

1-2009

How Do Management Students Prefer to Learn? Why Should We Care?

Ednilson Bernardes

Georgia Southern University, ebernardes@georgiasouthern.edu

Mark Hanna

Georgia Southern University, hannamd@georgiasouthern.edu

Recommended Citation

Bernardes, Ednilson and Hanna, Mark (2009) "How Do Management Students Prefer to Learn? Why Should We Care?," *International Journal for the Scholarship of Teaching and Learning*: Vol. 3: No. 1, Article 21.

Available at: <https://doi.org/10.20429/ijstl.2009.030121>

How Do Management Students Prefer to Learn? Why Should We Care?

Abstract

This paper reports the findings of a study of the learning styles of students in the operations management class at a regional comprehensive university in southeastern United States. Extant learning styles are found to be highly diverse and differ by student gender. However, in contrast to at least one prior study, the learning styles of our respondents did not differ by student major. Five areas of opportunity for future research arising from the results of this study are identified in the paper's conclusion.

Keywords

Learning styles, Management, Sensory approach, Instruction, VARK

How Do Management Students Prefer to Learn? Why Should We Care?

Ednilson Bernardes Georgia
Southern University Statesboro,
Georgia, USA
ebarnardes@georgiasouthern.edu

Mark Hanna
Georgia Southern University
Statesboro, Georgia, USA
hannamd@georgiasouthern.edu

Abstract

This paper reports the findings of a study of the learning styles of students in the operations management class at a regional comprehensive university in southeastern United States. Extant learning styles are found to be highly diverse and differ by student gender. However, in contrast to at least one prior study, the learning styles of our respondents did not differ by student major. Five areas of opportunity for future research arising from the results of this study are identified in the paper's conclusion.

Key words: learning styles, management, sensory approach, instruction, VARK

Introduction

Today's university population is not only culturally but also generationally diverse. Academic institutions of higher learning have increasingly incorporated in their institutional missions, and recruitment efforts, a commitment to attract a more diverse pool of students. This direction aims at enriching the learning environment and improving the outcomes of the learning experience. However, it has been pointed out that today's students have changed radically from previous generations (Prenski 2001a, Ward 2007). They represent the first generation to grow up in an environment permeated by digital technology, which may have an effect on how they learn (Prenski 2001b). Concurrently, the trend towards life-long learning has brought older students back to the classrooms. Jointly, these trends in diversity pose challenges for instruction delivery.

As cultural and generational diversity in the higher learning settings continue to grow, more traditional instructional strategies may need to be revised. For instance, Jarvis (2002) points out that teaching method will have to be adapted to a more heterogeneous body of students. Among the first steps to facilitate learning among an increasingly diverse group of students is the understanding of their learning behavior. For instance, Kolb (1984) indicates that different students naturally present a preference towards a certain learning style. Additionally, it has been pointed out that learning style is one of the sources of differences in the student's learning performance in structured educational environments (Kaplan and Kies 1995, Rosenfeld and Rosenfeld 2004). Likewise, it has been suggested that mismatches between instruction strategy and learning styles of a more heterogeneous body of students is connected to drop-out rates (Evans and Waring 2006). This is particularly consequential given the current efforts of universities towards retention and progression. Admittedly, learning styles are not the only factors to have implications for learning

outcome; however, the literature suggests that it is a very important factor. In addition, as suggested by Hawk and Shah (2007), it is likely that many faculty in higher education are unfamiliar with learning style models and their potential to inform and enhance the learning processes in the classroom. Therefore, understanding the learning styles of a more heterogeneous body of operations management students should constitute an initial step in improving learning outcomes in that class.

There are various approaches to learning style in the literature (Briggs 1994). This exploratory study adopts the perceptual (sensory) approach to learning styles (i.e., the physical senses favored by learners as they gather and assimilate new information) to investigate the learning styles of students taking operations management classes in a regional comprehensive university in southeastern U. S. A. Additionally, it examines possible relationships between selected demographic variables suggested to be relevant by previous studies in other settings and learning style. Finally, because understanding how contemporary management students learn is a major aspect of selecting appropriate and inclusive teaching strategies, this study identifies opportunities for a wide range of future research regarding learning style, teaching approach, and student outcomes.

Learning Styles

Although the concept of learning style is not universally accepted, and other bodies of literature have contributed additional factors to the understanding of learning, the extant literature on learning styles can assist instruction by offering a simple, unequivocal and consistent view of learning style differences and their effects (Felder and Brent, 2005). In this regard, the application of insights derived from this body of literature to instruction seems to continue to prove fruitful (e.g., Bloom, 2008). Therefore, we deemed this approach appropriate for the exploratory character of this study and for the context of university level undergraduate management classroom. In this section, we briefly present the concepts and major notions underlying the learning style approach that are important for our study and indicate references for further information where appropriate.

Learning style is typically described as a particular mode according to which an individual learns and thinks, a preferred means of acquiring knowledge, and habits and strategies associated with learning (Pritchard 2005). Honey and Mumford (1992) define learning style as a description of the attitudes and behaviors which determine an individual's preferred way of learning. Keefe (1987) defines learning styles as the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment. Stewart and Felicetti (1992) define learning styles as those educational conditions under which a student is most likely to learn. Although slightly different, these definitions share the common underlying attempt to tap into how (modes and processes) students prefer to learn rather than what (content) they learn.

Felder and Silverman (1988) suggest that a learning style framework be used to locate students on a number of scales pertaining to how they receive and process information. The very notion of learning is defined and conceptualized in the literature differently by different authors. These competing ideas about learning have led to diverse theoretical frameworks and terminology in learning styles research (for a conceptual review and classification see Briggs 1994, Messick 1994, Murray-Harvey 1994, Rayner and Riding 1997; Sternberg and Grigorenko 1997; for a contemporary review of learning style instruments see Hawk and

Shah, 2007). These various frameworks fall into three general categories that represent schemes to focus on the learner: 1) information processing, which tend to employ various tests to pinpoint differences in cognition and perception; 2) personality patterns, which deals with the effects of environment and socialization, and 3) perceptual modality, which addresses biologically based reactions to the physical environment. Collectively, these various frameworks provide approaches for thinking about diverse learning styles in a classroom and they are somewhat intertwined. They provide additional perspectives for explaining and understanding a learner's dominant thinking and learning style. In this paper, we adopt the perceptual approach to learning style to investigate student's preferences.

Bruner (1967) and Piaget (1990) describe how humans in general assimilate knowledge about their environment through three sensory modalities: visual, auditory, and kinesthetic. Likewise, college students use these three main sensory receivers to assimilate knowledge. Auditory learning occurs through hearing the spoken word. Auditory or aural students best remember information that they hear, so they may talk to themselves, move their lips as they read or simply read out loud. Students that present this style as dominant modality may have difficulty with reading and writing tasks. Kinesthetic learning takes place by doing and interacting. It involves the stimulation of nerves in the body's muscles, joints and tendons. It has two sub channels: kinesthetic (movement) and tactile (touch). Students that present this modality tend to lose concentration in the absence of movement or external stimulation. Visual learning takes place by looking at images, mental maps, demonstrations and body language. It also has two sub channels: linguistic and spatial. Students that are predominantly visual-linguistics learn through reading and writing activities. They might even write down words given to them orally, so they can learn from reading the words from the paper. Those that are visual-spatial often have difficulties with the written language; Visual imagery plays a major role in the student's learning process; as such, they perform better with charts, demonstrations, videos and other visual resources. A visual-spatial student learns all at once (holistically) rather than in a step-by-step fashion: they are whole-part learners that need to see the big picture first before delving into the details. Linear sequential thinking is very challenging to visual-spatial students.

According to the sensory approach, one of the receiving modalities is typically dominant, while multi-modality describes learners who have more than one strong learning preference. Fleming and Mills (1992) expanded the three broad traditional sensory modes described above to include "reading and writing" as an additional (separate) modality and developed the VARK instrument (Fleming 1995). The acronym VARK stands for visual, aural, reading/writing and kinesthetic modalities, respectively. This approach is relatively simple and easy to implement.

Independent of the theoretical approach adopted, life and past educational experiences and ongoing demands influence learning style (Kolb 1984, Dunn 1993, Manner 2001), which may change over time (Dunn 1993). However, during a period in which an individual exhibits a dominant learning preference, that person will achieve most easily when instructed with strategies and resources akin to that preference (Fleming 1995, Diaz and Cartnar 1999). In fact, the literature indicates that a match between learning style preferences and instruction strategy is associated with student's higher achievement (Garcia-Otera and Teddlie 1992, Miller 1998, Rochford 2004, Mangino and Griggs 2006). Also, some demographic characteristics have been shown to influence student learning style. For instance, Wehrwein et al. (2007) found that male and female physiology students have significantly different learning styles. Similarly, Biberman et al. (1986) found

significant differences in learning styles within the area of management. Importantly, one learning modality is neither preferable nor inferior to another, but simply different (Felder and Brent 2005). In fact, Felder and Brent (2005) points out that the most important application of learning styles is to assist instructors design a balanced teaching approach that addresses the learning needs of all of their students. He further adds that assessing the learning profile of a class without being overly concerned about *which* students have *which* preferences can provide additional support for effective instructional design.

In closing this section, it is important to remark that learning styles literature focus on a specific aspect and limited range of factors determining how learners react to learning opportunities. So, as with any given theory, a particular learning style approach is necessarily a simplification of the complexity of student learning. In this way, it does not take into account other factors such as environment, culture, teaching methods, and social norms.

Method

In the Spring of 2008, a paper version of the VARK instrument was distributed to all students attending the various sections of the undergraduate operations management class at the College of Business Administration of Georgia Southern University. The procedure for data collection followed the approved Institutional Review Board standards to assure that participation in the study was voluntary and that anonymity would be preserved. Consent to participate was indicated by the student's decision to fill out the questionnaire as was clarified in the instrument cover. At the beginning of each class, the researcher explained the purpose of the study and the procedure, leaving the class afterwards. The students returned the questionnaires to an envelope that was sealed by the class instructor and handed over to the researchers after the class ended. Data collection was performed over a 1-week period, during which each operations management class in that semester was visited once. The total number of respondents was 208 and the response rate was 98%.

We selected the VARK instrument because it was simple, concise, accessible, financially affordable and easy for students to complete. The instrument is comprised of 16 multiple choice questions with four items each corresponding to the four sensory modalities. A respondent could select anywhere from zero to four response choices in a question depending on the items s/he felt were applicable. The VARK instrument was scored using the proprietary algorithm developed by Fleming (1995).

In light of the exploratory and descriptive nature of the study, descriptive measures were computed to examine the learning style preferences. Analysis of the data was carried out using SPSS and focused on the participant's demographic characteristics and their responses to the VARK instrument. The analysis was performed by obtaining descriptive statistics, frequencies and percentages for sample characteristics and for student's response to the VARK instrument. The data is reported as percentages of students in each category of learning style preference. Chi-square analyses at 95% confidence level were conducted to investigate differences between learning styles and two demographic variables chosen for this study: gender and professional preference (which was captured by the variable declared or intended major concentration). These demographics were chosen based on findings from past studies carried out in different settings (e.g., Wehrwein et al. 2007; Slater, 2007).

Analysis and Discussion

The total number of student responses was tallied for each of the four sensory modalities (V, A, R, K) and for all possible combinations of the modalities (e.g., VA, VAR, VARK, etc.). Table 1 separates and identifies the percentages for the dominant unimodal and for the multiple learning modalities for male and female students. A total of 36.1% of the students were found to have a dominant unimodal sensory learning style. From this group, 2.4% were found to be visual, an equal percentage of 10.1% each presented aural and reading/writing styles, and 13.5% were kinesthetic. A total of 63.94% of students presented multiple sensory modalities (bi-modal, tri-modal and quad-modal). There were no gender differences in the percentages of male and female students who presented unimodal or multiple modes of sensory preferences $\chi^2(1, n = 208) = .23, p\text{-value} = .6$. For the aggregate sample of students, the visual modality was found to be the least frequent, while multiple modalities were the most common. These results immediately indicate the diversity in learning preferences exhibited by the students in our sample.

Table 1. Cross tabulation of learning preferences of male and female students

		Learning Preferences of Male and Female Students							
		V	A	R	K	Bi mode	Tri Mode	MM	Total
Female	% within Gender	1.3%	10.5%	14.5%	11.8%	13.2%	9.2%	39.5%	100.0%
	% of Total	.5%	3.8%	5.3%	4.3%	4.8%	3.4%	14.4%	36.5%
Male	% within Gender	3.0%	9.8%	7.6%	14.4%	22.7%	14.4%	28.0%	100.0%
	% of Total	1.9%	6.2%	4.8%	9.1%	14.4%	9.1%	17.8%	63.5%
Total	% total	2.4%	10.1%	10.1%	13.5%	19.2%	12.5%	32.2%	100.0%

A total of 19.2% of the students were found to favor two (4.8% female vs. 14.4% male) learning styles, 12.5% were found to prefer a combination of three learning styles (3.4% female vs. 9.1% male), and 32.2% were found to be quad-modal (14.4% female vs. 17.8% male). Among the male students, 34.8% were found to be unimodal, while 65.2% were found to favor a combination of two or more learning modalities. Among the female students, 13.9% were found to be unimodal, while 86.1% were found to prefer a combination of two or more sensory modalities. Thus there was a gender difference in the percentages of male and female students who preferred bi, tri or quad modal styles, $\chi^2(4, n = 208) = 7.8, p\text{-value} = .01$. Female students were significantly less likely than male students to prefer a unimodal learning style. Conversely, male students were significantly less likely than female students to prefer a multimodal learning style.

Table 2 shows the percentages of the combinations of specific multiple learning styles. For the bi-modal female students, the most frequent combination was the aural and kinesthetic (3.9%), while the other combinations were equally represented (2.6% each). For the bi-modal male students, the most frequent combination was also the aural and kinesthetic (10.6%), followed by aural and reading/writing (4.5%). For both male and female tri-modal students, the combination aural, kinesthetic and reading/writing were found to be the most

frequent (5.3% for female vs. 6.1% male). Interestingly, the combination visual/aural/kinesthetic was not represented in the female population. However, there was no significant difference between proportions of female compared to male students in the specific multiple modes preferences, $\chi^2(13, n = 208) = 13.77, p\text{-value} = .4$. A total of 38.2% of female students were found to be quad-modal, while 24.2% of male students were found to be quad-modal, exhibiting no dominant preference for any of the unimodal styles. The frequency of combinations containing a particular mode was relatively similar for all modalities (43.7% contained V, 55.2% contained A, 46.6% contained R and 55.8% contained K).

Table 2. Cross tabulation of specific multiple learning styles combination by gender

		Multiple Learning Preferences of Male and female Students									
		VARK	VAK	VAR	VRK	ARK	VA	VK	AK	AR	RK
Female	% w/in Gender	38.2%	2.6%	.0%	1.3%	5.3%	2.6%	2.6%	3.9%	2.6%	2.6%
	% of Total	13.9%	1.0%	.0%	.5%	1.9%	1.0%	1.0%	1.4%	1.0%	1.0%
Male	% w/in Gender	24.2%	4.5%	3.0%	4.5%	6.1%	2.3%	3.0%	10.6%	4.5%	2.3%
	% of Total	15.4%	2.9%	1.9%	2.9%	3.8%	1.4%	1.9%	6.7%	2.9%	1.4%
Total	% of Total	29.3%	3.8%	1.9%	3.4%	5.8%	2.4%	2.9%	8.2%	3.8%	2.4%

The percentage of female students whose learning style contained the “visual” mode somewhere in their profile (whether as unimodal or contained within one of the multiple mode combinations such as, for instance, VAK or VA) was found to be 48.6%, similar to the male students (44.5%). This modality was the least frequent for both male and female students, while “kinesthetic” was the most frequent for both genders (68.3% for females vs. 69.6% for males). The “aural” modality was also very similar for both male (65%) and female (65.7%) students. Interestingly, the write/read modality was slightly more frequent in the female group of students (64.5%) than in the male students (52.2%).

Table 3 separates and identifies the percentages for the dominant unimodal and for the multiple learning modalities for the various career preferences of the students in the study. For all majors, it was found that most students exhibit multiple learning preferences. These combined learning preferences were more frequent in the accounting (77% of the students) and information systems (75% of the students), while economics were the least frequent (50% of the students). Interestingly, finance, logistics and marketing majors were the only ones to exhibit students that were unimodal visual. The most unimodal kinesthetic were found to be the information systems and finance students. This might be related to the nature of the training on these programs. The students in economics presented the most unimodal read/write style (33.3%), which might be related to the more theoretic nature of the program, followed by management (20.6%). Marketing exhibited the most frequent unimodal aural style (17.6%), while logistics the most visual (5.9%).

Table 3. Cross tabulation of learning styles by professional preference

		Major							
		accounting	economics	finance	Inf. Syst.	logistics	marketing	management	others
V	% within Major	.0%	.0%	2.0%	.0%	4.3%	5.9%	.0%	.0%
	% of Total	.0%	.0%	.5%	.0%	.5%	1.4%	.0%	.0%
A	% within Major	3.7%	.0%	10.0%	.0%	13.0%	17.6%	5.9%	11.1%
	% of Total	.5%	.0%	2.4%	.0%	1.4%	4.3%	1.0%	.5%
R	% within Major	11.1%	33.3%	4.0%	.0%	8.7%	7.8%	20.6%	11.1%
	% of Total	1.4%	1.0%	1.0%	.0%	1.0%	1.9%	3.4%	.5%
K	% within Major	7.4%	16.7%	22.0%	25.0%	13.0%	5.9%	11.8%	22.2%
	% of Total	1.0%	.5%	5.3%	1.0%	1.4%	1.4%	1.9%	1.0%
MM	% within Major	77.8%	50.0%	62.0%	75.0%	60.9%	62.7%	61.8%	55.6%
	% of Total	10.1%	1.4%	14.9%	2.9%	6.7%	15.4%	10.1%	2.4%
% of Total		13.0%	2.9%	24.0%	3.8%	11.1%	24.5%	16.3%	4.3%

A chi-square test for independence was performed to investigate whether an association existed between career preference (measured by declared or intended major) and the categorical variables of single dominant and multimodal learning. We found no evidence of association between career preference and learning preferences, $\chi^2(28, n = 208) = 29.4$, $p\text{-value} = .39$. Interestingly, this finding is in contrast to previous studies, which have found a significant association between learning styles and choice of major. Biberman and Buchanan (1986) found that the learning styles of majors in accounting and economics/finance vary from majors in marketing and management. To more closely replicate Biberman and Buchanan's study we grouped our respondents by into three groups by major: 1) logistics and information systems, 2) marketing and management, and 3) accounting, finance and economics. No statistically significant difference was detected between the three groups, $\chi^2(8, n = 199) = 6.427$, $p\text{-value} = .60$. Neither was there a statistically significant difference between groups 2 and 3, $\chi^2(4, n = 168) = 5.707.4$, $p\text{-value} = .222$. The difference between our results and those of Biberman and Buchanan might be due to any number factors. First, our target population was from a regional comprehensive university and the characteristics of the body of students may differ from other settings such as major research institutions or liberal arts colleges. Second, the characteristics of the students attending college in 2008 differ from previous decades and this may have an impact. Finally, the present study focuses on the sensory aspect of

learning styles, captured by VARK, while Biberman and Buchanan (1986) used the Learning Style Inventory (Kolb et. al 1979). The use of different inventories will capture different aspects of learning style, such as those more cognitive as opposed to sensory, which may also have influenced the findings.

In summary, according to the results of this study, operations management faculty at the University of our Study should encounter a broad variety of learning styles in today's classrooms. The majority of the students should present multiple sensory modalities. However, no one single dominant modality or combination thereof seems to represent a management student. While a larger proportion of male students than female students may be unimodal learners, professional preference as indicated by choice of major does not seem to significantly explain differences in learning style.

Summary and Conclusion

The findings of this study suggest that great variations in learning preferences are likely to co-exist in the management classrooms of comprehensive regional universities. Our analysis indicates that 63.94% of the participants studied prefer learning styles that combine two or more sensory modalities. This preference for multimodal learning is in agreement with studies of medical and dental students (Murphy et al. 2004, Lujan and DiCarlo 2006). However, our results also pointed out that a substantial group of students are unimodal (2.4% verbal, 10.1% aural, 10.1% read/write, and 13.5% kinesthetic). Jointly, these findings have important consequences for instruction in management schools. They suggest that faculty need to recognize and address the wide-ranging variations in learning preferences of what appears to be an increasingly diverse body of students.

Because management classrooms seem to be populated by diverse unimodal learners, faculty trying to accommodate the disparate needs of their students should find it beneficial to adopt a variety of teaching and assessment strategies. This should assist students in achieving a deeper and more meaningful learning experience, while simultaneously developing their learning skills. Furthermore, while matching learning preference and instruction delivery is desirable and beneficial; instruction should also equip students with the skills associated with every learning style (Felder and Brent 2005). These skills will be necessary and invaluable for management students to achieve success and function effectively as professionals. Therefore, by addressing the individual needs of a diverse pool of learners, management faculty will also be assisting students in developing learning skills that are increasingly valued for their professional careers. In effect, faculty will be helping students with unimodal learning styles "learn to learn."

Past research suggests that a match between students' learning style preferences and instruction is associated with student's higher achievement (Garcia and Teddlie 1992, Miller 1998, Rochford 2004, Mangino and Griggs 2006). Therefore, faculty can assist students in maximizing their learning potential and academic achievement by broadening their range of presentation and evaluation. This should also cater to the growing need to address retention and progression of students. For instance, most of the unimodal students in our sample were found to be kinesthetic, so it is possible that they would perform poorly in a classroom where a teacher does not encompass that style in his/her instruction. Such a student might feel discouraged over time and may eventually even abandon or fail the course. It is even possible to speculate that, in the long run, such a student would drop out of college altogether if frequent mismatches occurred. Although there are other variables

that might have an effect in the hypothetical situation just described, the major point remains that faculty can assist students by broadening their range of information delivery modes. Instructional strategies that cater to students' learning preferences should not only make learning more enjoyable, but applying a multi-sensory approach to instruction can also ensure that information is retained through all senses. Thus multi-learning style instruction allows for a variety of entry points into the topic, focuses on students' strengths and should result in a deeper and richer understanding of the material.

Every study has limitations and ours is no exception. However, limitations are also opportunities for future research and that is how we approach the limitations of the present study. First, the learning styles literature focuses on a specific and limited range of factors determining how learners react to learning opportunities. Future studies can incorporate other factors that have been proposed to have a bearing on the complexity of learning, such as: 1) activity, context and culture (e.g., Lave and Wenger, 1991; Brown et al. 1989) and 2) social interaction (e.g., Wertsch et al. 1995; Driscoll 1994; Vygotsky 1978). Second, the VARK instrument identifies one facet of student learning style, i.e., the sensory modality. There are other approaches and instruments available that also attempt to tap into student learning styles. For instance, Honey and Mumford's (1992) Learning Style Questionnaire identifies four learning style categories that represent stages of Kolb's (1984) Experiential Learning Cycle: activist, reflector, theorist and pragmatist. The replication of the current study using the same instrument and alternative instruments might prove useful in better understanding management students. Third, the VARK instrument has not been validated, so caution is necessary in the interpretation of the results of this study. However, this instrument has been used in prior studies to investigate learning in other settings and has proven to be a useful approach to explore learning modality (e.g., Alkhasawneh et al., 2008; Peters, et al. 2008; Baykan and Naçar, 2007; Wehrwein et al. 2007; Slater et al., 2007; Dinakar et al., 2005; Murphy et al., 2004). Finally, we collected data in one point in time from students taking a required course in the management curriculum. Thus, the data represent a cross-sectional view of the student's preferences and does not take into account how and if these preferences change over time or if students who dropped the course had different learning styles than those enrolled at the time of our survey.

Our study suggests at least five areas of opportunity for future research. First, there are additional demographic factors to be explored. Our respondents come from an institution that prides itself on the diversity of its student body. A comparison of our results with those from an institution with a more homogeneous student body would be a useful test of the hypothesis that ethnic diversity increases the diversity in learning styles and complicates the path to effective instruction. Second, the relationships between learning style, instructional strategy and student performance are open to enquiry. For example, if students are placed in groups, how might performance and learning outcomes differ between groups with homogeneity of learning style and those with a diversity of learning styles. Third, relationships between learning style and curriculum structure are of interest. If possible, would it be preferable to create class sections, courses, and/or academic tracks based on learning style, or is the current recommendation to provide multi-modal instruction still the ideal? Fourth, what are the implications for the preparation and development of instructors? To what extent does instructor awareness of student learning style impact course preparation and choice of pedagogies? How much does an overt strategy to reach across all learning styles impact student performance and perceived teaching effectiveness. Fifth, how do students' learning styles change as they advance academically? Many university programs have adopted mission statements indicating their commitment to preparing "life-long learners." While these statements elevate the

importance of “learning to learn”, most student outcome assessments relate to past learning and current student skills and attitudes. Perhaps, one way to document that students are actually learning to learn would be to conduct longitudinal studies that track learning styles of student cohorts over time and/or other studies that contrast the learning styles of students at various stages of an academic program.

References

- Alkhasawneh, I.M, Mrayyan, M.T., Docherty, C., Alashram, S., Yousef, H.Y. (2008). Problem-based learning (PBL): Assessing student’s learning preferences using vark. *Nurse Education Today*, 28(5), 572-579.
- Baykan, Z. and Naçar. (2007). Learning styles of first-year medical students attending Erciyes University in Kayseri, Turkey. *Advances in Physiology Education*, 31(2), 158-160.
- Biberman, G., Buchanan, J. (1986). Learning style and study skills differences across business and other academic majors. *Journal of Education for Business*, 61(7), 303-307.
- Bloom, Adi. (2008). 'Nonsense' method sees the disaffected flourish. *Times Educational Supplement*; 6/27/2008 Issue 4794, p14-15.
- Briggs, J.B. (1994). Approaches to learning: Nature and measurement of. In *The international Encyclopedia of education*, Vol. 1, 319-322, Oxford: Pergamon Press.
- Brown, J.S., Collins, A. and Duguid, S. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32-42.
- Bruner, J.S. (1967). *Toward a theory of instruction*. Cambridge: Harvard University press.
- Diaz, D. and Cartnar, R. (1999). Student’s learning styles in two classes: online distance learning and equivalent on-campus class. *College teaching*, 47(4), 130-135.
- Dinakar, C., Adams, C., Brimer, A., and Silva, M. (2005). Learning preferences of caregivers of asthmatic children. *Journal of Asthma*, 42 (8), 683-687.
- Driscoll, M. P. (1994). *Psychology of Learning for Instruction*. Needham, MA: Allyn and Bacon.
- Dunn, R. (1993). Teaching gifted adolescents through their learning style strengths. In Dunn, R. (Ed). *Teaching and Counseling Gifted and talented Adolescents*, 37-67. Westport: Praeger.
- Evans, C. and Waring, M. (2006). Towards inclusive teacher education: Sensitizing individuals to how they learn. *Educational Psychology*, 26(4), 499-518.
- Felder, RM. and Brent, R. (2005). Understanding student differences. *Journal of Engineering Education*, 94(1), 57-72.
- Felder, RM. And Silverman, L.K. (1988). Learning and teaching styles in engineering education. *Engr Education*, 78(7), 674-681.

Fleming, N.D. (1995). I'm different; not dumb: Modes of presentation (VARK) in the tertiary classroom, in Zelmer, A. (ed) *Research and Development in Higher Education, HERDSA*, 18, 308-313.

Fleming, N.D. and Mills, C. (1992). Helping students understand how they learn. *The teaching professor*, 7(4).

Garcia-Otero, M. and Teddlie, C. (1992). The effect of knowledge of learning style on anxiety and clinical performance of nurse anesthesiology students. *American Association of Nursing Anesthesiology Journal*, 60(3), 257-260.

Hawk, T.F. and Shah, A.J. (2007). Using learning style instruments to enhance student learning. *Decision Sciences Journal of Innovative Education*, 5(1), 1-19.

Honey, P and Mumford, A. (1992). *The manual of learning styles*. Berkshire: Peter Honey Publications.

Jarvis, P. (2002). *The theory and practice of teaching*. London: Kogan Page.

Kaplan, E.J. and Kies, D.A. (1995). Teaching styles and learning styles: Which came first? *Journal of Instructional Psychology*, 22(1), 29-34.

Keefe, J.W. (1987). *Learning style: Theory and practice*. Reston: National Association of Secondary School Principals.

Kolb, D. A. (1984). *Experiential Learning: Experience as the source of learning and development*. New Jersey: Prentice Hall.

Kolb, D., Rubin, A. and Irwin, M. (1979). *Organizational psychology: An experiential approach*. Englewood Cliffs: Prentice Hall.

Lave, J. and Wenger, E. (1990). *Situated Learning: Legitimate Peripheral Participation*. Cambridge, UK: Cambridge University Press.

Lujan, H.L. and DiCarlo, S.E. (2006). First-year medical students prefer multiple learning styles. *Advances in Physiology Education*, 30(1), 13-16.

Mangino, C. and Griggs, S. (2003). Learning styles in higher education. In R. Dunn and S. Griggs (eds) *Synthesis of the Dunn and Dunn learning styles model research: who, what, when, where and so what - the Dunn and Dunn learning styles model and its theoretical cornerstone*. New York: St John's University.

Manner, B.M. (2001). Learning styles and multiple intelligences in students. *Journal of College Science Teaching*, 30(6), 390-394.

Messick, A. (1994). The manner of style: Manifestations of personality in cognition, learning, and teaching. *Educational Psychologist*, 29(3), 121-136.

Miller, J.A. (1998). Enhancement of achievement and attitudes through individualized learning-style presentations of two allied health courses. *Journal of Allied Health*, 27(3), 150-156.

Murphy, R.J., Gray, S.A., Straja, S.R. and Bogert, M.C. (2004). Student learning preferences and teaching implications. *Journal of Dental Education*, 68(8), 859-866.

Murray-Harvey, R. (1994). Learning styles and approaches to learning: Distinguishing between concepts and instruments. *British Journal of Educational Psychology*, 64(3), 373-388.

Peters, D., Jones, G. and Peters, J. (2008). Preferred learning styles in students studying sports-related programmes in higher education in the United Kingdom. *Studies in Higher Education*, 33(2), 155-166.

Piaget, J. (1990). *The child's conception of the world*. New York: Littlefield Adams.

Prensky, M. (2001a). Digital natives, digital immigrants. *On the Horizon*, 9(5), 1-6.

Prensky, M. (2001b). Do they really think differently? *On the horizon*, 9(6), 1-9.

Pritchard, A. (2005). *Ways of learning: Learning theories and learning styles in the classroom*. London: David Fulton.

Rayner, S. and Riding, R. (1997). Towards a categorization of cognitive styles and learning styles. *Educational Psychology*, 17(1-2), 5-27.

Rochford, R. (2004). Improving academic performance and retention among remedial students. *Community College Enterprise*, 10(2), 23-36.

Rosenfeld, M. and Rosenfeld, S. (2004). Developing teacher sensitive to individual learning differences. *Educational Psychology*, 24(4), 465-486.

Slater, J.A., Lujan, H.L. and DiCarlo, S.E. (2007). Does gender influence learning style preferences of first-year medical students? *Advances in Physiology Education*, 31(4), 336-342.

Sternberg, R.J. and Grigorenko, E.L. (1997). Are cognitive styles still in style? *American Psychologist*, 52(7), 700-712.

Stewart, K. L., and Felicetti, L. A. (1992). Learning styles of marketing majors. *Educational Research Quarterly*, 15(2), 15-23.

Vygotsky, L.S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.

Ward, S.P. (2007). The second-century student. *Georgia Southern*, 9(2), 22-27.

Wehrwein, E.A., Lujan, H.L. and DiCarlo, S.E. (2007). Gender differences in learning style preferences among undergraduate physiology students. *Advances in Physiology Education*, 31(2), 153-157.

Wertsch, J.V., and Sohmer, R. (1995). Vygotsky on learning and development. *Human Development*, 38, 332-37.