

**Evaluating the Scope of Learning Style Instruments Used in Studies
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Abstract

The purpose of this study was to determine the most commonly used learning style instruments within the field of agricultural education. Learning styles is a generic concept that frequently includes cognitive styles, personality styles, learning styles, sensory modes, and typologies like those associated with the work of Carl Jung. This paper seeks to describe the predominant instruments applied in the field of agricultural education and the purposes for which these instruments are used.

The primary agricultural education research journal (*Journal of Agricultural Education*) was evaluated for the purpose of the study. Articles were selected from the fourteen-year period from 1988-2002 and evaluated using procedures established by the researchers. Using the keywords, "learning styles," a total of 248 articles published in the 14 volumes of the Journal of Agricultural Education (JAE) were selected for examination. Of these 249 articles, 29 met the criteria set by the researchers for inclusion. It was determined that the most frequently used learning style instrument by researchers was the Group Embedded Figures Test (GEFT). More than half of the studies employed a descriptive design. The populations studied consisted primarily of college students with limited high school populations. This paper is intended to aid other researchers in identifying the most appropriate instrument for use in studying learning styles within the field of agricultural education.

Introduction/Theoretical Background

Learning styles is a generic concept that frequently includes cognitive styles, personality styles, learning styles, sensory modes, and typologies like those associated with the work of Carl Jung. Messick defines learning styles as “information processing habits representing the learner’s typical mode of perceiving, thinking, problem-solving, and remembering” (1970, p. 188). Learning style may be determined to provide guidance to a student who is struggling academically or to modify delivery methods to better suit the diversity of learning styles in a typical classroom to ensure student learning.

Lemire (1996) postulates that students’ learning styles are comprised of three categories. Learning style or modality describes how information enters the brain: visually, aurally, or tactically. Cognitive style refers to how the information is processed once the information gets to the brain. Finally, personality style refers to the primary characteristics of the individuals that are expressed in general ways through the personality.

Curry (1987) notes that learning involves more than one dimension. She suggests four levels that she represents as analogous to the layers of an onion. At the core of the onion are the personality traits of the learner. These traits are the most stable of the learning style levels. The second layer represents the information processing levels that include how information is received (modes) and how it is processed (cognitive). The third layer focuses on social interaction; how students act and relate in the classroom. The fourth layer deals with the instructional environment and students’ preferences for how they receive instruction. All levels are intertwined to create a picture of how a particular student learns. Curry states that the use of only one psychometric instrument to evaluate learning style only provides a glimpse of a student’s learning style. She recommends using at least three psychometrically reliable instruments to triangulate the various levels of learning style according to her model.

Various learning style instruments are available for use by teachers and researchers in the pursuit of understanding how students learn. There are modality models, cognitive models, and personality models. The following review will introduce major categories associated with learning styles and provide examples of instruments that measure the characteristics within each.

Learning Style/Modality Models

The learning style or modality model, which has its roots in neuro-linguistic programming (Lemire, 2001), argues that each person develops a model of the world based on how they receive sensory information: visually, aurally, or haptically (kinesthetic-tactile). Visual learners prefer to receive information via charts, maps, pictures, and diagrams. Aural learners prefer to hear their information in the form of lectures, tutorials, or discussions with other students. The Learning Channel Preference Test (LCPT) (O’Brien, 1989) is one tool frequently used to assess students’ preferred learning mode. Students taking the LCPT self-rate themselves by responding to 36 statements relating to how they prefer to receive

information. An additional instrument is the Learning Style Profile (LSP) that measures as one of its' facets learning modality (Keefe & Monk, 1988).

Cognitive Models

Cognitive models describe how people process information. Pask (1988) describes students as either holistic (global) or serial (sequential) learners. Serial learners prefer to engage in learning through a series of logical steps from beginning to end, building to the big picture. In contrast, holistic learners prefer to see the "big picture" first and then link the smaller parts into the overall framework. Felder's Index of Learning Styles (ILS) (Felder, 1993) includes a scale to determine if a student is a global or sequential learner. This model also includes scales that assess whether students are sensing or intuitive learners, visual or verbal learners, and active or reflective learners. These latter scales are based on the works of Carl Jung and David Kolb.

Kolb's Experiential Learning Model (ELM) (1985) draws heavily on the works of Dewey and Piaget. Dewey (1938) wrote that learning should be grounded in experience and active in nature. Piaget (1952) believed that learning best occurred through the student's interaction with the environment. Kolb describes learning as a four-step process. Learners first involve themselves in a *concrete learning experience* and then, reflect on that experience from several perspectives. From this reflection, they develop an *abstract conceptualization*, creating generalizations or principles. Students then test these general principles in new situations through *active experimentation*. Kolb developed the *Learning Styles Inventory* (LSI) (Kolb, 1985) to assess students' learning styles. The LSI identifies students as divergers, convergers, assimilators, or accommodators.

Anthony Gregorc (1982) developed a model focusing on the cognitive aspects of Kolb's ELM. The *Gregorc Style Delineator* is an inventory that plots a student's position on two intersecting continuums, using self-descriptive words that students rank order. The first is a perceiving continuum ranging from concrete to abstract. The second is an ordering continuum ranging from sequential to random. The intersection of these two continua identify a learner as concrete sequential (CS), abstract sequential (AS), abstract random (AR), or concrete random (CR) (Terry, 2002).

Personality Models

One of the most well researched models for examining personality styles is the Witkin (Witken & Goodenough, 1981) model. This model uses the *Group Embedded Figures Test* (GEFT) to differentiate students as either field dependent or field independent. Students are asked to identify a simple figure embedded within a more complex figure. Field dependent learners are described as students who are influenced by the surrounding environment and interpret new information in the context in which it occurs. Field independent learners can look at a whole picture and isolate individual pieces.

Another well-known personality inventory is the Meyers-Briggs Type Indicator (MBTI) (Claxton & Murrell, 1987) which consists of four dichotomous scales: introversion versus extroversion (I-E), thinking versus feeling (T-F), sensing versus intuiting (S-N), and judging versus perception (J-P). The result is sixteen possible personality types. It is believed that these preferences are developed early in life and change very little through adulthood. Claxton and Murrell note that the MBTI is a very complex instrument with high face validity and reliability.

Instrument Reliability

Debate has long surrounded the assessment of student learning styles. Curry (1990) cites three basic problems associated with the use of learning style inventories: (1) confusion in definitions of learning styles, (2) weaknesses in reliability and validity, and (3) the identification of relevant characteristics in instructional settings, or aptitude-treatment interactions.

Psychometrics is the scientific field of constructing and validating psychological tests (Hoffman, 2002). One of Curry's criticisms of learning style assessment is that many of the instruments used are psychometrically weak. Tuckman states that "test reliability means that a test gives consistent measurements." He further describes the validity of an instrument as "the extent to which the instrument measures what it purports to measure" (1999, p. 200). Many of the learning style instruments currently in use, including Dunn, Dunn, and Price's Learning Style Inventory (Blixt and Jones, 1995), have been criticized for lack of data supporting their reliability and validity.

Purpose and Objectives

The purpose of this study was to determine the most frequently used learning style instruments in the field of agricultural education and the direction that research in the field has taken. Specific objectives of the study were as follows:

1. determine the most frequently used learning style instruments in studies reported in the *Journal of Agricultural Education* (JAE),
2. describe the populations studied, and
3. identify the types of studies conducted.

Methodology

This study used a descriptive design. The primary agricultural education research journal, *Journal of Agricultural Education* (JAE), was evaluated for the purpose of the study. Fourteen volumes of the JAE (1988-2002) were selected for analysis. Using the keywords "learning styles," a total of 249 articles published in the 14 volumes of the JAE were selected for examination. Inclusion in the study required the use of a learning style instrument to measure the learning styles of students. Those studies that mentioned learning styles in the literature review or referred to learning style instruments, but did not employ one were not

included. Of the 249 articles examined, 29 articles met the criteria set by the researchers for inclusion. Articles included in this study used one or more instruments to assess some aspect of the learning styles of their participants. The studies selected for inclusion examined relationships between students' learning styles and achievement or learning style and teaching style.

The researchers collected specific data from each article that was selected for inclusion in the study. The data included ten categories of information: article number, year, study design, instrument used, instrument characteristics, instrument reliability, sample size, comparisons made in the study, variables measured, and type of population.

The researchers then examined all articles included in the time period and extracted data from the articles selected for inclusion. Each article was reviewed and appropriate data was recorded in a chart. Data were analyzed using frequencies and percentages.

Findings

The fourteen JAE volumes reviewed in the study included 249 articles containing references to "learning styles." Of this number, 29 articles were classified as measuring learning styles using a learning style instrument. Table 1 provides a summary of the learning style instruments used in the studies examined. Of the instruments used, the most prominent (64.7%) was the "Group Embedded Figures Test." The Meyers-Briggs Type Indicator was a distant second at five studies (17.2%). Six of the twenty-nine (20.6%) studies used more than one instrument. This finding supports information collected in the review of literature that revealed both of these instruments as common in the study of learning styles.

Table 1.

Summary of Learning Styles Instruments Used in Journal of Agricultural Education Articles, 1988-2002 (n=34).

<i>Instrument</i>	Category ^a	n	%
Group Embedded Figures Test (GEFT)	P	22	64.7
Myers Briggs Type Indicator (MBTI)	P	5	14.7
Learning Style Profile (LSP)	C M I	2	5.9
Author's Instrument	L	2	5.9
Individual Learning Preference (ILP)	P	1	2.9
Learning Style Inventory (LSI)	C	1	2.9
Secondary Learning Style Inventory (SLSI)	C	1	2.9

^a P = Personality, C = Cognitive, M = Modality, I = Instructional Preference, L = Learning Strategies

Note: 6 (21%) of the 29 studies used more than 1 instrument.

Evaluation of the individual studies reveals that more than 75% used the Group Embedded Figures Test (GEFT), either alone (58.9%) or in combination with an additional instrument (17.2%). See Table 2 for a summary of the instruments used for each study evaluated. While the Van Tilburg/Heimlich Teaching Style Preference instrument is not

listed as one of the instruments since it measures teaching styles and not learning styles, it is important to note that four of the studies used the instrument in conjunction with the learning styles instruments listed.

Table 2.

Summary of Studies using Learning Styles Instruments in Journal of Agricultural Education Articles, 1988-2002 – Combination of Multiple Instruments (n=29).

<i>Instrument Combination</i>	Category ^a	n	%
Group Embedded Figures Test (GEFT)	P	17	58.9
Group Embedded Figures Test (GEFT) & Myers Briggs Type Indicator (MBTI)	P	3	10.3
Group Embedded Figures Test (GEFT) & Author's Instrument	P, L	2	6.9
Learning Style Profile (LSP)	C, M, I	2	6.9
Individual Learning Preference (ILP)	P	1	3.4
Learning Style Inventory (LSI)	C	1	3.4
Myers Briggs Type Indicator (MBTI)	P	1	3.4
Myers Briggs Type Indicator (MBTI) & Author's Instrument	P, L	1	3.4
Secondary Learning Style Inventory (SLSI)	C	1	3.4

^a P = Personality, C = Cognitive, M = Modality, I = Instructional Preference, L = Learning Strategies

More than 76% (22 out of 29) of the studies examined used instruments that assessed learning styles from the perspective of personality characteristics and did not include other dimensions of learning. Two studies used an instrument (LSP) that assessed learning styles across multiple categories.

Of the 29 studies examined, three of the studies used an author's instrument component that measured learning styles. While many studies reported using an author's instrument, only studies that used instruments measuring learning styles were included in the list of instruments. For example, author's instruments that merely collected data describing the participants, such as gender and age, were not included as learning style instruments. Research designs employed in the studies were predominantly descriptive and correlational (see Table 3) and the populations studied were primarily college students (see Table 4).

Table 3.

Research Designs Reported in Studies using Learning Styles Instruments in Journal of Agricultural Education Articles, 1988-2002 (n=29).

Design	n	%
Descriptive	16	55.2
Correlational	9	31.0
Experimental	3	10.3
Quasi-Experimental	1	3.4

Table 4.

Populations Studied Using Learning Style Instruments in Journal of Agricultural Education Articles, 1988-2002 (n=30).

Populations Studied	n	%
Undergraduate Students	13	43.0
Pre-Service Teachers	6	20.0
High School Students *	6	20.0
Teachers	3	10.0
Graduate Students	1	3.3
4-H Members	1	3.3

* Note: One study included both teachers and high school students. A second study used both undergraduate and high school students taking an online biology course.

Conclusions

The overall purpose of the study was to examine research being conducted on student learning styles in the field of agricultural education and determine the most commonly used learning style instruments. The goal was to provide a snapshot of past research that can assist in guiding future research. Based on the findings presented, it can be concluded that certain instruments are used more frequently than others. Specifically, the GEFT is used by the majority of researchers (76%). As revealed in the literature, the GEFT is an instrument with a personality model and is used to differentiate students as either field dependent or field independent. Given that the study of learning styles includes not only personality models, but also cognitive and modality models, one can conclude that by examining only one facet of student learning styles, these studies have made a limited contribution to the understanding of learning styles and their effects on student achievement.

It can be further concluded that college students have been studied much more frequently (20 out of 29) than high school audiences. It is possible that the paperwork required by the Institutional Review Board to study minors may in fact discourage studies focused on high school populations.

Instruments used most often in the *Journal of Agricultural Education* suggest two trends. Almost without exception, a well-documented instrument was used in conducting research related to learning styles. However, given the literature related to the instruments available and the questions surrounding certain instruments, one can conclude that researchers should consider including other instruments, such as the Gregorc Style Delineator or Kolb's Learning Styles Inventory, in their research.

Implications and Recommendations

Results from this study illustrate implications for both teachers and researchers interested in studying learning styles. In relation to the use of instruments, this study points out that certain instruments are more commonly used than other instruments in the field of agricultural education even though the literature surrounding learning styles encourages the use of multiple instruments to triangulate findings. It is important for researchers to select instruments based on reliability and validity and care should be taken not to "use an instrument just because it has always been used.

Both the GEFT and the MBTI fall into the "personality" category of learning style instruments (Lemire, 1996), however, both Lemire and Curry argue that student learning involves more than personality. Given that the majority of the studies used either the GEFT or the MBTI instrument, it is recommended that researchers consider instruments or combinations of instruments that address multiple learning style categories. For example, the Felder and Silverman instrument, the Index of Learning Styles (Felder, 1993), combines three facets of learning styles: personality, learning modality, and cognitive processing. This instrument allows a multi-modal approach. Recent studies (Zywno, 2003 and Livesay, et al., 2002) have found that the validity and reliability of the ILS meets acceptable standards, but further testing is required. Closer inspection of instruments such as the ILS is needed to advance the study of learning styles in the field.

Additional research is recommended to look further into actual reasons that authors use particular instruments. Because many authors chose to use the GEFT, the question arises as to "why." Reasons such as familiarity, convenience, and cost can only be hypothesized. Further research into this area may reveal the need for training in the area of studying learning styles or possibly the need for the development of an instrument that more closely meets the needs of agricultural education while taking into consideration the facts surrounding the measurement of learning styles.

This study has generated more questions than answers in the pursuit of understanding the measurement of learning styles within the field of agricultural education. While the number and type of instruments used to measure learning styles has been identified, the need to identify the most effective methodology possible for the field is yet to be determined.

References

- Blixt, S. & Jones J. (1995). Review of the Learning preference inventory. *The eleventh mental measurement yearbook*. Lincoln: University of Nebraska Press.
- Curry, L. (1987). *Integrating concepts of cognitive or learning style: A review with attention to psychometric standards*. Ottawa, Ontario, Canada: Canadian College of Health Service Executives.
- Curry, L. (1990). A critique of research on learning styles. *Educational Leadership*, 56(2), 50-56.
- Claxton, C.S. & Murrell, P.H. (1987). Learning styles: implications for improving educational practices. *ASHE-ERIC Higher Education Reports*. College Station, TX: Association for the Study of Higher Education.
- Dewey, J. (1938). *Experience and education*. New York: Macmillan.
- Felder, R. M. (1993). Reaching the second tier: Learning and teaching styles in college science education. *Journal of College Science Teaching*, 23(5), 286-290.
- Gregorc, A.F. (1982). *Gregorc Style Delineator*. Maynard, MA: Gabriel Systems.
- Hoffman, E. (2002). *Psychological testing at work*. New York: McGraw-Hill.
- Keefe, J. & Monk, J. (1988). *Learning style profile examiner's manual*. Reston, VA: National Association of Secondary School Principles.
- Kolb, D.A. (1985). *Learning-style inventory: Self-scoring inventory and interpretation booklet*. Boston: McBer & Company.
- Lemire, D. (1996). *Using learning styles in education: research and problems*. *Journal of Accelerated learning and teaching*, 21(1&2), 45-58.
- Lemire, D. (2001). An introduction to learning styles for college teachers. *Journal of College Reading and Learning*, 32(1), 86-92.
- Livesay, G., Dee, K., Felder, R., Hites, L., Nauman, E. & O'Neal, E. (2002). Statistical evaluation of the Index of Learning Styles, Proceedings of the ASEE Annual Conference and Exposition, Montreal, Quebec, Canada.
- Messick, S. (1970). The criterion problem in the evaluation of instruction: Assessing possible, not just intended, outcomes. In W.C. Wittrock and D.E. Wiley (*Eds.), *The evaluation of instruction: Issues and problems*. New York, NY: Holt, Rinehart, & Winston.

- O'Brien, L. (1989). Learning styles: Make the student aware. *NASSP*, 73. 85-89.
- Pask, G. (1988). Learning strategies, teaching strategies, and conceptual or learning style. In Schmeck, R., Ed., *Learning Strategies and Learning Styles*. New York: Plenum Press.
- Piaget, J. (1952). *Judgment and reasoning in the child*. New York: Humanities Press.
- Terry, M. (2002). Translating learning style theory into developmental education practice: An article based on Gregorc's cognitive learning styles. *Journal of College Reading and Learning*, 32(2). 154-176.
- Tuckman, B.W. (1999). *Conducting educational research*. Fifth edition. Fort Worth, TX: Harcourt Brace College Publishers.
- Witkin, H.A. & Goodenough, D. (1981). *Cognitive styles: Essence and origins*. New York. International Universities Press.
- Zywno, M.S. (2003). A contribution to validation of score meaning for Felder-Soloman's index of learning styles. Proceedings of the American Society for Engineering Education Annual Conference & Exposition. June 2003, Nashville, TN. Retrieved May 15, 2003 from http://www.ncsu.edu/felder-public/ILSdir/Zywno_Validation_Study.pdf.