning through more than one medium involves more of the brain in learning. However, if too much mental processing is required, learning can be compromised (Muthukumar, 2005). One way to limit the mental processing requirements is to ensure the learners only focus on one medium at a time.
- Let students choose how to present their knowledge, at least some of the time.
  - Knowledge can be demonstrated in group discussions, debates, speeches, computer presentations, written assignments... Activities like these can be combined with CBT materials.
- Let learners have some input in how they would like to be taught (Smith & Renzulli, 1984).
  - For example, let students choose whether to receive a generalization and then examples or vice versa, whether to receive a different version of the content or supplementary information, how much practice they should get, and even the material's level of difficulty. Assuming that students can make good decisions about these choices, a practical problem remains of whether instructors would be able to design and develop these alternatives. Since it could be hard to justify the costs for creating these alternatives, particularly for CBT applications, instructors should simply provide variation for different learning outcomes.
  - Note that students will not necessarily make the best choices with respect to their learning style (Davidson & Savenye, 1992). Students may choose to do what they think is easy or activities with which they are already familiar.
  - Instructors must be willing to incorporate strategies in which they have less comfort, if learners can influence how they are taught.
  - Instructors must remember to utilize their natural teaching strengths, while accommodating learners.
- Create learning materials that help ensure success.
  - Success may help make mismatches in teaching style and learning style less important.
  - Ensure success through organizing the material into small incremental steps and by providing numerous practice opportunities with immediate and detailed feedback (Fenrich, 2005).
  - With CBT applications, designers can help ensure success by allowing students to have control over the instruction's pace and sequence (Fitzgerald, 1990).
- Encourage students to cooperatively work in pairs while learning.
  - Working in pairs can help increase performance (Cavalier & Klein, 1998; Enochs, Handley & Wollenberg, 1986; Fitzgerald, 1990; Hoffman & Waters, 1982; Hooper, Temiyakarn & Williams, 1993) since students who work in pairs or groups tend to discuss and thus think about the material and questions more than when they are working alone.
  - With "live" teaching and particularly with CBT programs, working in pairs can help those who do not like to work alone (extroverts).
- Allow for flexibility.
  - Let students learn where they prefer (in a hard chair, on a lounge, on the floor, in a noisy area, in a quiet area, where it is bright, where the light is low, in warm areas, in cool areas …). For CBT applications, a laptop can provide this flexibility.
  - For CBT applications, make the program available so that students can work when they prefer. This also lets them take breaks when they need.

- For CBT applications, include a workbook with summaries of the multimedia material so that students do not have to take detailed notes, which can become tedious (Fenrich, 2005). This particularly affects students who are inclined to copy everything presented by the computer.

Instructors can also help students by having them assess their learning styles and then teaching them strategies to accommodate their individual learning styles (Ross, Drysdale & Schulz, 2001). However, it is not essential that instructors categorize and label a student into a particular learning style, especially since many individuals incorrectly identify elements of their learning style (Geisert & Dunn, 1991). Labeling students with a learning style could have negative consequences if the information is incorrect, not used properly, or abused (Butler, 1986).

Discussion

Given, it is important for instructors to address learning styles when designing their lessons and instructors will not have the time or receive funding to develop each lesson specifically for each learning style, instructors must deal with learning styles in practical ways. To address learning styles when creating lessons for both "live" and CBT applications, instructors should:
- Conduct a learner analysis to determine the students' learning styles, motivational factors, and interests.
- Include a variety of instructional activities so that each student experiences at least one preferred activity.
- Teach different earning outcomes with different instructional strategies.
- Use instructional strategies that go beyond basic teaching methods.
- Include a variety of media so that all students can learn from media they prefer.
- Let students choose how to present their knowledge.
- Let learners have some input in how they would like to be taught.
- Create learning materials that help ensure success.
- Encourage students to work in pairs.

Specifically for CBT applications:
- Include activities that holists prefer such as allowing students to see the whole idea at the beginning of the lesson.
- Support abstract thinkers and others through variety, overviews, learner control of pace and sequence, motivating them, meaningful and relevant content, and enabling them to work with others.
- Interactivity can take the form of learners answering questions that require thinking, students being actively involved with a simulation or an educational game, providing feedback, utilizing the learner's existing knowledge and experience, students making comments and annotations, learners modifying the computer program, and/or students discussing the content in pairs or groups of three.
- Use discovery-learning techniques.
- Include a variety of media (video, audio, still images, and text).
- Allow for flexibility.
- Let students use a laptop so that they can learn where they prefer.
- Include a workbook with summaries of the material.

Instructors should remember that:
- In general, each learning style is equal in terms of achievement.
- Matching learning style with the instructional design can lead to increased achievement and better attitudes.
- Effective learning can still occur when the student's preferred learning style does not match the instructional design.

- Within each learning style categorization and preference, most students generally fall somewhere along the continuum between two opposite extremes.
- Students can benefit from assessing their learning styles if they are then taught strategies to accommodate their individual learning styles.

- No one single teaching method or medium is perfect for all learners.

Well-designed CBT applications have the potential to help students who cannot easily concentrate, cannot stay with a task until it is completed, do not pay attention to details, have poor memories for facts, and have poor reading skills.

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Biography

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In Peter's book entitled, "Creating Instructional Multimedia Solutions: Practical Guidelines for the Real World", he provides practical information that he has gained through years of experience in the field.

Peter taught secondary school in Nigeria for two years. He continues to support developing countries through a number of initiatives. His goal is to make the world a better place through his instructional multimedia productions and training workshops.