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# Preferred Learning Styles for Respiratory Care Students at Texas State University – San Marcos

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**Abstract**
Academic success includes setting goals, effective time management, and the match of teaching methods to learning style. It also depends on the educator and the manner in which material is presented. Learning style influences the retention of information and the depth of comprehension. If educators present material in a style that matches a student's preferred learning style, then academic performance may improve. Assessing learning styles will benefit the student and the educator. Material retention will improve, thus improving test scores and limiting remediation. It is also important to determine if students, as a group, fit into a particular style or a particular cycle as they move through an educational program. The study: Students in the Department of Respiratory Care at Texas State University-San Marcos completed a questionnaire used to assess preferred learning styles. Methods: Analysis of variance was run to test for a relationship between learning cycle and student classification in the program (i.e. freshman, sophomore, junior, or senior). Cross tabulation was run to test for a relationship between learning style and student classification in the program. Results: Eighty-two students received the Kolb LSI questionnaire. The data demonstrated the juniors preferred a converger learning style and the senior students are in the abstract conceptualization cycle of learning. There were no relationships demonstrated between other groups in the study. Discussion: The junior and senior students appear to prefer the stage of learning involving thinking and problem analysis. When a group of students demonstrate a preference for a particular learning style then educators can develop their curriculum along a similar path.

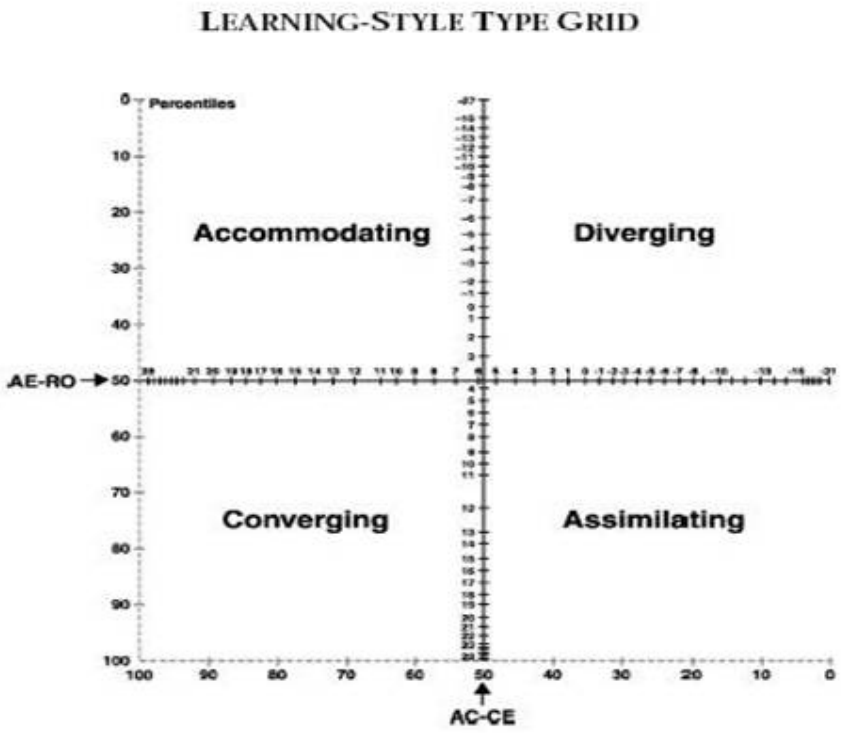
## Introduction

David Kolb stated that, "knowledge is created through the transformation of experience." [1] With every new experience, we possess the ability to learn something new, to increase our knowledge base. Academic institutions and educators utilize this fundamental idea when educating students. Academic success for the student may encompass goal setting, proper time management, study skills, and their preferences for a particular style of learning.[2] A student's learning style determines how that person comprehends and retains information and is important for the student and the educator.[2] The manner in which information is presented will affect the student's ability to learn. Personal learning styles influence the student's ability to acquire information as well as interact with the teacher and with peers.[9, 10] Students learn in many different ways; some individuals grasp new material when it is presented using a kinesthetic style and others prefer an audio/visual style.[3] Regardless of the style of learning, most educators utilize only a small number of teaching styles. For example, lecture material is presented in a PowerPoint® slide format and followed weeks later with an exam. However, there are as many ways to teach as there are to learn. Are we as educators employing the best teaching method for the student? Educators must understand that students differ in their learning style and it is imperative to implement a variety of teaching styles to reach them.[9] Having numerous styles of teaching at your disposal could increase comprehension and retention of material.[5] Employing strategies to improve teaching effectiveness may occur if we match teaching style with student learning style.[8] There are a number of tests used to assess learning styles. One of the most common tests used today is the Kolb Learning Style Inventory (LSI)[1,4]

Kolb's work is based on the theories of Jean Piaget, John Dewey, and J.P. Guilford, and is supported in the literature as being a valid instrument to test learning

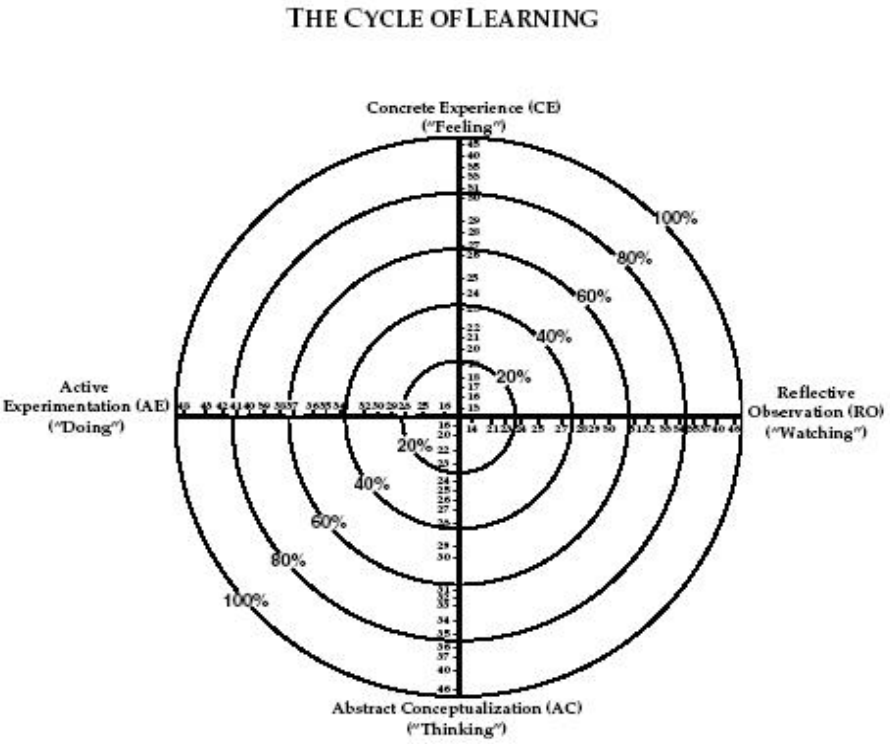
styles.[4] Kolb's LSI classifies the learner into one of four learning styles: 1) Converger, 2) Diverger, 3) Assimilator, and 4) Accommodator.[1] *(Figure 1)*

**Figure 1:** Kolb Learning Style Inventory - © Experience Based Learning Systems, Inc. Developed by David A. Kolb. Reproduced with permission from the Hay Group, Inc.




In addition to the learning styles, Kolb defined four learning cycles. These cycles include: 1) Concrete Experience (CE), which consists of learning from feelings or reactions to new experiences, 2) Reflective Observation (RO), which consists of learning from listening and observing, 3) Abstract Conceptualization (AC), which consists of learning from thinking or analyzing problems in a systematic method, and 4) Active Experimentation (AE), which consists of learning by doing.[1] These four cycles are tied into learning styles in that each style incorporates two cycles. *(Figure 2)*

**Figure 2:** Kolb Learning Style Inventory - © Experience Based Learning Systems, Inc. Developed by David A. Kolb. Reproduced with permission from the Hay Group, Inc.




Think of learning style inventories as dimensions as opposed to categories; thus, there is some overlap. Assimilators prefer to learn using *Reflective Observation* and *Abstract Conceptualization*. The learner integrates observations into the world of existing concepts.[4] Convergers learn using *Active Experimentation* and *Abstract Conceptualization*. Kolb describes it as someone who learns by thinking and doing.[1] Accommodators learn using *Active Experimentation* and *Concrete Experience*. The learner takes new concepts/experiences and adjusts them to relate in the real world.[6] These students are motivated by being actively involved in the learning process.[4] Divergers learn using *Concrete Experience* and *Reflective Observation*. These students prefer specific information presented in a detailed, systematic and reasoned manner.[4] Divergers need time to reflect on the information presented. Although these types of learners incorporate *Concrete Experience* into their style, they prefer to watch before getting involved.[7]

Students will move between learning cycles. Kolb states, "the actual process of growth in any single individual…probably proceeds through successive oscillations from one stage to another." The learning process is dynamic and based on the learners needs for different abilities at different times. Therefore, one should not assume that a student learns using only one style. Ideally, each student will possess a portion of each learning stage.[8, 11] If students possess a portion of each cycle, then educators will need to develop lectures in such a way to include a portion of each cycle.[8] Although students have a preference toward a particular style, most are able to comprehend material when presented in a different style.[1] To determine an individuals learning style, he/she completes an instrument called the "Learning Style Inventory" by answering questions contained in Kolb's Self Scoring Inventory and Interpretation booklet.

After a search of the literature, there was little research on learning styles for Allied Health students especially respiratory therapy students. The objective of the research study was to determine the learning style of Respiratory Care students at Texas State University – San Marcos. Future research possibilities include assessment of the learning styles of other students in the College of Health Professions at Texas State, and correlation studies between learning style and grade point average as well as learning styles of the faculty.

*Materials and Methodology*

Students in the Respiratory Care program at Texas State University – San Marcos voluntarily completed a Kolb LSI questionnaire. The Kolb LSI is a questionnaire of 12 sentences and sentence endings that describe learning.

The questionnaire asks the student to rank each ending to the sentence according to how well each ending describes the way the student learns. All participating students received an explanation of the study's purpose and assurance of anonymity of their results from the other students if desired. Those students who did not want to participate in the study were removed without repercussion. Students completed the questionnaire in the Department of Respiratory Care classrooms located in the Health Science Building. Instructions were printed on the questionnaire as well as read by the administrator. The rankings from each questionnaire as well as demographic information were entered into a statistical program for data analysis. An analysis of variance was run to test for a relationship between learning cycles and student classification in the program (i.e. freshman, sophomore, junior, or senior). Cross tabulation was run to test for a relationship between learning style and student classification in the program. A Pearson correlation was run to test for a correlation between each learning cycle. Students completing the questionnaire received information identifying their individual learning style along with advice on proper study habits.

**Results**

Eighty-two subjects participated in this study. Of the eighty-two subjects, 23.17% preferred the accommodator style, 26.83% preferred the diverger style, 24.39% preferred the converger style, and 25.61% preferred the assimilator style. Male subjects made up 23.2% (n=19) of the subjects and females consisted of 76.8% (n=63). The demographic analysis by classification demonstrates that 28% (n=23) of the students are freshman, 25.6% (n=21) are sophomores, 29.3% (n=24) are juniors, and 17.1% (n=14) are seniors. *(Table 1)*

**Table 1:** The percentage of RC students who prefer a particular learning style.

| Learning Style | N | % |
|---|---|---|
| Converger | 20 | 24.39 |
| Assimilator | 21 | 25.61 |
| Diverger | 22 | 26.83 |
| Accommodator | 19 | 23.17 |

There was no significant relationship between any phase of the learning cycle and gender. There was no significant relationship between college classification and the accommodator, diverger, or assimilator styles. There was a significant relationship between college classification (e.g. freshman, sophomore, etc.) and the converger style. (*Table 2*)

**Table 2:** Pearson chi-square of learning style and student classification. Only the converger style shows significance. Significant at $p < 0.05$

| Pearson chi-square | | |
|---|---|---|
| **Learning Style** | **Classification** | **P-value** |
| Converger | Fr: 10.0%<br>So: 15.0%<br>Jr: 50.0%<br>Sr: 25.0% | 0.0281* |
| Accommodator | Fr: 31.6%<br>So: 36.8%<br>Jr: 26.3%<br>Sr: 5.3% | 0.3310 |
| Assimilator | Fr: 23.8%<br>So: 28.6%<br>Jr: 19.0%<br>Sr: 28.6% | 0.3245 |
| Diverger | Fr: 45.5%<br>So: 22.7%<br>Jr: 22.7%<br>Sr: 9.1% | 0.1788 |

There also exists a significant relationship between classification and *abstract conceptualization* as well as between classification and *active experimentation*. (*Table 3*)

**Table 3:** ANOVA comparison of student classification to Kolb's 4 learning cycles. Significant at $p < 0.05$

| Analysis of Variance | | |
|---|---|---|
| **Dependent Variable** | **P value** | **Pairwise comparisons for classification** |
| Concrete Experiencing (CE) | 0.5729 | No significance |
| Active Experimentation (AE) | 0.0383* | Significant for juniors > seniors |
| Abstract Conceptualizing (AC) | 0.0007* | Significant for seniors > freshman, sophomore, and juniors |
| Reflective Observation (RO) | 0.0533 | No significance |

There was no significant correlation between learning style and gender. Pearson Correlation was run on the 4 cycles of learning. It was discovered there is a negative correlation between the following cycles: concrete

experiencing and reflective observation, between concrete experiencing and abstract conceptualizing, between reflective observation and abstract conceptualizing, between abstract conceptualizing and active experimentation, and between concrete experiencing and active experimentation.

**Discussion**

Respiratory care students at Texas State seem to have a preference to the converger learning style. The students at the junior level seem to prefer this style of learning compared to the freshman, sophomore, and senior students. This fact is consistent with the data from the analysis of variance. This test statistic demonstrated that the junior level students are at the active experimentation cycle of learning. This is consistent with the type of learning the juniors are experiencing in the respiratory care program. These students learn to utilize critical thinking skills when assessing and treating patients. The senior level students appear to cluster into the abstract conceptualization portion of the learning cycle. This stage characterizes the student as learning by thinking or analyzing problems.[1] This cycle also contains the converger learning style and is consistent with the level of learning the seniors are experiencing in the program. The freshman and sophomore students have not developed a preferred learning style as a group.

**Conclusions**

The learning preferences indicate at which level each individual relies on a particular style to process and comprehend information.[1] Respiratory therapy students, prior to their upper division course work, do not fit into a particular learning style. This indicates that faculty must employ a variety of teaching techniques to affectively reach all students. If curriculum and course work are not developed to incorporate all stages of learning then many of our students might struggle.[11] The student must also become a self-advocate in their learning process. He/she will need to identify the academic strengths and weaknesses they possess. The educator can assist the student in this process by administering the Kolb LSI periodically throughout enrollment in the program. This will allow the student to determine if their learning style has changed. It will also reveal to the students and faculty where they are situated in the learning cycle. The junior and senior level students seem to conform to a style or cycle of learning that involves thinking. This is an important quality to possess prior to attempting their board exams. Equally, this style of learning is very important to possess when working in a dynamic environment such as the intensive care unit of the hospital. Upper level course work should incorporate a style of teaching that focuses on critical thinking skills. By matching the teaching style with the student's preferred learning style, material retention should improve, thus improving board exam scores. Faculty should assess preferred learning styles throughout the students' enrollment in the program.

Kolb's research on learning styles and other professions has been quite extensive. Accommodating included professions such as management, marketing, and public finance.[1] Diverging included professions such as nursing, social work, and psychology.[1] Converging included professions such as engineers, computer science, and medical technology.[1] Assimilating included such professions as biology, mathematics, and the physical sciences.[1] The study performed by Campeau demonstrated a preference toward the converging style for emergency medical care assistants.[6] The work of ambulance personnel involves rapid decision-making and problem-solving.[6] This type of work appears to be appealing with a learner who prefers the converging style. Farina assessed the learning style among physical therapy students found a preference for the converging and assimilating styles. No statistical information was provided in the article.

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